
 BHEL Tenders		Government eProcurement System			
Tender Details				Date : 01-Dec-2021 03:22 PM	
 Print					
Basic Details					
Organisation Chain	Bharat Heavy Electricals Limited BAP - Ranipet Purchase				
Tender Reference Number	7710727E				
Tender ID	2021_BHEL_6405_1				
Tender Type	Open Tender	Form of contract	Supply		
Tender Category	Goods	No. of Covers	2		
General Technical Evaluation Allowed	No	ItemWise Technical Evaluation Allowed	No		
Payment Mode	Not Applicable	Is Multi Currency Allowed For BOQ	No		
Is Multi Currency Allowed For Fee	No	Allow Two Stage Bidding	No		
Cover Details, No. Of Covers - 2					
Cover No	Cover	Document Type	Description		
1	Fee/PreQual/Technical	.pdf	Techno Commercial offer along with PQR documents		
2	Finance	.xls	Price Bid		
Tender Fee Details, [Total Fee in ₹ * - 0.00]			EMD Fee Details		
Tender Fee in ₹	0.00	Fee Payable To	Nil	Fee Payable At	Nil
Tender Fee Exemption Allowed	No			EMD Amount in ₹	0.00
				EMD through BG/ST or EMD Exemption Allowed	No
				EMD Fee Type	fixed
				EMD Percentage	NA
				EMD Payable To	Nil
				EMD Payable At	Nil
Work /Item(s)					
Title	CW Gas Chlorination system for Sagardighi Project				
Work Description	CW Gas Chlorination system - SUPPLY ERECTION, COMMISSIONING, PG TEST AND HANDING OVER) FOR SAGARDIGHI TPP EXTN U5 1X660 MW PROJECT				
Pre Qualification Details	as per tender documents				
Independent External Monitor/Remarks	Shri Arun Chandra Verma, IPS (Retd.)				
Tender Value in ₹	NA	Product Category	Miscellaneous Goods	Sub category	NA
Contract Type	Tender	Bid Validity(Days)	180	Period Of Work (Days)	300
Location	Sagardighi	Pincode	742237	Pre Bid Meeting Place	NA
Pre Bid Meeting Address	NA	Pre Bid Meeting Date	NA	Bid Opening Place	RANIPET
Should Allow NDA Tender	No	Allow Preferential Bidder	No		
Critical Dates					
Publish Date	01-Dec-2021 03:20 PM	Bid Opening Date	23-Dec-2021 05:00 PM		
	01-Dec-2021 04:00 PM		23-Dec-2021 11:00 AM		

Document Download / Sale Start Date		Document Download / Sale End Date	
Clarification Start Date	01-Dec-2021 04:30 PM	Clarification End Date	23-Dec-2021 10:00 AM
Bid Submission Start Date	01-Dec-2021 05:00 PM	Bid Submission End Date	23-Dec-2021 11:00 AM


Tender Documents

NIT Document	S.No	Document Name	Description	Document Size (in KB)
	1	Tendernotice_1.pdf	CW Gas Chlorination system for Sagardighi Project	489.73

Work Item Documents	S.No	Document Type	Document Name	Description	Document Size (in KB)
	1	Tender Documents	CommercialDocument.pdf	Commercial Documents	5256.21
	2	Tender Documents	TechPQR.pdf	Technical Pre Qualification Requirements PQR	672.00
	3	Tender Documents	01121459933298.pdf	Quality Requirements	697.39
	4	Tender Documents	TechSpec.pdf	Technical Specifications	16008.72
	5	BOQ	BOQ_6689.xls	Price bid format BOQ	324.50

Tender Inviting Authority

Name	SACHIN SAINI
Address	Sr officer Procurement BAP BHEL Ranipet 04172 283132

	BHEL: BAP: RANIPET Water Systems Pre-Qualification Requirement (QR) for Gas Chlorination System	Ref: GCL: Sagardighi(1x660 MW)
		Dt: 11.09.2021
		Rev: 00

PRE-QUALIFICATION REQUIREMENT

The Qualification requirements for Gas Chlorination System and accessories are listed below, and bidder should meet the same.




- 1) Bidder should have Designed, Manufactured, Supplied and commissioned at least one number of Gas Chlorination System. The individual stream capacity of the reference gas chlorination system should not be less than 50 kg/hr and shall comprise of chlorinator, evaporator, ejector, tonners & leak absorption system as minimum. Such Gas Chlorination System should have been in successful operation for at least one (1) year as on date of technical bid opening.


Documentary evidence to be submitted by the bidder (in support of meeting Qualification requirement) along with the bid.

1. Performance certificate from the end user for the successful operation of the reference plant for minimum one year as on date of technical bid opening.
2. Purchase Order copy for the reference plant.

General

1. Supplier should be a manufacturer for the Gas Chlorination package dealing with the package on regular basis.
2. Bidders who defaulted, in any of the previous tenders floated by BHEL are not permitted to respond. Such offers, if found later, will not be considered for evaluation.
3. After receipt of offers, during scrutiny, if any vendor found to have been banned by BHEL, then their offer will be summarily rejected at any stage.
4. In case BHEL decides, bidder to arrange necessary permission to visit the reference plant furnished by the bidder for meeting the PQR requirements.

Prepared by  Harsh Deep	Checked by  D Balaraju Naik	Approved by  M Salar Manalan
--	--	---

	BHEL: BAP: RANIPET Water Systems Pre-Qualification Requirement (QR) for Gas Chlorination System	Ref: GCL: Sagardighi(1x660 MW)
		Dt: 11.09.2021
		Rev: 0

Annexure-I**Qualification Requirement Datasheet****A. Customer details: -**

- a) Name :
 b) Designation :
 c) Mobile :
 d) Land line :
 e) Fax :
 f) Email id :
 g) Postal address :

B. Plant Details: -

Date of Supply :

Date of commissioning:

Sl. No.	Parameters	Unit	Value
1.	Gas Chlorination plant capacity	kg/hr.	
2.	Each stream capacity of Gas chlorination plant	Kg/hr	

Signature of the Vendor

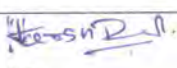
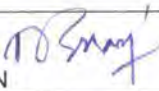
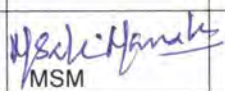
469360/2021/BAP-WS(CON)

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

BHARAT HEAVY ELECTRICALS LIMITED,
 RANIPET- 632 406.

TECHNICAL SPECIFICATION
 FOR
 GAS CHLORINATION PLANT

1X660 MW WBPDCI-SAGARDIGHI - TPS
 WEST BENGAL

00	08.09.2021	 HD	 DBN	 MSM	Fresh issue
Rev.No	Date	Prepared	Checked	Approved	Remarks

	<p style="text-align: center;">SPECIFICATION FOR GAS CHLORINATION PLANT</p>	SPEC.NO.ROS:6322
		Rev:00

INDEX

S.No.	Description	Reference	PAGE No.
1.	Technical Specification for Gas Chlorination (main)	ROS 6322	3
2.	E,C&I specification	ROS 4291	15
3.	Special conditions of contract (SCC)	ROS 6322	150
4.	Mandatory spares	Annexure-1	158
5.	Sub Vendor List	Annexure-2	162
6.	Quality Plan	Annexure-3	244
7.	Master Drawing List (MDL)	Annexure-4	254
8.	PG test procedure	Annexure-5	256
9.	Design philosophy, PID, Equipment list	Annexure-6	264
10.	Hoists Specification	Annexure-7	296
11.	Quality Assurance, Control	Annexure-8	306
12.	Drawings & Documents to be submitted	Annexure-9	316
13.	Painting Specification	Annexure-10	318
14.	Health Safety & Environment plan (HSE)	Annexure-11	330
15.	Additional General Technical requirement	Annexure-12	401
16.	Engineering services	Annexure-13	409
17.	Project management & site services	Annexure-14	420
18.	Spares, Tools, Tackles & Consumables	Annexure-15	440
19.	General specifications for Erection, Commissioning & PG test	Annexure-16	442
20.	Deviation format	Annexure-A	451
21.	Compliance cum confirmation schedule	Annexure-B	452

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

SECTION -1

1.0 SCOPE OF INQUIRY/ INTENT OF SPECIFICATION

- 1.1 The specification is intended to cover design, engineering, manufacture, fabrication, assembly, inspection and testing at vendor's & sub-vendor's works, painting, mandatory spares along with spares for erection and commissioning, startup and commissioning as required, forwarding, proper packing, shipment and delivery at site, unloading, handling & transportation at site, Erection & Commissioning, trial run, on FOR site basis, preparation & submission of "As Built" drawings, PG test at site and handing over of Gas Chlorination as per the details in different sections / volumes of this specification for 1X660 MW WBPDCI-SAGARDIGHI – TPS.
- 1.2 The contractor shall be responsible for providing all material, equipment & services, required to fulfill the intent of ensuring operability, maintainability, reliability and safety of the complete work indicated in this specification. In addition, Bidder shall take all necessary additional steps in all stages of execution to ensure that required performance is met with, irrespective of whether it has been specifically listed herein or not. Bidder shall consider all / any required component / accessory necessary for proper performance of the equipment. Bidder shall assume full responsibility for providing requisite facilities to complete supply, erection and commissioning of Gas Chlorination.
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser inline with drawings and specifications and shall be entitled to reject any work or material, which is not in full accordance herewith.
- 1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items do not figure in the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items do not figure in the drawing.
- 1.5 The general terms and conditions, instructions to tenderer and other attachment referred to elsewhere in the specification are part of the tender specification. The equipment materials and works covered by this specification are subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for, and governed by all requirements stipulated herein.
- 1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

format enclosed with this specification. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as listed in the specification of BHEL/ Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by BHEL/ Customer as and when brought to their notice either by the bidder or by BHEL/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

- 1.7 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.
- 1.8 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.9 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder / vendor and Customer /Purchaser / Employer will mean BHEL and / or Customer (WBPDC: West Bengal Power Distribution Corporation Ltd.) including their consultant as interpreted by BHEL in the relevant context.
- 1.10 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and dispatch release issued by BHEL / Customer.
- 1.11 BHEL's / Customer's representative shall be given full access to the shop in which the equipment is being manufactured or tested and all test records shall be made available to him.

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

SECTION – 2

2.0 PROJECT INFORMATION

1	Name of the Project	Sagardighi Thermal Power Station (1x660 MW) Unit-5, phase-III.
2	Station Capacity	1x660 MW (Coal Based)
3	Owner	West Bengal Power Distribution Corporation Ltd. (WBPDC)
4	Site Location	Manigram village, Sagardighi, Raghunathganj sub-division, Murshidabad District, West Bengal.
5	Latitude	24 ⁰ 22' 13.7" N
6	Longitude	88 ⁰ 6' 15.8" E
7	Nearest Town	Ajimganj, Jangipur, Raghunathganj.
8	Nearest railway Station	Manigram railway station on Bandel-Barhawara branch line 1 km from site.
9	Nearest Airport	240 KM Kolkata
10	Site Conditions	
	Elevation above MSL	34 m
	Temperature –Minimum	10°C during Winter
	- Maximum	42°C during Summer
	- Design Ambient	50°C
	- Ambient (performance)	26.9°C
	Average relative humidity	84 %
	Annual Rainfall - Average	1389 mm
	- Maximum	1043 mm
	- Lowest	343 mm
	Mean Wind Speed	47 m/sec
	Wind Pressure	As per the latest revision of IS 875/1987
	Siesmic Co-efficient	Zone –III, as per IS 1893 (Part-IV)
11	Source of water	The source of water for this project is the River Bhagirathi (5 km). The water from the River Bhagirathi will be transferred and stored in the five (5) nos. Plant Raw Water Reservoirs by augmentation of the Intake water transportation system.
12	Source of Coal	The Power plant shall receive coal from ECL mines. Coal is planned to be transported in rake loads through the existing Pakur- Tildanga-Dhulian-Monigram broad gauge line or through Pakur- Nalhati (proposed)–Takipara-Gosaingram-Poradanga-Monigram broad gauge line.

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

SECTION – 3

3.0 SCOPE OF SUPPLY

The specification covers in principle, the design, engineering, manufacture, fabrication, assembly, inspection and testing at vendor's & sub-vendor's works, painting, mandatory spares along with spares for erection and commissioning, start up and commissioning as required, forwarding, proper packing, shipment and delivery at site, unloading, handling & transportation at site, Erection & Commissioning, trial run, on FOR site basis, preparation & submission of "As Built" drawings, PG test at site and handing over of GAS CHLORINATION plant for 1x660 MW SAGARDIGHI TPS including complete Electrical, C&I and Civil Works as specified and necessary.

1. The Broad scope of supply shall be:

- a. GAS CHLORINATION plant comprising of following equipment for Cooling water (CW) Chlorination plant. Chlorine ton containers with isolation valves, eductor tubes, roller supports, safety accessories and automatic switchover facility, Chlorine manifolds with all accessories, electrically heated water bath type chlorine evaporators with all accessories, strainers, pressure regulation and shutoff valves for chlorine gas lines, Chlorinators with remote vacuum regulator, chlorine gas flow meter, differential pressure regulator, manual flow control valve, fixed throat type remote ejector, water supply booster pumps with all accessories, chlorinated water diffusers, Free Residual Chlorine (FRC) Analyzer, monorail hoist, weighing scale, Emergency Chlorine leak absorption system, FRP hoods for chlorine tonners with flexible hose arrangement, ventilation fans, blowers, FRP duct work to absorption tower, absorption tower, caustic solution preparation cum recirculation tank with corresponding pumps, safety & supervisory equipment and all other equipment and accessories required for complete GAS CHLORINATION plants of Sagardighi 1x660 MW power plant.
- b. All integral and interconnected pipe works, valves, strainers, pressure relief valves, instrument stubs, specialties, sumps, gates, all types of pipe supports, pipe racks, pipe bridges etc. for the entire system.
- c. All piping as required and up to the dosing points as per Tender P&IDs and drawings shall be provided by Bidder.
- d. Chlorine water diffuser and Mixing system (injection quill) as mentioned in Design memorandum & P&ID.
- e. Exhaust fans and proper ventilation system as required.
- f. All necessary structural steel for pipe supporting structure, platforms, walkways / pathways and access stairs, mechanical plant and equipment, mechanical services and pipe work associated with Gas Chlorination plant.
- g. All steel inserts with lugs, plates, bolts, nuts, sleeves, edge angles and all other embedding components etc. as required to grout in civil works and to support/hold the equipment being supplied under this specification for opening/maintenance purpose

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

- h. Electrically heated water bath type Chlorine Evaporators, each with all accessories shall be provided for each stream wherever applicable.
- i. Flexible connector with valved ends joining chlorine ton-container to the pipe manifold shall be constructed of annealed copper tubing with cadmium plated for internal and external surfaces. Copper tubing with suitable expansion loop shall be provided with silver soldered copper nipples on each end connected by ammonia type union. Alternatively, flexible metal hose, constructed of corrugated metal with Monel tire braid and Monel nipples may be supplied. Tubing shall be hydraulically tested to 40 Kg /Sq.cm
- j. Piping handling chlorine shall be as simple as possible, with minimum number of screwed and flanged joints. Piping shall be well supported and adequately sloped to allow drainage. Low spots shall be avoided. Suitable allowances shall be provided for pipe expansion due to change in temperature.
- k. PVC or similar materials shall not be used in liquid chlorine and pressurised chlorine gas lines. PVC can be used in chlorine gas line operating under vacuum.
- l. For chlorinated water service PVC or rubber lined steel, polyethylene tubing or rubber hose may be used. Neoprene lined hose shall not be used in chlorinated water service.
- m. All necessary drains, vents and sampling points, with valves, as specified and as required
- n. All tanks complete with inlet and outlet connections, all fittings and appurtenances etc. as specified and as required.
- o. Wherever pipe racks are not available, pipes shall run on pedestals or below ground. All auxiliary structure & fixing items such as U clamps, nuts, bolts, channels, insert plates etc. required to lay the pipes on pedestals shall be in bidder's scope of work.
- p. Hangers, and supports, wrapping/ coating for underground piping, start up and commissioning spares, special tools necessary for proper maintenance or adjustment of the equipment packed in permanent box.
- q. Finish painting for touch up painting of equipment after erection at site in sealed containers
- r. Initial charge of all lubricant & grease and first fill of chlorine to all tonners and all chemical including initial fill of caustic
- s. Monitoring gadgets, instruments and equipment's required for maintenance (till PG test and plant handover).
- t. If chlorine line is run on a pipe rack, where it saves space, with other pipelines carrying flammable materials, the chlorine lines should be protected from fire, resulting from leak or break in one of the other lines as per the procedures indicated by Chlorine Institute, USA
- u. All piping above the ground shall be suitably protected from atmospheric corrosion by adequate painting system or adequate insulation system. All buried pipelines shall be coal tar coated and wrapped. Buried pipes shall be cathodically protected.
- v. Unplasticised PVC line for chlorine solution piping, all joints shall be socket type with solvent welding. For these pipes, laid on the sand level, insulation shall be

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

provided to prevent solar effect and mechanical damages on the pipe. Pipes shall be of schedule 80.

- w. Gas mask along with breathing apparatus tank complete with full mask, full vision face pieces, air flow regulating valves & all accessories shall be provided. In addition to above, canister type breathing apparatus shall be provided in which moisture content from the wearer exhaled air react with granular chemical in breathing apparatus & liberates oxygen. The released oxygen enters a breathing bag from which the wearer can inhale. Other safety equipment such as safety showers, etc shall also be provided by Bidder.
- x. Bidder shall perform the guarantee parameters as per specification requirement to the satisfaction of owner. The exact modalities of verifying guarantee for the parameters indicated in the specification shall be finally as agreed with the owner during detailed engineering & mutually agreed.
- y. Any item/work either supply of equipment or erection material which have not been specifically mentioned in but are necessary to complete the works for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification and shall be in bidder's scope without any commercial, technical and delivery implication to BHEL.

2. Electrical

The Specification of Electrical items, scope & terminal Points shall be as per Electrical spec.

3. Control & Instrumentation

Control & Instrumentation - Refer C& I portion of this specification

4. Scope of services

- a. Design & engineering of Gas Chlorination system.
- b. Erection, commissioning, unloading, storage and handling at site of all the equipment, including but not limited to the above list which are required for completion of the gas chlorination systems shall be considered by Bidder.
- c. Bidder shall store all high value items under lock & key, using containers only.
- d. All tools & tackles required for the system shall be provided by Bidder.
- e. During erection, cutting oil, grease and other foreign materials inside pipe lengths and fittings shall be removed. New valves or other equipment received in an oily condition shall be dismantled and cleaned before use.
- f. Chlorine pipeline and valves, after installation shall be hydraulically tested at 40 Kg/Sq.cm for leak tightness
- g. Drying of pipeline shall be done by passing steam through lines from the high end allowing condensate and foreign matter to drain out. Steaming shall be continued until the pipeline is thoroughly heated and no further debris is present in the lines. Steam supply shall then be disconnected and the pipeline shall be dried by passing dry air (dew point - 40 Deg.C) through the hot pipeline.
- h. After drying, the system shall be filled with dry air at 10 Kg/Sq.cm (g) and tested for leaks by application of soap solution on the joints. Small quantities of chlorine

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

gas shall then be introduced in the pipeline, test pressure built up with air and tested for chlorine leakage.

- i. The complete installation including chlorine ton containers shall meet the requirements of Chief Controller of Explosives, Nagpur, India and any other statutory regulations prevalent in India. Successful Bidder shall take total responsibility for obtaining necessary clearances & License from the local government bodies and the CCOE for supply, installation & operation of the plant. Requisite documents to facilitate vendor for obtaining the same will be provided by BHEL / end Customer on request. All statutory clearances (including CCOE approval) shall be in the scope of Bidder.
- j. Pre-Commissioning work such as flushing, hydraulic testing etc. Necessary consumables and instrumentation as required for inspection and testing at works as well as at site including pre-commissioning activities shall be arranged by the successful bidder at their own cost
- k. Arrangement of all lubricants, instruments, reagents for carrying out trial run, commissioning and PG test
- l. Monitoring gadgets, instruments and equipment required for maintenance (till PG test and plant hand over)
- m. Complete grouting for equipment including foundation bolt & base frame filling and finishing, fixing and any concreting inside the vessels and lining.
- n. All personnel required during maintenance, Commissioning and Performance guarantee test.
- o. All special tools necessary for proper maintenance or adjustment of the equipment packed in a suitable Tool box shall be provided by Bidder. The same shall be handed over to BHEL at the Time of unit take over
- p. Trial run for requisite period.
- q. Performance guarantee test
- r. Painting shall be as specified in “Surface Preparation & Painting” of this technical specification. Bidder to note that paint shed shall be finalized during detailed engineering as per customer & BHEL requirement and any variation in the painting schedule as finally approved by customer shall be taken care by bidder without any commercial and delivery implication
- s. Final touch up paint at site
- t. Preparation & submission of all drawings including Piping isometric drawing for all piping in Gas chlorination system package
- u. Preparation of drawings / document / P&ID's in 3D modelling software and providing soft copy of same to BHEL
- v. Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance
- w. Any other service required for making the installation complete in all respect within battery limits and for satisfactory erection & commissioning of the system as well as to meet any statutory requirement relevant to the package, unless specifically EXCLUDED from scope of services

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

5. Painting

Supply and application of shop painting and final painting at manufacturer's works and at site for the entire system as specified elsewhere in this Bid Document

6. Consumables

- a. All consumables (lubricating oil, inhibitor for oil, etc.) as applicable, required for pre commissioning, commissioning, PG test till taking over along with topping up required for six (6) months operation of the plant shall be in the scope of the Bidder. However, bidder to refer to relevant clauses in the entire tender.
- b. Initial charge of all lubricant & grease, first fill of chlorine to all tonners and all chemical (including initial fill of caustic) shall be in the scope of Bidder.
- c. All spares required for erection and commissioning of complete system, new set of special tools and tackles, fixtures etc. of the system shall be provided by Bidder.

7. Terminal points

- a. The details regarding terminal points are provided in Design memorandum, Layout and P&IDs.
- b. CW Chlorination systems will be housed in a separate building adjacent to Cooling water treatment system. Bidder to refer to Layout drawing/ key plan for location & coordinates.
- c. Motive water line for CW Gas Chlorination system will be provided from ACW pump discharge at one point near CW Chlorination building. Further piping up to respective Chlorination system booster pumps shall be in Bidder's scope. Bidder to refer to Layout drawings for coordinates.
- d. CW Chlorination shall be carried out in the Cooling water forebay and CW pump houses sump. Piping up to the Forebay & Pump houses, valves, necessary diffusers arrangement shall be provided by Bidder.
- e. For PT plant Chlorination, tapping shall be taken from common discharge of CW Chlorine solution header to CW fore-bay. Dosing line shall be extended to PT plant stilling chamber (CWBD Treatment plant of cap. 350 m³/hr). Piping upto the stilling chamber along with valves, diffuser shall be considered in Bidder's scope (Refer P&ID and Layout).
- f. All drains from Chlorination plant drains shall be terminated in nearest drain channel/absorption system as specified in P&ID.
- g. Chlorine Gas leaked from Chlorine Ton Container & Chlorinator room, to be connected to suction of Blowers of Chlorine Absorption System.
- h. Caustic solution from Leak absorption system of CW chlorination (after absorbing the leak in case of tonner leak) shall be properly diluted, discharged/draind to nearest drain trench.
- i. Service air supply (25NB connection) at 5 to 7 kg/cm² (g) near of the Chlorination plants. Please refer to Layout drawing for coordinates. Further piping and distribution within Gas Chlorination plant shall be in Bidder's scope.

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

- j. Service water connection (50NB connection) – near to the Chlorination plants. Please refer to Layout drawing for coordinates. Further piping and distribution within Gas Chlorination plant shall be in Bidder's scope.
- k. Potable water connection (50NB connection) – near to the Chlorination plants. Please refer to Layout drawing for coordinates. Further piping and distribution within Gas Chlorination plants shall be in Bidder's scope.

8. Exclusion

- a. All civil work including foundation of equipment by BHEL. However, complete grouting for equipment, fixing and any concreting inside vessels, etc., shall be in the scope of bidder.
- b. Pedestals for pipe supports by BHEL. However, auxiliary structure, supports components for piping is in bidder's scope.
- c. Air conditioning, ventilation & fire fighting facilities. However, bidder to furnish the requirements of the same after award of contract.
- d. Refer to E, C&I specification for exclusions
- e. Drinking water (or potable water), service water, service air up to terminal points is by BHEL and further piping and termination as per requirement is in Vendor scope.
- f. Monorail for hoist/ crane movement is excluded from bidder scope. However, hoists/ cranes are in Bidder's scope.

9. Civil

- a. Entire civil design & works required for the Gas Chlorination plant as per the inputs of Bidder shall be in BHEL's scope. However complete grouting for all equipment including tanks shall be in the scope of the bidder.
- b. Operating / maintenance platforms and interconnection platforms (if any) with ladders / stairs & handrails, structural supports and hangers for pipes / cables / ducts, crane rails, all embedment's and inserts with lugs including anchor fasteners, bolts etc., dressing of foundations, grouting of pockets and underpinning of base plates for equipment / structures and fixing supports, filling and finishing of openings in walls, floors, cladding, roof and trenches shall be in Bidder's scope.

10. Material handling requirements

- a. One number Weighing scale of 2-ton capacity of platform dial type shall be provided. Weighing scale shall be suitable for fixing on the ground.
- b. Electrically operated monorail hoist shall be provided for lifting the ton container in the CW chlorination building. Lifting bar to grab the empty or full ton container during handling (1 No.) shall have suspension type load indicator of minimum capacity (Net) 3000 Kg.

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

SECTION-4

4.0 General requirements of specification

1. Approved Design memorandum (BHEL DOC NO.: 4-WT-040-01613, WBPDCD DOC NO.: RP-DC-445-WTP-A074) Rev 02
2. P& ID for CW Gas Chlorination System (BHEL DOC NO.: 1-WT-040-01922, WBPDCD DOC NO.: RP-DG-445-WTP-A075) Rev 02
3. Layout drawings: (BHEL DOC NO.: 1-WT-080-01916, WBPDCD DOC NO.: RP-DG-445-WTP-A058) Rev 02
4. Qualification requirement shall be as per tender specification specified elsewhere.
5. Bidder to refer to the specification for list of Mandatory spares and include the same in scope of supply (**Annexure-1**).
6. Indicative Sub Vendor list shall be as per attached list (**Annexure-2**). However, Bidder shall submit the list for all the equipment during contract stage for approval by BHEL.
7. Quality plan shall be as per attached quality plan document (**Annexure-3**). However, Bidder shall submit Quality plan for all the equipment supplied, services & works during contract stage for approval by BHEL.
8. Minimum list of drawings shall be as per attached master drawing list (**Annexure-4**). However, bidder shall submit the list during contract stage for approval by BHEL.
9. Bidder shall submit the PG test procedure for Gas Chlorination plant for approval and same shall be followed. Requirements are specified in (**Annexure-5**)
10. List of Design philosophy, PID, Equipment layout which are part of this tender are provided as **Annexure-6**.
11. Project schedule for Gas Chlorination plant shall be submitted by Bidder for approval.
12. Refer **Annexure-7** for Technical requirements for Hoist
13. Refer **Annexure-8** for Quality Assurance requirements
14. Refer **Annexure-9** for List of Drawings & Documents to be submitted along with bid and after award of contract.
15. Bidder to refer to Painting Specification **Annexure-10** for meeting the requirements of this package.
16. Bidder to also refer to the General conditions of contract (GCC) and Special conditions of contract (SCC) (ROS:6322).
17. Bidder to refer to Health Safety and Environment plan for Site Operation by Subcontractors in **Annexure-11**.
18. Refer **Annexure-12** for Additional General Technical requirements
19. Refer **Annexure-13** for Engineering services requirements
20. Refer **Annexure-14** for Project Management and site services
21. Refer **Annexure-15** for Spares, Tools, Tackles & Consumables
22. Refer **Annexure-16** for General Specification for Erection & Commissioning
23. Refer **Annexure-A** Technical Deviation format
24. Refer **Annexure-B** for Compliance and confirmation schedule
25. Bidder to refer to relevant section of specification of Service air. Bidder to integrate with overall service air distribution piping and ensure distribution to required areas

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

within this plant package. Bidder shall also consider necessary air receivers to meet system requirements.

26. Bidder to consider proper Packaging for shipping and storage at site and the procedure shall be duly submitted to Customer
27. Bidder shall furnish 3D model in editable format to ensure integration with overall 3D model of the Power plant
28. Customer approved Design Philosophy & P&ID attached with this specification is minimum requirement and to be complied by Bidder. Bidder to design the equipment/system for safe and trouble free operation of Plant to meet the performance duty required by systems.
29. The Pre-treatment plant complete with all accessories shall conform to this technical specification, Design memorandum & PID. The decision of BHEL shall be final in case of any discrepancy.
30. All the instruments shall be supplied along with necessary fittings, accessories, valve manifold, root valves, Canopy & Structural steel as required. Instrument Installation, along with hardware shall be in bidder scope
31. The make shall be as per approved vendor list. The model of various instruments/items/systems shall be subject to approval of owner/purchaser during detailed engineering stage. No commercial implication in this regard shall be acceptable. In case of any conflict or repetition of clauses in the specification, the more stringent requirements among them are to be complied with.
32. Each valve/instrument shall be fitted with a stainless steel or aluminium nameplate indicating the valve/instrument service and reference number in accordance with the approved equipment coding system
33. All valves above 150NB shall be double flanged. All valves dimension standard shall be as per ASME B16.5 standards.
34. The above given scope is indicative & minimum. Any item/ equipment not indicated above however required for the completeness of the system shall be supplied by bidder without any technical, commercial and delivery implication to BHEL
35. Uniformity of make and type of instruments and control components shall be followed throughout for rationalization of spares' inventory, except for certain proprietary items where this requirement cannot be met.

	SPECIFICATION FOR GAS CHLORINATION PLANT	SPEC.NO.ROS:6322
		Rev:00

SECTION-5


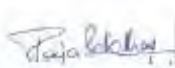

5.0 PUMPS & PIPING SELECTION CRITERIA


Sl. No.	Pipe Size	Velocity in m/sec		
		Below 50mm	50mm-150mm	200mm & above
1	Pump Suction for Water		1.2-1.5	1.2-1.8
2	Pump Discharge for Water	1.2-1.8	1.8-2.4	2.1-2.5
3	Header		1.5-2.4	2.1-2.4
4	Compressed Air Below 2Kg/cm2(g)	15-20	20-30	25-35
5	Compressed Air Above 2Kg/cm2(g)	20-30	25-40	35-45
6	Suction to compressor/Blowers		7-8	
7	Pump Suction for Chemical Solution	0.8-1.2	0.8-1.3	
8	Pump Discharge for chemical solution	1.2-1.4	1.3-1.5	
GRP PIPES				
9	For GRP Pipe with negative suction		1.2 (Max)	2 (Max)
10	For GRP Pipe with pressurized suction		1.5 (Max)	
11	For GRP Pipe Delivery		2.0 (Max)	2.0 (Max)

SECTION – 6

6.0 IMPORTANT POINTS TO BIDDERS


1. If the vendor has suggestions/requirements of any additional instruments/equipment over & above as shown in the P & ID drawing, the same shall be clearly indicated and suitably covered in the commercial bid also separately.
2. The specification for the instruments/equipment available in the main specification shall be taken for such additional requirements (or) Customer should be contacted.

<p>COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED; It must not be used directly or indirectly in any way detrimental to the interest of the company.</p>	<p>BHARAT HEAVY ELECTRICALS LIMITED, RANIPET- 632 406.</p> <p>TECHNICAL SPECIFICATION for Electrical, Control & Instrumentation</p> <p>Of</p> <p>Cooling Water- GAS CHLORINATION PLANT</p> <p>Project: SAGARDHIGI TPS (UNIT#5)</p> <p>SPEC NO: ROS 4291, REV-00</p>				
					
	15.09.2021	AJV	MEGA	VNS	Fresh issue
Date	Prepared	Checked	Approved	Remarks	

	1 X 660MW, Sagardhigi (Unit #5)	BAP-RANIPET
	Technical Specification for Gas Chlorination Plant (E, C & I Scope)	Spec. No: ROS: 4291, Rev-00 PART of ROS: 6322, Rev-00

INDEX

SECTION	SUB-SECTION	DESCRIPTION
A	0	INTRODUCTION
	1	Project Information
	2	General Specification
B	0	General Technical Requirement (ELECTRICAL)
C	0	General Technical Requirement (C&I)
D	0	Documentation
E	0	Scope Division between BHEL and CW-GCP Vendor
F	0	Customer Specific Technical Requirement
	F.1	Specification for Motorised Ball Valve
	F.2	LT MOTOR (Volume: II-F/1, Section-II)
	F.3	LCP (Volume: II-F/1, Section-VIII)
	F.4	Technical Specification, C & I Systems (Volume: II-E, Section-VI)
	F.5	Typical Instrument Installation Diagram (12A05-DWG-I-0022)
G		LIST OF ANNEXURES
	G.1	DDCMIS interface for LT unidirectional drive- Contactor operated
	G.2	Electrical Load List format
	G.3	Cable Schedule format
	G.4	Motor datasheet format

	1 X 660MW, Sagardighi (Unit #5)	BAP-RANIPET
	Technical Specification for Gas Chlorination Plant (E, C & I Scope)	Spec. No: ROS: 4291, Rev-00 PART of ROS: 6322, Rev-00

SECTION-A: INTRODUCTION

1. PROJECT INFORMATION

1.1 THE PROJECT

Sagardighi Thermal Power Station, Phase-III, comprising of a single extension Unit of 660 MW capacity of Super Critical technology is being implemented by The West Bengal Power Development Corporation Limited in Murshidabad district, West Bengal, India. This Power Station will generate electricity and feed into the West Bengal Transmission Grid to meet the power demand in West Bengal.

1.2 THE SITE


Sagardighi Thermal Power Station site is located at Manigram village, 13 KM north of Sagardighi town by the side of the SMGR (Sagardighi-Manigram-Gankar-Raghunathganj) Road at a distance 20 KM from National Highway 34 in Murshidabad District, West Bengal and around 240 KM from Kolkata, India. The nearest rail station is Manigram adjacent to the site on Bandel - Barhawara branch line and 6.5 KM from Sagardighi Railway Station on Sainthia - Azimgunj line of Eastern Railway.

1.3 THE SPECIFICATION AND TENDER

The accompanying Tender Specification is for the Engineering, Supply, Delivery, Erection, Testing and Commissioning of the Cooling Water Gas Chlorination plant as specified. The Plant and materials offered must be of proven quality where reliability in service and ease of operation and maintenance are the foremost prerequisites. The completion time should be the shortest possible.


1.4 SITE CONDITION

1	Elevation above MSL	34 m
2	Temperature –Minimum	10°C during Winter
	- Maximum	42°C during Summer
	- Design Ambient	50°C
	- Ambient (performance)	26.9°C
3	Average relative humidity	84 %
4	Annual Rainfall - Average	1389 mm
	- Maximum	1043 mm
	- Lowest	343 mm
5	Mean Wind Speed	47 m/sec
6	Wind Pressure	As per the latest revision of IS 875/1987
7	Siesmic Co-efficient	Zone –III, as per IS 1893 (Part-IV)

	1 X 660MW, Sagardhigi (Unit #5)	BAP-RANIPET
	Technical Specification for Gas Chlorination Plant (E, C & I Scope)	Spec. No: ROS: 4291, Rev-00 PART of ROS: 6322, Rev-00

2. GENERAL SPECIFICATION


1. Services and Equipment as per SECTION-E, "Scope Division between BHEL and CW-GCP Vendor".
2. Supply of mandatory spares as specified in mechanical section ROS 6322
3. Bidder shall confirm total compliance to the specification without any deviation from the technical/ quality assurance requirements stipulated.
4. The make of all the items shall be from approved sub-vendor list. The make/ model of instruments/ items/ systems not specified in the Sub-vendor list shall be subject to approval of BHEL/ Customer during detailed engineering stage without any commercial and delivery implications to BHEL.
5. Uniformity of make and type of Electrical, instrument and control components shall be followed throughout for rationalization of spares' inventory, except for certain proprietary items where this requirement cannot be met.
6. Vendor representative shall be available at site at the time of commissioning of the system and Vendor to delegate/ depute their person /experts as per owner/ consultant requirements.
7. The scope in this specification is indicative. Any item/ work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The bidder shall supply the same without any technical, commercial and delivery implication to BHEL.
8. In case of any conflict or repetition of clauses in the specification, the more stringent requirements among them are to be complied with. BHEL decision will be taken as final.

	1 X 660MW, Sagardhigi (Unit #5)	BAP-RANIPET
	Technical Specification for Gas Chlorination Plant (E, C & I Scope)	Spec. No: ROS: 4291, Rev-00 PART of ROS: 6322, Rev-00

SECTION: B**GENERAL TECHNICAL REQUIRMENTS (ELECTRICAL):**

The equipment and services to be provided by bidder under this specification shall be as detailed here below, but not to be limited to the following:

1. Electrical load requirement for Cooling Water Gas Chlorination Plant shall be furnished as per the format in Annexure-G.2.
2. All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information (SECTION-A).
3. Motors shall meet minimum requirement of Electric motor specification (Section: F.1)
4. Various drawings including GA drawing, Data sheet as per required format, quality plans, Calculations, test reports, test certificates, operation and maintenance manuals, characteristic curves, wiring diagrams/schemes etc. shall be furnished as specified at contract stage. All documents shall be subject to customer / BHEL approval without any commercial implications to BHEL.
5. Vendor shall clearly indicate equipment locations and local routing lengths in their cable listing as per the format in Annexure-G.3.


	1 X 660MW, Sagardhigi (Unit #5)	BAP-RANIPET
	Technical Specification for Gas Chlorination Plant (E, C & I Scope)	Spec. No: ROS: 4291, Rev-00 PART of ROS: 6322, Rev-00

SECTION: C**GENERAL TECHNICAL REQUIREMENTS (C&I):**

1. Bidder to include all the instruments required for the package along with necessary fittings, remote chemical seal diaphragm accessories and valve manifolds etc.
2. The motor operated valves shall have limit switches for open/ close feedback. Motor operated valves for valve sizes less than 50 NB shall be rated for 240 V single phase AC only. For other higher sizes, the motor operated valves shall be rated for 415 V three phase only.
3. Panel dimensions shall be chosen liberally such that double door opening is available at front /rear or both at front & rear which shall be finalized during detailed engineering by BHEL to accommodate the panels within plant layout. Maximum single (half door) width acceptable is 600mm.
4. The design, manufacture, inspection, testing, site calibration and installation of all C&I equipment and systems covered under this specification shall conform to the latest editions of applicable codes and standards eg. ANSI, ASME, IEEE, ISO, IEC, IGCI, AWS, NFPA, AISC, IGS, SAMA, UBC, UL, NESC, NEMA, ISA, DIN, VDE, IS etc.
5. For instrument & control cable scope of supply refer 'SECTION-E'.
6. Instrument installation drawings are to be provided by bidder.
7. Every panel- mounted instrument, requiring power supply, shall be provided with a pair of easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.

HART HAND HELD CALIBRATOR

Hand held calibrator (One no.) shall be provided for adjustment/ calibration/ maintenance of the HART compatible transmitters. The hand held calibrator shall be suitable for all types of transmitters supplied in the package. If one type of hand held type calibrator is not suitable for communicating with all types of transmitters, then separate hand held calibrator shall be provided.

	1 X 660MW, Sagardhigi (Unit #5)	BAP-RANIPET
	Technical Specification for Gas Chlorination Plant (E, C & I Scope)	Spec. No: ROS: 4291, Rev-00 PART of ROS: 6322, Rev-00

SECTION-D: DOCUMENTATION

Documents of Electrical, C&I System shall be submitted to end user/ owner for approval during detail engineering. Changes, if any required, shall be accommodated by the bidder without any price and/ or time implication.

Following documents to be furnished by the bidder along with the bid:

- Duly stamped and signed copy of Quality Plan.
- Requirement of electronic earthing, if any.
- Electrical power requirement in prescribed format duly signed and stamped.
- SDDR of Enquiry documents.


Editable & PDF copy of Drawings/ Documents and data to be furnished within two months after award of the contract:

1. C&I System Design Basis Report incorporating Control philosophy.
2. Control & operational write-up for the system
3. GA & wiring diagram of local control panel and its Power Requirement.
4. Local control panel and field instruments quality plan. Local control panel & instruments data sheet.
5. Filled up Electrical Load data as per Attached Formats (Annexure-G.2)
6. Cable schedule, cable interconnection drawing as per Attached Formats (Annexure-G.3)
7. Instrument schedule indicating range, operating pressure, flow etc., along with selected make & model.
8. Instrument hook-up diagram.
9. Electronic Earthing schemes
10. Filled up Motor datasheets as per Attached Formats (Annexure-G.4)
11. Logic diagrams with system description / functional write-up.
12. DCS IO List
13. Motors: Detailed catalogue, part number and subassembly/assembly drawings with manufacturer's cross reference for each spare part.
 - 1) OGA drawing with terminal boxes, earthing etc.
 - 2) Arrangement drawing of terminal boxes.
 - 3) Characteristic curves:
 - i. Current vs. time at rated voltage.
 - ii. Speed vs. time at rated voltage.
 - iii. Torque vs. speed at rated voltage and minimum voltage.
For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.
 - iv. Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.
 - v. Load performance curves.

NOTE:

1. Documents mentioned in other sections of this specification is included.
2. Any other document decided during detailed engineering to be submitted.


469360/2021/BAP-WS(CON)

	1 X 660MW, Sagardhigi (Unit #5)	BAP-RANIPET
	Technical Specification for Gas Chlorination Plant (E, C & I Scope)	Spec. No: ROS: 4291, Rev-00 PART of ROS: 6322, Rev-00

E: SCOPE DIVISION BETWEEN BHEL AND CW-GCP VENDOR


S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	1. 415 V AC (3 Phase, 3 Wire) supply to motors, 415 V AC (3 Phase, 4 Wire) supply to other equipment etc. shall be provided by BHEL based on load data provided by vendor at contract stage for the equipment supplied by vendor as part of contract. 2. Any other voltage level (AC/DC) required will be derived by the vendor.
2	DCS System	BHEL	BHEL	
3	Local Push Button Station (LPBS) for motors	BHEL	BHEL	Located near the motor.
4	Local Control Panel (LCP)	Vendor	Vendor	Single panel including all motors, MOV of CW-GCP system and with required interfacing between field instruments and DCS. include required supply feeders for Ventilation system, exhaust fans (16A feeders) of CW-GCP system.
5	LT Motors with base plate and foundation hardware	Vendor	Vendor	Makes shall be subject to customer/ BHEL approval at contract stage. All motors shall be 415V, 3 Phase only.
6	Instruments & Fittings	Vendor	Vendor	Complete instrumentation supply , erection including site calibration of Instrument until Handover to end customer in Vendor's scope
7	Junction box for control & instrumentation cable	BHEL	BHEL	
8	Ventilation System	Vendor	Vendor	
9	Chlorine Leak detection system	Vendor	Vendor	
10	Chlorine Extraction system	Vendor	Vendor	Chlorine leak inside the Chlorinator room shall be extracted.

469360/2021/BAP-WS(CON)

	1 X 660MW, Sagardhigi (Unit #5)	BAP-RANIPET
	Technical Specification for Gas Chlorination Plant (E, C & I Scope)	Spec. No: ROS: 4291, Rev-00 PART of ROS: 6322, Rev-00


11	Electric Operated Hoist with isolating switch	Vendor	Vendor	<p>BHEL will provide one number 415 V (3ph) supply feeder and Input Power Cable from MCC supply feeder to isolating switch to be placed at 1.2 mtr above ground. Any other voltage level (AC/DC) required will be derived by the vendor. Motor starter shall be part of crane control panel.</p> <p>Flexible Power cables (festoon cable)/ shrouded DSL from isolator to hoist & upto motor shall be supplied by vendor. Earthing arrangement shall be part of hoist cable by vendor.</p>
12	Mandatory Spares	Vendor	Vendor	Refer Mechanical section
13	Safety Equipment	Vendor	Vendor	Refer Mechanical section
	Cable, Tray & Accessories			
14	<p>Power cables, control cables and screened instrument cables for</p> <p>a. both end equipment in BHEL's scope</p> <p>b. both end equipment in vendor's scope</p> <p>c. one end equipment in vendor's scope</p>	BHEL BHEL BHEL	BHEL Vendor BHEL	<p>1. For b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes will be done by BHEL</p> <p>2. Termination at BHEL equipment terminals by BHEL.</p> <p>3. Termination at Vendor equipment terminals by Vendor. Vendor shall provide lugs & glands in his scope.</p>
15	Any special type of cable like compensating, co-axial, prefab, MICC, OFC etc.	Vendor	Vendor	Any special cable required for equipment, instrument etc., supplied by Vendor.
16	<p>a. Cable trays, accessories & cable trays supporting system</p> <p>b. 100/ 50 mm cable trays/ Conduits/ Galvanised steel cable troughs for local cabling</p>	BHEL Vendor	BHEL Vendor	Local cabling i.e., branching from nearby main route cable tray (BHEL scope) to equipment (vendor's supply) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs.

469360/2021/BAP-WS(CON)

	1 X 660MW, Sagardhigi (Unit #5)	BAP-RANIPET
	Technical Specification for Gas Chlorination Plant (E, C & I Scope)	Spec. No: ROS: 4291, Rev-00 PART of ROS: 6322, Rev-00

17	Conduit and conduit accessories for cabling of equipment supplied by vendor	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
18	Cable glands, lugs and cable tag for equipment supplied by Vendor	Vendor	Vendor	<ol style="list-style-type: none"> 1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type Aluminium lugs for Aluminium power cables and heavy duty tinned copper lugs for copper power cables 3. Solder less crimping type heavy duty copper lugs for control and instrumentation cables.
	Lighting & Earthing			
19	Lighting	BHEL	BHEL	
20	Equipment grounding & lightning protection	BHEL	BHEL	There shall be provision for connecting earthing cable/ flat on equipment supplied by vendor.
21	Below grade grounding	BHEL	BHEL	
	Drawing/ Document			
22	For Control & Instrument Cables a. Cable schedules b. Cable interconnection/ Loop diagram	Vendor Vendor	- -	Cable listing for Control and Instrumentation Cable (excluding power cables) in enclosed excel format shall be submitted by vendor during detailed engineering stage.
23	Electrical cable tray layout drawing	Vendor	-	For ensuring proper cabling, vendor shall furnish cable tray layout drawings (both in print & AUTOCAD form) of complete plant indicating location and identification of all equipment that require cabling. Cabling arrangement (cable trays, ducts, conduits etc.) shall be decided during Engineering stage.
24	Electrical Equipment GA drawing	Vendor	-	For necessary interface review. Electrical equipment layout & cable tray layout drawing shall be subjected


469360/2021/BAP-WS(CON)

	1 X 660MW, Sagardhigi (Unit #5)	BAP-RANIPET
	Technical Specification for Gas Chlorination Plant (E, C & I Scope)	Spec. No: ROS: 4291, Rev-00 PART of ROS: 6322, Rev-00

				to BHEL/ customer approval without any commercial implications to BHEL.
25	Any other equipment/ material/ service required for completeness of system but not specified above (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/ customer after award of contract.
2. All QAPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.
3. In case the requirement of Junction Box arises on account of Power Cable size mismatch due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.
4. Vendor shall indicate location of Electronic Earth pit (if required) in their Civil assignment drawing.

	1 X 660MW, Sagardhigi (Unit #5)	BAP-RANIPET
	Technical Specification for Gas Chlorination Plant (E, C & I Scope)	Spec. No: ROS: 4291, Rev-00 PART of ROS: 6322, Rev-00

SECTION-F: Customer Specific Technical Requirement

F.1 Specification for Motorised Ball Valve (for valve sizes less than 50 NB)

Starter control for the valve shall be considered in LCP panel with power supply available in LCP.

Item description	Single phase Motorised Ball valve in (CPVC MOC for chemical service- Threaded Union at both ends BSP screw connection
Input power supply	240 V +/- 10% single phase AC 50Hz
Manual Override	Required
Duty	Open/ Close
Enclosure	Weather proof & Corrosion Proof
Protection class	IP-65
Mounting	On pipe- screwed connection suitable for pipe size
Cable connection	Terminal Block to suit 2.5 sq.mm cables Cable gland/ Plug in type
Limit Switches for PLC feedback signal	Mechanical Potential free contacts for full open & full close

**SECTION: F-2**

VOLUME: II-F/1

SECTION-II

TECHNICAL SPECIFICATION
FOR
A.C. & D.C. MOTORS



**CONTENT**

CLAUSE NO.	DESCRIPTION	PAGE NO.
1.00.00	SCOPE	1
2.00.00	STANDARDS	1
3.00.00	SERVICE CONDITIONS	1
4.00.00	TYPE AND RATING	1
5.00.00	PERFORMANCE	3
6.00.00	SPECIFIC REQUIREMENTS	4
7.00.00	ACCESSORIES	7
8.00.00	TESTS	8
9.00.00	SPARE	9
10.00.00	DRAWINGS, DATA & MANUALS	9

ATTACHMENT

ANNEXURE-A	DESIGN DATA	10
------------	-------------	----





SECTION - II

A.C. & D.C. MOTORS

1.00.00 SCOPE

- 1.01.00 This specification covers the general requirements of the electric motors for plant auxiliary equipment except for special application like crane, lift, submersible pump etc., motors for which are covered in individual equipment specifications.
- 1.02.00 Motors shall be furnished in accordance with both this general specification and the accompanying driven equipment specification.
- 1.03.00 In case of any discrepancy, the driven equipment specification shall govern.

2.00.00 STANDARDS

- 2.01.00 All motors shall conform to the latest applicable IS, IEC and CBIP Standards/Publications except when otherwise stated herein or in the driven equipment specification.
- 2.02.00 Equipment and materials conforming to any other standard, which ensures equal or better quality may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

3.00.00 SERVICE CONDITIONS

- 3.01.00 The motors will be installed in hot, humid and tropical atmosphere, highly polluted area.
- 3.02.00 Unless otherwise noted, electrical equipment/system design shall be based on the service conditions and auxiliary power supply given in the annexure of this specification.
- 3.03.00 For motor installed outdoor and exposed to direct sun rays, the effect of solar heat shall be considered in the determination of the design ambient temperature.

4.00.00 TYPE AND RATING

4.01.00 A.C. Motors

- 4.01.01 Motors shall be general purpose, constant speed, squirrel cage, three/single phase, induction type.
- 4.01.02 All motors shall be either totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or closed air circuit air cooled (CACW) or closed air water cooled (CACW) type. Temperature rise shall be limited to 70 deg C by resistance method.
- 4.01.03 All motors shall be rated for continuous duty. They shall also be suitable for long period of inactivity.





- 4.01.04 All LT motor shall conform to minimum efficiency performance standards (MEPS) of IE2 mentioned in IS: 12615. All HT motors shall have efficiency and power factor higher than 90% and 0.83 respectively.
- 4.01.05 The motor name-plate rating at 50°C shall have at least 15% margin for LT system and 10% margin for HT system, over the input power requirement of the driven equipment at rated duty point and also covering the maximum load demand of the driven equipment under entire operating range, including voltage and frequency variations, unless stated otherwise in driven equipment specification or in general electrical specification.
- 4.01.06 The motor characteristics shall match the requirements of the driven equipment so that adequate starting, accelerating, pull up, break down and full load torques are available for the intended service. The direction of rotation of motor and its cooling fan should be properly matched with the driven equipment.
- 4.02.00 AC motor for VFD application (If applicable)
- 4.02.01 Inverter duty motors are designed according to the requirements of IEC/TS-60034 part17 & part 25 or NEMA MG-1, Part-30, Part 31 and have performance characteristics match with the driven equipment and variable speed requirement.
- 4.02.02 Induction motors to be operated in adjustable-speed drive applications should be de-rated as per NEMA/IEC standard due to the reduction in cooling resulting from any reduction in operating speed and the effect of additional losses introduced by harmonics generated by the control.
- 4.02.03 Inverter duty motors shall have VPI/improved insulation systems that do not degrade readily due to transient voltage spikes and have an adequate thermal margin.
- 4.02.04 Inverter duty motors shall be self ventilated without any auxiliary blower. Force ventilation shall be subject to purchaser approval.
- 4.02.05 Inverter motor shall be suitable for scalar (open loop) control, without any speed feedback signal, where fast response is not required. Vector (closed loop) control will be used with encoder if specified.
- 4.02.06 The breakdown torque at any frequency within the defined frequency range shall be not less than 150% of the rated torque at that frequency when rated voltage for that frequency is applied.
- 4.02.07 The motor should be capable of producing a breakaway torque of at least 140% of rated torque requiring not more than 150% rated current when the voltage boost is adjusted to develop rated flux in the motor and when the inverter is able to produce the required minimum fundamental frequencies
- 4.02.08 The motor shall be provided with insulated bearing on one side.
- 4.02.09 Normally the maximum safe speed shall be as per IEC/NEMA, however it should be coordinated with VSD requirement.





4.02.10 In case of a conflict, the requirement mentioned under clause no. 4.02.00 for motors for VFD application shall supersede the corresponding requirement for standard motors.

4.03.00 **D. C. Motors**

4.03.01 D.C. motor provided for emergency service shall be shunt wound type. It can also be of compound-wound type with the series field shorted.

4.03.02 Motor shall be sized for operation with fixed resistance starter for maximum reliability. Starter panel complete with all accessories shall be included in the scope of supply.

5.00.00 PERFORMANCE

5.01.00 **Running Requirements**

5.01.01 Motor shall run continuously at rated output over the entire range of voltage and frequency variations as given in the annexure.

5.01.02 The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75% rated voltage at motor terminals.

5.02.00 **Starting Requirements**

5.02.01 Motor shall be designed for direct on line starting at full voltage. Starting current at rated voltage for LT motors shall be 6 times of full load current plus IS tolerance. For 3.3KV and 11KV motor except BFP, starting current shall be maximum 6 times of full load current inclusive IS tolerance. For Boiler feed pump motor, starting current shall be limited to 4.5times of full load current plus IS tolerance.

For D.C. Motors the starting current shall be limited to 2 times full load current.

5.02.02 The motor shall be capable of withstanding the stresses imposed if started at 110% rated voltage.

5.02.03 Motor shall start with rated load and accelerate to full speed with 80% rated voltage at motor terminals without exceeding acceptable winding temperature.

5.02.04 Motor shall be capable of three equally spread starts per hour, two starts in quick succession from cold condition and one restart from hot condition.

5.02.05 Pump motor subject to reverse rotation shall be designed to withstand the stresses encountered when starting with non-energized shaft rotating at 125% rated speed in reverse direction.

5.03.00 **Stress During Bus Transfer**

5.03.01 The motor may be subjected to sudden application of 150% rated voltage during bus transfer, due to the phase difference between the incoming voltage and motor residual voltage.

5.03.02 The motor shall be designed to withstand any torsional and/or high current stresses, which may result, without experiencing any deterioration in the normal life and performance characteristics.





- 5.04.00 Locked Rotor Withstand Time
- 5.04.01 For motors with starting time upto 20 secs, starting time at minimum permissible voltage should be less than the locked rotor withstand time under hot condition at highest voltage limit by at least 2.5 secs.
- For motors with starting time more than 20 secs. and upto 45 secs, starting time at minimum permissible voltage should be less than the locked rotor withstand time under hot condition at highest voltage limit by at least 5 secs.
- For motors with starting time more than 45 secs, starting time at minimum permissible voltage should be less than the locked rotor withstand time under hot condition at highest voltage limit by at least 10% of the starting time
- 5.04.02 To prevent unwanted tripping of a high inertia load at start-up, there may be need to shunt out the motor's overload trip device. Speed switches mounted on the motor shaft may be provided in such case. Heating experienced during start-up must still be considered when sizing the motor.
- 5.04.03 Hot thermal withstand curve shall have a margin of at least 10% over the full load current of the motor to permit relay setting utilising motor rated capacity.
- 5.05.00 Torque Requirements
- 5.05.01 Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.
- 5.05.02 Pull out torque at rated voltage shall not be less than 205% of full load torque.

6.00.00 SPECIFIC REQUIREMENTS

6.01.00 Enclosure

- 6.01.01 Enclosures for the motor and the cable box shall conform to the degree of protection IP-55 unless otherwise specified.
- 6.01.02 Motors like circulating water pumps of large output ratings, located inside a building and not directly exposed to coal dust or fly ash, could have screen protected drip proof enclosure conforming to IP-23.
- 6.01.03 Motor located in hazardous area shall have flameproof enclosure conforming to IS: 2148 /Equiv. as detailed below:
- a) Fuel Oil area : Group IIB
 - b) Hydrogen generation plant area : Group IIC (or Group-I, Div-II as per NEC or Class-1, Gr-B, Div-II as per NEMA/IEC60034)

Separate Canopy shall be provided for LT motors located in outdoor or semi-outdoor area.





6.02.00 Cooling

6.02.01 The motor shall be self ventilated type, either totally enclosed fan cooled (TEFC) or closed air circuit air cooled (CACW).

6.02.02 For large capacity motors, totally enclosed tube ventilated (TETV) may be considered for acceptance. In case of motors rated 3000kW and above, closed air circuit water cooled (CACW) motors may be offered for consideration before proceeding with design and manufacturing.

6.03.00 Winding and Insulation

6.03.01 All insulated winding shall be of copper.

6.03.02 ~~HT motors shall have Class F insulation with winding temperature limited to 120°C. Windings shall be impregnated to make them non-hygroscopic and oil resistant. The lightning impulse and coil inter-turn insulation surge withstand level shall be as per IEC-60034 – Part 15.~~

6.03.03 LT motors shall have Class F or higher insulation with temperature limited to 120°C.

6.04.00 Tropical Protection

6.04.01 All motors shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.

6.04.02 All fittings and hardware shall be corrosion resistant.

6.05.00 Bearings

6.05.01 ~~Motor rated above 1000kW shall have insulated bearings to prevent flow of shaft currents.~~

6.05.02 Vertical shaft motors shall be provided with thrust and guide bearings.

6.06.00 Noise & Vibration

6.06.01 Noise level shall not exceed 85 db (A) except for BFP motor for which the maximum limit shall be 90 db (A).

6.06.02 Peak amplitude of vibration shall be limited within the values prescribed in IS:12075 / IEC 60034-14.

6.07.00 Motor Terminal Box

6.07.01 Motor terminal box shall be detachable type, made of cast iron or pressed steel and located in accordance with Indian Standards clearing the motor base- plate/ foundation.

6.07.02 Terminal box shall be capable of being turned 360° in steps of 90°, unless otherwise approved.

6.07.03 Terminal box for all LT motors shall be diagonally split type and shall have the same degree of protection as motor.





- 6.07.04 The terminal box shall have sufficient space inside for termination /connection of suitable sized HT cables. Where the specified main cable size demands, adopter/extension box of suitable size shall be provided as a part integral to the motor, for easy termination of the cable.
- 6.07.05 Terminals shall be stud or lead wire type, substantially constructed and thoroughly insulated from the frame.
- 6.07.06 The terminals shall be clearly identified by phase markings, with corresponding direction of rotation marked on the non-driving end of the motor.
- 6.07.07 The terminal box shall be capable of withstanding maximum system fault current for a duration of 0.25 sec.
- 6.07.08 For HT motor, the terminal box shall be phase segregated type. The neutral leads shall be brought out in a separate terminal box (not necessarily phase segregated type) with shorting links for star connection.
- 6.07.09 Motor terminal box shall be furnished with suitable cable lugs and double compression brass glands to match Owner's cable. All threads shall be ISO metric thread only.
- 6.07.10 The gland plate for single core cable shall be non-magnetic type.
- 6.08.00 **Grounding**
- 6.08.01 The frame of each motor shall be provided with two separate and distinct grounding pads complete with tapped hole, GI bolts and washer.
- 6.08.02 The grounding connection shall be suitable for accommodation of ground conductors as follows:
- | | |
|------------------------------|-------------------|
| Motor above 90 kW | 50 x 6 mm GI Flat |
| Motor above 30 kW upto 90 kW | 35 x 6 mm GI Flat |
| Motor above 5 kW upto 30 kW | 25 x 3 mm GI Flat |
| Motor upto 5 kW | 8 SWG GI Wire |
- The above sizes shall be superseded by different sizes if so indicated in the relevant clause of the General Electrical Specification.
- 6.08.03 The cable terminal box shall have a separate grounding pad.
- 6.09.00 **Rating Plate**
- In addition to the minimum information required by IS, the following information shall be shown on motor rating plate :
- Temperature rise in °C under rated condition and method of measurement.
 - Degree of protection.
 - Bearing identification no. and recommended lubricant.
 - Location of insulated bearings.



7.00.00 ACCESSORIES

7.01.00 General

Accessories shall be furnished, as listed below, or if otherwise required by driven equipment specification or application.

7.02.00 Space Heater

7.02.01 Motor of rating 30 kW and above shall be provided with space heaters, suitably located for easy removal or replacement.

7.02.02 The space heater shall be rated 240 V, 1 phase 50 Hz and sized to maintain the motor internal temperature above dew point when the motor is idle.

7.03.00 Temperature Detectors

7.03.01 All HT motors shall be provided with minimum four (4) numbers simplex or two (2) numbers duplex platinum resistance type winding temperature detectors per phase.

7.03.02 Each bearing of HT shall be provided with minimum one (1) duplex or two (2) simplex type temperature detectors.

7.03.03 The temperature detector mentioned above shall be resistance type, 3 wire, platinum wound, 100 Ohms at 0°C.

7.04.00 Indicator/Switch

7.04.01 Dial type local indicator with alarm contacts shall be provided for the following: -

- a) HT motor bearing temperature.
- b) Hot and cold air temperature of the closed air circuit for CACA and CACW motor.

7.04.02 Flow switches shall be provided for monitoring cooling water flow of CACW motor and oil flow of forced lubrication bearing, if used.

7.04.03 Alarm switch contact rating shall be minimum 0.5 A at 220V D.C. and 5A at 240V A.C.

7.05.00 Current Transformer for Differential Protection

7.05.01 Motor above 1000 kW shall be provided with three differential current transformers (PS class) mounted over the neutral leads within the enclosure. Matching three (3) numbers PS class CTs shall be mounted on the switchgear end.

7.05.02 The arrangement shall be such as to permit easy access for C.T. testing and replacement. Current transformer characteristics shall match Owner's requirements to be intimated later.





7.06.00 **Accessory Terminal Box**

7.06.01 All accessory equipment such as space heater, temperature detector, current transformers etc., shall be wired to and terminated in terminal boxes, separate from motor (power) terminal box.

7.06.02 Accessory terminal box shall be complete with double compression brass glands and pressure type terminals to suit owner's cable connections.

7.07.00 **Drain Plug**

Motor shall have drain plugs so located that they will drain the water, resulting from the condensation or other causes from all pockets of the motor casing.

7.08.00 **Lifting Provisions**

Motor weighing 25 kg. or more shall be provided with eye bolt or other adequate provision of lifting.

7.09.00 **Dowel Pins**

The motor shall be designed to permit easy access for drilling holes through motor feet or mounting flange for installation of dowel pins after assembling the motor and driven equipment.

7.10.00 **Painting**

Motor including fan shall be painted with corrosion proof paints. The paint shade shall be as specified in the Annexure.

8.00.00 TESTS

8.01.00 Upon completion, each HT & LT motor shall be subject to routine tests as per Schedule-C of Section -I. In addition, any special test called for in the driven equipment specification shall be performed.

8.02.00 Unless and otherwise stated, Six (6) copies of routine test certificates shall be submitted for approval prior to the despatch of the motors from works.

8.03.00 The following type test reports shall be submitted for each type and rating of HT motor:

- a) Degree of protection test for the enclosure followed by IR, HV and no load run test.
- b) Fault level withstand test for each type of terminal box.
- c) Lightning impulse withstand test on the sample coil as per IEC 60034, part-15.
- d) Surge withstand test on inter-turn insulation as per clause no. 5.1.2 of IEC 60034, part-15.

8.03.04 The following type tests shall be performed on a representative sample of 11000V and 3300V motor of each type & rating, even if type test certificates of these tests are submitted by the Bidder for Purchaser's approval:





- a. Measurement of stator resistance (and rotor resistance on slip ring motors).
- b. No load test at rated voltage to determine voltage, current, power input and speeds.
- c. Locked rotor reading of voltage, current, power input and values of torque of motor.
- d. Full load test to determine efficiency, power factor and slip.
- e. Temperature rise test. During heat run test, bearing temperature, Winding temperature, core temperature, coolant flow and its temperature shall be recorded. In case temperature rise test is carried at any load other than rated load, specific approval for test procedure and method has to be obtained.
- f. Momentary overload test.
- g. Test for noise level of motor.

9.00.00 ~~SPARE~~

~~Recommended spares for three (3) years operation shall be quoted along with the bid clearly identifying the part numbers with recommended quantities.~~

10.00.00 **DRAWINGS, DATA & MANUALS**

Drawings, data & manuals for the motors shall be submitted as indicated below :

10.01.00 Along with the bid

- a) List of the motors
- b) Individual motor data sheet as per Annexures
- c) Scheme & write up on forced lubrication system, if any.
- d) Type test report

10.02.00 After Award of Contract for Information (I)/ Approval (A)

- a) Dimensional General Arrangement drawing (I)
- b) Foundation Plan & Loading (I)
- c) Cable end box details.(I)
- d) Space requirement for rotor removal (I)
- e) Thermal withstands curves hot & cold (I)
- f) Starting and speed torque characteristics at 80%, 100% & 110% voltage (A)
- g) Complete motor data sheet (A)
- h) Erection & Maintenance Manual (I)



ANNEXURE-A

DESIGN DATA

1.0 AUXILIARY POWER SUPPLY

Supply	Description	Consumer
H.T. Supply	11 kV, 3 \emptyset , 3W, 50 Hz Non-effectively earthed Fault level 40 KA symm. for 3 second	Motors above 1500 kW
H.T. Supply	3.3 kV, 3 \emptyset , 3W, 50 Hz Non-effectively earthed Fault level 40 KA symm. for 3 second.	Motors above 160kW upto 1500 kW.
L.T. Supply	415V, 3 \emptyset , 3W, 50 Hz Effectively earthed Fault level 50 KA symm. for 1 seconds. 240V, 1 \emptyset , 2W, 50 Hz Effectively earthed	Motors above 200W upto 160 kW Motors below 200W Lighting, space heating, A.C. control protective devices
D.C. Supply	220V, 2W, unearthed Fault level 25* KA for 1 second (Min.)	D.C. alarm, control protective devices

* However actual value shall be substantiated by the bidder through calculation.

2.0 RANGE OF VARIATION

A.C. Supply

Voltage : $\pm 10\%$

Frequency : $\pm 5\%$

Combined Volt & frequency : 10% (absolute sum)

D.C. Supply

Voltage : 190 to 240 Volt

3.0 Paint Shade : RAL 7032



**SECTION: F-3****VOLUME: II-F/1****SECTION-VIII**

**TECHNICAL SPECIFICATION
FOR
LOCAL CONTROL BOARDS/PANELS,
~~LOCAL ISOLATING SWITCH UNITS~~
~~AND LOCAL PUSH BUTTON STATIONS~~**





CONTENT

CLAUSE NO.	DESCRIPTION	FILE NO.
1.00.00	SCOPE OF SUPPLY	1
2.00.00	CODES AND STANDARDS	1
3.00.00	DESIGN CRITERIA	1
4.00.00	SPECIFIC REQUIREMENTS	5
5.00.00	TESTS	15
6.00.00	DRAWINGS, DATA AND MANUALS	16

ATTACHMENTS

ANNEXURE-A	RATINGS AND REQUIREMENTS	18
ANNEXURE-B	A.C/D.C POWER SUPPLY	19
ANNEXURE-C	FUNCTIONAL REQUIREMENTS OF ANNUNCIATOR	20
ANNEXURE-D	AREA WISE INDICATIVE LIST OF LOCAL CONTROL BOARDS/PANELS	21





SECTION - VIII

LOCAL CONTROL BOARDS/PANELS, LOCAL ISOLATING SWITCH UNITS AND LOCAL PUSH BUTTON STATIONS

1.00.00 SCOPE OF SUPPLY

1.01.00 The following equipment shall be furnished with all accessories:

- a) Complete set of Local Control Boards/Panels, an indicative list of which is given in Annexure-D
- b) Local Push Button Stations: As required
- c) Local Isolating Switch Units: As required

1.02.00 Furnishing, Mounting, and wiring of all equipments, devices and accessories.

1.03.00 Floor Channel sill, vibration damping pad, and kick plates for all floor-mounted control boards/panels, complete with holding down bolts and nuts.

1.04.00 Mounting hardware for all control boards/panels, Local Push Button Stations, and Local Isolating Switch Units.

1.05.00 Mandatory Spares

2.00.00 CODES AND STANDARDS

2.01.00 All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

2.02.00 Equipment and material conforming to any other standards, which ensure equal or better quality, may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

2.03.00 The electrical installation shall meet the requirements of Indian Electricity Rules as amended up to date and relevant IS Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

3.00.00 DESIGN CRITERIA

3.01.00 Local Push Button (L.P.B.) stations shall be used for controlling drives from local.

3.02.00 Local Isolating Switch (L.I.S) Units shall be used for local isolation of power supply to various machines in the Workshop Building.

3.03.00 All equipment except L.I.S. Units and L.P.B stations, shall be located in a clean but hot, humid, and tropical atmosphere. The L.I.S. Units and L.P.B. stations





shall be generally installed in a hot, humid, and tropical atmosphere, heavily polluted at places with fly ash and/or coal dust, and shall be suitable for outdoor service with degree of protection specified elsewhere in this specification.

- 3.04.00 All Control Boards/Panels, L.I.S. Units, and L.P.B. stations shall be liberally sized so as to provide spacious layout of equipment and devices with sufficient working space in between.
- 3.05.00 Adequate space/terminals shall be kept in the boards/panels for installing additional equipment in future.
- 3.06.00 For continuous operation at specified ratings, temperature rise of the various components/equipment shall be limited to the permissible values stipulated in the relevant standards and/or this specification.
- 3.07.00 All equipment/components thereof shall be capable of withstanding the mechanical forces and thermal stresses of the system short circuit current without any damage or deterioration of material.
- 3.08.00 Design, material selection, and workmanship shall be such as to present a neat appearance outside and inside with no welds, rivets, screws, or bolt heads apparent from the exterior surface of the boards/panels. All instrument cut-outs, mounting studs, and support brackets shall be accurately located.
- 3.09.00 **DB/Local Starter Panel for Dust Suppression, Dust Extraction, Sump Pump, Coal Sampler, Bunker Level and other Panels**

The Local Starter Panel shall be fixed type with compartmentalized execution. One (1) no. 415 V \pm 10% 3 phase 3 wire 50 Hz +3 to -5% power supply feeder shall be provided for each panel. Power shall be received through an incoming MCCB having R/Y/B indication lamps, voltmeter with selector switch, and ammeter with selector switch. Individual motor feeder shall have their switch fuse, power contactor; overload relay-cum-single phasing preventor (hand reset type), stop/ start push button, auto/manual selector switch, Red/Green/Trip indication lamp, auxiliary relays, timers, etc. The stop push button shall be lockable type. Necessary interlock, annunciation, 415/240 V Transformers for control supply, space heating as applicable to meet system requirement shall also be provided and in no case derive any power supply from its main feeder. Separate feeders shall also be provided for brakes and rail clamp as applicable. Facility shall be provided for resetting the motor overload relay from outside without opening the panel door. Panel door shall be interlocked with the incoming MCCB such that the door cannot be opened when MCCB is ON.

The details indicated above for DB/Local Starter Panel is applicable for motors rated upto 90 KW. For motors rated above 100 KW, the details indicated in the respective 415V PMCC specification (Refer section-VI) and associated single line diagram shall govern.

Interlock, control, indication, annunciation etc. shall be achieved by relay logic with the exception of Paddle Feeder. For paddle feeder the logic shall be based





on PLC control and provision for remote operation from CHP control room shall be provided. .

Isolation of individual circuit in the DB/Local Starter Panel shall be provided through individual MCB/Fuse.

Control features as described under relevant mechanical section shall be considered for interlocking and preparation of control schematic.

Thermostatically controlled space heater shall be provided.

Necessary door interlock defeat feature shall also be provided for testing purpose. Wherever necessary, the panels shall be designed for outdoor and of weather proof/rain protection type. Ratings of components shall conform to the rating indicated in the enclosed module selection chart.

Paddle Feeder Local Panel (If applicable)

- a) Following indications shall be provided in local panel, for each drive :
 - i) Paddle feeder travel drive
 - ii) Paddle wheel ON/OFF
 - iii) Brake release
 - iv) Hydraulic power pack indication
 - v) Cable reeling drum on
- b) Annunciation windows shall be provided for all drive trip indications and all other major fault.
- c) Local & Remote metering shall be provided for current indication for drive rated 30 KW and above and also paddle wheel coal feeding rate .
- d) PLC based logic shall be provided for Paddle feeder and shall be interfaced with local panel for control, indication and annunciation.
- h) Separate cable reeling drum shall be provided for power & control cable. Combined trailing cable shall have 19C X 2.5 mm² (cu) control cable and 8 pair 1.5 mm² (cu) screened cable for signal and communication.

Travelling Tripper MCC Cum Control Panel

In addition to indication to be provided for drives, following indications shall also be provided in local panel:

- i) Brakes applied
- ii) Rail clamps applied
- iii) Flap Gate position
- iv) Travel driver over speed





- v) Traveling tripper – Forward/Reverse
- vi) Cable Reeling Drum on

Traveling tripper position on bunker shall be provided in the PLC.

Control features as described under relevant mechanical portion shall be considered for interlocking and preparation of control schematic.

Cable reeling drum shall be provided for power & control cable. Apart from meeting the requirements in respect of control, indication & annunciation and telecommunication following spare cores shall be provided :

- i) 4 pair cores (Shielded) for communication
- ii) 4 core for control.

Sump Pump Control Panel

Sump Pump Control Panel shall be provided with level controller, necessary contacts to start pumps in auto mode when level reaches high. Further, very high level shall cause hooter to blare for a predetermined period of time. In manual mode it shall be possible to start individual pump. However, in manual mode and auto mode of operation, pump shall be tripped when level in the sump pit reaches low. Working and standby logic also to be incorporated as per requirement.

In addition to other indicating lamps level high indication lamp shall also be provided in local panel.

Control Panel for Drives of ETP

Control panel for each drive shall be provided near the drive. The panel shall be fabricated from cold rolled MS sheets of minimum 2mm thickness for load bearing members, 1.6mm for non-load bearing members and 3mm for gland plates. Panel shall be suitable for outdoor installation with IPW-55 or better.

The panel shall house the starter for the drive motors. Motor starter feeder shall be chosen to provide Type-2 co-ordination. Power supply for motor space heater shall also be derived from this panel.

Control panel shall have all necessary standard features viz.

- Motor ON/OFF push buttons
- Process interlocking provisions
- Auto/Manual selection position
- Motor ON/OFF indication

Miscellaneous Control Panels

Miscellaneous control panel i.e. dust suppression panel, ventilation panel, etc. shall have individual starter feeder for individual drive. Other features as specified above shall also be provided. Equipment such as Vibrating feeders,





Magnetic separators, Metal detectors, Dust suppression, Ventilation, Dust extraction, Coal Sampler, Bunker Level, Hoists etc. shall have individual starter-cum-control panels to suit individual requirements. The panels shall include all necessary feeders, start stop PB, indicating lamp, annunciation system, 415/240V control transformers for control supply and space heating as applicable to meet system requirement. For Magnetic Separators, separate panels shall be provided. One panel shall accommodate transformer & rectifier and the other panel shall accommodate incomer and other controlling items.

The requirement of 4-20 mA signals for Belt Weigher and bunker level indicator have been provided in the relevant Specification.

4.00.00 **SPECIFIC REQUIREMENTS**

4.01.00 **Construction**

4.01.01 Local Control Boards/Panels

- a) Local Control Boards may consist of a number of vertical panels mounted side-by-side, in which case, they shall be bolted together to form a compact unit. Where two panels meet, the joints shall be smooth, close-fitting, and unobtrusive.
- b) The control boards/panels/stations shall be totally enclosed type, conforming to degree of protection IP-54 or better.
- c) Generally, the local control boards/panels shall be free-standing, floor-mounted, dead-front assemblies. In some cases, however, wall-mounted type control boards/panels may also be accepted.
- d) Floor-mounted control boards/panels shall be assembled on channel/angle base plates with anti-vibration mountings and stainless steel kick-plates.
- e) Control boards/panels shall be of folded sheet steel construction, minimum 2 mm. thick, and free from all surface defects.

The boards/panels shall have sufficient structural reinforcement to ensure a plane surface, to limit vibration, and to provide rigidity during shipment and installation.

- f) All floor-mounted panels shall have rear door.
- g) Doors shall have concealed type hinges and padlocking arrangement. Doors shall be grounded by flexible copper braid.
- h) All doors and removable covers shall be provided with neoprene rubber gaskets all round and latches sufficiently strong to hold them in alignment when closed.
- i) Working height of the panels shall be limited between 550 mm and 1800 mm above floor level.





4.01.02 Local Push Button Stations

- a) L.P.B. Stations shall be furnished in sheet steel enclosure of dust and vermin-proof, weather-proof, gasketed construction, suitable for outdoor use without canopy, and conforming to degree of protection IP-55 or better.
- b) L.P.B. Stations shall be suitable for column/structure/wall mounting and shall be complete with push-buttons, terminal blocks, anodised aluminum inscription plate, two (2) nos. earthing terminals, removable gland plate along with crimp type tinned copper lugs and compression type glands for cable/conduit entry from top and bottom. The earthing terminals shall be suitable for connection to one (1) no. 8 SWG G.I. wire.
- c) L.P.B. Stations shall be of the following basic type and equipped with:

Type-A	:	One(1) START push-button and one(1) STOP push-button.
Type-B	:	One(1) OPEN push-button, one(1) CLOSE push-button, and one(1) STOP push-button.
Type-C	:	Flame proof type as per IS-2148. one (1) START push-button and one(1) STOP push-button.
Type-D	:	One(1) STOP Lock-out switch.

Any other type of L.P.B. Station, if required, shall be subject to approval of the Purchaser.
- d) OPEN, CLOSE, and START push-buttons shall be spring return to normal type. STOP push-buttons shall have mushroom head actuator with press-to-latch and key-to-release feature.
- e) OPEN/START push buttons shall be GREEN, STOP push buttons shall be RED, and CLOSE buttons may be YELLOW.
- f) All push-buttons shall have a minimum of two (2) Normally-Open and two (2) Normally-Closed electrically separate contacts, rated minimum 10 A at operating voltage.
- g) Wiring shall be done by 1/C - 2.5 sq.mm. 1100V grade, PVC/XLPE insulated, stranded copper conductor, cable. Each wire shall be identified at both ends by ferrules with wire designation.
- h) Terminals shall have provision for connecting at least two (2) nos. 2.5 sq.mm. copper cable and shall be rated for carrying continuously minimum 10 A at 240V A.C. and 2 A at 220V D.C.





4.01.03 Local Isolating Switch Units

- a) L.I.S. Units shall be furnished in sheet steel enclosure of dust and vermin-proof, weather-proof, gasketed construction, suitable for outdoor use without canopy, and conforming to degree of protection IP-55 or better.
- b) L.I.S. Units shall be suitable for column/structure/wall mounting and shall be complete with load-break switch, terminal blocks, anodized aluminum inscription plate, two (2) nos. earthing pads, removable gland plate along with crimp type tinned copper lugs and compression type glands for cable/conduit entry from top and bottom. The earthing pads shall be suitable for connection to 25 x 3 mm G.S. flat
- c) Load-break switches shall be four-pole, air break, heavy-duty type. Duty class of load-break switches shall be AC-23 for motor feeders. Motor feeder switches shall be capable of safely breaking the locked rotor current of the associated motor circuit.
- d) Terminals shall be clip-on type, 10 sq.mm. minimum.

4.02.00 Equipment Mounting

4.02.01 All equipment shall be so mounted that removal and replacement may be accomplished individually without interruption of services to others. No equipment shall be mounted on panel door.

4.02.02 All equipment mounted inside the panels shall be so located that their terminals and adjustments are readily accessible for inspection or maintenance.

4.02.03 For Local Control Boards/Panels control components such as push buttons, indicating lamps, selector switches, indicating meters etc. shall be flush mounted on the front face of the board/panel while switch fuses, supervision relays (AC/DC) etc. shall be mounted inside.

4.03.00 Name Plate

4.03.01 Nameplates shall be furnished for each panel and for each instrument or device mounted on the panel. Each LPB Station shall also be provided with a nameplate.

4.03.02 The material of the nameplate shall be lamicoïd or approved equal, 3 mm thick, with white letters on black background.

4.03.03 The nameplates shall be held by self tapping screws. The size of nameplate shall be approx. 20 mm x 75 mm for equipment and 40 mm x 150 mm for the panels. The size of the nameplate shall suit the overall dimensions of LPB station/L.I.S Unit.

4.03.04 Nameplates for panels shall be provided both on the front and on the rear and shall be according to final device/designation list.





- 4.03.05 Control and meter selection switches shall have integral nameplates. Nameplates for all other devices shall be located below the respective devices.
- 4.03.06 Instruments and devices mounted on the face of the panels shall also be identified on the rear with the instrument or device number. The number may be painted on or adjacent to the instrument or device case.
- 4.04.00 Mimic Diagram
- 4.04.01 Mimic diagram of electrical connections shall be furnished on the front face of all electrical control panels.
- 4.04.02 Mimic buses shall be at least 3 mm thick and 10 mm in width, made of suitably treated metal strips or approved equivalent and colour coded to denote different voltages.
- 4.04.03 The mimic representation, colour and size of diagram are subject to the approval of the Purchaser.
- 4.05.00 Illumination, Space Heating and Receptacles
- 4.05.01 Each panel shall be provided with interior fluorescent tube with door switch, space heater with thermostat and 5A, 3-pin receptacle with plug. Third pin of the socket shall be effectively grounded through the metallic structure.
- 4.05.02 Tube, heater and receptacle circuits shall be suitable for available A.C. supply and furnished with individual ON-OFF switch.
- 4.05.03 The lamp shall be located at the ceiling and guarded with protective cage. Space heater shall be located near the floor so as not to pose any hazard to service personnel.
- 4.06.00 AC/DC Power Supply
- 4.06.01 Necessary A.C. and D.C. supplies as required for control and service shall be arranged by the contractor. Single feeder shall be arranged for A.C supply and duplicate feeders shall be arranged for D.C supply.
- 4.06.02 Isolating switch fuse units shall be provided for the incoming AC/DC power supplies and bus wires shall be run for power distribution to different panels. D.C. supply isolating switches shall be double pole, double throw with off and A.C. supply isolating switches shall be 4-pole, double throw type.
- 4.06.03 Fuse and link shall be provided for individual circuits for protection and also for isolation from bus wire without disturbing other circuits.
- 4.06.04 The fuse requirements in each panel shall be grouped in easily accessible fuse blocks or distribution panel. The grouping shall be done in a neat and orderly fashion.
- 4.06.05 Alarm relays with reverse flag shall be provided to annunciate failure of main incoming A.C. and D.C. power supplies and annunciation D.C. supply in each





panel. Lamp indications shall be provided individually for main D.C. supply-1 fail, main D.C. supply-2 fail, and panel annunciation D.C. supply fail. A common A.C. electric bell shall be provided to give an audible alarm in case of failure of D.C. supply-1/D.C. supply-2/annunciation D.C. supply in any panel. A common push-button shall also be provided for cancellation of lamp indications and audible alarm.

- 4.06.06 Separate circuits shall be provided for (a) indication and alarm (b) tripping, and (c) control.
- 4.06.07 For lighting, auxiliary supply and space heating A.C. supply shall be used. D.C. supply shall be used for providing control supply to annunciator.
- 4.06.08 Bus wires of adequate capacity shall be provided to distribute the incoming supplies to different cubicles of a VDB. Isolating switch fuse units shall be provided at each cubicle for A.C/D.C supplies.
- 4.07.00 Wiring
- 4.07.01 The panels shall be fully wired up at the factory to ensure proper functioning of control, protection and metering schemes.
- 4.07.02 All spare contacts of relays and switches shall be wired up to terminal blocks.
- 4.07.03 Wiring shall be done with flexible, heat resistant, 1100V grade, PVC insulated, switchboard wires with stranded copper conductor, 2.5 Sq.mm for current, control circuits and voltage circuits.
- 4.07.04 Each wire shall be ferruled by plastic tube with indelible ink print at both end having terminal Block No., terminal numbers, destination number as per approved wiring drawing.
- 4.07.05 All wire termination shall be made with insulated sleeve solderless crimping type tinned copper lugs. Wires shall not be tapped or spliced between terminals.
- 4.07.06 Wiring shall be neatly bunched in groups by non-metallic cleats or bands. Each group shall be adequately supported along its run to prevent sagging or strain on the termination.
- 4.07.07 Colour codes shall be used for wiring as per latest revision of IS: 375.
- 4.08.00 Terminal Block
- 4.08.01 Multi-way terminal blocks complete with necessary binding screws and washers for wire connections and marking strip for circuit identification shall be furnished for terminating the panel wiring and outgoing cables. Terminals shall be box-clamp type, 10 sq.mm. minimum. Terminals for C.T. secondary leads shall have provision of shorting and grounding.
- 4.08.02 Not more than two wires shall be connected to one terminal. If necessary, a number of terminals shall be jumpered together to provide wiring points.





- 4.08.03 Each terminal shall be identified with designation as per approved schematic. At least 20% of the total number of active terminals shall be furnished as spare in each panel.
- 4.08.04 The wiring and terminals shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.
- 4.08.05 The terminal blocks shall be located to allow easy access and also to suit floor openings for cable entry.
- 4.08.06 The terminal blocks within the panels shall be mounted on vertical support brackets. The support brackets shall be tack welded to the interior sheet steel mounting plates of the cabinet. Support brackets shall not be welded directly to the walls of the enclosure. The terminal blocks shall be attached to the support brackets with round head machine screws.
- 4.08.07 Terminal blocks shall generally be mounted vertically with adequate spacing (not less than 100 mm) between adjacent rows.
- 4.08.08 The bottom of the terminal block shall be at least 200 mm above the incoming cable gland plate.
- 4.09.00 Cable Entry
- 4.09.01 The Control Boards/Panels shall have provisions of cable entry from the bottom. Bottom plate shall be provided to make entry dust-tight. L.P.B. stations and Local Isolating Switch Units shall have provision for cable/conduit entry from both top and bottom. Suitable cable gland-plates shall be provided.
- 4.10.00 Grounding
- 4.10.01 50 x 6 mm TINNED COPPER ground bus shall be provided in each control panel extending along the entire length of the assembly.
- 4.10.02 The ground bus shall have two-bolt drilling with GI bolts and nuts at each end and shall be suitable for connection to 50 x 6 mm G.S. flat.
- 4.10.03 The ground bus shall be bolted to the panel structures and shall effectively ground the entire assembly. The cases of meters, relays and switching devices shall be grounded through the steel structure.
- 4.10.04 Whenever a circuit is grounded, a single wire from the circuit shall be run independently to the ground bus and connected to it.
- 4.11.00 Painting
- 4.11.01 Panels and Push-button Stations shall be finished with two coats of synthetic enamel paint white inside and gray (shade 631 of IS-5) outside. Panels and push-button stations shall be stoved after each spraying of finish paint. Painting process shall be of powder coating.





- 4.11.02 Caution Notice plate shall be affixed at the back of each vertical panel.
- 4.12.00 Switches
- 4.12.01 Switches shall be dust protected, heavy duty, switchboard type, complete with escutcheon plate. Contacts shall be silver surfaced and rated minimum 10A at operating voltage.
- 4.12.02 415V Breaker control switches shall be 3-position (TRIP/NORMAL/-CLOSE), 120°, spring return to neutral with lost motion device, non-lockable, sequence device, pistol grip handle, RED/AMBER/GREEN (circuit breaker CLOSED/TRIPPED-OR-TRIP CIRCUIT UNHEALTHY/OPEN) indicating lamps shall be provided with each breaker control switch.
- 4.12.03 Contact details and type of handle required for other types of switches are given below:

Sl. No.	Application	Switch description
a)	Synchronizing Selector switch	180°, 4-position (INCOMER-1/ BUS-SECTION/INCOMER-2/OFF), stayput type, pistol grip handle. OR 120°, 3-position (INCOMER/TIE/OFF) stayput type, pistol grip handle.
b)	Trip Selector Switch	120°, 3-position (INCOMER-1/ BUS-SECTION OR TIE/INCOMER-2), stayput type, pistol grip handle.
c)	Meter Selector Switch	4-position (OFF/R/Y/B for ammeter selector switch and OFF/R/Y/YB/RB for voltmeter selector switch), maintained contact, stay-put type, knob handle. Ammeter selector switches shall have make-before-break contacts.
d)	Auto-Manual Selector switch	120°, 2-position (AUTO/MANUAL), stayput type, non-lockable, spade handle.
e)	On-off Switch/Local- Remote Selector Switch	90°, 2-position (ON/OFF OR LOCAL/REMOTE), stayput type, non-lockable, spade handle.

- 4.12.04 Any other type of switch, if required, shall be subjected to approval of purchaser.





- 4.12.05 Tenderer shall decide the number of switch contacts taking into account the scheme requirements and spares.
- 4.13.00 Fuses
- 4.13.01 Fuses shall be HRC, preferably link type, with a minimum interrupting capacity equal to the system short circuit current.
- 4.13.02 Fuses shall be furnished complete with fuse boxes and fittings of such design as to permit easy and safe replacement of fuse element. Visible indication shall be provided on blowing of the fuse.
- 4.13.03 Motor fuse characteristics and ratings shall be chosen to ride over motor starting period without blowing. The fuse on incoming feeder, wherever provided, shall be chosen to provide discrimination with motor/feeder fuses.
- 4.14.00 Contactors
- 4.14.01 Contactors shall be three pole, air break type, with non-bouncing silver/silver alloy contacts. Contactor duty shall be class III - category AC3 for unidirectional drives and AC4 for bi-directional and inching drives/class I - category DC2.
- 4.14.02 Each contactor shall be provided with minimum two (2) N/O and two (2) N/C auxiliary contacts rated 10 A at operating voltage. The exact requirement of contacts shall be decided by the Tenderers taking into account the scheme requirements and spares.
- 4.14.03 Contactor starters shall comply with the requirements of IS-8544 (Part - 1) in respect of co-ordination of the characteristics of contactor, overload relay, and fuse. The type of co-ordination shall be Type-C as per IS-8544.
- 4.15.00 Thermal Overload
- 4.15.01 Thermal overload relays shall be three elements, positive acting, ambient temperature compensated with adjustable settings.
- 4.15.02 Single phasing preventor shall be provided as an inbuilt feature of the thermal overload relay.
- 4.15.03 Overload relays shall be manual reset type with 1 NO and 1 NC contacts. Resetting of relays shall be possible with compartment door closed. Colour of resetting button shall be BLACK.
- 4.15.04 Relays for fan motors having long starting time shall be saturable core C.T. operated.
- 4.16.00 Current Transformers
- 4.16.01 Current Transformers shall be cast resin type. All secondary connections shall be brought out to terminal blocks where wye or delta connection will be made.





- 4.16.02 Accuracy class of the current transformers shall be:
- a) Class PS for differential
 - b) Class 5P20 for other relaying
 - c) Class 0.5, ISF<5 for metering.
- 4.16.03 Drives requiring current monitoring shall be provided with current transducers with calibration for full-scale reading. The output shall be 4-20 mA D.C; 4-18mA of which shall correspond to the normal range and 18-20 mA shall correspond to the suppressed range.
- 4.17.00 Voltage Transformers
- 4.17.01 Voltage Transformers shall be cast-resin type and shall have an accuracy class of 0.5.
- 4.17.02 High voltage windings of voltage transformer shall be protected by current limiting fuses.
- 4.17.03 Low voltage fuses, sized to prevent overload, shall be provided in all ungrounded secondary leads. Fuses shall be suitably located to permit easy replacement while the board/panel is energised.
- 4.18.00 Push Button
- 4.18.01 All push buttons shall be oil tight, heavy duty, push to actuate type, with coloured button and inscription plate marked with its function. The colour of "ON" and "OFF" push buttons shall be RED and GREEN respectively. RESET push buttons shall be coloured black.
- 4.18.02 Each push button shall have minimum 2 NO. + 2 NO. contacts, rated 10A at 240V AC and 2A at 220V DC.
- 4.18.03 Push buttons shall be shrouded type except for emergency trip button, which shall be mushroom type for easy identification.
- 4.19.00 Lamps
- 4.19.01 Lamps shall be LED type.
- 4.19.02 LED lamp shall be made in accordance with InP Technology (Aluminium Indium Gallium Phosphide Technology). The body shall be made of Poly Carbonate Unbreakable Lens. LED shall be protected by inbuilt fuse with surge suppressor or leakage voltage glow protection. LED circuit shall be PCB mounted. Intensity shall be greater than 200 mcd. All Push Button lamp shall be as per LED indicating lamp.





- 4.20.00 Operating Range
- All instruments shall be generally suitable for operation on 1A or 5A C.T. secondary circuit and/or 110V V.T. secondary circuit.
- 4.21.00 Meters
- 4.21.01 All indicating instruments shall be switchboard type, back connected, suitable for flush mounting, 96 x 96 mm with 240 Deg. scale, antiglare glass and accuracy class of $\pm 2\%$ of the full scale. The dials shall be made of such material as to ensure freedom from warping, fading, and discolouring during the lifetime of the instruments.
- 4.21.02 All indicating instruments shall be enclosed in dust-tight cases suitable for tropical use.
- 4.21.03 Meters shall have provision for zero-adjustment from front of the panel.
- 4.21.04 Meters shall be compensated for temperature errors and factory calibrated to read the primary quantities directly without using a multiplying factor.
- 4.21.05 D.C. ammeters, wherever required, shall be provided with external shunt if the current exceeds 5A. The rated voltage drop for the shunts shall be 75mV.
- 4.22.00 Annunciator System
- 4.22.01 Each control panel shall be provided with an annunciator window board. The annunciator boards shall be back-connected and suitable for semi-flush mounting.
- 4.22.02 The annunciator system shall be solid state type with optical isolation for input signals. The functional requirements shall be as per Annexure-C.
- 4.22.03 Each annunciator group shall be independent, complete with its own power supply, acknowledge-reset-test buttons and other necessary accessories. Hooter for audible alarm shall be common for each control panel assembly.
- 4.22.04 Each annunciator group shall be provided with a common alarm relay for group alarm annunciation in remote control room. The common alarm relay will operate on actuation of any alarm point of the group.
- 4.22.05 The annunciator shall be non-integral type with hardware box mounted separately for easy access and maintenance.
- 4.22.06 Audible alarms with different tones shall be used for trip, non-trip and ring back functions.
- 4.22.07 The window size shall be such as to accommodate minimum three (3) lines of twelve (12) characters each. Each character shall be minimum 4.75 mm high.
- 4.22.08 The annunciator system shall be suitable for operation from both NO and NC type initiating contacts.





- 4.22.09 At least 10% spare channels and window facia shall be provided in each annunciator group.
- 4.23.00 Relays
- 4.23.01 Auxiliary relays shall be furnished in fixed, dust-tight, casings and mounted inside the panel.
- 4.23.02 The relays shall have adequate numbers of contacts to suit scheme requirements. Besides, each relay shall have spare contacts for future use.
- 4.23.03 Contacts shall be silver-surfaced, bounce-free, and capable of repeated operation without deterioration.
- 4.24.00 Auxiliary Devices
- 4.24.01 The Contractor shall furnish, install, and wire-up all auxiliary devices such as timing / switching / lockout / auxiliary relays/auxiliary contactors, etc. as required for the proper functioning of the approved schemes.
- 4.24.02 The Contractor shall number the various types of relays and contactors as per the numbers appearing in the approved Schematic/Wiring appearing in the approved Schematic/Wiring diagrams.
- 5.00.00 **TESTS**
- 5.01.00 All Control Boards/Panels, L.I.S. Units and L.P.B. Stations shall be completely assembled, wired, adjusted and tested at the factory prior to shipment to ensure accuracy of wiring, correctness of control scheme and proper functioning of all components.
- 5.02.00 Routine Tests
- 5.02.01 The tests shall include wiring continuity tests, high voltage tests, insulation measurement test both before and after high voltage test, and functional tests to ensure accuracy of wiring operation of the control/ protection/metering schemes and individual equipment. Detailed test report including procedure and drawing shall be furnished.
- 5.02.02 All switches, meters, relays and other devices shall be tested and calibrated in accordance with relevant IS standards.
- 5.03.00 Type test certificate on any equipment, if so desired by the Purchaser shall be furnished. Otherwise the equipment shall have to be type tested, free of charge, to prove the design.
- 6.00.00 **DRAWINGS, DATA & MANUALS**
- 6.01.00 To be submitted with the Bid





- 6.01.01 General Arrangement drawings and cross-section of each equipment showing constructional features, cable entry points etc.
- 6.01.02 Typical foundation plan.
- 6.01.03 Bill of Materials.
- 6.01.04 Technical leaflet and Catalogues of:
- a) Local Control Boards and Local Starter-cum-Control panels
 - b) Local Isolating switch units
 - c) Local Push Button Stations
 - d) Switches and Lamps
 - e) Meters, relays, push buttons
 - f) Switch fuse units
 - g) Annunciator System
 - h) Auxiliary Devices
 - i) Terminal Blocks/glands.
 - j) Temperature Scanner
- 6.02.00 To be submitted after award of Contract
- 6.02.01 Dimensional general arrangement of all Local Control Boards, Local Starter-cum-control panels, Local Push Button Stations, and Local Isolating switch units showing equipment disposition and identification along with space requirements and cable entry points.
- 6.02.02 Foundation plan and loading diagram, clearly showing panel fixing arrangement, floor opening for cable entry etc.
- 6.02.03 Cross section with parts list.
- 6.02.04 Schedule of materials and label inscriptions.
- 6.02.05 Detailed Control Schematics clearly showing terminal and wire numbering.
- 6.02.06 Wiring diagram showing all equipment and devices in their relative physical positions and all wiring upto the terminal blocks.
- Equipment/Device and terminals shall be identified with designations/numbers as per approved schematic and connection diagrams.





- 6.02.07 Data Sheets and Instruction Manual for each piece of equipment.
- 6.02.08 Any other relevant drawing or data necessary for satisfactory installation operation and maintenance or as required by purchaser.
- 6.03.00 Tenderers may note that the drawings, data and manuals listed are minimum requirements only. The Bidder shall ensure that all other necessary write-ups, curves and information required to fully describe the equipment offered are submitted with his bid.





ANNEXURE-A

RATINGS & REQUIREMENTS

1.0 LOCAL CONTROL BOARD

1.1 General

Type	:	Fixed type
Service	:	Indoor/Outdoor
Enclosure	:	IP-54/ IP-65 (Weather Proof)

1.2 System

Voltage	:	415 Volt \pm 10%
Phase	:	3
Frequency	:	50 Hz +3 to- 5%
System	:	Solidly grounded

1.3 Rated Current at 50°C

Bus bar	:	To be decided by the Bidders
Switches	:	To be decided by the Bidders

1.4 Short Circuit Rating

Interrupting	:	50 KA
Short time for 3 Second	:	50 KA

1.5 Insulation Level : 2.5 KV for 1 min.



ANNEXURE-B

A.C./D.C. POWER SUPPLY

1.0 SYSTEM VOLTAGES

All systems shall be designed for satisfactory operation from the following power supply: -

A.C. Supply : 240 Volt, 1 Phase, 50 Hz, 2 wire, effectively grounded system.

Fault level 50 KA rms Symmetrical.

D.C. Supply : 220V, 2 Wire, ungrounded.

Fault level 25* KA

* Indicative only ; actual value to be decided by the bidder and to be substantiated by calculation.

2.0 PERMISSIBLE VARIATION

Equipment and accessories shall be suitable for operation over the entire range of voltage/frequency variation as listed below :

A.C. Supply : Voltage \pm 10%
: Frequency +3 to- 5%
: Combined Volt + Freq. 10% (absolute sum)

D.C. Supply : Voltage \pm 10%

Service Voltage for Control Panels/
Distribution Boards : 240V \pm 10%, 1ph, 50Hz +3 to- 5%





SECTION-VI
TECHNICAL SPECIFICATION
CONTROL AND INSTRUMENTATION SYSTEMS





CONTENT

CLAUSE NO.	DESCRIPTION	PAGE NO.
1.00.00	FIELD INSTRUMENTS	1
2.00.00	NOT USED	44
3.00.00	CONTROL PANEL/DESK MOUNTED INSTRUMENTS AND ELECTRICAL SYSTEM ACCESSORIES	44
4.00.00	CONTROL VALVE, ACTUATORS AND ACCESSORIES	50
5.00.00	CONTROL DESK / PANEL / RACK	60
6.00.00	PROGRAMMABLE LOGIC CONTROLLER	71
7.00.00	DISTRIBUTED CONTROL SYSTEM (DCS)	80
8.00.00	ROTATING MACHINE CONDITION MONITORING SYSTEM (RMCMS)	134
9.00.00	PLANT WIDE NETWORK	141
10.00.00	POWER SUPPLY SYSTEM	142
11.00.00	INSTRUMENTATION CABLE	142
12.00.00	ERECTION HARDWARE	157
13.00.00	TYPE TESTS REQUIREMENTS	167
14.00.00	SPECIAL TOOLS & TACKLE AND TEST EQUIPMENT FOR DCS & OTHER SYSTEMS	168





SECTION-VI

TECHNICAL SPECIFICATION

CONTROL AND INSTRUMENTATION SYSTEMS

1.00.00 FIELD INSTRUMENTS

This section provides general guidelines for field instruments and equipment to be supplied under this specification. All measuring instruments/equipment and subsystems offered by Bidder shall be from reputed experienced manufacturer of specified type and range of equipment, whose guaranteed and trouble free operation has been established. All instruments/equipment shall be of proven reliability, accuracy, repeatability requiring a minimum of maintenance and comply with the acceptable international standards. All instruments/equipment and accessories shall be supplied as per technical specifications, ranges, make as approved by Owner.

- i) HART management system shall be integral feature of the DDCMIS and shall be provided for centralised configuration, maintenance, diagnostics & record-keeping for all electronic transmitters.
- ii) Bidder shall provide following facilities as a minimum through software:
 - a) Constant scanning to monitor faults of changes to instrument configuration.
 - b) Owner-defined and standard calibration and configuration procedures for all transmitters.
 - c) Constant signal data collection facilities to maintain continuously updated records.
 - d) Automatic tracking of configuration changes made in the field, such as may be introduced by hand-held communicator. All configuration function associated with hand-held communicators shall be available in the system.
 - e) Event and log reports on screen as well as on printer.
 - f) Any addition/deletion of transmitter will be reported on printer and logged in hard disk.

1.01.00 PRESSURE TRANSMITTER

01. Type : Microprocessor based Smart, HART protocol compatible
02. Transmission : 2 - Wire





03. Output Signal : Simultaneous transmission of digital and 4-20 mA DC signal.
04. Signal Processing : Silicon solid state electronic circuitry
05. Sensor type : Capsule / Diaphragm
06. Element material : AISI-316 or better
07. Static Pressure : 150 % of maximum span continuously, without affecting the calibration.
08. Turn-down ratio : 10 : 1 for vacuum/very low pressure application ; 30 : 1 minimum for other applications.
09. Span and Zero : Locally adjustable non-interacting. Facility for elevation and suppression by 100% of span
10. Enclosure Class : Weather proof as per IP-65 with durable corrosion resistant epoxy coating (Explosion proof for NEC Class-1, Division 1 area wherever required)
11. Output Indicator : Backlit LCD type
12. Nameplate : Tag number, service engraved in stainless steel tag plate
13. Body : Forged Carbon Steel (SS for DM Water & corrosive service).
14. Power supply : 16 - 48 Volts D.C.
15. Load : 500 Ohms (min.) at 24 Volts D.C.
16. Ambient Temperature : 0 - 50°C
17. Performance :
 - i) Accuracy : $\pm 0.075\%$ of Span or better
 - ii) Repeatability : $\pm 0.05\%$ of Span or better
 - iii) Response time : 100 msec or better
 - iv) Stability : $\pm 0.1\%$ of Calibrated Span for 6 months up to 70 Kg/cm² and $\pm 0.25\%$ of Calibrated Span for more than 70 Kg/cm²
 - v) Zero and span drift : $\pm 0.015\%$ per deg. C at max span and 0.11% per deg. C at min span
18. Sealing/Isolation : Extended diaphragm with 5 meters SS armored capillary for corrosive, viscous and dirty fluid applications. Material for separator





diaphragm shall be as per application. Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application

- | | | | |
|-----|-------------|---|--|
| 19. | Diagnostics | : | Self indicating feature |
| 20. | Accessories | : | <ul style="list-style-type: none"> a) Universal mounting bracket suitable for 2" pipe mounting. b) High tensile carbon steel U- bolts. c) Installation accessories as per relevant installation drawing. d) Syphons for steam and hot water services. e) ½" NPT 2-valve stainless steel manifold for pressure transmitters constructed from SS316 bar stock. In case it becomes necessary to use a DP transmitter for gauge pressure measurement then a 2-valve manifold should be used in place of 5-valve manifold. f) Companion flange with nuts, bolts and gaskets. g) Hand held configurator kit for calibration of Smart Transmitter. |

1.02.00 Differential Pressure Transmitter

- | | | | |
|-----|------------------------|---|---|
| 01. | Type | : | Microprocessor based Smart, HART protocol compatible |
| 02. | Transmission | : | 2-Wire |
| 03. | Output signal | : | Simultaneous transmission of digital and 4-20 mA DC signal. |
| 04. | Signal Processing Unit | : | Silicon solid-state electronic circuitry |
| 05. | Sensor type | : | Capsule/Diaphragm |
| 06. | Element material | : | AISI-316 (Stainless Steel) or better |
| 07. | Static Pressure/ | | |





WBPDC

	Overload Pressure	:	Maximum line (or static) pressure on either side without permanent deformation or loss of accuracy
08.	Turn-down ratio	:	10 :1for vacuum/very low pressure application; 30 : 1 minimum for other applications.
09.	Span and Zero	:	Locally adjustable, non-interacting
10.	Enclosure class	:	Weather proof as per IP-65 with durable corrosion resistant epoxy coating (Explosion proof for NEC Class-1, Division 1 area wherever required))
11.	Zero suppression / elevation	:	At least 100% of Span
12.	Output Indicator	:	Backlit LCD type
13.	Nameplate	:	Tag number and Service engraved in stainless steel tag plate
14.	Body	:	Forged Carbon Steel (SS for DM Water)
15.	Ambient temperature	:	0 - 50° C
16.	Power supply	:	16 - 48 Volts DC
17.	Load	:	500 Ohms (min.) at 24 Volts DC
18.	Performance :-		
	i) Accuracy	:	±0.2 % of span or better
	ii) Repeatability	:	± 0.05 % of span or better
	iii) Response time	:	100 msec or better
	iv) Stability	:	± 0.1% of Calibrated Span for 6 months up to 70 Kg/cm ²
	v) Zero and span drift	:	± 0.015% per deg. C at max span and 0.11% per deg. C at min span
19.	Sealing/Isolation	:	Extended diaphragm with 5 meters. SS armored capillary for corrosive, viscous and dirty fluid applications. Material for separator diaphragm, depending on application.
20.	Diagnostics	:	Self indicating feature
21.	Accessories	:	a) Universal mounting bracket suitable for 2" pipe mounting.





- b) High tensile carbon steel U-bolts.
- c) Installation accessories as per relevant installation drawing.
- d) Syphons for steam and hot water services.
- e) ½" NPT 5-valve stainless steel manifold, constructed from SS316 bar stock.
- f) Companion flange with nuts, bolts and gaskets.
- g) Hand held configurator kit for calibration of Smart Transmitter.

1.02.00 DISPLACER TYPE LEVEL TRANSMITTERS

- | | | | |
|-----|--------------------------------------|---|---|
| 01. | Type | : | SMART |
| 02. | Stages of operation | : | Continuous |
| 03. | Material - | | |
| | i) Displacer | : | AISI 316 SS |
| | ii) Suspension wire | : | AISI 316 SS |
| | iii) Torque tube housing application | : | Carbon steel or SS as per application |
| | iv) Torque tube | : | Inconel |
| | v) Displacer chamber | : | Carbon steel or SS as per process application |
| | vi) Transmitter Housing | : | Die cast aluminium or better |
| 04. | Power supply | : | 16-48 Volts D.C. |
| 05. | Transmission | : | 2-wire |
| 06. | Output Signal | : | Simultaneous transmission of digital and 4-20 mA DC signal. Standard HART protocol. |
| 07. | Signal processing | : | Solid-state electronic circuitry |
| 08. | Static / overload pressure | : | Maximum static pressure without permanent deformation or loss of accuracy. |
| 09. | Turn-down ratio | : | 10 : 1 or better |





10. Zero & Span : Easily accessible (local zero & span adjustment and non-interactive type)
11. Enclosure Class : IP-65 (Explosion proof for NEC Class-1, Division 1 area)
12. Output Indicator : Yes, Backlit LCD type
13. Nameplate : Tag number and Service engraved in stainless steel tag plate
14. Ambient Temperature : 0 - 50°C
15. Load Impedance : 500 Ohms at 24 Volts (minimum)
16. Process Connection : 2" Companion flange with nuts, bolts and gaskets
17. Performance -
 - Accuracy : $\pm 0.2\%$ of span or better
18. Accessories :
 - a) Counter Flange, nuts, bolts, gaskets etc.
 - b) Weights for 5 point calibration of instruments.
 - c) Vent and drain plugs
 - d) Special calibration tool/configurator, if any.
19. Preferred Features :
 - a) Test plug connection and cutout terminals physically separated from other electronics.
 - b) Electronic Damping facility (adjustable).

1.03.00 MASS FLOW METER

A. Sensor

01. Measuring Principle : Coriolis Mass flow.
02. Primary Element : Flow Tube of 316SS or better
03. Temperature Control : To be provided for heavy fuel oil application. Heating arrangement shall be integral. For Heating
04. Process Connection : Flanged and rating as per process requirement.
05. Drain : Self-draining facility





06. Enclosure : Stainless steel
07. Accessories : Counter flanges, Mounting nuts, bolts, gaskets etc.
- B. Transmitter
01. Measured quantities : Mass Flow rate, Total Mass Flow, Density, Temperature as minimum.
02. Input Signal Processing : Digital Processing.
03. Display : Digital Display (LCD).
04. Output : 2 Nos. isolated output of 4-20mA DC with HART protocol, selectable from four measured quantities & field bus output for softlink with DCS
05. Load : < 750 ohms.
06. Power supply : "UPS", (if the external power supply is 230V AC, 50 HZ).
07. Turn Down : 100:1
08. Accuracy : $\pm 0.2\%$ of measured value
09. Housing : IP 65 (Explosion proof for NEC Class-1, Division 1 area).
10. Hazardous duty Version : FM Standards.
11. Nameplate : Tag number, service engraved in stainless steel tag plate
12. Accessories : a) As required for field mounting
b) Handheld configurator
c) Mounting U-bolts, nuts, bolts, prfab cable etc.
- 1.04.00 Turbine Flow meter
- A. Sensor
01. Type : Turbine (in line full-bore, based on magnetic pick up pulses)



02. Output Signal : Pulse
03. Material of Construction : a) Body : AISI 316
 b) Rotor: AISI 431 or 410
 c) Bearings: Tungsten Carbide / Stellite Sleeve
04. Flow rate range : As required.
05. Linearity : $\pm 0.25\%$ or better.
06. Repeatability : $\pm 0.02\%$ or better.
07. Ambient temperature : 50°C
08. Mounting : On-Line, flanged
09. Enclosure : IP 65
- B. Transmitter
01. Electronics : Solid State
02. Power Supply : "UPS", if the external power supply is 230V AC, 50 HZ.
03. Input : Input from Sensor
04. Display : Backlit LCD
05. Output : Isolated 4-20mA DC with HART protocol.
06. Measuring Accuracy : $\pm 0.5\%$ of full scale range
07. Totalized Value : Required
08. Housing : IP-65 (Explosion proof for NEC Class-1, Division 1 area)
09. Nameplate : Tag number, service engraved in stainless steel tag plate
10. Accessories : a) Clamping strip, bracket, prefab cable etc.
 b) Calibration or cofigurator kit.

1.05.00 Vortex Flow meter

A. Sensor

01. Type : Vortex





02. Output Signal : Pulse
03. Material of Construction : AISI 316
04. Sensor Seal : PTFE / higher based on temperature
05. Flow range : As required.
06. Linearity : $\pm 1\%$ or better.
07. Repeatability : $\pm 0.2\%$ or better.
08. Ambient temperature : 50°C
09. Mounting : On-Line, flanged.
10. Enclosure : IP 65
11. Accessories : Nuts, bolts, gaskets etc.
- B. Transmitter
01. Electronics : Solid State-remote mounting
02. Power Supply : 24 V DC.
03. Input : Input from Sensor
04. Display : Backlit LCD
05. Output : Isolated 4-20mA DC.
06. Protocol : HART
07. Totalized Value : Required
08. Housing : IP-65 (Explosion proof for NEC Class-1, Division 1 area)
09. Nameplate : Tag number, service engraved in stainless steel tag plate
10. Accessories : a) Clamping strip, bracket, prefab cable etc.
b) Special tool kit for calibration/ configuration .



1.06.00

Rotameter

- | | | | |
|-----|--------------------------|---|--|
| 01. | Type | : | Online upto 2" and Bypass above 2" line size" |
| 02. | Metering tube | : | Borosilicate glass |
| 03. | Float | : | AISI 316-SS unless the process fluid demands some other material. |
| 04. | Body MOC | : | SS as per fluid condition. |
| 05. | Scale | : | Aluminium Graduated - Engraved black on white background. |
| 06. | Process connection | : | Flanged to line size or threaded for connection size ½" or less. |
| 07. | Accuracy | : | ± 2% of full scale detection or better for on-line type and ±4% of full-scale detection or better for by-pass type. |
| 08. | Nameplate | : | Tag number, service engraved in stainless steel tag plate |
| 09. | Accessories | : | Slip-on orifice plate of 316-SS and taps of / SS as per application. Applicable SS Isolation valves and SS Range Orifice - for bypass type rotameters. |
| 10. | Housing protection class | : | IP- 65. |

1.07.00

Pressure Gauge and Differential Pressure Gauge

- | | | | |
|-----|----------------------|---|---------------------------|
| 01. | Type | : | Bourdon/Bellows/Diaphragm |
| 02. | MOC Sensing & Socket | : | AISI-316 SS |
| 03. | Movement Material | : | AISI-304 SS |
| 04. | Case Material | : | Stainless steel.. |
| 05. | Bezel Material | : | SS 304. |
| 06. | Socket Material | : | SS 316 |
| 07. | Enclosure | : | IP-65. |
| 08. | Dial Size | : | 150 mm |





09. Scale : Black lettering on white background in 270 Deg. arc.
10. Window : Shatterproof glass
11. Range Selection : Normal process pressure – 50 ~ 70 % of range (approximately).
12. Over-range Protection : 125% of maximum range by internal stop. External stop at zero
13. Adjustment : Micrometer screw for zero adjustment. Internal micrometer screw for range adjustment.
External zero adjustment for glycerine filled gauges.
14. Element Connection : Argon welding
15. Process Connection : 1/2" NPT(M) Bottom connection for local mounting, back connection for panel mounting.
16. Performance : Accuracy of ± 1.0 % of span or better.
17. Operating ambient temperature : 0 - 50°C
18. Safety Feature : Blow out disc./diaphragm at the back
19. Accessories : a) Snubbers and Glycerin filled for pulsating fluid applications and at pump discharge.
b) Stainless steel Diaphragm chemical seals for corrosive, viscous and solid-bearing or slurry type process fluids. diaphragm chemical seal shall be provided with the following:
1) Top chamber : SS 304
2) Bottom Chamber: SS 316
3) Sealing fluid: Silicon DC 200
4) Diaphragm: SS 316
c) 3-way SS gauge cock/ 2-Valve SS-316 barstock manifold for pressure gauges with 1/2" NPT process connection..





- d) 5-valve SS316 manifold constructed from barstock for differential pressure gauge. Process connection ½" NPT.
- e) Union, nut & tail piece and other Installation accessories as required.
- f) Syphons for steam and hot water services.

- 20. Applicable standard : IS-3624 / 1996 , EN-837-1
- 21. Nameplate : Tag number, service engraved in stainless steel tag plate

1.08.00 Temperature Gauge

- 01. Type : Inert gas filled remote mounting system.
- 02. Sensing Element Material : Bourdon - AISI-316 SS
- 03. Capillary Armoring : Stainless steel flexible
- 04. Movement Material : AISI 304 SS
- 05. Bulb / Stem Diameter : 12 mm
- 06. Bulb / Stem Material : AISI 316
- 07. Capillary : Stainless Steel
- 08. Thermometer connection to well : ½" NPT
- 09. Case Material : Stainless steel
- 10. Dial Size : 150 mm in general (100 mm for SWAS gauges)
- 11. Scale : Black lettering on white background in 270 Deg. arc.
- 12. Mounting : Surface/Panel
- 13. Over range Protection : 125 % of range or more
- 14. Instrument connection : Bottom connection for local mounting and back connection for panel mounting.





15. Range : Normal temperature – 50 ~ 70% of range approximately.
16. Zero adjuster : Micrometer screw adjustable from front.
17. Window : Shatterproof glass.
18. Accuracy : $\pm 1\%$ or better
19. Enclosure Class : IP-65
20. Capillary : 5 meters (local)/15.0 meters (local panel) - armoured stainless steel
21. Compensation : Capillary and Case Compensation
22. Accessories : a) Forged/barstock SS316 thermowell screwed as per ASME PTC code. Process connection M 33X2 (M). Material of construction of thermowell:
1) SS 316: in general
2) Inconel: For flue gas application
3) Tungsten carbide: For coal mill application
b) Installation accessories as required.
23. Nameplate : Tag number, service engraved in stainless steel tag plate

1.09.00 Thermocouples

01. Type : a) Type-K (Chromel Alumel) / Type-R (Pt.-Rhodium Pt.) / Type-E (Chromel Constantan) [As per application]
b) Duplex (Triplex incase of turbine/Generator/excitor bearing temperature may be used)
c) Ungrounded
02. Wire gauge : 16 AWG for Type-K, 24 AWG for Type-R
03. Standard : ANSI-MC 96.1.
04. Protecting Tube :-
i) O.D. : 8 mm
ii) Material : 316-SS Seamless
iii) Filling : Magnesium Oxide (Purity above 99.4%)





05. Response time with Thermowell : a) Less than 20 seconds for measurement.
b) Less than 10 seconds for control.
06. Accuracy : $\pm 1.1^{\circ}\text{C}$ upto 300°C & 0.4% of measured temperature range above 300°C .
07. Head :
- i) Type : IP-65 universal screwed type. (Explosion proof for NEC Class-1, Division 1 area)
 - ii) Material : Die cast aluminum or better
 - iii) Terminal blocks : Nickel plated Brass - screw type / silver plated
 - iv) Instrument connection : $\frac{1}{2}$ " NPT to well
 - iv) Cable connection : $\frac{1}{2}$ " NPT gland and grommet.
 - v) Others : Terminal head cover with SS chain and suitable gasket. All thermowells in the high velocity steam service shall be checked for Strouhal's frequency limit to arrive at a safe size and design of thermowells"
08. Accessories : a) Adjustable nipple-union-nipple [$\frac{1}{2}$ " Sch 80 X $\frac{1}{2}$ " NPT (M)] with thermowell connection
b) Compression fittings/unions
c) Flanges etc. (for flanged connections only)
d) Barstock thermowell of stepless tapered design as per ASME PTC19.3 code.
- Process connection M33x2 (M) in general or $1\frac{1}{2}$ " flanged for flue gas/Furnace/air etc. application.
- Material of construction of thermowell:
- 1) SS 316: in general
 - 2) Inconel: For flue gas application
 - 3) Tungsten carbide: For coal mill application.





09. Nameplate : Tag number, service engraved in stainless steel tag plate

1.10.00

Passing condition of various drain valves shall be monitored by measuring drain pipe metal temperature at the downstream of the drain valves. Also Drum, SH, RH metal temperature measurement shall be provided. Necessary thermocouples shall be provided as per the following specification.

- | | | | |
|-----|---------------------------------------|---|---|
| 01. | Measuring medium | : | Metal temperature |
| 02. | Metal of thermocouple element | : | Chromel-Alumel Type-K |
| 03. | Type of thermocouple ungrounded type. | : | Duplex with separate hot junctions, |
| 04. | Insulation | : | Mineral insulation Magnesium Oxide |
| 05. | Thermocouple wirer gauge | : | 16 AWG |
| 06. | Protective Sheath | : | SS 321 |
| 07. | Protective Sheath Dia | : | 8 mm O.D. |
| 08. | Characteristics of thermocouple | : | Special limits of error as in ANSI MC 96.01.1975 |
| 09. | Mounting Accessories | : | 1/2" BSP SS sliding end connector, weld pad, weld on clamps of heat resistant steel SS 310. |
| 10. | Cold end sealing | : | SS pot seal with colour coded PTFE headed sleeve insulated flexible tails. Sealing compound - Epoxy resin |
| 11. | Minimum Bending Radius | : | 30 mm |
| 12. | Length of T/C | : | 30 mtrs. (minimum) |

1.11.00

Resistance Temperature Detector

- | | | | |
|-----|------------|---|-----------------------------------|
| 01. | Type | : | Platinum (Duplex), Ungrounded |
| 02. | Resistance | : | 100 ohm at 0°C |
| 03. | Base | : | Wound on ceramic (anti-inductive) |
| 04. | Wiring | : | 3/4 Wire |





05. Protecting Tube :-
- i) O.D. : 8 mm
 - ii) Material : SS-316, Seamless
 - iii) Filling : Magnesium oxide (Purity above 99.4%).
06. Response time : a) < 20 seconds for measurement.
b) < 10 seconds for control.
07. Calibration : DIN 43760
08. Accuracy : $\pm 0.5\%$ of range
09. Head :
- i) Type : IP-65 universal screwed type. (Explosion proof for NEC Class-1, Division 1 area)
 - ii) Material : Die cast aluminum or better
 - iii) Terminal blocks : Nickel plated Brass-screw type / silver plated
 - iv) Cable connection : $\frac{1}{2}$ " NPT gland and grommet.
 - v) Others : Terminal head cover with SS chain and suitable gasket. All thermowells in the high velocity steam service shall be checked for Strouhal's frequency limit to arrive at a safe size and design of thermowells"
10. Accessories : a) Adjustable nipple-union-nipple [$\frac{1}{2}$ " Sch 80 X $\frac{1}{2}$ " NPT (M)] with thermowell connection
- b) Compression fittings/unions
 - c) Flanges etc. (for flanged connections only)
 - d) Barstock thermowell of stepless tapered design as per ASME PTC19.3 code.
- Process connection M33x2 (M) in general or 1 1/2" flanged for flue gas/Furnace/air etc. application.
- Material of construction of thermowell:
- 1) SS 316: in general
 - 2) Inconel: For flue gas application





3) Tungsten carbide: For coal mill application.

11. Nameplate : Tag number, service engraved in stainless steel tag plate

1.12.00 Pressure Switch

01. Type : i) Piston for high pressure application (above 40 bar)

ii) Bellow /Diaphragm for low pressure application (below 40 bar)

02. Sensing element material : AISI SS-316. All other wetted part SS316.

03. Case Material : Die-cast aluminum alloy with neoprene gasket.

04. Setter Scale : Black graduation on white linear scale. Graduation 0-100% with red pointer for set points.

05. Over range : 150 % of maximum pressure

06. Adjustments : a) Internal Set Point
b) Differential adjustment

07. End Connection : 1/2" NPT (M) bottom connected

08. Switch configuration : Two SPDT

09. Switch Rating : 240V, 5A AC/220V, 0.5A DC

10. Switch Type : Snap acting, shock & vibration proof

11. Terminal Block : Suitable for full ring lugs for cable connection.

12. Elect connection : Plug in socket

13. Enclosure Class : IP-65 weather and dust proof (Explosion proof for NEC Class-1, Division 1 area).

14. Performance : a) Repeatability $\pm 0.5\%$ of full range
b) Accuracy of Setting Indication of $\pm 1.5\%$

15. Ambient temperature : 0 – 50°C





16. Nameplate : Tag number, service engraved in stainless steel tag plate
17. Accessories : a) Remote diaphragm seal with SS-316 capillary for viscous & corrosive application. MOC of seal material shall be as per process fluid requirement.
- b) Snubbers for pulsating fluid application.
- c) Syphons for steam and hot water services.
- d) Retention ring and screws for surface mounting.
- e) 1/2" NPT 2 Valve SS-316 manifold constructed from barstock
- f) Brass cable gland

1.13.00 Differential Pressure Switch

01. Type : Bellows / Diaphragm / Piston actuated
02. Sensing element material : AISI SS-316. For all other wetted part SS 316
03. Case Material : Die-cast aluminum alloy with neoprene gasket.
04. Setter Scale : Black graduation on white scale with 0-100% graduation and provided with red pointer for set point adjustment
05. Over range : Static pressure on any one side, the other side being open to atmosphere.
06. Adjustments : a) Internal set point adjustment
b) Differential adjustment
07. Process Connection : 1/2" NPT (M) bottom connected / back connected.
08. Switch configuration : Two SPDT
09. Switch rating : 240V, 5A AC/220V, 0.5A DC.
10. Switch type : Snap acting type contacts, shock and vibration proof.





11. Terminal Blocks : Suitable for full ring lugs for cable connection.
12. Elect connection : Plug in socket
13. Performance :
 - a) Repeatability $\pm 0.5\%$ of full range
 - b) Accuracy of set point Indication: $\pm 1.5\%$
14. Operating Ambient Temperature : 0 - 50°C
15. Enclosure : IP-65 (Explosion proof for NEC Class-1, Division 1 area).
16. Accessories :
 - a) Snubbers for pulsating fluid application.
 - b) Syphons for steam and hot water services.
 - c) Retention ring and screws for surface mounting.
 - d) 1/2" NPT 3-Valve SS-316 manifold constructed from barstock
17. Nameplate : Tag number, service engraved in stainless steel tag plate
18. Remote Seal type for special application :
 - a) Silicone oil / fluorolube filled remote diaphragm seal for dirty / viscous / corrosive fluid.
 - b) SS armoured capillary at least 3 meters each.
 - c) Adapter flanges with nuts, bolts and gaskets for instrument and process side.

1.14.00 Temperature Switch

01. Type : Inert gas filled-in
02. Sensing Element Material : Bellow / Bourdon AISI SS-316
03. Bulb Material : AISI SS-316
04. Capillary : Stainless steel armoured
05. Movement Material : AISI SS-304
06. Case material : Epoxy coated steel plate or die-cast aluminum alloy with neoprene gasket and





clear glass where applicable cover conforming to IP-65. (Explosion proof for NEC Class-1, Division 1 area).

07. Scale : Black lettering on white background
08. Over range Protection : 120 %
09. Instrument connection : Bottom
10. Switch configuration : Two SPDT
11. Switch rating : 240V, 5A AC/220V, 0.5A DC
12. Switch type : Snap acting, shock and vibration-proof.
13. Adjustability : Internal Set point adjustable over span range
14. Elect connection : Plug in socket
15. Compensation : a) Capillary compensation with invar wire throughout the capillary length.
b) Case compensation
16. Performance :
- i) Scale Accuracy : ± 1.0 % of full scale
- ii) Repeatability : < 0.5 % of full range
- iii) Response time : Less than 40 seconds with thermowell
17. Capillary length : 5 meters (minimum) for local mounting/15 meters for local panel mounting.
18. Nameplate : Tag number, service engraved in stainless steel tag plate
19. Accessories : Thermowell from SS barstock, Mounting accessories, 1/2" NPT cable gland.

1.15.00 Level Switch

01. Type : External cage float operated. Magnetically coupled.
02. Float Material : AISI-316 stainless steel or better
03. Other wetted parts : AISI-316 stainless steel or better
04. External Cage : Carbon steel / Stainless steel or better as per process requirements, welded type / flanged





construction. Cage pressure rating shall equal or exceed the rating of the main vessel.

- | | | | |
|-----|------------------------------|---|---|
| 05. | External cage mounting | : | Side-Side. |
| 06. | External cage connection | : | 25 NB socket welded. |
| 07. | Switch housing | : | Epoxy coated die-cast aluminum alloy with neoprene gasket conforming to IP-65. (Explosion proof for NEC Class-1, Division 1 area). |
| 08. | Type of switch configuration | : | 2 SPDT (two nos.) |
| 09. | Contact rating | : | 5A, 240V/AC, 0.25A, 220V DC |
| 10. | Accessories | : | <ul style="list-style-type: none"> a) Counter flange, nuts & bolts, suitable gasket etc. b) Steel globe type drain valve. c) ½"NPT cable gland d) Stainless steel alpha-numeric engraved for service and tag. e) Globe drain valve |
| 11. | Preferred feature | : | Switch operating point marked on cage |
| 12. | Mounting | : | On standpipe |

1.16.00 Conductivity Type Level Switch

- | | | | |
|-----|--------------|---|--|
| 01. | Type | : | Conductivity discrimination. |
| 02. | Application | : | Drain pots viz. on CRH line |
| 03. | Mounting | : | Flanged – on external cage. |
| 04. | Probe MOC | : | Stainless steel with high purity ceramic. |
| 05. | Probe rating | : | > Maximum design pressure of vessel. |
| 06. | Input | : | Four independent channel with selectable switching threshold for water conductivity. |
| 07. | Relay Output | : | Four isolated output relays for Hi, Lo, Hi-Hi, Lo-Lo. |





08. Contact type & rating : 2SPDT or 1 DPDT @ 5A 30V DC.
09. Local Display : Coloured LEDs for Hi, Lo, Hi-Hi, Lo-Lo, Power & fault.
10. Power supply : Dual 240V AC, 50 Hz, 1Ph UPS supply.
11. Enclosure : IP-65, corrosion resistant & wall mounting type (Explosion proof for NEC Class-1, Division-1 area).
12. Accessories : a) PTFE cable from probe to electronics
b) Mounting accessories
c) External cage
d) Washer & gasket
13. Test pressure : Two times rated pressure
14. Elect connection : Plug in socket

1.17.00 Capacitance Type Level Switch

01. Type : Capacitance type
02. Probe : a) Rod or suspended electrode
b) Rope type probes may be used only where required probe length is greater than 1.5 meters.
c) Reference rod for non grounded tank.
03. Probe Mounting : 1-1/2" Flanged
04. Material of construction : 316 SS and to suit fluid type
05. Insulation : PTFE/PP/Kynar Part/Full as required
06. Enclosure : Powder coated Die cast aluminium. with neoprene gasket conforming to IP-65. (Explosion proof for NEC Class-1, Division 1 area).
07. Ambient temperature : 0-60°C.
08. Mounting : Top Mounting
09. Supply voltage : 240V AC, 50 Hz, 1Ph UPS supply/ 24V DC





10. Relay output : 2 SPDT
11. Contact rating : 5A min. at 240V AC on resistive load
12. Response time : 100 msec or better
13. Elect connection : Plug in socket
14. Accessories : Counter flange, cable gland, prefab cable and stainless steel name plate engraved with alpha-numeric.

1.18.00 RF Type Level Switch

- Sensing Probe :
01. Type : Rigid
 02. Material : SS-316
 03. Mounting : Threaded
 04. Probe Head Housing : Cast Aluminium
 05. Protection : IP-66
- Electronic Controller :
01. Supply Voltage : 240V AC (UPS)
 02. Relay Output : 2 nos. SPDT
 03. Contact Rating : 240V AC,5A/ 220V DC, 0.25A
 04. Housing Material : Cast Aluminium
 05. Protection : IP-65
 06. Local LED Indication : Power On, Alarm Level, Probe Healthy
 07. Switching Repeatability : $\pm 0.5\%$
 08. Accessories : Coaxial cable probe connection to controller
1/2"NPT Cable Gland

1.19.00 Ultrasonic Level Switch

01. Principle of operation : Ultrasonic contact level technology
02. Input Power : 24V DC/ 240V AC





- | | | | |
|-----|--------------------|---|---|
| 03. | Output Contact | : | 2 SPDT (240V AC, 5A/ 220V DC, 0.25A) |
| 04. | Switch Mounting | : | Integral |
| 05. | Sensor Material | : | SS-316 |
| 06. | Enclosure | : | Cast Aluminium (IP-65) |
| 07. | Process Connection | : | 2" Flanged |
| 08. | Repeatability | : | 2 mm |
| 09. | Power supply | : | 240V AC, 50 Hz, 1Ph UPS supply/ 24V DC |
| 10. | Cable connection | : | ½" NPT with cable gland |
| 11. | Accessories | : | Cable gland, cable, companion flange, bolts & nuts, gaskets etc. along with all mounting hardware |

1.20.00 Ultrasonic Level Transmitter

- | | | | |
|-----|-----------------------------|---|---|
| 01. | Principle of operation | : | Detection of reflected ultrasonic pulse |
| 02. | Signal processing | : | Microprocessor Controlled Signal Processing |
| 03. | Type | : | Smart |
| 04. | Display | : | Large alpha-numeric back lit LCD/LED |
| 05. | Calibration & configuration | : | Accessible from front of panel |
| 06. | Diagnostic | : | On-line |
| 07. | Status | : | For power, Hi / Lo / V. Hi / V. Lo-level indication, fault etc. |
| 08. | Construction | : | Plug-on board |
| 09. | Power supply | : | 240V AC, 50 Hz, 1Ph UPS supply/ 24V DC |
| 10. | Signal Output | : | 4-20 mA DC (isolated) - 500 Ohm load with HART protocol. |
| 11. | Hysteresis | : | Fully adjustable preferred |
| 12. | Output contacts | : | 2SPDT Potential free changeover contacts @ 5A 230V AC. |





13. Accuracy & Repeatability : 0.25% of span or better
14. Resolution : 0.1% of span
15. Operating temp. : Transmitter- 0 to 50° C and Sensor 0 to 80° C
16. MOC Sensor : SS 316 in general / PTFE, PP for corrosive application.
17. Humidity : 1% to 95% non condensing.
18. Enclosure : IP-65 powder coated die cast aluminium
19. Cable connection : ½” NPT with cable gland
20. Mounting : 2” flanged for sensor and Transmitter on panel / surface.
21. Accessories : Cable gland, prefab cable, mounting accessories.

1.21.00 Conductivity Type E lectronic Level Indicator

01. Type : Conductivity discrimination.
02. Application : Separator drum Level .
03. No. of Probes : As per manufacturer standard.
04. Probe Mounting : Flanged – on standpipe.
05. Probe MOC : Stainless steel with high purity ceramic.
06. Probe rating : > Maximum design pressure of vessel.
07. Input : Independent channel with selectable switching threshold for water conductivity.
08. Relay Output : Four isolated output relays for Hi, Lo, Hi-Hi, Lo-Lo.
09. Contact type & rating : 2 SPDT or 1 DPDT @ 5A 30V DC.
10. Current output : Isolated 4-20 mA DC
11. Local Display : a) Coloured (Red & Green) LEDs for level.
b) Flashing LEDs for fault.
12. Remote Display : Red, Green & flashing yellow LEDs for steam, Water & Fault indication respectively.





13. Power supply : Dual 240V AC, 50 Hz, 1Ph UPS supply.
14. Enclosure : a) IP-65, corrosion resistant & wall mounting type for local electronics.
b) IP-42 for remote indicator
15. Accessories : a) PTFE cable from probe to electronics
b) Mounting accessories.
c) Standpipe
d) Washer & gaskets
e) Double isolation valves on each connection, double drain valves & double vent valves with mechanical lock.
f) ½" NPT cable gland
16. Test pressure : Two times design pressure
- 1.22.00 Air Filter Regulator
01. Filter Element : Sintered Bronze
02. Filter Size : 5 microns
03. Input Air : 10.0 Kg/Sq. cm (maximum)
04. Output : Adjustable from 0-2.0 Kg / Sq. cm or 0-7.0 Kg / Sq. cm (continuous) as applicable.
05. Effect of Supply : Maximum 0.02 Kg/Sq. cm for a change pressure variation in supply pressure of 4 Kg/Sq. cm
06. Bowl Material : Metallic.
07. Accessories : 2" dial size output pressure gauge
08. Feature : No perceptible drop of pressure on opening the drain port.
- 1.23.00 SOLENOID VALVE
01. Operating Principle : Electromagnetic (noiseless)
02. Coil voltage rating : 24V DC (in general) other 220V DC /240V AC /110V AC as required





- | | | | |
|-----|---------------------|---|---|
| 03. | Ways | : | 3 ways in general other depending on requirement |
| 04. | Port size | : | 1/4" NPT all ports |
| 05. | Body | : | SS Bar Stock |
| 06. | Trim | : | AISI SS-316 |
| 07. | Manual Operator | : | In built |
| 08. | Duty | : | Suitable for continuous energization |
| 09. | Sealing | : | Airtight and leak proofing with nitrile (NBR) and polyurethane (PUR) material |
| 10. | Ambient Temperature | : | 0 - 50 ^o C |
| 11. | Fluid Temperature | : | 0-150 ^o C (approx.) |
| 12. | Coil Enclosure | : | Stainless Steel |
| 13. | Insulation | : | Class-H |
| 14. | Coil Casing | : | IP-65 (Explosion proof for NEC Class-1, Division-1 area) |
| 15. | Response time | : | 4-7msec |
| 16. | Mounting | : | On pipe or on panel |
| 17. | Cable Connection | : | ½" NPT cable gland |
| 18. | Accessories | : | Mounting brackets, nuts and bolts |
| 19. | Special feature | : | (i) LED indication for power

(ii) Double coil type for open & close operation of valve / damper.

(iii) Solenoid valve directly integral to actuator body shall have NAMOOR interface for uniformity |

1.24.00 ORIFICE PLATE

- | | | | |
|-----|-------------------|---|---|
| 01. | Application | : | Low fluid velocity flow measurement |
| 02. | Design Standard | : | Concentric as per ASME PTC-19.5 (Part –II), ISA RP-3.2 or BS-1042, Part-I |
| 03. | Number of Tapings | : | As required plus one additional pair of taps |
| 04. | Diameter Ratio | : | Between 0.34 to 0.7 |





- | | | | |
|-----|----------------|---|---|
| 05. | Thickness | : | 3mm for main pipe of diameter upto 250mm, 6mm for main pipe of diameter above 250mm and 10mm for diameter above 500 mm |
| 06. | Document | : | Beta ratio calculation, assembly drawing and Flow vs. DP curve. |
| 07. | Meter run pipe | : | Same as pipe material |
| 08. | Accessories | : | Flanges, gaskets, nuts & bolts, root valves (1" 316 SS globe) jack screw, meter run pipe, Drain & vent hole as per application etc. |

NOTE: One flow element of each type shall be calibrated in the test laboratory for validation of computed flow calculations.

1.25.00 FLOW NOZZLE

- | | | | |
|-----|-----------------|---|--|
| 01. | Application | : | High fluid velocity flow measurement |
| 02. | Design Standard | : | ASME PTC 19.5 |
| 03. | Tapings | : | D and D/2 (Numbers as required plus one additional pair of taps) |
| 04. | Diameter Ratio | : | Between 0.4 and 0.7 |
| 05. | Material | : | 316 SS (321 SS for high temperature) |
| 05. | Document | : | Beta ratio calculation, assembly drawing and Flow vs. DP curve. |
| 06. | Meter run pipe | : | Same as pipe material |
| 07. | Accessories | : | Meter run pipe, nipples and root valves (1" 316 SS globe).(Inspection port assembly for nozzles used in plant performance purpose) |

NOTE: One flow element of each type shall be calibrated in the test laboratory for validation of computed flow calculations.

1.26.00 GAUGE GLASS

- | | | | |
|-----|-----------------|---|--|
| 01. | Type | : | Reflex |
| 02. | Glass | : | Toughened borosilicate. Resistant to mechanical and thermal shocks. |
| 03. | Body material | : | Carbon steel / stainless steel- As per process requirements (Flanged Connection) |
| 04. | Pressure rating | : | Twice the maximum working pressure |





05. Temperature rating : 300° C
06. Bolts and nuts : Rust proof alloy steel
07. Accessories : Suitable ball check valves of SS-304/316 body, gaskets, companion flange etc.

1.27.00 LEVEL GAUGE (FLOAT & BOARD)

01. Type : Float and Board
02. Float & Tape MOC : AISI 316
03. Pulley and Pulley Housing material : SS 304
04. Guide wire : SS 316 Stainless steel
05. Accuracy : +/- 2 mm
06. Indication : Vertical dial
07. Rating : Twice the design pressure
08. Spring tension assembly : SS 304
09. Anchor plate : SS304
10. Calibrated scale board: Aluminium with black graduation

Note: The measuring rope/tape shall be passed through conduits

1.28.00 POWER CYLINDERS (PNEUMATIC)

01. Mounting Type : a) Fixed position mounting (End mounting).
: b) Trunnion mounting
02. Control Signal : 4-20 mA DC to smart positioner with HART protocol for modulating purposes. 24V/48VDC operated solenoid valve operating on pneumatic line for open & closing purpose of on & off drive.
03. Supply Air : 0-7 Kg / Cm².
04. Selection : Based upon thrust / torque, stroke length, angular movement, full-scale travel time, repeatability, space factor etc. Provision for air-to-open and air-to-close operation.
05. Casing : IP-65.





06. Accessories (as required) :
- a) Air lock relay
 - b) Hand wheel.
 - c) Air filter regulator with gauge.
 - d) Volume Booster.
 - e) Limit Switches.
 - f) Smart Positioner with integral I-P convertor, feedback position Transmitter (4-20 mA DC output), Input & Output pressure gauges, local keypad & display.
 - g) Solenoid Valve
 - h) Junction box with cable gland
07. Fail-safe operation : Stay put for regulating duty.
08. Repeatability : Better than 0.5% of full travel.
09. Hysterisis : Less than $\pm 1\%$ of full travel
10. Operating Temp. limit : 80^o C (min.)

1.29.00

SIGHT GLASS

01. Type : Flap-type
02. End connection : Screwed / Flanged
03. Material :
- a) Body : SS-304
 - b) Cover Plate : SS-304
 - c) Indicator : SS-316
04. Sight Glass : Toughened Borosilicate
05. Gasket : Neoprene
06. Bolts & Nuts : High tensile steel
07. Hydraulic Test
- Pressure : 1.5 times maximum working pressure
08. Accessories : As required

1.30.00

SMOKE DENSITY ANALYZER

01. Type : Insitu dry visible light (through LED)
02. Principle of





- Measurement : Transmission & absorption (Dual beam type)
03. Sensor type : Luminiscence
04. Display : Back Lit LCD
05. Measurement range : 0-999 mg/m³, 0-999 mg/Nm³, 0-100% opacity
06. Measurement averaging : Selectable 10 sec to 60 minutes
07. Accuracy : 0.2% of F.S
08. Resolution : 0.1% of F.S / 1mg/m³ whichever is better
09. Linearity : 1.0% of F.S
10. Repeatability : < 0.5% of Span
11. Response time (upto 90% of full scale) : 5 sec
12. Flue gas temperature : 90^oC (When FGD in op[eration)
135^oC (When FGD not in operation)
Max 600^oC (at APH outlet)
13. Ambient temperature : 0 - 60^oC
14. Operating temperature : Transmitter & receiver- 0-90^oC, Electronic unit – 0-70^oC
15. Mounting : Transceiver on opposite side of the duct
16. Analog output : 4-20mA DC (in 500 ohm resistance) to DCS
17. Alarm output : 2 SPCO potential free rated at 230 VAC, 5A
18. Power Supply : 240V AC, 50 Hz, 1 Phase UPS
19. Automatic misalignment detection : Required
20. Automatic compensation of lens contamination : Required
21. Purge air Failure : Purge air to be provided from Blower unit and to be monitored for failure.
22. Span and Zero Check : Automatic periodic with manual override



23. Housing : Corrosion resistant painted aluminium rated at IP-65
24. Fail safe shutter : Automatic fail safe shutter against power and air failure
25. Input normalisation : Correction for temperature, pressure, oxygen and water vapour to be provided.
26. Preferred Features : "Power Supply On" LED visible from front
27. Accessories : a) Mounting pads suitable for mounting projector and receiver units on duct, flanges, etc.
b) Blower unit (Purging System) with purge fail alarm at CCR
c) Enclosure for electronic units & indicators
28. Application : At chimney
At each ESP outlet

1.31.00

SO_x & NO_x ANALYZER

As per Protocol for Real time (Emission & Effluent) Data Management from Insudtries Version-1.2 (10.06.2015); Instruments/Analysers/Equipments (each model) individually certified from Institutions like TUV, MCERTs, USEPA etc. as notified by CPCB.

01. Type : Insitu Probe/ Cross duct type analyser
02. Gases to be measured : SO_x, NO_x
03. Principle of measurement : Infrared absorption/ UV Spectroscopy
04. Flue gas Temperature : As per process requirement
05. Mounting/Application : Flanged/ On chimney
06. Measurement range : Fully selectable as per process requirement
07. Units of measurement : PPM, mg / Nm³ and %
08. Power Supply : 240V, 50 Hz, 1 Phase UPS
09. Local Display : Back lit LCD / LED
11. Accuracy : 2% of measured value





12. Repeatability : 1% of full scale
13. zero & Span drift : 2% per month
14. Calibration : Zero and Span calibration in manual and automatic mode. Automatic calibration interval shall be fully selectable. Remote Calibration and configuration facility from the remote location shall be possible. (i.e, the hardware and software required for Remote Calibration and configuration from Remote location to be provided).
15. Analog output : 4-20 mA DC (in 500 ohm resistor) to DCS for each channel
16. Alarm output : (1NO + 1NC) for each measured parameter and self diagnostic failure. All contacts rated at 230V AC, 5A
17. Input normalisation : Required–online with pressure and temperature sensor and also provision for key pad entry of inputs
18. Probe material : Stainless Steel 316L
19. Enclosure : Corrosion resistant epoxy painted aluminium housing & enclosure rated to IP-65.
20. Accessories : a) Compressor/Blower unit, tubes & fittings for calibration and purging, purge fail alarm in CCR
b) Calibration gas cylinders for SO₂, Nox & N₂ (for Zero Calibration) filled in 10 Ltrs. of WC carbon cylinder with necessary SS regulators with pressure & flow gauges, solenoid valve & SS tubings and SS fittings etc. as required.
c) Mounting flanges, gasket etc.
d) control unit for interface with PC based data logger to be provided.

1.32.00 OXYGEN ANALYZER

01. Type : In-situ, Zirconium sensor, micro-processor-based transmitter,
02. Range : 0.1-10% / 0.25-25% by volume
03. Output : 4-20 mA DC linear





04. Probe Length /
Material : 1800 mm (approximate depending on duct size) / SS 316
05. Process Temperature : As per Process Requirement.
06. Measurement
Reference : Instrument Air
07. Accuracy : $\pm 1\%$ of F.S.
08. Response Time : Less than 5 (five) sec for 90% of full scale
09. Amplifier Housing : IP-65
10. Calibration : Manual or Automatic periodic-operator selectable
11. Power Supply : 240V, 50 Hz, 1 Phase UPS
12. Material for Gas Carrying Components : Stainless Steel
13. Read Out : Backlit LED/LCD
14. Protection : Automatic cell protection against reducing atmosphere
15. Alarm Facility : 1 HI and 1 LO independently adjustable over span. Contact rating 500 mA at 220 V DC (minimum).
16. Preferred Features : a) HI and LO alarm LED visible from front.
b) Power Supply On/Failure LED visible from front
17. Accessories : a) Mounting flanges, adaptor plate and protection shield (protection/abrasive shield shall be SS 316)
b) Gasket, nuts and bolts
c) Cable with conduit from cell to amplifier (as required) and other special cables (if any)
d) Automatic calibration kit (complete with all accessories and standard Gas Cylinders)



			e) Solenoid valve, Pressure regulator with Filter and Flow indicator
	18.	Application	: a) At economizer outlet b) At each air preheater inlet and outlet
1.33.00		H2 + CO2 + AIR ANALYZER	
	01.	Type	: Thermal Conductivity
	02.	Range Selection	: 3 ranges.
	03.	Range	: As required
	04.	Output	: 4-20mA DC (Isolated)
	05.	Operating ambient temp.	: 10 ^o C to 50 ^o C
	06.	Power Supply	: 240V AC, 50Hz UPS
	07.	Sample gas flow control	: Required
	08.	Reference gas flow	: Required
	09.	Reference gas pressure regulator	: Required
	10.	Cell response	: 95% of change in 30 Sec.(Appox.)
	11.	Accuracy	: 2% of full scale
	12.	Repeatability	: 1% of full scale
	13.	Local Indicator	: Indicating meter of 1% accuracy Backlit LCD/LED display
	14.	Alarm facility	: Dual (High & Low) independently adjustable.
	15.	Contact rating	: 0.5A at 220 V AC
	16.	Enclosure	: Flame Proof
	17.	Accessories	: Calibration gas, mounting accessories and others as required to be provided
	18.	Application	: Generator Gas Purity.
1.34.00		CO ANALYZER	
	01.	Operating Principle	: NDIR



02. Type : In-situ, microprocessor based probe type at economiser. In-situ, microprocessor based Cross duct/Probe type at chimney
03. Range : As per process requirement
04. Accuracy : 1% Full Scale
05. Linearity : $\pm 1\%$ of Full Scale
06. Repeatability : $< 1\%$ of span
07. Calibration : Automatic & Manual (Zero & Span)
08. Power Supply : 240V AC
09. Output Signal : 4~20 mA DC
10. Alarm annunciation : Four relay contacts, dual alarm set points (240V AC, 5A)
11. Enclosure : Cast Aluminium (IP-65)
15. Indication : LCD Display
16. Op. Temperature Range : At Economiser (350 Deg C) and at Chimney (100 Deg C)
17. Accessories : Interconnection cable (as required) in flexible conduits
Tube / fittings, mounting brackets/ pads as required
Purge system for cleaning
Surge Arrester
18. Location : At Economizer and Chimney
19. Additional Feature : Remote Calibration and configuration facility from the remote location shall be possible. (i.e, the hardware and software required for Remote Calibration and configuration from Remote location to be provided).

1.35.00

MERCURY ANALYZER

01. Operating Principle : Atomic absorption spectroscopy
02. Range : 0-100 $\mu\text{g}/\text{Nm}^3$
03. Measuring Parameters : Total gaseous mercury
04. Output : 4~20 mA DC





05. Alarm/ Annunciation : Four Relay contacts, dual alarm set points (240V AC, 5A)
06. Indication : LCD Display
07. Sampling System : Extractive
08. Enclosure : IP-65
09. Power Supply : 240V AC (UPS)
10. Location : On Chimney
10. Accessories : a) Inbuilt calibration facility through calibrator. Inbuilt cell for Zero & Span calibration to be provided. Handling of Liquid Mercury to be avoided.
b) Remote calibration facility to be provided.
c) The Mercury analyser cabinet to be placed inside an enclosed AC environment.

1.36.00 DEW POINT METER

01. Type : Direct mounting capacitance type with change in output proportional to moisture present
02. Sensing Element : Ceramic/ Aluminium Oxide sensor
03. Service : Dry Air
04. Range : -90 Deg.C to 10 Deg.C Dew point temperature
05. Sensor Accuracy : ± 2 Deg C Dew point
06. Repeatability : 0.5 Deg.C Dew point
07. Op.Ambient Temperature : -40 Deg.C to 50 Deg.C
08. Op. Pressure : 0-10 Kg/cm²
09. Display : Combined enclosure with 5 digit seven segments LED display
10. Element Filter : 80 micron sintered stainless steel
11. Output : 4~20 mA DC loop powered
12. Power Supply : 24V DC nominal





13. Enclosure Class : IP-65
14. Interchangeability : Fully Interchangeable Transmitters
15. Accessories : Sampling System, cables, sensor holder, dessicant chambers, souble compression fittings, 3/4" cable gland, mounting fixture etc.

1.37.00

DENSITY METER

01. Operating Principle : Vibration Density measurement
02. Wetted Part Material : SS-316L
03. Case Material : Cast Aluminium
04. Output : 4~20 mA DC
05. Electrical connection : 1/2" NPT
06. Enclosure Class : IP-65
07. Local Display : Digital 5 digit, density display with temp. compensation
08. Accuracy : ±1.0 %
09. Power Supply : 240V AC (UPS)
10. Location : At the discharge of Gypsum bleed pump in FGD system.

1.38.00

RADAR TYPE LEVEL MEASUREMENT

01. Type : Radar based on Time Domain Reflectometry
02. Antena : Co axial / single rod type guided wave or Horn type as required for the application
03. Communication : Two wire 4-20mA DC, HART protocol
04. Environmental temperature : 0 – 50°C
05. Enclosure : Explosion proof /IP 65 as per application
06. Cable Entry : 1/2" NPT
07. Calibration : a) Self calibration with internal reference
b) Zero & Span calibration
08. Programming : Handheld programmer & Local key pad
09. Process Connection : Flanged /screwed





- | | | |
|-----|--------------------|--|
| 10 | Transmitter Beam | |
| | Angle | : 10 degree or less |
| 11 | Blocking distance | : less than 300 mm |
| 12. | Electronic Housing | : Epoxy painted Die-Cast aluminium alloy |
| 13. | Antenna / Flange | |
| | assembly | : 316 SS or Hestalloy (as required) |
| 14. | Output Indicator | : Digital Integral Display (Backlit LCD/LED) |
| 15. | Accuracy | : 5 mm or 0.1% of probe length |
| 16. | Accessories | : a) Programming tool kit
b) Gasket |

1.39.00 CHLORINE LEAK DETECTOR

- | | | |
|-----|-----------------------|--------------------------------------|
| 01. | Type | : Electrochemical |
| 02. | Resolution | : 0.1 ppm |
| 03. | Display Type | : Digital Indicating Meter |
| 04. | Operating Temperature | : 0~45°C |
| 05. | Alarm Contacts | : Dual Alarm setpoints (240V AC, 5A) |
| 06. | Enclosure Class | : IP-65 |
| 07. | Mounting | : Wall mounting |
| 08. | Power Supply | : 240V AC |
| 09. | Output | : 4~20 mA DC (600 Ω load) |

1.40.00 RESIDUAL CHLORINE ANALYZER

- | | | |
|-----|--------------|--|
| 01. | Type | : Amperometric |
| 02. | Electrode | : Platinum/ Gold and copper electrode shall be provided with cell cleaning system |
| 03. | Display Type | : LCD in Analyzer Panel |
| 04. | Range | : 0 to 20.0 mg/L (ppm) |
| 05. | Accuracy | : 2% or better . The measurement accuracy shall not be affected by presence of treatment chemicals as chromates, |





phosphates, de-former highly polluted water, change in temperature etc.

- | | | | |
|-----|-----------------|---|---|
| 06. | Sensitivity | : | 0.01 mg/L |
| 07. | Alarm Contacts | : | Dual Alarm setpoints (240V AC, 5A) |
| 08. | Enclosure Class | : | IP-65 |
| 09. | Power Supply | : | 240V AC |
| 10. | Output | : | 4~20 mA DC (600 Ω load) |
| 11. | Calibration | : | Zero & Span adjustment. Final calibration adjustments of the analyzer to be done at site and duly verified bt titration. Temperature compensation range 0-50°C. |
| 12. | Mounting | : | Field mounting conform to IP-65 |
| 13. | Accessories | : | Chemical reagents, sample drain, pumping system (if required) etc. |

1.41.00 ELECTRIC TO PNEUMATIC (E/P) CONVERTERS

- | | | | |
|-----|----------------------|---|---|
| 01. | Air Supply | : | 1.5 kg/cm ² |
| 02. | Max. supply Pressure | : | 7 kg/cm ² |
| 03. | Input Signal | : | 4-20 mA DC (as required by the design of control system). |
| 04. | Output Signal | : | 0.2 to 1.0 kg/cm ² |
| 05. | Control Action | : | Air to Close, Air to Open and Fail freeze-field seletable |
| 06. | Response Time | : | 5 seconds for 0 to 90% output pressure |
| 07. | Repeatability | : | +/- 0.1% span typical |
| 08. | Accuracy | : | +/- 0.25% span typical |
| 09. | Linearity | : | 0.5% of span or better |
| 10. | Hysteresis | : | 0.1% of span or better |
| 11. | Ambient Temp. | : | |
| | effect | : | Less than 0.02% of span per °C between |





-20 °C to +60 °C

12. Supply pressure effect: less than 1%
13. Span and zero adjustment : screw
14. Mounting : Close to Actuator (but not on the actuator)
15. Output Capacity : To suit the actuator
16. Protection Class : IP 65
17. Allowable Drift Rate : $\pm 2\%$ of set point / hour maximum

On loss of control signal, the last set point pressure shall be maintained so that the associated control valve remains in stay put condition.

1.42.00

SMART POSITIONER

01. Type : Universal design (linear or rotary application)
02. Input Signal : 4-20mA DC , 2 wire loop with 24V DC.
03. Output Signal (position F/B) : i) 4-20mA
ii) Configurable end position switch
04. Supply Pressure : Single acting 1.2 to 7.0 bar
Double acting 1.2 to 10.5 bar
05. Air Delivery : Single acting 10.0 SCFM at 2.1 bar supply
Double acting 7.2 SCFM at 2.1 bar supply
06. Housing : IP 65
07. Repeatability : $\pm 0.3\%$ of span or better
08. Accuracy : $\pm 0.1\%$ of span or better
09. Communication : Hart protocol
10. Power-up with position : < 150 ms or better control
11. Power interruption without reset : <100ms or better
12. Body Material : Aluminium
13. Response Time : Less than 10 sec





14. Features :
- i) Noncontact position feedback sensor
 - ii) Integral Electro-Pneumatic convertor
 - ii) Self calibration with tunable response time
 - iii) Online diagnostics
 - iv) Pressure guages to be provided on positioner (I/P & O/P pressure)

1.43.00 MAGNETIC LEVEL INDICATOR

01. TYPE : Magnetically coupled level indicator
02. Display : Coloured flags
03. Chamber material : Stainless steel
04. Wetted part material : Stainless steel
05. Process connection : Side Side Flanged
06. Drain & Vent : Flanged
07. Scale : Standard, Stainless steel
08. Accessories : Counter flange, gaskets

1.44.00 FLOW SWITCH

01. Type : Paddle /Piston/Disk
02. Wetted part material : Stainless steel or Hastelloy for acidic application
03. End connection Tee :
- i) Threaded upto 1" line size with integral
 - ii) Flanged for line size > 1 ½"
04. Enclosure material : Die cast aluminium
05. Enclosure class : IP 65
06. Switch configuration : 2 SPDT
07. Contact rating : 240V AC 15A
08. Repeatability : 2%
09. Cable connection : ½"NPTF





10. Accessories : Tee, counter flange

1.45.00 ULTRA SONIC TYPE FLOW METER

- a) Ultrasonic Flow meter shall be dual path transit time clamp-on type.
- b) The flow meters shall be of proven reliability, accuracy and repeatability requiring a minimum of maintenance. They shall comply with relevant international standards and shall be subject to approval.
- c) CW flow shall be measured by redundant Ultrasonic Flow meter.
- d) All accessories required for mounting/erection of these instruments shall be furnished, erected and installed as necessary for completeness of the system though not specifically asked for. Also the equipment shall include necessary cables, flexible conduits, junction boxes required for the purpose.
- e) Flow meters shall be provided with suitable environment protection devices / structures such that they shall be suitable for continuous operation in the operating environment of a coal fired utility station without any loss of function or departure from the specification requirements.
- f) Technical Requirements
 01. Type : Transit time Clamp On Ultrasonic meter
 02. Mounting Style : Dual path with two sets of transducers on the same pipe
 03. Flow measurement : Instantaneous Flow rate as well as totalized flow
 04. Power supply : 240V AC, 50Hz with built –in battery back up.
 05. Analog Outputs : Isolated 4-20mA linear outputs for each path
 06. Binary Output : Contact relay outputs, 2 NO + 2 NC for alarm
 07. Communication ports : RS 232 C digital
Hand held terminal port
 08. Display/Indication : Flow meter with LCD screen backlight based local display and keypad. If required, transmitter shall be suitably located away from the sensor for better access and visibility.
 09. Recording / Totalizing /





- Logging Facilities : Yes. Should be able to compute cumulative flow over intervals selectable by Owner i.e., daily, weekly, monthly etc. The data shall be stored in the memory of flow computer for access in future.
10. Software features : Compensation for any cross path errors Programming, configuration, shall be possible from front panel.
11. Diagnostics : False signal tolerance , power supply failure etc.
12. Protection Class : IP-65 or better, Weather protection against direct sunlight, rain etc for Flow meter and suitable for Cooling water for Transducer.
13. Accuracy : $\pm 1\%$
14. Electrical connection : Plug and socket
15. Accessories : All mounting hardware required like clamping fixtures, mechanism to remove the transducers online, interconnecting cables etc.
All weather canopy for protection from direct sunlight and direct rain. Material of all fittings shall be SS 316
- g) Bidder shall submit certified flow calculation and differential pressure Vs. flow curves for each element for Owner's approval. Sizing calculation, precise flow calculation for all the flow elements, fabrication and assembly drawings and installation drawings shall be submitted for Owner's approval.

2.00.00 NOT USED

3.00.00 CONTROL PANEL/DESK MOUNTED INSTRUMENTS AND ELECTRICAL SYSTEM ACCESSORIES.

(For electrical System's Meter and for synchronisation, bidder shall refer to Electrical volume of specification)

3.01.00 Digital Indicator (If required)

01. Type : Five and half digit LED seven-segment display with sign.
02. Display Character : 13.8 mm, RED (LED)
03. Accuracy : 0.1% of reading, ± 2 digit





04. Input : 4-20mA DC/1-5 V DC/ pulse (as applicable)
05. Mounting : Flush Panel
06. Power Supply : 240V \pm 10%, 50 \pm 2.5 Hz

3.02.00 PUSH BUTTON

01. Type : Shrouded square format
02. Face Dimension : 32 x 32 mm (maximum)
03. Contact Configuration : 2 NO + 2 NC
04. Contact Addition : Add-on block up to 4 each with 2 pairs of contacts
05. Contact Material : Hard Silver Alloy
06. Contact Rating : 500V / 10 A
07. Utilization Category : AC11 / DC11
08. Insulation Voltage : 2 KV for 1 minute between terminals and earth
09. Mechanical Life : 1 million operation
10. Construction : Aluminum shrouding with plastic lens
11. Colors : Red, Green, Yellow, Black, etc.
12. Connection : Screw terminals
13. Enclosure Class : IP-52
14. Legend : Engraving

3.03.00 ILLUMINATED PUSH BUTTON

01. Type : Square format
02. Face Dimension : 32 x 32 mm (maximum)
03. Contact Configuration : 2 NO + 2 NC (minimum)
04. Contact Addition : Add-on-Block up to 4 each with 2 pairs of contacts
05. Contact Material : Hard Silver Alloy
06. Contact Rating : 500 V/ 10A





07. Utilization Category : A C11 / DC11
08. Insulation Voltage : 2 KV for 1 minute between terminals and earth
09. Mechanical Life : 1 Million Operation
10. Lamp : LED with built-in resistors as required
11. Lamp Rating :-
 - a) Voltage : 240 V AC
 - b) Watt : 2 Watt (approx.)
12. Lamp and Lens Replacement : From front
13. Construction : Transparent Plastic Lens
14. Color : Red, Green, Amber, Yellow etc.
15. Connection : Screw terminals
16. Enclosure Class : IP-52
17. Legend : Engraving

3.04.00

SELECTOR SWITCH

01. Type : 2/3/4 position stay put type with rotary lever actuator.
02. Face Dimension : 32 x 32 mm (maximum)
03. Contact Configuration : 4 pair of contacts
04. Contact Addition : Add-on-Block up to 4 each with 2 pairs of contact
05. Contact Material : Hard silver Alloy
06. Contact Rating : 500 V/10 A
07. Utilization Category : AC11 / DC11
08. Insulation Voltage : 2 KV for 1 minute between terminals and earth
09. Mechanical Life : 1 million operation
10. Construction : Aluminum shrouding
11. Connection : Screw terminals





12. Enclosure Class : IP-52

3.05.00

INDICATING LAMP

01. Type : LED with built-in resistor
02. Face Dimension : 32 x 32 mm (maximum)
03. Voltage : 240 V AC
04. Watt : 2.5 Watt (approximate)
05. Lamp and Lens Replacement : From front
06. Construction : Transparent Plastic lens
07. Color : Red, Green, Amber, Yellow etc.
08. Connection : Screw terminals
09. Legend : Engraving

3.06.00

INDICATING METERS (A.C)

01. Type : Rectifier type taut band
02. Face Dimension : 96 x 96 mm
03. Scale : Radial arc of 240 Deg.
04. Accuracy : 1.5% of full scale.
±0.5 Hz for frequency meter
05. Input : 0-1/0-5A for current measurement, 0-240V for voltage measurement, 50 ± 2.5 Hz for Frequency measurement
06. Zero Adjustment : Screw on meter face
07. Enclosure : Shielded Case IP-52
08. Mounting : Flush Panel
09. End Scale
Suppression : 6 times the measuring range only for motor ammeters

3.06.01

INDICATING METERS (D.C)

01. Type : Taut band moving coil
02. Face Dimension : 96 x 96 mm





- | | | | |
|-----|-----------------|---|--|
| 03. | Scale | : | Radial arc of 240 Deg. |
| 04. | Accuracy | : | 1.5% of full scale |
| 05. | Input | : | 0-75 mA for current measurement. Direct reading for voltage measurement. |
| 06. | Zero Adjustment | : | Screw on meter face |
| 07. | Enclosure | : | Shielded case IP-52 |
| 08. | Mounting | : | Flush Panel |
| 09. | End Scale | : | |
| | Suppression | : | 2 times the measuring range only for motor ammeters. |

3.07.00 AUXILIARY RELAY

- | | | | |
|-----|-----------------------|---|---|
| 01. | Type | : | Plug-in type with base/DIN rail Mounted |
| 02. | Coil voltage | : | 240 V AC/24V DC / 220V DC |
| 03. | Contact Configuration | : | 2 NO & 2 NC (Minimum), additional contacts as per requirement |
| 04. | Contact rating | : | 250V/5A (A.C/D.C.) |
| 05. | Operating range | : | 80 to 110% of rated voltage |
| 06. | Insulation | : | 2 KV for 1 minute between terminals & earth. |
| 07. | Mechanical life | : | 20 million operations |
| 08. | Enclosure | : | Transparent cover |
| 09. | Connection | : | Screw terminals. |
| 10. | Mounting | : | Projection mounting inside panel /DIN rail Mounting |

Note : Coil protection: diode/surge suppressor shall be provided

3.08.00 COUPLING RELAY

- | | | | |
|-----|--------------|---|---|
| 01. | Type | : | Miniature plug-in type/ DIN rail Mounting |
| 02. | Coil voltage | : | 24 V D.C. / 48 V DC or others as required. |
| 03. | Contact | : | 2 NO & 2 NC (Minimum)-Additional contact as per requirement |





04. Contact rating : 250 V/10A (A.C)/220V/2A (D.C)
05. Operating range : 70 to 110% of rated voltage.
06. Insulation : 2 KV for 1 minutes between terminal & earth.
07. Mechanical life : 20 million operations
08. Coil protection : Diode
09. Indication : Coil on LED
10. Enclosure : Transparent cover
11. Connection : Screw terminals.
12. Mounting : Projection mounting inside panel / DIN rail mounting




3.09.00 UNINTERRUPTED POWER SUPPLY (FOR CONTROL EQUIPMENT ROOM, UNIT CONTROL ROOM AND OFFSITE PLCs)

UPS with 2x100% configuration shall be provided for the equipments / devices located in the Control Equipment (DCS) room and Unit Control room. Normally both of the redundant UPS will run in parallel mode sharing 50% load. On failure of any UPS, its load shall automatically get transferred to the other healthy UPS. For detail specification of UPS refer volume IIF/2 section X-A1 & X-A2.

3.11.00 Push Button Station (Emergency Stop)

01. Function : Hardware communication between P/B Station & DCS
02. Type : Mechanical keys Shrouded
03. Size : 48 mm
04. Mounting : On Auxiliary Console
05. Signal Level : 24V DC Binary
06. Ambient temperature : 0-50 ° C
07. Ambient Humidity : 0-95% RH (max.)



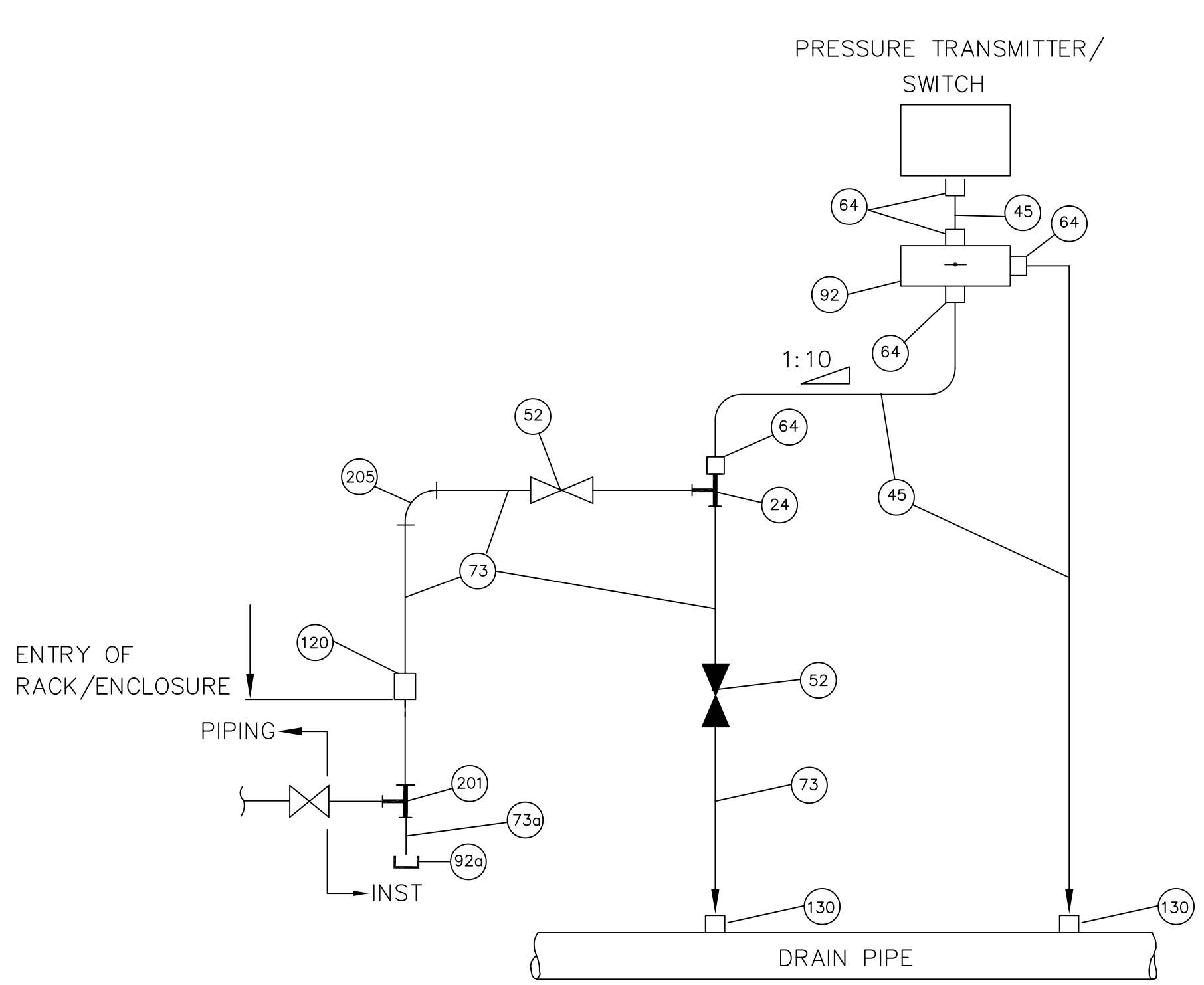
1	2		3		4		5		6																																																																																														
<table border="1"> <thead> <tr> <th>S/N</th> <th>DESCRIPTION</th> <th>SHEET NO.</th> </tr> </thead> <tbody> <tr><td>1.</td><td>COVER SHEET</td><td>1 OF 27</td></tr> <tr><td>2.</td><td>INDEX SHEET</td><td>2 OF 27</td></tr> <tr><td>3.</td><td>NOTES</td><td>3 OF 27</td></tr> <tr><td>4.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES</td><td>4 OF 27</td></tr> <tr><td>5.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES</td><td>5 OF 27</td></tr> <tr><td>6.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES</td><td>6 OF 27</td></tr> <tr><td>7.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES</td><td>7 OF 27</td></tr> <tr><td>8.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES</td><td>8 OF 27</td></tr> <tr><td>9.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES</td><td>9 OF 27</td></tr> <tr><td>10.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES</td><td>10 OF 27</td></tr> <tr><td>11.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER (LEVEL)</td><td>11 OF 27</td></tr> <tr><td>12.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER (LEVEL)</td><td>12 OF 27</td></tr> <tr><td>13.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – FLOAT OPERATED LEVEL SWITCH</td><td>13 OF 27</td></tr> <tr><td>14.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFFERENTIAL PRESSURE GAUGE</td><td>14 OF 27</td></tr> <tr><td>15.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE SWITCH</td><td>15 OF 27</td></tr> <tr><td>16.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE SWITCH</td><td>16 OF 27</td></tr> <tr><td>17.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – SWAS</td><td>17 OF 27</td></tr> <tr><td>18.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES</td><td>18 OF 27</td></tr> <tr><td>19.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES</td><td>19 OF 27</td></tr> <tr><td>20.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES</td><td>20 OF 27</td></tr> <tr><td>21.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – AIR PURGING SCHEME</td><td>21 OF 27</td></tr> <tr><td>22.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – AIR PURGING SCHEME</td><td>22 OF 27</td></tr> <tr><td>23.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES</td><td>23 OF 27</td></tr> <tr><td>24.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES</td><td>24 OF 27</td></tr> <tr><td>25.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES</td><td>25 OF 27</td></tr> <tr><td>26.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PNEUMATIC CONTROL VALVE</td><td>26 OF 27</td></tr> <tr><td>27.</td><td>TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PNEUMATIC SOLENOID VALVE</td><td>27 OF 27</td></tr> </tbody> </table>											S/N	DESCRIPTION	SHEET NO.	1.	COVER SHEET	1 OF 27	2.	INDEX SHEET	2 OF 27	3.	NOTES	3 OF 27	4.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	4 OF 27	5.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	5 OF 27	6.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	6 OF 27	7.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	7 OF 27	8.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	8 OF 27	9.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES	9 OF 27	10.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES	10 OF 27	11.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER (LEVEL)	11 OF 27	12.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER (LEVEL)	12 OF 27	13.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – FLOAT OPERATED LEVEL SWITCH	13 OF 27	14.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFFERENTIAL PRESSURE GAUGE	14 OF 27	15.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE SWITCH	15 OF 27	16.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE SWITCH	16 OF 27	17.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – SWAS	17 OF 27	18.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	18 OF 27	19.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	19 OF 27	20.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES	20 OF 27	21.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – AIR PURGING SCHEME	21 OF 27	22.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – AIR PURGING SCHEME	22 OF 27	23.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES	23 OF 27	24.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	24 OF 27	25.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES	25 OF 27	26.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PNEUMATIC CONTROL VALVE	26 OF 27	27.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PNEUMATIC SOLENOID VALVE	27 OF 27									
S/N	DESCRIPTION	SHEET NO.																																																																																																					
1.	COVER SHEET	1 OF 27																																																																																																					
2.	INDEX SHEET	2 OF 27																																																																																																					
3.	NOTES	3 OF 27																																																																																																					
4.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	4 OF 27																																																																																																					
5.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	5 OF 27																																																																																																					
6.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	6 OF 27																																																																																																					
7.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	7 OF 27																																																																																																					
8.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	8 OF 27																																																																																																					
9.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES	9 OF 27																																																																																																					
10.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES	10 OF 27																																																																																																					
11.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER (LEVEL)	11 OF 27																																																																																																					
12.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER (LEVEL)	12 OF 27																																																																																																					
13.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – FLOAT OPERATED LEVEL SWITCH	13 OF 27																																																																																																					
14.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFFERENTIAL PRESSURE GAUGE	14 OF 27																																																																																																					
15.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE SWITCH	15 OF 27																																																																																																					
16.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE SWITCH	16 OF 27																																																																																																					
17.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – SWAS	17 OF 27																																																																																																					
18.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	18 OF 27																																																																																																					
19.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	19 OF 27																																																																																																					
20.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES	20 OF 27																																																																																																					
21.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – AIR PURGING SCHEME	21 OF 27																																																																																																					
22.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – AIR PURGING SCHEME	22 OF 27																																																																																																					
23.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES	23 OF 27																																																																																																					
24.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PRESSURE TRANSMITTER/ SWITCHES	24 OF 27																																																																																																					
25.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – DIFF. PRESSURE TRANSMITTER/ SWITCHES	25 OF 27																																																																																																					
26.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PNEUMATIC CONTROL VALVE	26 OF 27																																																																																																					
27.	TYPICAL INSTRUMENT INSTALLATION DIAGRAM – PNEUMATIC SOLENOID VALVE	27 OF 27																																																																																																					
<div style="border: 1px solid black; padding: 5px; display: inline-block;">FOR TENDER PURPOSE ONLY</div>																																																																																																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="11" style="text-align: center;">TYPICAL INSTRUMENT INSTALLATION DIAGRAM</th> </tr> <tr> <th colspan="11" style="text-align: center;">THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD.</th> </tr> <tr> <th colspan="11" style="text-align: center;">KOLKATA, INDIA</th> </tr> <tr> <th colspan="11" style="text-align: center;">SAGARDIGHI THERMAL POWER STATION</th> </tr> <tr> <th colspan="11" style="text-align: center;">1 x 660 MW, PHASE-III</th> </tr> <tr> <th colspan="11" style="text-align: center;">EXTN. UNITS # 5</th> </tr> </thead> <tbody> <tr> <td colspan="2" style="text-align: center;">A.T.</td> <td colspan="2" style="text-align: center;">S.B.</td> <td colspan="2" style="text-align: center;">A.K.P.</td> <td colspan="2" style="text-align: center;">S.K.</td> <td colspan="2" style="text-align: center;">FIRST ISSUE</td> <td colspan="1" style="text-align: center;">-</td> <td colspan="1" style="text-align: center;">0</td> <td colspan="1" style="text-align: center;">22.06.2017</td> </tr> <tr> <td colspan="2" style="text-align: center;">APPROVED</td> <td colspan="2" style="text-align: center;">REVIEWED</td> <td colspan="2" style="text-align: center;">CHECKED</td> <td colspan="2" style="text-align: center;">DRAWN</td> <td colspan="2" style="text-align: center;">DESCRIPTION</td> <td colspan="2" style="text-align: center;">RELEASE STATUS</td> <td colspan="1" style="text-align: center;">REV.</td> <td colspan="1" style="text-align: center;">DATE</td> </tr> </tbody> </table>											TYPICAL INSTRUMENT INSTALLATION DIAGRAM											THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD.											KOLKATA, INDIA											SAGARDIGHI THERMAL POWER STATION											1 x 660 MW, PHASE-III											EXTN. UNITS # 5											A.T.		S.B.		A.K.P.		S.K.		FIRST ISSUE		-	0	22.06.2017	APPROVED		REVIEWED		CHECKED		DRAWN		DESCRIPTION		RELEASE STATUS		REV.	DATE
TYPICAL INSTRUMENT INSTALLATION DIAGRAM																																																																																																							
THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD.																																																																																																							
KOLKATA, INDIA																																																																																																							
SAGARDIGHI THERMAL POWER STATION																																																																																																							
1 x 660 MW, PHASE-III																																																																																																							
EXTN. UNITS # 5																																																																																																							
A.T.		S.B.		A.K.P.		S.K.		FIRST ISSUE		-	0	22.06.2017																																																																																											
APPROVED		REVIEWED		CHECKED		DRAWN		DESCRIPTION		RELEASE STATUS		REV.	DATE																																																																																										
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;"></td> <td colspan="9" style="text-align: center;">DEVELOPMENT CONSULTANTS PVT. LTD.</td> </tr> <tr> <td colspan="2"></td> <td colspan="9" style="text-align: center;">CONSULTING ENGINEERS</td> </tr> <tr> <td colspan="2" style="text-align: center;">JOB NO.</td> <td colspan="3" style="text-align: center;">DCL- 12A05</td> <td colspan="6" style="text-align: center;">SCALE : NIL</td> </tr> <tr> <td colspan="2" style="text-align: center;">DWG. NO.</td> <td colspan="3" style="text-align: center;">12A05-DWG-I-0022</td> <td colspan="6" style="text-align: center;">REV. 0</td> </tr> </table>													DEVELOPMENT CONSULTANTS PVT. LTD.											CONSULTING ENGINEERS									JOB NO.		DCL- 12A05			SCALE : NIL						DWG. NO.		12A05-DWG-I-0022			REV. 0																																																						
		DEVELOPMENT CONSULTANTS PVT. LTD.																																																																																																					
		CONSULTING ENGINEERS																																																																																																					
JOB NO.		DCL- 12A05			SCALE : NIL																																																																																																		
DWG. NO.		12A05-DWG-I-0022			REV. 0																																																																																																		

**PRESSURE TRANSMITTER/PRESSURE SWITCH
MOUNTED ABOVE SOURCE POINT**

PRESSURE TRANSMITTER/
SWITCH

BILL OF MATERIAL		
ITEM NO.	QTY./INST	DESCRIPTION
24	1	UNEQUAL TEE, 1/2" SW X 1/2" NPT (F)
45	3 M	TUBE, 1/2" OD
52	2	GLOBE VALVE, 1/2" SW
64	5	MALE CONNECTOR 1/2" NPT(M) X 1/2" OD
73	15	IMPULSE PIPE, 15 NB
73a	1	NIPPLE, 1/2" SW X 1/2" NPT (F), 150 MM
92	1	2-VALVE MANIFOLD, 1/2" NPT (F)
92a	1	DRAIN PLUG, 1/2" NPT (M)
120	1	BULK HEAD UNION/COUPLING, 1/2" SW
130	2	HALF COUPLING, 1/2" SW
201	1	EQUAL TEE, 1/2" SW
205	2	90° ELBOW, 1/2" SW

SERVICE : CONDENSER PRESSURE ETC.



FOR TENDER PURPOSE ONLY

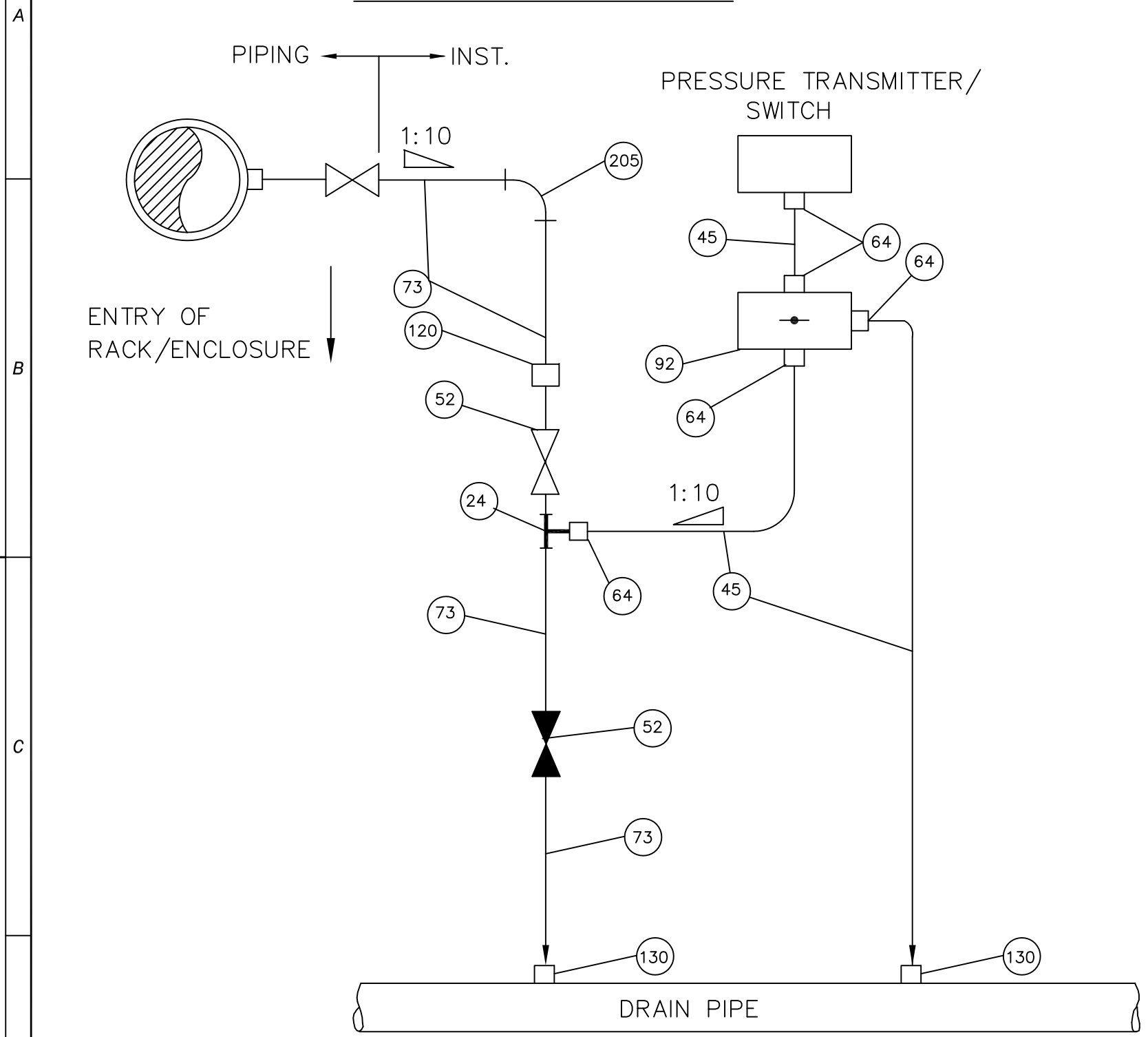
REVIEWED	APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE
	A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017

TYPICAL INSTRUMENT INSTALLATION DIAGRAM		DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS	
THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA		JOB NO. DCL- 12A05	SCALE : NIL
SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5		DWG. NO. 12A05-DWG-I-0022	REV. 0

A3 (9-96) [420x297]

D 12A05-DWG-I-0022-R-0-SHT-4 OF 27 C 22.06.2017

**PRESSURE TRANSMITTER/PRESSURE SWITCH
MOUNTED BELOW SOURCE POINT**



BILL OF MATERIAL		
ITEM NO.	QTY./INST	DESCRIPTION
24	1	UNEQUAL TEE, 1/2" SW X 1/2" NPT (F)
45	3 M	TUBE, 1/2" OD
52	2	GLOBE VALVES, 1/2" SW
64	8	MALE CONNECTOR, 1/2" NPT (M) X 1/2" OD
73	15 M	IMPULSE PIPE, 15 NB
92	1	2 VALVE MANIFOLD, 1/2" NPT (F)
120	1	BULK-HEAD UNION, 1/2" SW
130	2	HALF COUPLING, 1/2" SW
205	1	90° ELBOW, 1/2" SW

SERVICE : CONDENSATE, FEED WATER ETC.

FOR TENDER PURPOSE ONLY

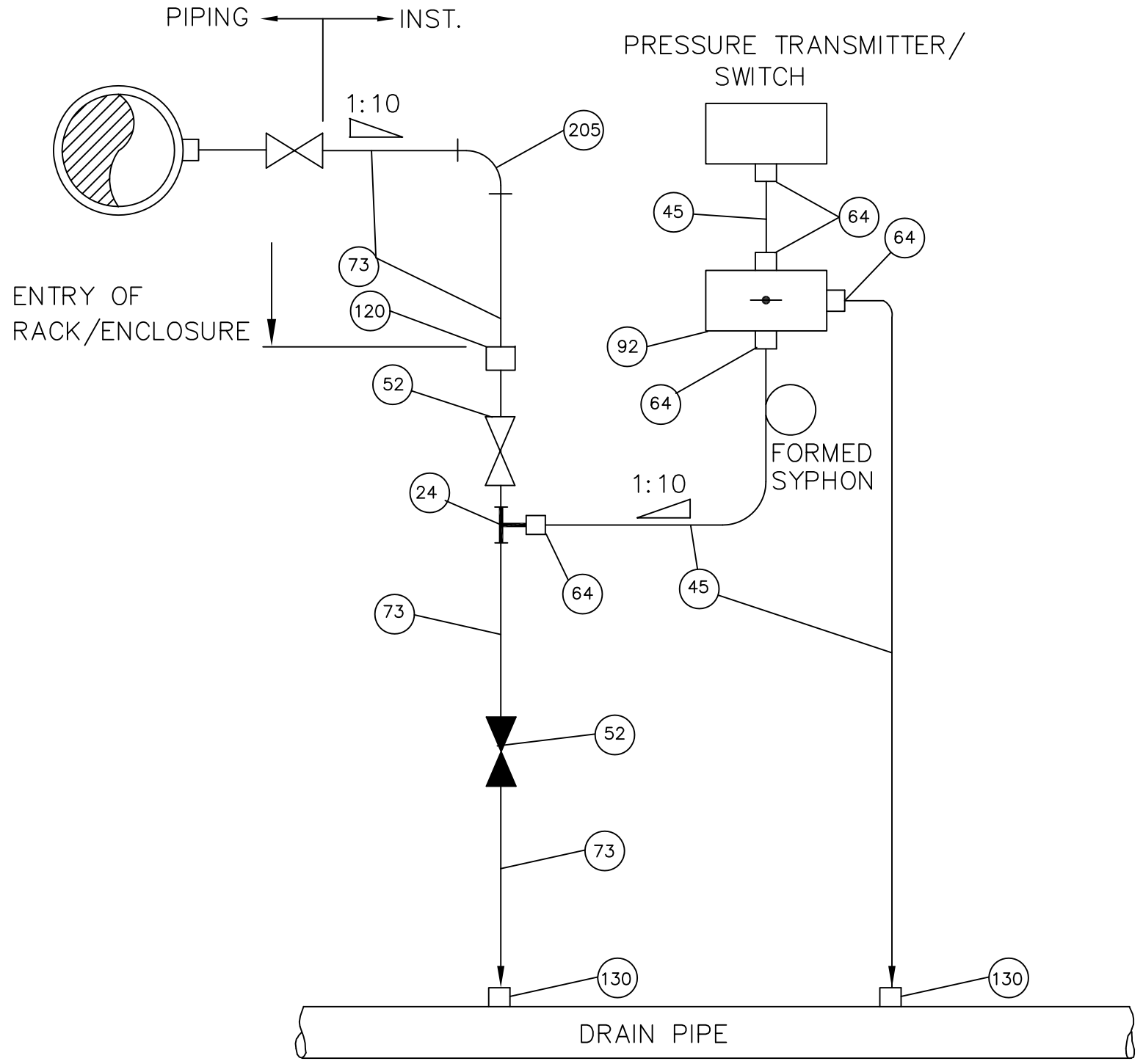
REVIEWED	APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE
	A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017

TYPICAL INSTRUMENT INSTALLATION DIAGRAM		DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS	
THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA		JOB NO. DCL- 12A05	SCALE : NIL
SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5		DWG. NO. 12A05-DWG-I-0022	REV. 0

A3 (9-96) [420x297]

D 12A05-DWG-I-0022-R-0-SHT-5 OF 27 C 22.06.2017

PRESSURE TRANSMITTER/PRESSURE SWITCH
MOUNTED BELOW SOURCE POINT(WITH SYPHON)



BILL OF MATERIAL		
ITEM NO.	QTY./INST	DESCRIPTION
24	1	UNEQUAL TEE, 1/2" SW X 1/2" NPT (F)
45	3 M	TUBE, 1/2" OD
52	2	GLOBE VALVES, 1/2" SW
64	8	MALE CONNECTOR, 1/2" NPT (M) X 1/2" OD
73	15 M	IMPULSE PIPE, 15 NB
92	1	2 VALVE MANIFOLD, 1/2" NPT (F)
120	1	BULK-HEAD UNION, 1/2" SW
130	2	HALF COUPLING, 1/2" SW
205	1	90° ELBOW, 1/2" SW

SERVICE : LOW PRESSURE STEAM

FOR TENDER PURPOSE ONLY

REVIEWED	APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE
	A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017

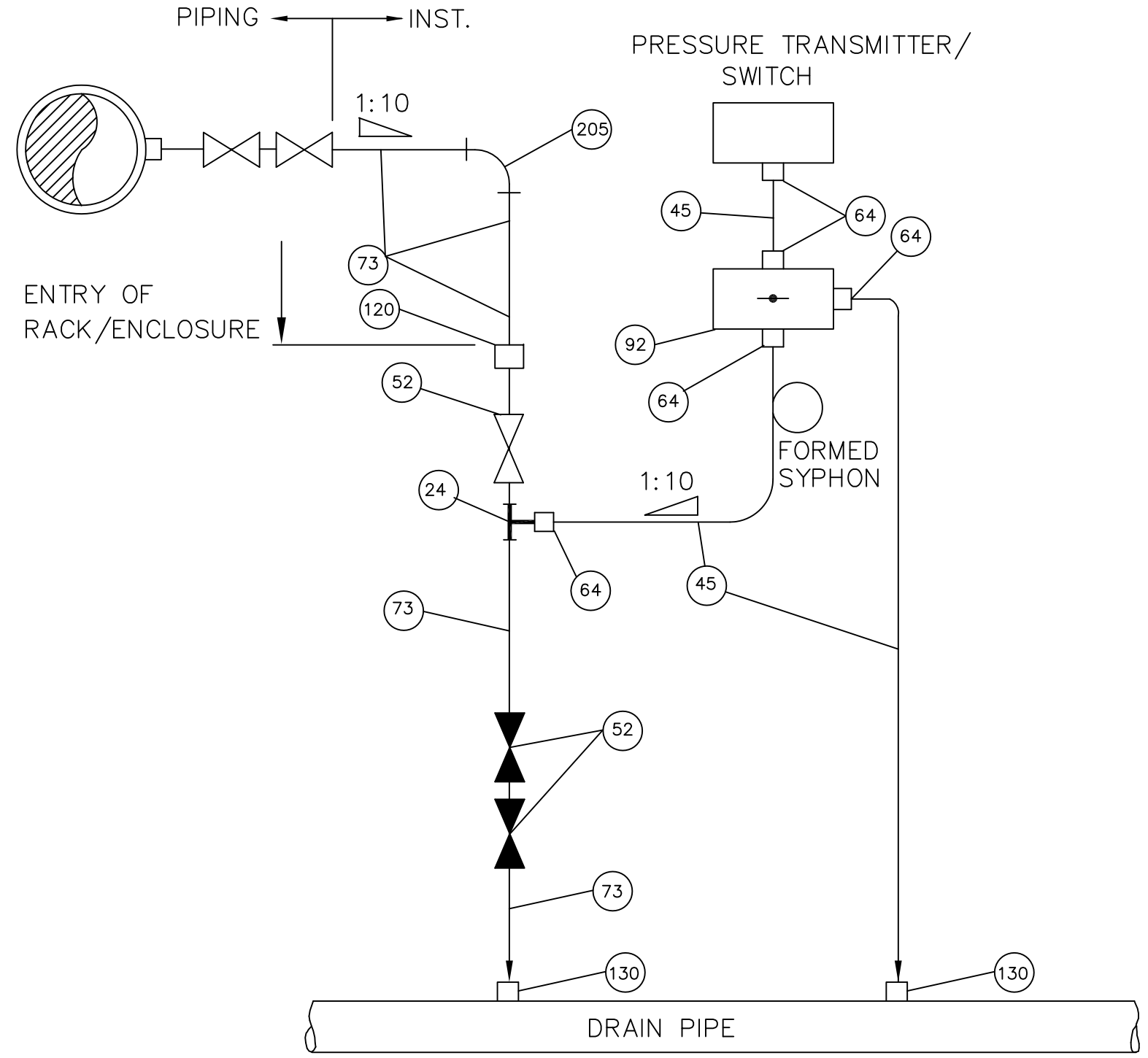
TYPICAL INSTRUMENT INSTALLATION DIAGRAM		DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS	
THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA		JOB NO. DCL- 12A05	SCALE : NIL
SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5		DWG. NO. 12A05-DWG-I-0022	REV. 0

A3 (9-96) [420x297]

D 12A05-DWG-I-0022-R-0-SHT-6 OF 27 C 22.06.2017

**PRESSURE TRANSMITTER/PRESSURE SWITCH
MOUNTED BELOW SOURCE POINT(WITH SYPHON)**

BILL OF MATERIAL		
ITEM NO.	QTY./INST	DESCRIPTION
24	1	UNEQUAL TEE, 1/2" SW X 1/2" NPT (F)
45	3 M	TUBE, 1/2" OD
52	3	GLOBE VALVES, 1/2" SW
64	8	MALE CONNECTOR, 1/2" NPT (M) X 1/2" OD
73	15 M	IMPULSE PIPE, 15 NB
92	1	2 VALVE MANIFOLD, 1/2" NPT (F)
120	1	BULK-HEAD UNION, 1/2" SW
130	2	HALF COUPLING, 1/2" SW
205	1	90° ELBOW, 1/2" SW



SERVICE : SERVICE : MEDIUM & HIGH PRESSURE STEAM

FOR TENDER PURPOSE ONLY

REVIEWED	APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE
	A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017

TYPICAL INSTRUMENT INSTALLATION DIAGRAM		DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS	
THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA		JOB NO. DCL- 12A05	SCALE : NIL
SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5		DWG. NO. 12A05-DWG-I-0022	REV. 0

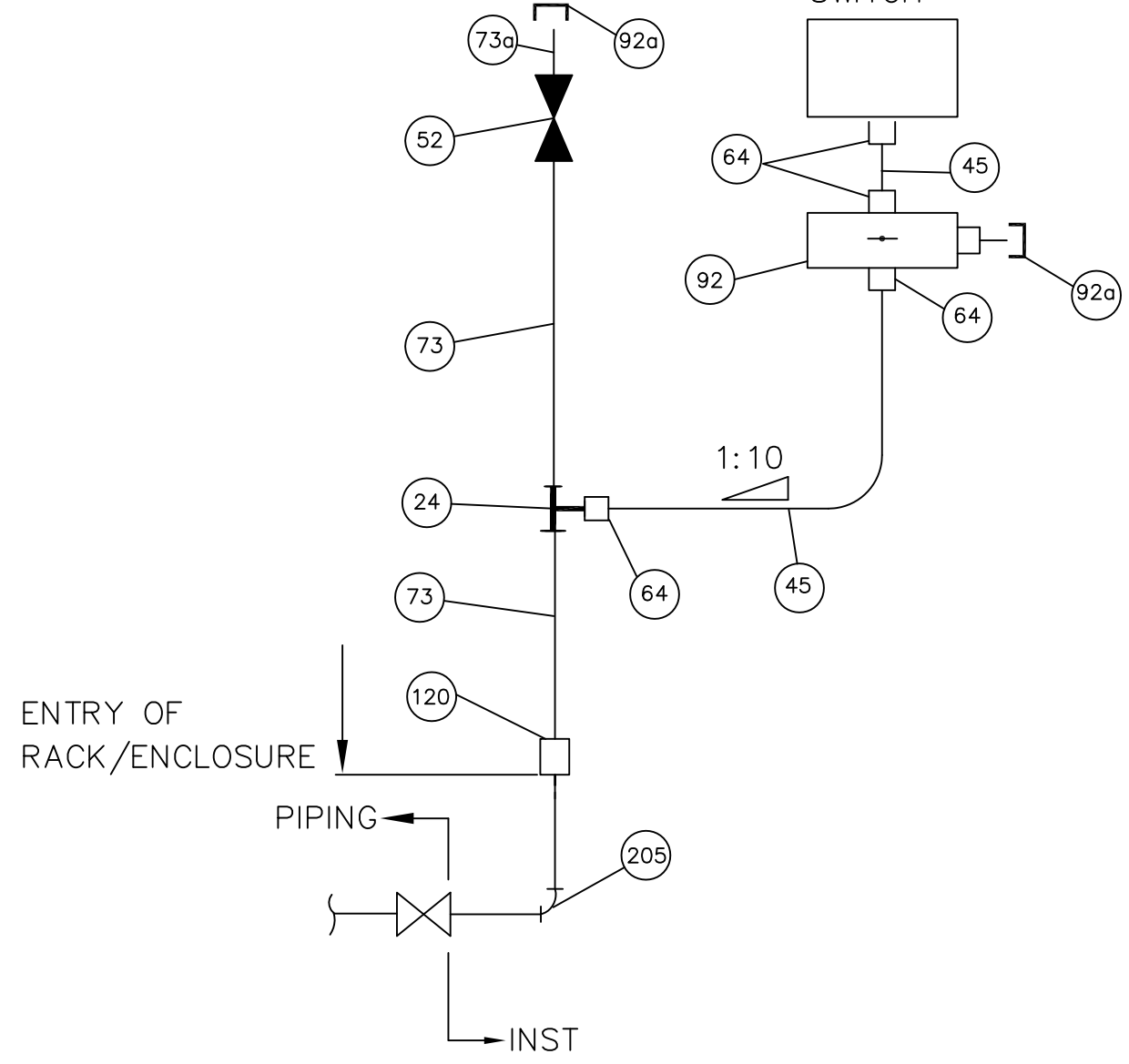
A3 (9-96) [420x297]

D 12A05-DWG-I-0022-R-0-SHT-7 OF 27 C 22.06.2017

PRESSURE TRANSMITTER/PRESSURE SWITCH
MOUNTED ABOVE SOURCE POINT

BILL OF MATERIAL		
ITEM NO.	QTY./INST	DESCRIPTION
24	1	UNEQUAL TEE, 1/2" SW X 1/2" NPT (F)
45	3 M	TUBE, 1/2" OD
52	1	GLOBE VALVE, 1/2" SW
64	4	MALE CONNECTOR 1/2" NPT(M) X 1/2" OD
73	15 M	IMPULSE PIPE, 15 NB
73a	1	NIPPLE, 1/2" SW X 1/2" NPT (F), 150 MM
92	1	2-VALVE MANIFOLD, 1/2" NPT (F)
92a	2	VENT PLUG, 1/2" NPT (M)
120	1	BULK HEAD UNION/COUPLING, 1/2" SW
205	1	90° ELBOW, 1/2" SW

PRESSURE TRANSMITTER/
SWITCH



SERVICE : INSTRUMENT AIR

FOR TENDER PURPOSE ONLY

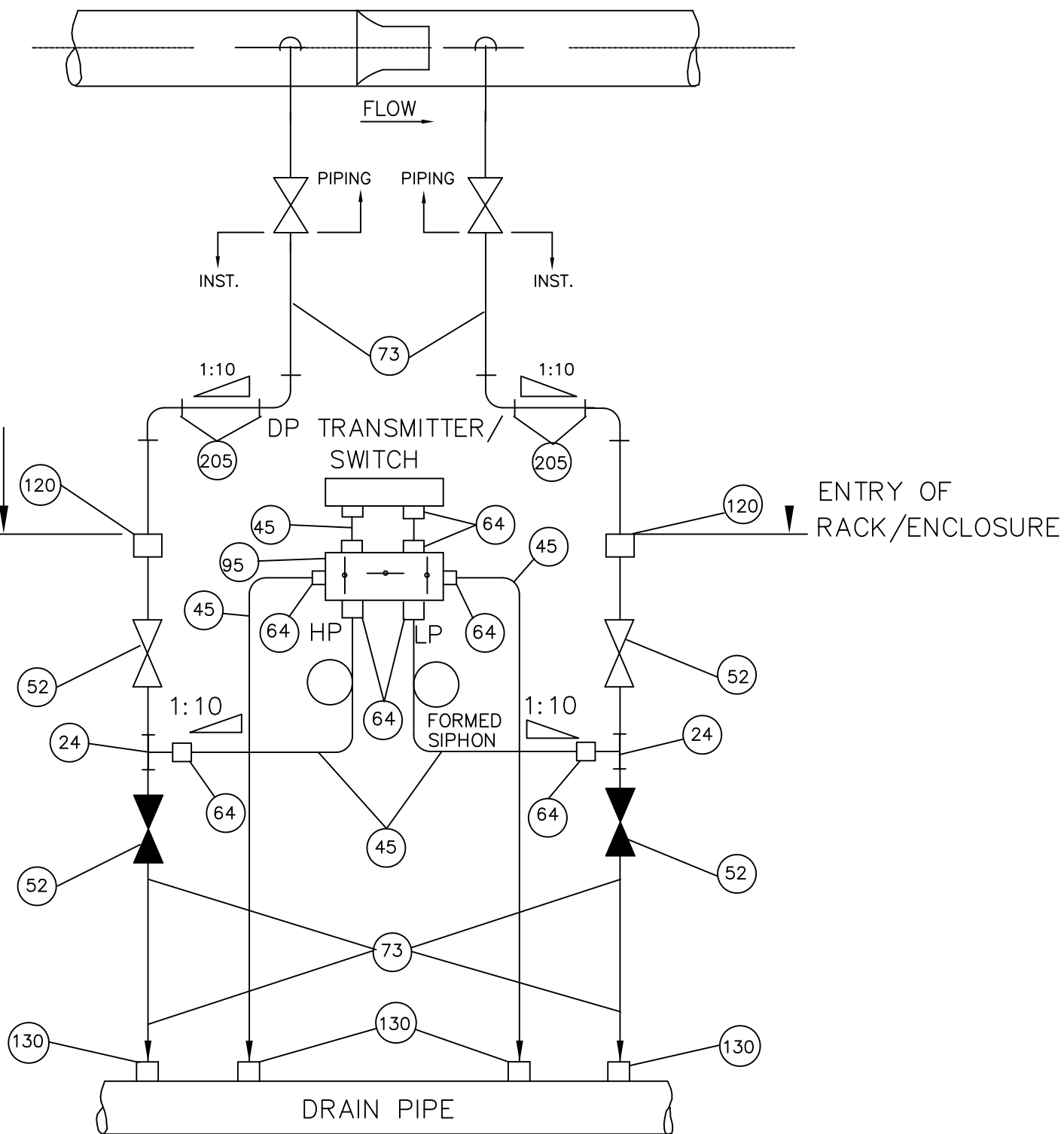
REVIEWED	APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE
	A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017

TYPICAL INSTRUMENT INSTALLATION DIAGRAM		DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS	
THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA		JOB NO. DCL- 12A05	SCALE : NIL
SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5		DWG. NO. 12A05-DWG-I-0022	REV. 0

A3 (9-96) [420x297]

D 12A05-DWG-I-0022-R-0-SHT-8 OF 27 © 22.06.2017

**DIFF. PRESS. TRANSMITTER/DIFF. PRESS. SWITCH
MOUNTED BELOW SOURCE POINT**



BILL OF MATERIAL		
ITEM NO.	QTY./INST	DESCRIPTION
24	2	UNEQUAL TEE, 1/2" SW X 1/2" NPT (F)
45	6 M	TUBE, 1/2" OD
52	4	GLOBE VALVE, 1/2" SW
64	10	MALE CONNECTOR, 1/2" NPT (M) X 1/2" OD
73	30 M	IMPULSE PIPE, 15 NB
95	1	5 VALVE MANIFOLD, 1/2" NPT (F)
120	2	BULK-HEAD UNION, 1/2" SW
130	4	HALF COUPLING, 1/2" SW
205	4	90° ELBOW, 1/2" SW

SERVICE : CONDENSATE, FEED WATER ETC.

PRIMARY ELEMENT : FLOW NOZZLE/ORIFICE

FOR TENDER PURPOSE ONLY

TYPICAL INSTRUMENT INSTALLATION DIAGRAM



DEVELOPMENT CONSULTANTS PVT. LTD
CONSULTING ENGINEERS

THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD.

KOLKATA, INDIA
SAGARDIGHI THERMAL POWER STATION
1 x 660 MW, PHASE-III
EXTN. UNITS # 5

JOB NO. DCL- 12A05 SCALE : NIL

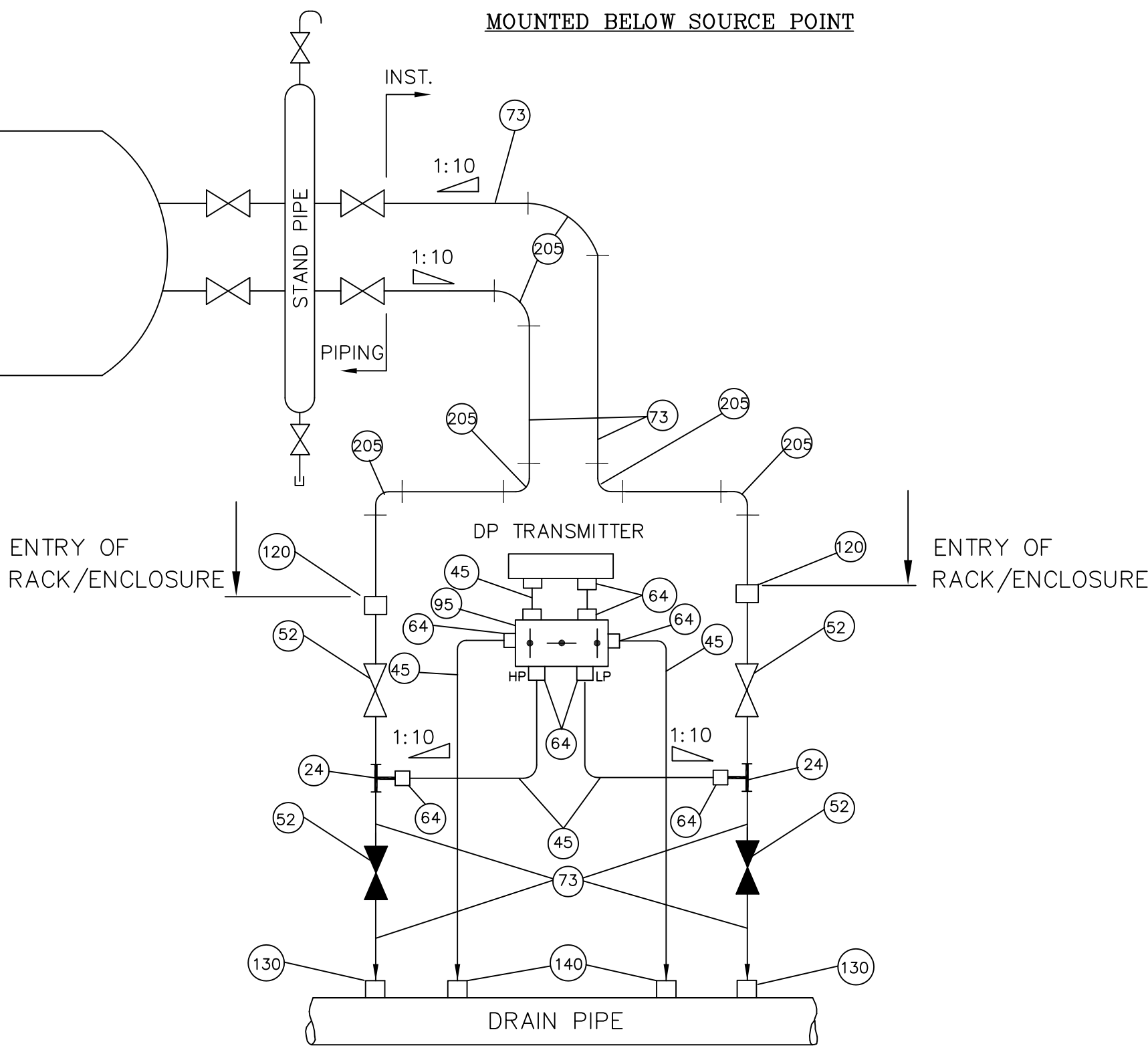
DWG. NO. 12A05-DWG-I-0022

REV. 0

REVIEWED											
		A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017		
		APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE		

**DIFF. PRESS. TRANSMITTER (LEVEL)
MOUNTED BELOW SOURCE POINT**

BILL OF MATERIAL		
ITEM NO.	QTY./INST.	DESCRIPTION
24	2	UNEQUAL TEE, 1/2" SW X 1/2" NPT (F)
45	6 M	TUBE, 1/2" OD
52	4	GLOBE VALVE, 1/2" SW
64	8	MALE CONNECTOR, 1/2" NPT (M) X 1/2" OD
73	30 M	IMPULSE PIPE, 15 NB
95	1	5 VALVE MANIFOLD, 1/2" NPT (F)
120	2	BULK-HEAD UNION, 1/2" SW
130	4	HALF COUPLING, 1/2" SW
205	6	90° ELBOW, 1/2" SW



SERVICE : WATER

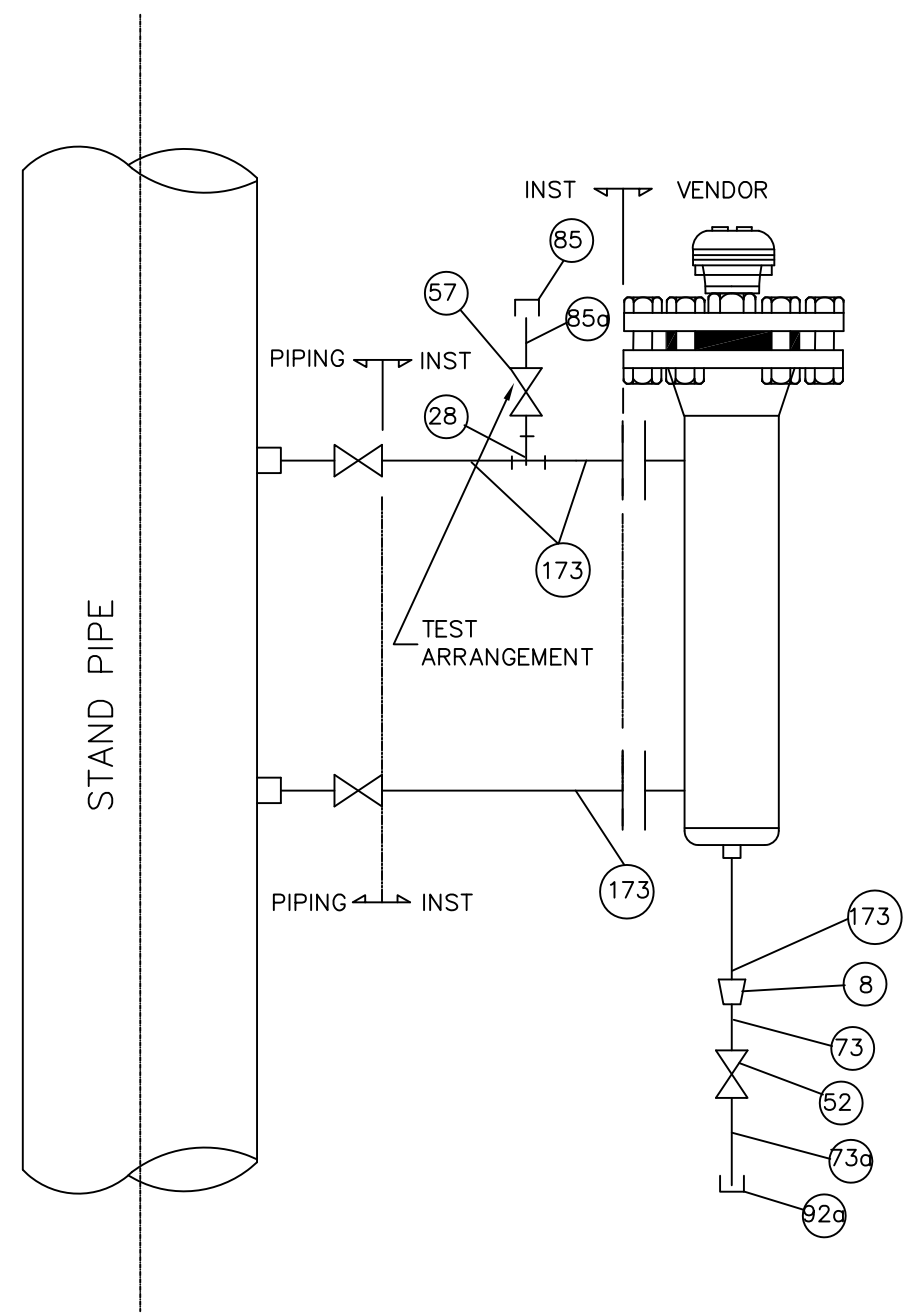
FOR TENDER PURPOSE ONLY

TYPICAL INSTRUMENT INSTALLATION DIAGRAM
THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD.
KOLKATA, INDIA
SAGARDIGHI THERMAL POWER STATION
1 x 660 MW, PHASE-III
EXTN. UNITS # 5

DEVELOPMENT CONSULTANTS PVT. LTD
CONSULTING ENGINEERS
JOB NO. DCL- 12A05 SCALE : NIL
DWG. NO. 12A05-DWG-I-0022 REV. 0

REVIEWED	APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE
	A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017

FLOAT OPERATED LEVEL SWITCH



BILL OF MATERIALS		
ITEM NO	QTY/ INST	DESCRIPTION
8	1	REDUCER, 1" SW X 1/2" SW
28	1	EQUAL TEE, 1" SW
52	1	GLOBE VALVE, 1/2" SW
57	1	GLOBE VALVE, 1" SW
73	1 M	IMPULSE PIPE, 15 NB
73a	1	NIPPLE, 1/2" SW X 1/2" NPT (F)
85	1	PLUG, 1" NPT (M)
85a	1	NIPPLE, 1" SW X 1" NPT (F)
92a	1	DRAIN PLUG, 1/2" NPT (M)
173	1 M	IMPULSE PIPE, 25 NB

SERVICE : CONDENSATE

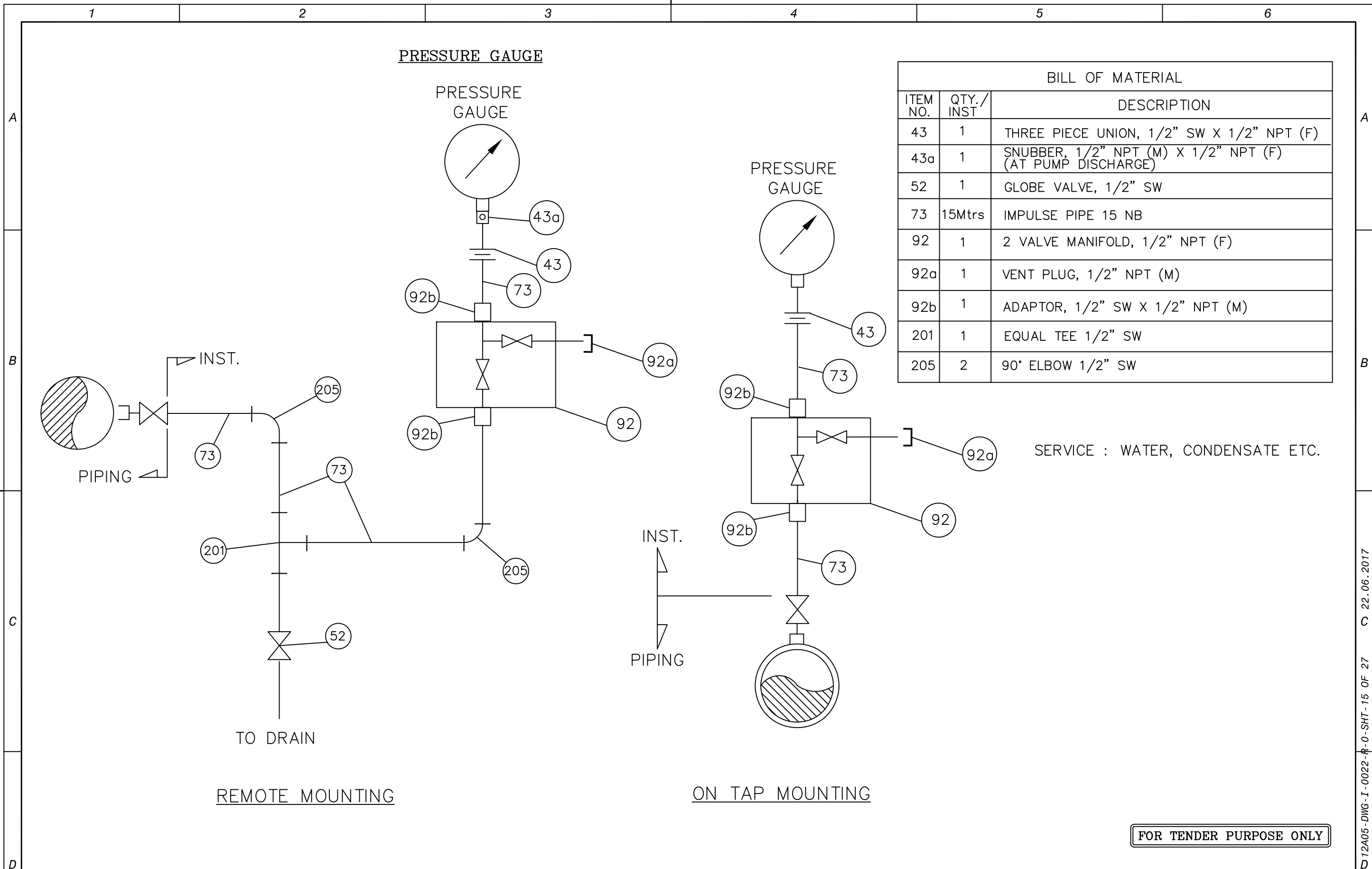
FOR TENDER PURPOSE ONLY

REVIEWED											
		A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017		
		APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE		

TYPICAL INSTRUMENT INSTALLATION DIAGRAM		DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS	
THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA		JOB NO. DCL- 12A05	SCALE : NIL
SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5		DWG. NO. 12A05-DWG-I-0022	REV. 0

A3 (9-96) [420x297]

D 12A05-DWG-I-0022-R-0-SHT-13 OF 27 C 22.06.2017



BILL OF MATERIAL		
ITEM NO.	QTY./INST	DESCRIPTION
43	1	THREE PIECE UNION, 1/2" SW X 1/2" NPT (F)
43a	1	SNUBBER, 1/2" NPT (M) X 1/2" NPT (F) (AT PUMP DISCHARGE)
52	1	GLOBE VALVE, 1/2" SW
73	15Mtrs	IMPULSE PIPE 15 NB
92	1	2 VALVE MANIFOLD, 1/2" NPT (F)
92a	1	VENT PLUG, 1/2" NPT (M)
92b	1	ADAPTOR, 1/2" SW X 1/2" NPT (M)
201	1	EQUAL TEE 1/2" SW
205	2	90° ELBOW 1/2" SW

SERVICE : WATER, CONDENSATE ETC.

FOR TENDER PURPOSE ONLY

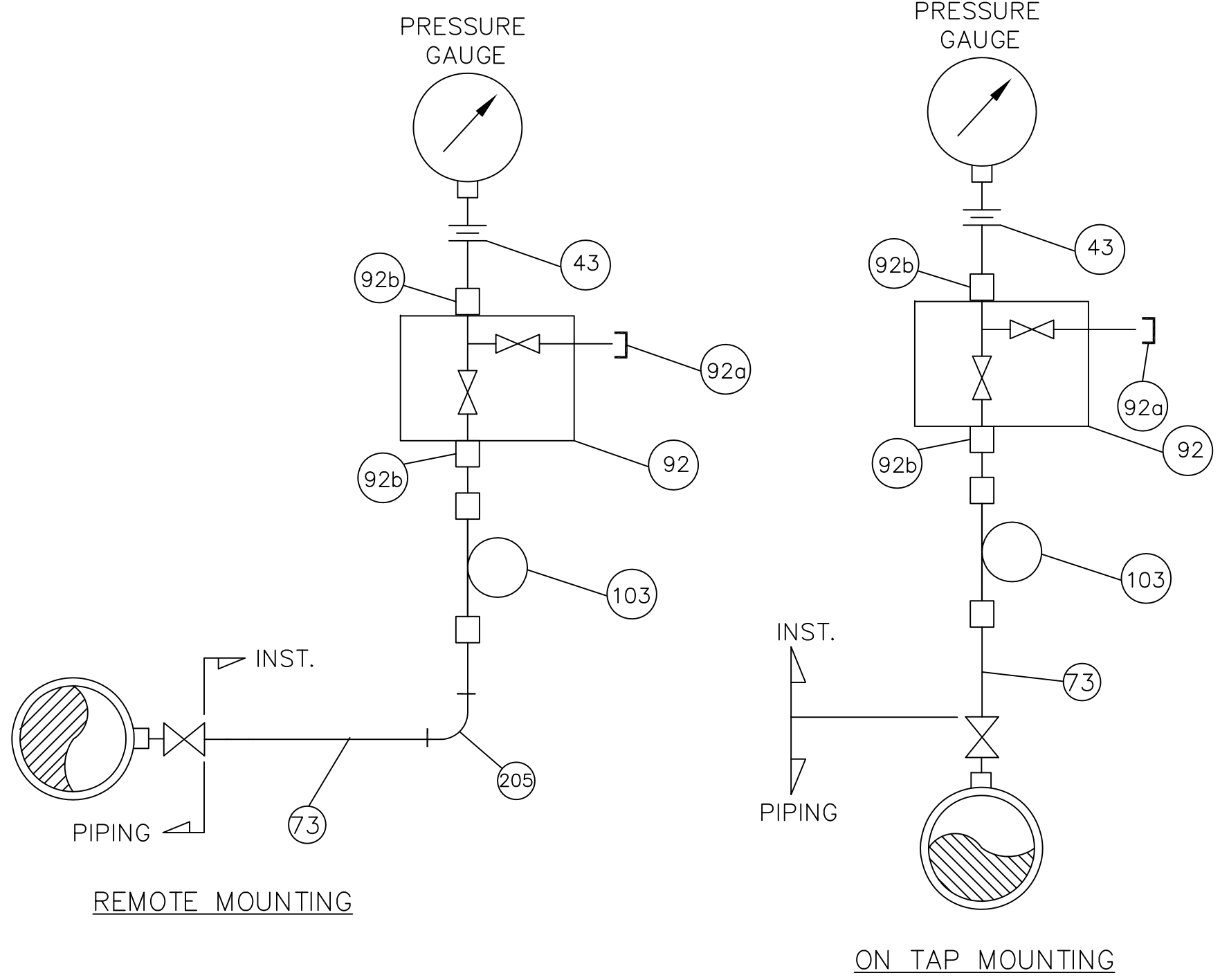
REVIEWED	APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE
	A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017

TYPICAL INSTRUMENT INSTALLATION DIAGRAM THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5		DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS JOB NO. DCL- 12A05 SCALE : NIL DWG. NO. 12A05-DWG-I-0022 REV. 0
---	--	--

A3 (9-96) [420x297]

D 12A05-DWG-I-0022-R-0-SHT-15 OF 27 © 22.06.2017

PRESSURE GAUGE



BILL OF MATERIAL		
ITEM NO.	QTY./INST	DESCRIPTION
43	1	THREE PIECE UNION, 1/2" SW X 1/2" NPT (F)
73	15Mtrs	IMPULSE PIPE 15 NB
92	1	2 VALVE MANIFOLD, 1/2" NPT (F)
92a	1	VENT PLUG, 1/2" NPT (M)
92b	1	ADAPTOR, 1/2" SW X 1/2" NPT (M)
103	1	SYPHON 1/2" SW
205	1	90° ELBOW 1/2" SW

SERVICE : STEAM, FEED WATER

FOR TENDER PURPOSE ONLY

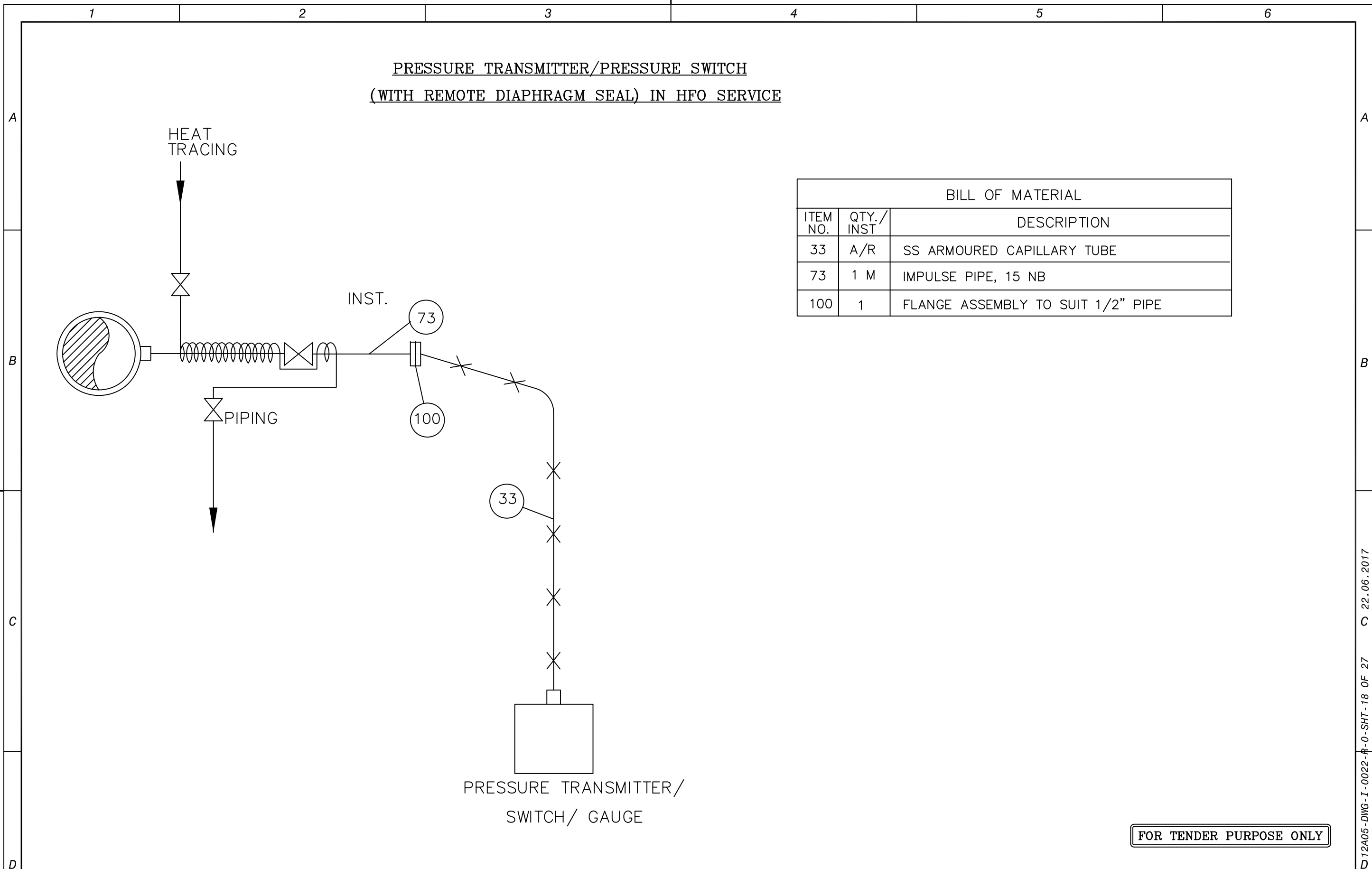
REVIEWED	APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE
	A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017

TYPICAL INSTRUMENT INSTALLATION DIAGRAM		DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS	
THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA		JOB NO. DCL- 12A05	SCALE : NIL
SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5		DWG. NO. 12A05-DWG-I-0022	REV. 0

A3 (9-96) [420x297]

D 12A05-DWG-I-0022-R-0-SHT-16 OF 27 C 22.06.2017

PRESSURE TRANSMITTER/PRESSURE SWITCH
(WITH REMOTE DIAPHRAGM SEAL) IN HFO SERVICE



BILL OF MATERIAL		
ITEM NO.	QTY./INST.	DESCRIPTION
33	A/R	SS ARMoured CAPILLARY TUBE
73	1 M	IMPULSE PIPE, 15 NB
100	1	FLANGE ASSEMBLY TO SUIT 1/2" PIPE

FOR TENDER PURPOSE ONLY

REVIEWED											
		A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017		
		APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE		

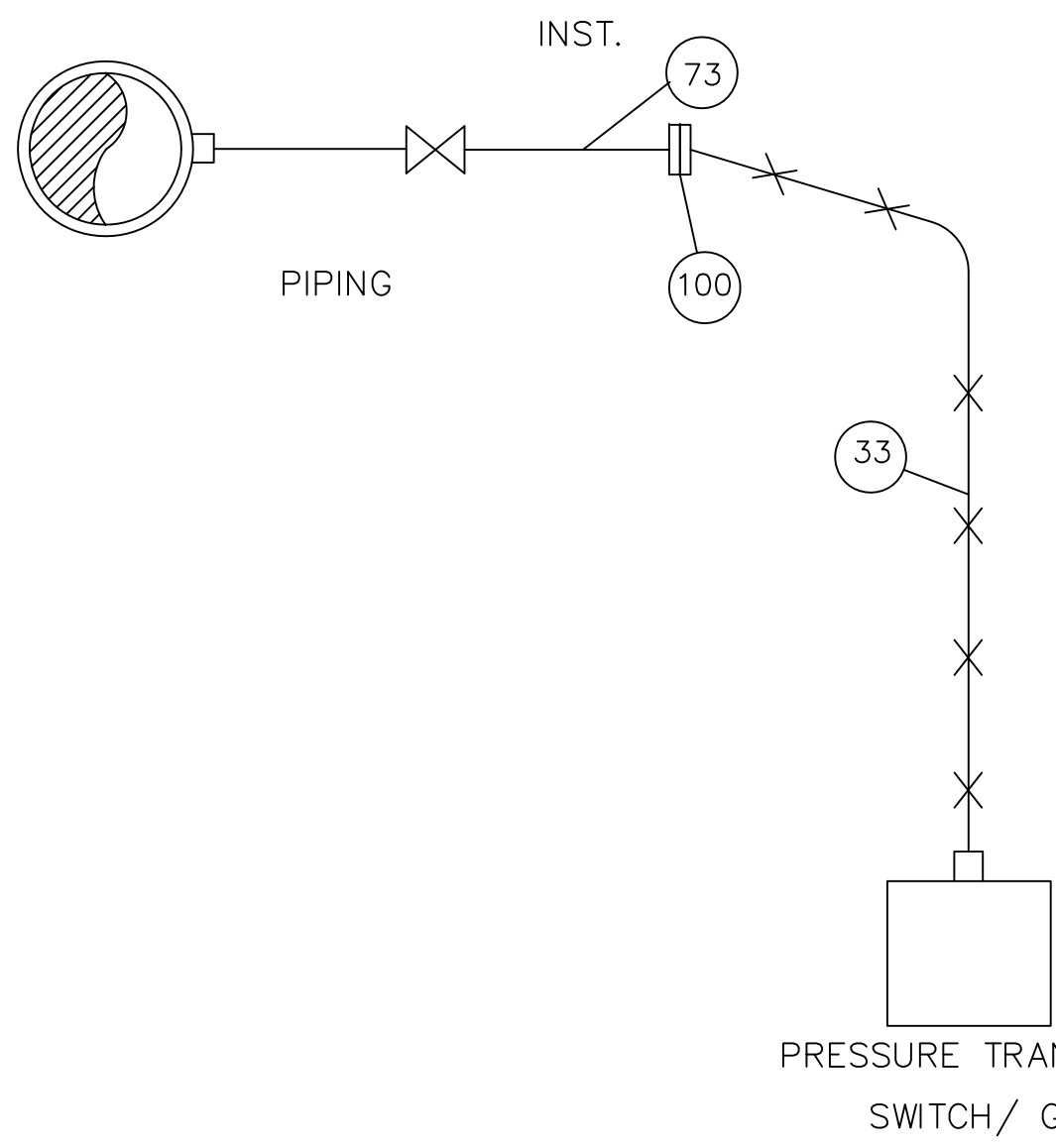
TYPICAL INSTRUMENT INSTALLATION DIAGRAM		DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS	
THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA		JOB NO. DCL- 12A05	SCALE : NIL
SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5		DWG. NO. 12A05-DWG-I-0022	REV. 0

A3 (9-96) [420x297]

D 12A05-DWG-I-0022-R-0-SHT-18 OF 27 © 22.06.2017

PRESSURE TRANSMITTER/PRESSURE SWITCH
WITH REMOTE DIAPHRAGM SEAL

BILL OF MATERIAL		
ITEM NO.	QTY./INST	DESCRIPTION
33	A/R	SS ARMoured CAPILLARY TUBE
73	1 M	IMPULSE PIPE, 15 NB
100	1	FLANGE ASSEMBLY TO SUIT 1/2" PIPE



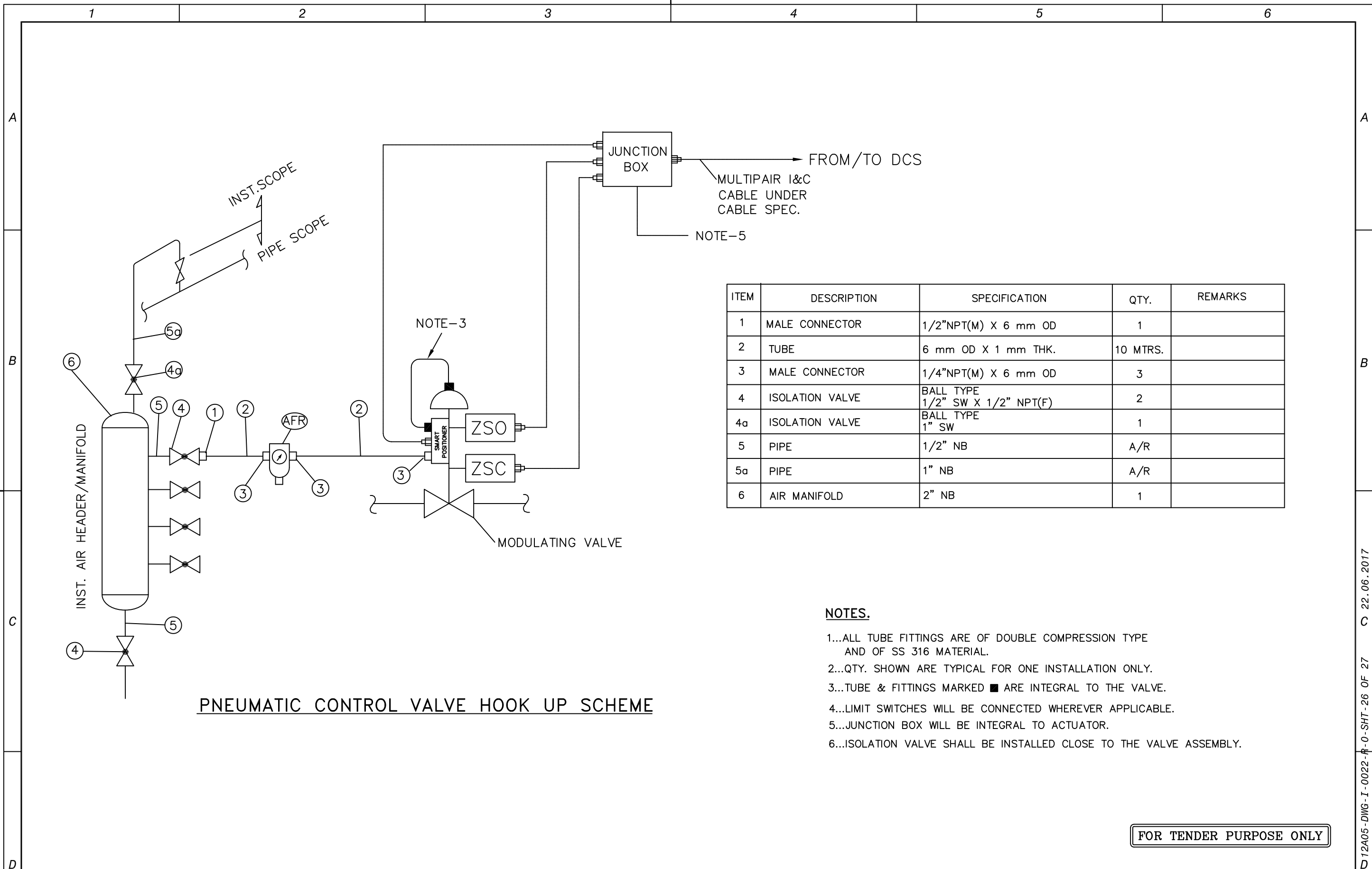
SERVICE: CORROSIVE/ VISCOUS/SOLID BEARING OR SLURRY SERVICE

FOR TENDER PURPOSE ONLY

REVIEWED	APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE	TYPICAL INSTRUMENT INSTALLATION DIAGRAM		DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS	
	A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017	THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA		JOB NO. DCL- 12A05	SCALE : NIL
									SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5		DWG. NO. 12A05-DWG-I-0022	REV. 0

A3 (9-96) [420x297]

D 12A05-DWG-I-0022-R-0-SHT-19 OF 27 C 22.06.2017



ITEM	DESCRIPTION	SPECIFICATION	QTY.	REMARKS
1	MALE CONNECTOR	1/2"NPT(M) X 6 mm OD	1	
2	TUBE	6 mm OD X 1 mm THK.	10 MTRS.	
3	MALE CONNECTOR	1/4"NPT(M) X 6 mm OD	3	
4	ISOLATION VALVE	BALL TYPE 1/2" SW X 1/2" NPT(F)	2	
4a	ISOLATION VALVE	BALL TYPE 1" SW	1	
5	PIPE	1/2" NB	A/R	
5a	PIPE	1" NB	A/R	
6	AIR MANIFOLD	2" NB	1	

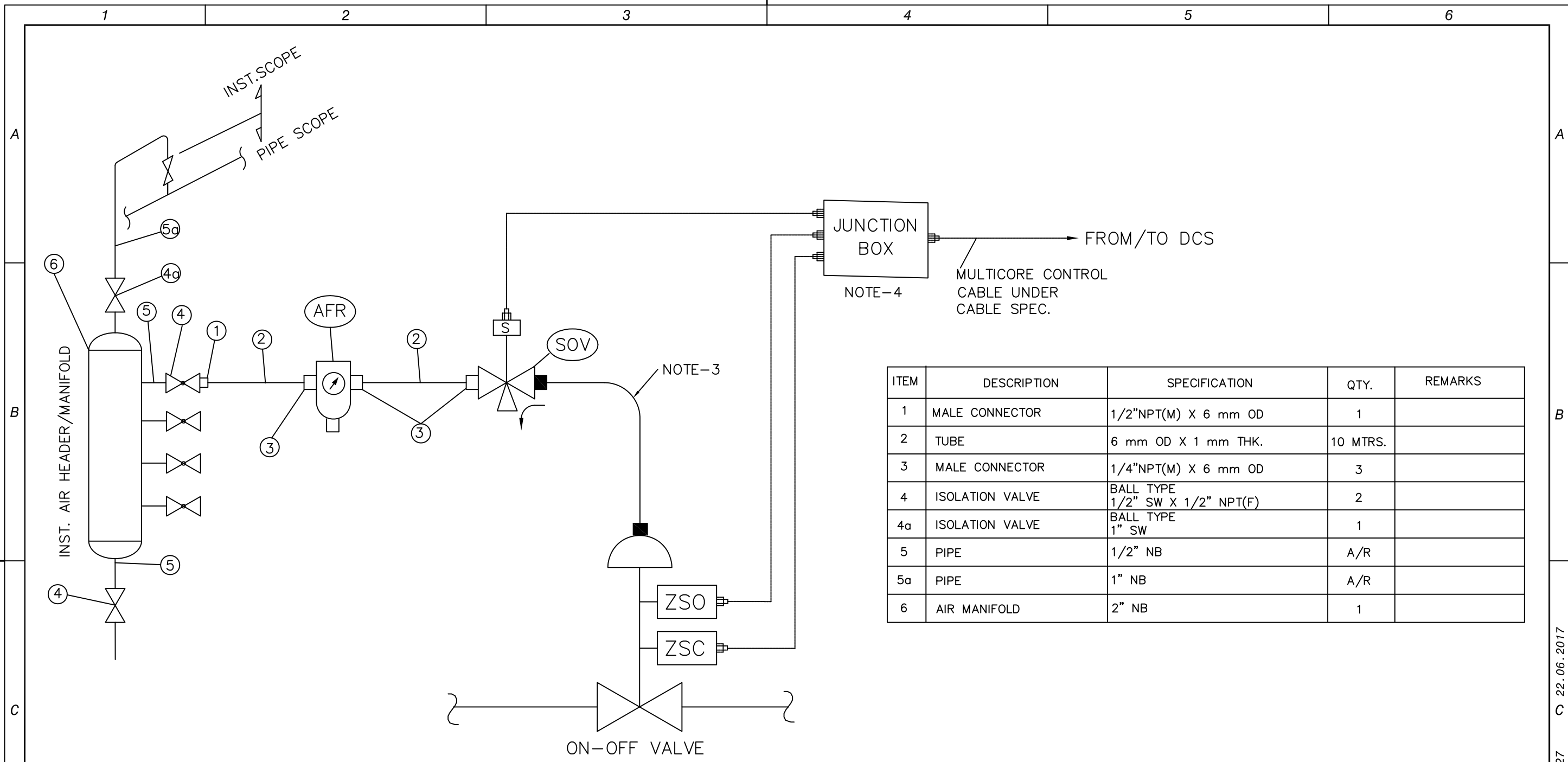
PNEUMATIC CONTROL VALVE HOOK UP SCHEME

NOTES.

- 1...ALL TUBE FITTINGS ARE OF DOUBLE COMPRESSION TYPE AND OF SS 316 MATERIAL.
- 2...QTY. SHOWN ARE TYPICAL FOR ONE INSTALLATION ONLY.
- 3...TUBE & FITTINGS MARKED ■ ARE INTEGRAL TO THE VALVE.
- 4...LIMIT SWITCHES WILL BE CONNECTED WHEREVER APPLICABLE.
- 5...JUNCTION BOX WILL BE INTEGRAL TO ACTUATOR.
- 6...ISOLATION VALVE SHALL BE INSTALLED CLOSE TO THE VALVE ASSEMBLY.

FOR TENDER PURPOSE ONLY

REVIEWED										TYPICAL INSTRUMENT INSTALLATION DIAGRAM		DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS	
										THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA		JOB NO. DCL- 12A05 SCALE : NIL	
										SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5		DWG. NO. 12A05-DWG-I-0022 REV. 0	
		A.T.		S.B.		A.K.P.		S.K.		FIRST ISSUE		-	
		APPROVED		REVIEWED		CHECKED		DRAWN		DESCRIPTION		RELEASE STATUS	



PNEUMATIC SOV HOOK UP SCHEME

NOTES.

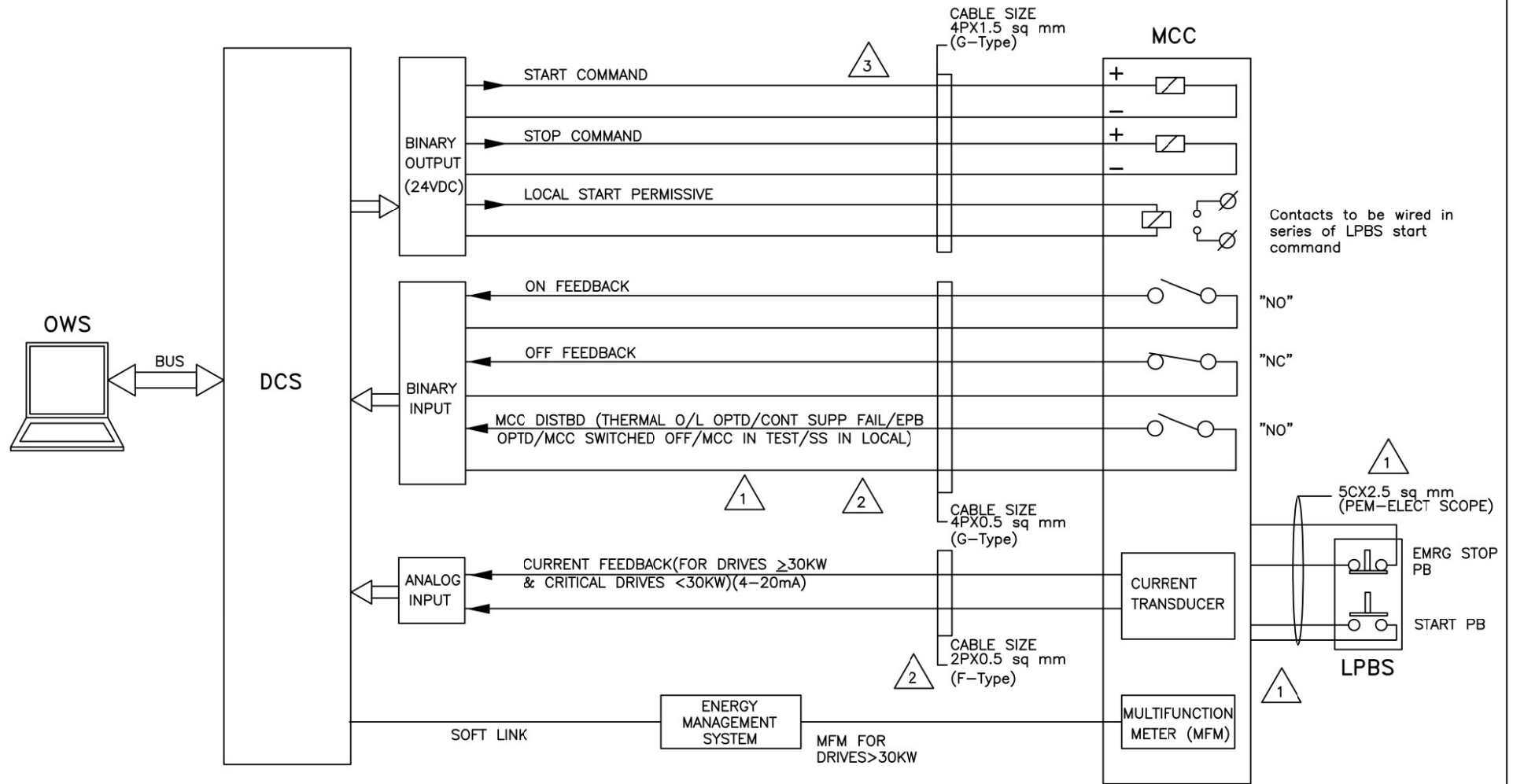
- 1...ALL TUBE FITTINGS ARE OF DOUBLE COMPRESSION TYPE AND OF SS 316 MATERIAL.
- 2...QTY. SHOWN ARE TYPICAL FOR ONE INSTALLATION ONLY.
- 3...TUBE & FITTINGS MARKED ■ ARE INTEGRAL TO THE VALVE.
- 4...JUNCTION BOX WILL BE INTEGRAL TO ACTUATOR.
- 5...ISOLATION VALVE SHALL BE INSTALLED CLOSE TO THE VALVE ASSEMBLY.

FOR TENDER PURPOSE ONLY

TYPICAL INSTRUMENT INSTALLATION DIAGRAM										DEVELOPMENT CONSULTANTS PVT. LTD CONSULTING ENGINEERS	
THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. KOLKATA, INDIA										JOB NO. DCL- 12A05 SCALE : NIL	
SAGARDIGHI THERMAL POWER STATION 1 x 660 MW, PHASE-III EXTN. UNITS # 5										DWG. NO. 12A05-DWG-I-0022 REV. 0	
REVIEWED											
		A.T.	S.B.	A.K.P.	S.K.	FIRST ISSUE	-	0	22.06.2017		
		APPROVED	REVIEWED	CHECKED	DRAWN	DESCRIPTION	RELEASE STATUS	REV.	DATE		

Annexure-G.1

DCS INTERFACE FOR UNIDIRECTIONAL LT DRIVE (CONTACTOR OPERATED)



NOTES:
REDUNDANCY IN OUTPUT SHALL BE PROVIDED FOR ALL CRITICAL LT DRIVES



PROJECT: 1X660MW SAGARDIGHI THERMAL POWER EXTENSION PROJECT (UNIT #5)

TITLE DDCMIS INTERFACE FOR UNIDIRECTIONAL LT DRIVE (CONTACTOR OPERATED)

DRG.NO. PE-DM-445-145-1002

DATE 20.04.2021

REV.NO. 04

SHT

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

1. For the purpose of clarity, it may please be noted that the information given in regard to the cables to be routed through WinPath as per the system elaborated below is called "Cable List", while the term "Cable Schedule" applies to the cable list with routing information added after routing has been carried out.
2. The cable list shall be entered as an MS Excel file in the format as per enclosed template EXT_CAB_SCH_FORMAT.XLS. No blank lines, special characters, header, footer, lines, etc. shall be introduced in the file. No changes shall be made in the title line (first line) of the template.
3. The field properties shall be as under:
 - a. UNITCABLENO: A/N, up to sixteen (16) characters; each cable shall have its own unique, unduplicated cable number. In case this rule is violated, the cable cannot be taken up for routing.
 - b. FROM: A/N, up to sixty (60) characters; the "From" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
 - c. TO: A/N, up to sixty (60) characters; the "To" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
 - d. PURPOSE: A/N, up to sixty (60) characters; the purpose (i.e. power cable/ indication/ measurement, etc.) to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
 - e. REMARKS: A/N, up to forty (40) characters; Any information pertinent to routing to be specified here (e.g., cable number of the cable redundant to the cable number being entered). Information in excess of 40 characters will be truncated after 40 characters.
 - f. CABLESIZE: A/N, 7 characters exactly as per the codes indicated below shall be specified here. The program cannot route cables described in any other way/ format.
 - g. PATHCABLENO: Field reserved for utilization by the program. User shall not enter any information here.
4. One list shall be prepared for each system/ equipment (i.e., separate and unique cable lists shall be prepared for each system).
5. The cables shall be described as per the scheme listed below:

A	NN	A	NNN
Cable	No. of cores	Cable code	Cable size
Voltage	(e.g. 01,03,3H, 07)	(See C below)	(e.g. 035,185,2.5, 0.5)
Code (see B below)			

(A) SYSTEM VOLTAGE CODES:

(ac) A = 11KV, B = 6.6KV, C = 3.3KV, D = 415V, E = 240V, F = 110V

(dc) G = 220V, H = 110V, J = 48V, K = +24V, L = -24V

(B) CABLE VOLTAGE CODES:

A = 11KV (Power cables)

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

- B = 6.6KV (Power cables)
 C = 3.3KV (Power cables)
 D = 1.1KV (LV & DC system power & control cables)
 E = 0.6KV (0.5 sq. mm. Control cables)

(C) CABLE CODES

PVC Copper

- A = Armoured FRLS
 C = unarmoured FRLS
 B = Armoured Non-FRLS
 D = Unarmoured Non-FRLS

PVC Aluminium

- E = Armoured FRLS
 G = unarmoured FRLS
 F = Armoured Non-FRLS
 H = Unarmoured Non-FRLS

XLPE Copper


- J = Armoured FRLS
 L = unarmoured FRLS
 K = Armoured Non-FRLS
 M = Unarmoured Non-FRLS

XLPE Aluminium

- N = Armoured FRLS
 Q = unarmoured FRLS
 P = Armoured Non-FRLS
 R = Unarmoured Non-FRLS

- S = FIRE SURVIVAL CABLES
 T = TOUGH RUBBER SHEATH
 U = OVERALL SCREENED
 V = PAIRED OVERALL SCREENED
 W = PAIRED INDIVIDUAL SCREENED
 Y = COMPENSATING CABLES
 I = PRE-FABRICATED CABLES
 Z = JELLY FILLED CABLES

469360/2021/BAP-WS(OGN)

	MOTOR DATA SHEET - C	SPECIFICATION NO.	
		VOLUME	II B
		SECTION D	
		REV NO. 00	DATE 08/09/2010
		SHEET 1	OF 7


LT MOTORS**A. GENERAL**

1. Manufacturer & Country of origin.
(Shall be as per approved QA make)
2. Equipment driven by motor
3. Motor type
4. Quantity

B. DESIGN AND PERFORMANCE DATA


1. Frame size
2. Type of duty
3. Type of enclosure /Method of cooling/Degree of protection
4. Applicable standard to which motor generally conforms
5. Efficiency class as per IS 12615
6. (a) Whether motor is flame proof Yes/No
(b) If yes, the gas group to which it conforms as per IS:2148
7. Type of mounting
8. Direction of rotation as viewed from DE END__
9. Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)
10. Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)
11. Maximum continuous load demand of driven equipment in KW
12. Rated Voltage (volts)
13. Permissible variation of :

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	MOTOR DATA SHEET - C	SPECIFICATION NO.	
		VOLUME	II B
		SECTION D	
		REV NO. 00	DATE 08/09/2010
		SHEET 2	OF 7

- a. Voltage (Volts)
- b. Frequency (Hz)
- c. Combined voltage and frequency
14. Rated speed at rated voltage and frequency(RPM)
15. At rated Voltage and frequency:
- a. Full load current
- b. No load current
16. Power Factor at
- a. 100% load
- b. NO load
- c. Starting.
17. Efficiency at rated voltage and frequency,
- a. 100% load
- b. 75% load
- c. 50% load
18. Starting current (amps) at
- a. 100 % voltage
- b. 85% voltage
- c. 80% voltage
19. Minimum permissible starting Voltage (Volts)
20. Starting time with minimum permissible voltage
- a. Without driven equipment coupled
- b. With driven equipment coupled

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	MOTOR DATA SHEET - C	SPECIFICATION NO.	
		VOLUME	II B
		SECTION D	
		REV NO. 00	DATE 08/09/2010
		SHEET 3	OF 7


21. Safe stall time with 100% and 110% of rated voltage
- From hot condition
 - From cold condition
22. Torques :
- Starting torque at min. permissible voltage(kg-mtr.)
 - Pull up torque at rated voltage.
 - Pull out torque
 - Min accelerating torque (kg.m) available
 - Rated torque (kg.m)
23. Stator winding resistance per phase (ohms at 20 Deg.C.)
24. GD^2 value of motors
25. No of permissible successive starts when motor is in hot condition
26. Locked Rotor KVA Input
27. Locked Rotor KVA/KW
28. Vibration limit :Velocity (mm/s)
29. Noise level limit (dBA)

C. CONSTRUCTIONAL FEATURES

- Stator winding insulation
 - Class & Type
 - Winding Insulation Process
 - Tropicalised (Yes/No)

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			


469360/2021/BAP-WS(OGN)

	MOTOR DATA SHEET - C		SPECIFICATION NO.	
			VOLUME	II B
			SECTION D	
			REV NO. 00	DATE 08/09/2010
			SHEET 4	OF 7

- d. Temperature rise over specified maximum ambient temperature of 50 deg C
 - e. Method of temperature measurement
 - f. Stator winding connection
2. Main Terminal Box
 - a. Type
 - b. Location (viewed from NDE side)
 - c. Entry of cables(bottom/side)
 - d. Recommended cable size (To be matched with cable size envisaged by owner)
 - e. Fault level (MVA), Fault level duration (sec)
 - f. Cable glands & lugs details (shall be suitable for power cable)
 3. Type of DE/NDE Bearing
 4. Motor Paint shade
 5. Weight of
 - a. Motor stator (KG)
 - b. Motor Rotor (KG)
 - c. Total weight (KG)
- D. List of accessories.**
1. Space Heaters (Applicable for 30 KW & above motor) (Nos./Power in watts/supply voltage)
 2. Terminal Box for Space Heater (Yes/No)
 3. Speed switch (Yes/No) No of contacts and contact ratings of speed switch

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

469360/2021/BAP-WS(OGN)

	MOTOR DATA SHEET - C	SPECIFICATION NO.	
		VOLUME	II B
		SECTION D	
		REV NO. 00	DATE 08/09/2010
		SHEET 5	OF 7

4. Insulation of bearing (Yes/No)

5. Noise reducer(Yes/No)

6. Grounding pads

i) No and size on motor body

ii) Nos on terminal Box

7. Vibration pads

i) Nos and size

ii) Location

8. Any other fitments

E. List of curves.

1. Torque speed characteristic of the motor

2. Thermal withstand characteristic

3. Starting. current Vs. Time

4. Starting. current Vs speed

5. P.F. and Effi. Vs Load

F. Additional Data to be filled for each rating of DC Motor

1. Rated armature voltage (Volt)

2. Rated field excitation (Amp)

3. Permissible % variation in voltage


4. Minimum Permissible Starting voltage (volt)

5. At rated voltage

i) Full load Armature current.(Amp)

ii) Full load Field current (Amp)


NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	MOTOR DATA SHEET - C	SPECIFICATION NO.	
		VOLUME	II B
		SECTION D	
		REV NO. 00	DATE 08/09/2010
		SHEET 6	OF 7

- iii) No load Armature current (Amp)
6. Full load Field current (Amp)
7. No load Armature current (Amp)
8. Minimum permissible field current(Amp) to avoid overspeeding at
- i) Maximum permissible voltage
- ii) Rated voltage
- iii) Minimum Permissible Voltage
9. Resistance (indicative Values) in ohm
- i) Armature winding (Arm + IP + Series) at 25 deg.C
- ii) Field Winding at 25 deg. C
10. Inductance (indicative values)
- i) Armature winding
- ii) Field winding
11. Value of trimmer resistance (ohm) to be connected in series with the shunt field to obtain rated speed at
- i) 220 V DC
- ii) 250 V DC
- iii) 187 V DC
12. Value of the external resistance (ohm) required to be connected in series with armature during starting only
13. Technical data sheet for external resistance box
14. GA drawing of motor
15. Starting time calculation

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

469360/2021/BAP-WS(OGN)

	MOTOR DATA SHEET - C	SPECIFICATION NO.	
		VOLUME	II B
		SECTION D	
		REV NO. 00	DATE 08/09/2010
		SHEET 7	OF 7

16. Starter resistance design calculation
17. Electrical connection diagram of motor

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

SPECIAL CONDITIONS OF CONTRACT (SCC)

Project Information

	Project Name	Sagardighi Thermal Power Station (1x660 MW) Unit-5, phase-III.
	Ultimate Customer	West Bengal Power Distribution Corporation Ltd. (WBPDCCL)
	Location of Plant	<p>Location: Manigram village, Sagardighi, Raghunathganj sub-division, Murshidabad District, West Bengal.</p> <p>Access by: Nearest Railway station: Manigram railway station on Bandel-Barhawara branch line 1 km from site. Latitude: 24° 22' 13.7" N Longitude: 88° 6' 15.8" E</p>
	Consignee Address (Ship to)	Sagardighi Thermal Power Station (1x660 MW) Unit-5, phase-III. Manigram village, Sagardighi, Raghunathganj sub-division, Murshidabad District, West Bengal
	Mode of Dispatch	By Road / Rail / Sea on Door Delivery and Freight Pre Paid Basis.
	Unloading at site	By Vendor
	Storage at site	By Vendor, preferably in a container with lock & key for items like small valves, instruments, panels etc.
	Movement of Material within Site	By Vendor

	Provision of facilities at Site	<p>Construction Power: Construction Power (3 phase AC 415V) shall be provided free of cost within the plant premises.</p> <p>Construction Water: Construction water shall be provided free of cost within the plant premises.</p> <p>Land for Temporary store (open and closed store): Limited area of land within the plant premises as allotted by M/s.WBPDCL shall be provided free of cost, subject to availability.</p> <p>Land for Labour colony: Land for construction of temporary accommodation may be available free of cost, subject to availability. However, all other infrastructure/facilities as per prevailing statutory norms shall be provided by the bidder at his cost.</p>
		<p>All facilities like open area development temp. Illumination, temp roads and drains, securities, fire safety equipment etc. shall be in the scope of bidder at his cost. No tree felling should be done without prior approval of WBPDCL.</p> <p>Establishment of Quality control lab for construction works is to be arranged by the bidder at his cost.</p>
	Inspection Agency (Domestic supplies)	<p>Vendor shall give inspection call in line with approved QAP / Customer Hold Points to Regional BHEL-CQS center / Third Party Inspection Agency (TPIA) (as informed by BHEL) on "BHEL CQS Website"; with a copy of inspection call to BHEL (respective units) for arranging Customer/Third Party participation (wherever applicable), with an advance notice of 15 days for participation in inspection/ Joint inspection on the proposed date. The MDCC shall be issued by customer based on the BHEL-CQS/TPIA report OR Joint inspection report of BHEL CQS/TPIA & Customer (wherever applicable).</p>

	Inspection Agency (Imported supplies)	In case of Imported Supplies advance notice of 30 days for participation in inspection (if applicable, in line with approved QAP / Customer Hold Points) to be given. The Test Certificates & Inspection reports duly accepted by the Foreign Vendor Inspection agency/BHEL/WBPDCL in line with approved QAP/Customer Hold Points shall be submitted to BHEL. The above Inspection reports & Test certificates shall be reviewed by BHEL in line with the Technical Specifications & Approved Data sheets and then sent to customer for their clearance. The customer dispatch clearance (MDCC) will be given to the Foreign Vendor or their representative in India through BHEL after acceptance/clearance of above test certificates by Customer.
	Material Receipt Certificate (MRC)	For Packages wherever E&C is in the scope of Vendor, The vendor shall arrange Material Receipt Certificate from the project site, duly signed by Customer and BHEL-Site after receipt & physical verification of the material at site.
	Packing, Identification & marking	<ul style="list-style-type: none"> • The supplier shall include and provide for securely protecting and packing the materials so as to avoid loss or damage during handling & transport by air, sea, rail and road. • All packing shall allow for easy removal and

		<p>checking at site. Special precaution shall be taken to prevent rusting of steel and iron parts during transit by sea. Gas seals or other materials shall be adopted by the Contractor for protection against moisture during transit.</p> <ul style="list-style-type: none"> • The number of each package in a shipment shall be shown in fraction, numerator showing number of the package and the denominator showing total number of packages in a lot / consignment. The packages number shall be generally prepared in the sequence in which they will be required for erection. • Each package delivered under the Contract shall be marked by and at the expense of the supplier and such marking must be distinct and in English language (all previous irrelevant markings being carefully obliterated). Such marking shall show the description and quantity of contents, the name and address of consignee, the gross weight and net weight of the package, the name of the Contractor with a distinctive number of mark sufficient for purposes of identification. All markings shall be carried out with such materials as to ensure quickness of drying, fastness and indelibility. Each equipment or parts of equipment shall, when shipped or railed or otherwise dispatched be tagged with reference to the assembly drawings and corresponding part numbers. Each bale or package shall contain a packing note quoting specifically the name of the Contractor, the number and date of contract and the name of the office placing the contract, nomenclature of the stores and include a schedule of parts for each complete equipment giving the part numbers with reference to the assembly drawing and the quantity of each part, drawings nos. and tag numbers. • Rotor bearings should not be used as a support while packing • Besides wherever necessary, packing shall bear a special marking "TOP", "BOTTOM", "DO NOT TURN OVER", "KEEP DRY", "HANDLE WITH CARE" etc.
--	--	--

		<ul style="list-style-type: none"> • All packing cases, containers (excluding marine container), packing and other similar materials shall be new. • Notwithstanding anything stated in this clause, the Contractor shall be entirely responsible for loss, damage or depreciation or deterioration to the materials & supplies due to faulty and/or insecure packing. • One copy of respective standard manufacturer's erection instruction/operation instruction manual shall be kept in each package/container for immediate reference. • Each and every package box shall be marked with the following, as a minimum: <ul style="list-style-type: none"> (i). Name and address of Consignee: (ii). Project reference: (iii). Contract No.: (iv). Packing No.: (1/10, 2/10, 3/10 when there are 10 packages for one consignment) (v). Net Weight/Gross Weight: (vi). Port of Loading: (vii). Destination Port: (viii). Packing Mark: [symbols indicating "TOP", "BOTTOM", "DO NOT TURN OVER", "KEEP DRY", "HANDLE WITH CARE" etc. (ix). Type of Equipment: <ul style="list-style-type: none"> "E" (for Equipment supply) "T" (for Tools & Tackles) "S" (for Mandatory Spares) • Two copies of packing list should be kept in case/package No. 1 of each consignment of the goods and four copies in each case (three inside the box and one copy in a special packet at the outer side of the Box).
--	--	---

	Commissioning spares	The commissioning spares shall be properly packed separately in separate box and each spare shall be properly tagged giving details (to match the description given in the packing slip) to facilitate their proper identification. Three copies of packing list is to be kept inside the box and one copy in a special packet at the outer side of the Box.
	Mandatory Spares	The Mandatory spares shall be properly packed separately in separate box indicating Mandatory Spares in bold letters and each spare shall be properly tagged giving details i.e. item number of the equipment in line with the Ultimate Customer Contract & Number per item (to match the description given in the packing slip) to facilitate their proper identification by ultimate customer M/s WBPDCCL. Three copies of packing list along with Manufacturing drawing no. Reference, Catalogue reference etc. is to be kept inside the box and one copy in a special packet at the outer side of the Box
	Submission of	As per Technical specification/ Kick off meeting.
	Final Drawing / Documents along with O&M Manual, Type Test Certificates (if any)	
	"item-rate" items	The quantity indicated in the BOQ / Price bid is approximate only and is liable for variation. The quantity of each item may vary to any extent as per requirement. Payment will be as per actual quantity executed as certified by BHEL Engineer. Contractor shall not be eligible for any compensation on this account.

	Surplus materials	Ownership of any plant and equipment in excess (i.e, surplus material including scrap and commissioning spares) of the requirements for the facilities shall lie with the bidder, upon completion of trial operation or at such earlier time when BHEL and bidder agree that the surplus material / scrap in question are no longer required for the completion of facilities. WBPDCCL / BHEL will issue necessary gatepass for taking back the surplus materials / scrap after such agreement.
	Demurrage charges	No demurrage charges shall be payable
	Penalty for Guaranteed power consumption and performance	As per the Technical specification
	HSE guidelines	As per Annexure-11
	Warranty	Warranty for water system packages shall be 12 months from the date of handing over of packages to customer.
	Vendor/Sub vendor approval	WBPDCCL informed that in view of their previous experience, Chinese vendors to be avoided. Vendor list subject to Customer Approval.

5.0 MANDATORY SPARES

S.No.	Equipment/ Package Name	Quantity to be supplied
	C.W. Chlorination Plant	
1	Flexible connector	2Nos.
2	Rupture Disc	2Nos.
3	Evaporator Immersion Heater	1No.
4	Pressure-Vacuum Relief Valve	1No.
5	Pressure-Vacuum Relief Valve Spring	2Nos.
6	Filter element refill pack	4packs
7	Pressure regulating Valve (PRV)	1No.
8	Vacuum Regulating Valve	1No.
9	SS-Solenoid Valve	2Nos.for each type and rating
10	Coil for Solenoid Valve	2Nos.for each type and rating
11	Gate Valve	2Nos.for each type,size,& class
12	Globe Valve	2Nos.for each type,size,& class
	Check Valve	2Nos.for each type,size,& class
14	Diaphragm Valve	2Nos.for each type,size,& class
15	Ball Valve	2Nos.for each type,size,& class
16.1	Centrifugal Pump-Booster pump	
(i)	Impeller complete Assembly	1Set for each Type and rating of Pump
(ii)	Shaft sleeve	1Set for each Type and rating of Pump
(iii)	Complete Set of Pump Bearing	1Set for each type and rating
(iv)	Electrical Spares	
a.	Motor of each type and rating (Note: motors covered in mechanical spare items need not be included here again)	10% of the installed quantity or minimum 1 number whichever is higher
b.	Bearings (DE and NDE) for each type and rating of motors	2 Sets
c.	Motor terminal block	1 No. for each type and rating of motor
16.2	Centrifugal Pump-Recirculation pump	
(i)	Impeller complete Assembly	1Set for each Type and rating of Pump
(ii)	Shaft sleeve	1Set for each Type and rating of Pump

(iii)	Complete Set of Pump Bearing	1Set for each type and rating
(iv)	Electrical Spares	
a.	Motor of each type and rating (Note: motors covered in mechanical spare items need not be included here again)	10% of the installed quantity or minimum 1 number whichever is higher
b.	Bearings (DE and NDE) for each type and rating of motors	2 Sets
c.	Motor terminal block	1 No. for each type and rating of motor
17	Chlorine Gas Filter	One (1) complete set
18	Diaphragm assembly of Safety shut off valve	2Sets
19	Liquid chlorine evaporator	
(i)	valve	4Nos.each type and size
20	Blowers	
(i)	Rotating Assembly	1Set for each type and rating
(ii)	Electrical Spares	Applicable Item
a.	Motor of each type and rating (Note: motors covered in mechanical spare items need not be included here again)	10% of the installed quantity or minimum 1 number whichever is higher
b.	Bearings (DE and NDE) for each type and rating of motors	2 Sets
c.	Motor terminal block	1 No. for each type and rating of motor
21	Strainer	1No. for each type
22.00	Electrical Spares	
22.01	Motorised Actuator	
(i)	Actuator for auto shutoff valve in chlorine gas line	1 No.
(ii)	Actuator for auto changeover valve for chlorine tonner manifold.	1 No.
22.02	Motor for caustic tank Agitator	1 No.
23.0	C&I Field Instruments & Others	
23.01	Electronic transmitters	
(i)	Pressure	1 (one) no. complete set for each type and model/range used in the system
(ii)	Level	1 (one) no. complete set for each type and model/range used in the system

23.02	Different type of switches	
(i)	Pressure switch	2 (two) no. of each type and model/range used in the system
(ii)	Differential pressure switch	2 (two) no. of each type and model/range used in the system
(iii)	Level switch	2 (two) no. of each type and model/range used in the system
(iv)	Temperature switch	2 (two) no. of each type and model/range used in the system
23.03	Solenoid valve	
(i)	Complete solenoid valve assembly	2 (two) no. for each type and rating used in the system
(ii)	Coil (single or double coil type)	10% of total nos. used in the system or minimum 5 (five) no. whichever is more for each type of rating.
23.04	Different types of Gauge	
(i)	Pressure gauge	10% of total nos. used in the system or minimum 1 (one) no. whichever is more for each type and rating.
(ii)	Differential pressure gauge	10% of total nos. used in the system or minimum 1 (one) no. whichever is more for each type and rating.
(iii)	Temperature gauge	10% of total nos. used in the system or minimum 1 (one) no. whichever is more for each type and rating.
23.05	Rotameter	10% of total nos. used in the system or minimum 2 (Two) no. whichever is more for each type, rating/ model and size used in the system
23.06	Gauge glass	1 No. of each type and size
23.07	Erection hardware	
(i)	Transmitter's Manifold	10% of total nos. used in the system or minimum 2 (Two) no. whichever is more for each type, rating/ model and size used in the system
(ii)	Impulse line isolation valve	10% of total nos. used in the system or minimum 4 (Four) no. whichever is more for each type, rating/ model and size used in the system
(iii)	Impulse line fittings	Each type/ size 25 Nos
(iv)	Impulse pipe	Each type/ size 100 Mtrs

23.08	Liquid chlorine evaporator	
i	Water level gauge glass	1 No.
ii	Water bath level control switch	1 No.
iii	Thermostatic switch water temperature controller	1 No.
iv	Temperature switch- water temperature high	1 No.
23.09	Chlorine leak detector system	
(i)	Sensor unit (complete)	2 No.
(ii)	Transmitter/ processing unit (complete)	2 No.

1. Bidder shall follow the attached approved Sub-Vendor list. The Sub Vendor list provided is compiled list of all BHEL units and sufficient Sub-Vendors have been already approved by WBPDCCL. No additional Vendors will be entertained for the equipment already available in the Sub-Vendor list.
2. Incase any equipment is not specified in the list, Bidder shall submit the credentials of the Sub Vendors during contract stage for Approval.
3. Credentials shall consist of the following as minimum
 - a. List of refernces for similar application
 - b. Minimum 2nos. of Purchase Orders of similar references
 - c. Minimum 2nos. of Performance certificates/ Inspection clearance reports
 - d. Sub Vendor Catalogues
4. Finalized list of Sub Vendors shall be submitted to WBPDCCL for intimation/ approval/ clearance.

469360/2021/BAP-WS(CON)



The West Bengal Power Development Corporation Limited

(A Government of West Bengal Enterprise)

Corporate Identity No.: U40104WB1985SGC039154

Registered & Corporate Office: Bidyut Unnyan Bhavan,

Plot - 3/C, LA - Block, Salt Lake City, Sector - III, Kolkata - 700 098

Phone: 033-2335-0445/2335-0571/2339-3100

Fax: 033-2339-3286/2335-0516

website: www.wbpdcl.co.in. E-mail: wbpdcl@wbpdcl.co.in

Ref. No. WBPDC/Corp./SGMP03/AV/8/047

Date: 16.06.2020

To,
Shri A.K. Singhal, GM
PS- MKTG. BHEL House,
Siri Fort, New Delhi 110 049

Sub : Vendor List of Sagardighi Thermal Power Extension Project Unit No.5 (1X660MW)

Ref : E-mail from BHEL PS-MKTG dtd. 29th August, 2019

Dear Sir,

Please find the reviewed Vendor List for the captioned Project.

BHEL may note that some Vendors have been identified under 'DR' category for which BHEL is requested to provide detail credentials of the Vendor in line with the tender requirements for Approval consideration from WBPDC.


The entire Vendor List is divided under the following sub heads-

- | | | | |
|----|---------------------------|---|------------|
| a) | Mechanical Aux.Packages | : | Annexure-A |
| b) | Mechanical Equipment List | : | Annexure-B |
| c) | FGD Plant Equipment List | : | Annexure-C |
| d) | CHP Equipment List | : | Annexure-D |
| e) | AHP Equipment List | : | Annexure-E |
| f) | Electrical Equipment List | : | Annexure-F |
| g) | C&I Equipment List | : | Annexure-G |
| h) | FPA Equipment List | : | Annexure-H |
| i) | HVAC System | : | Annexure-I |
| j) | PSER Erection Vendors | : | Annexure-J |

This is for your information and further necessary action from your end.

Thanking you,

Yours faithfully


16.6.2020
Kalyanbrata Chakrabarty
GM (Projects)

<p><i>Bandel Thermal Power Station</i> GM-26846369,DGM(O) 26846447, DGM(M) 26846403, Senior Manager(P&A)-26845086 Senior Manager-26845083 Guest House-26845201 Fax : 2684 6151</p>	<p><i>Santalidih Thermal Power Station</i> GM-260227 Senior Manager(P&A)260226 Senior Manager(F&A)260341 Electrical Control Room-260228 Guest House260342/260203 Guest House260217 STD Code-3251</p>	<p><i>Kolaghat Thermal Power Station Ph:</i> GM 231110,DGM(O)231254 DGM(M)231261 DGM(U)231255 DGM(Accts.)231290 STD Code-03228 E-mail: wbpdcl@cal.vsnl.net.in</p>	<p><i>Bakreswar Thermal Power Project</i> GM- 220201DGM(Const.)-220210 Senior Manager(P&A)/(F&A)-220202 Guest House(Abdarpur)225475,225346 PBX:220694, Fax-220214 Email: bktp@cal2.vsnl.net.in STD Code:03462</p>
--	--	---	--

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

SL. NO.	Item Description	Vendor Name	Remarks
1	OXYGEN DOSING SYSTEM	ENPRO INDUSTRIES PVT.LTD. MARKAL KHED,PUNE	Approved
		POWER PIPING COMPANY ,Mandaiyur	DR
		PSI ENGINEERING SYSTEMS (P) LTD., Chennai	Approved
		Positive Metering Pumps (I) Pvt. Ltd.,Nasik	DR
		V.K PUMP INDUSTRIES PVT LTD, Nasik	Approved
2	CHEMICAL DOSING SYSTEM	ENPRO INDUSTRIES PVT.LTD., MARKAL KHED,PUNE	Approved
		PSI ENGINEERING SYSTEMS (P) LTD., Chennai	Approved
		SWELORE ENGG. PVT. LTD, AHMEDABAD	Approved
		TECHNO CONSULTANTS , GHATKOPAR (W) MUMBAI	Approved
		MILTON ROY INDIA (P) LTD.	Approved
		V.K PUMP INDUSTRIES PVT LTD, Nasik	Approved
3	CONDENSATE POLISHING UNIT	BGR ENERGY SYSTEMS LIMITED.,	Approved
		DRIPLEX WATER ENGINEERING INTERNATIONAL PRIVATE LIMITED, Hardwar	Approved
		ION EXCHANGE (INDIA) LTD	Approved
		THERMAX LTD. PUNE	Approved
		VA TECH WABAG LTD	Approved
4	MILL REJECT SYSTEM (PNEUMATIC TYPE)	MECAWBER BEEKAY PVT LTD., GREATER NOIDA	Approved
		UNITED CONVEYOR CORPORATION (INDIA) PVT.LTD.,KOLKATA	Approved
5	COLTCS	GEA BGR ENERGY SYSTEM INDIA LTD., Nellore	Approved
		TAPROGGE GmBH, Noida	Approved
		TECHNOS, FRANCE	Approved
		EIMCO WATER TECHNOLOGIES ,LLC, USA	Approved
		KLUMP & KOLLER GmbH	Approved
		FILTRATION ENGINEERS LTD.	Approved
MULTITEX FILTRATION ENGINEERS LIMITED,	Approved		
6	CW TREATMENT PLANT (Items to be procured from the approved Vendor List)	CLEAR WATER LTD.	Approved
		THERMAX LTD.	Approved
		DRIPLEX WATER ENGG. LTD.	Approved
		CHEMBOND ASHLAND WATER TECHNOLOGIES LTD.,MUMBAI	Approved
		VA TEC WABAG LTD	Approved
7	CHLORINATION PLANT (Items to be procured from the approved Vendor List)	PERFECT CHLORO SYSTEMS	Approved
		METITO POLLUTION CONTROL INDIA LTD	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
1	VIBRATION ISOLATION	GERB	Approved
2.	STEEL GATE / GLOBE / NR VALVES 'BHEL' Make Valves are approved for only for 1500 CLASS or below.	WEIR B.D.K VALVES INDIA PVT. LTD.	Approved
		KIRLOSKAR BROTHERS LTD.	Approved
		LEADER VALVES LTD.	Approved
		KSB VALVES	Approved
		FOURESS ENGG.INDIA LTD.	Approved
		VAG VALVES	DR
		AUDCO INDIA	Approved
		DEWARANCE	DR
		Hawa Valves (India) Pvt. Ltd.	Approved
		HAWA ENGINEERS LTD.	Approved
		INTERVALVE POONAWALLA LTD.	Approved
MICON VALVES (INDIA) PVT. LTD.	DR		
3.	BALL VALVES	FLOW CHEM INDUSTRIES	Approved
		FISHER SANMAR LIMITED	Approved
		KIRLOSKAR BROS. LTD.	Approved
		LEADER VALVES LTD.	Approved
		KSB VALVES	Approved
		WEIR B.D.K VALVES INDIA PVT. LTD.	Approved
		VAG VALVES	Approved
		A.V. VALVES LTD	Approved
		Hawa Valves (India) Pvt. Ltd.	Approved
INTERVALVE POONAWALLA LTD.	Approved		
4.	CAST IRON GATE /GLOBE/ NR/ SAFETY RELIEF VALVES	H.SARKER & COMPANY	Approved
		G.M.DALUI & SONS PVT.LTD.	Approved
		KIRLOSKAR BROS. LTD.	Approved
		LEADER VALVES LTD.	Approved
		VENUS PUMP & ENGG. WORKS	Approved
5.	SAFETY RELIEF VALVE (TUBE SIDE AND SHELL SIDE)	BHEL-HPBP TRICHY	Approved for Class 1500 or below
6.	Safety Valve, Safety relief Valve & ERV 'BHEL' Make Valves are approved for only for 1500 CLASS or below.	SEMPELL GmbH./Germany	Approved
		DRESSER CONSOLIDATED,/USA	Approved
		DRESSER CONSOLIDATED,/United Kingdom	Approved
		TYCO VALVES & CONTROLS,/USA	Approved
		MEIWA CORPORATION,/Japan	Approved
		BOPP&REUTHER,SICHERHEITS-UND/Germany	Approved
		REINEKE MESS-UND REGELTECHNIL GMBH/Germany	Approved
		VALVTECHNOLOGIES,/USA	Approved
		BOPP&REUTHER,SICHERHEITS-UND/Germany	Approved
		VALVTECHNOLOGIES,/USA	Approved
7	GUN METAL VALVES	A.V.VALVES LTD,	Approved
		LEADER VALVES LTD.,	Approved
		VALTECH INDUSTRIES	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
8	BUTTER FLY VALVES (STEAM SERVICE)	FOURESS ENGG.INDIA LTD.	Approved
		INSTRUMENTATION LTD.	Approved
		BDK PROCESS CONTL. HUBLI	Approved
9.	BUTTER FLY VALVES (WATER SERVICE)	WEIR B.D.K VALVES INDIA PVT. LTD.	Approved
		FOURESS ENGG.INDIA LTD.	Approved
		INSTRUMENTATION LTD.	Approved
		LARSEN & TOUBRO LTD.	Approved
		KIRLOSKAR BROS. LTD.	Approved
		TYCO VALVES & CONTROLS INDIA PVT.LTD.	Approved
10.	SPRING LOADED BYPASS VALVES/ PLUG VALVES/ ANGLE DRAIN VALVES	WEIR VALVES & CONTROLS M.E.	Approved
		WEIR B.D.K VALVES INDIA PVT. LTD.	Approved
		FISHER SANMAR LIMITED	Approved
		LARSEN & TOUBRO LTD	Approved
		LEADER VALVES LTD.	Approved
		REINEKE MEB-UND REGELTECHNIK GMBH	Approved
		SEMPELL AG, GERMANY	Approved
		VELAN INC.,CANADA	Approved
11.	AIR RELEASE VALVES	H.SARKER & COMPANY	Approved
		LEADER VALVES LTD.	Approved
		VENUS PUMP & ENGG. WORKS	Approved
		G.M.DALUI & SONS PVT.LTD.	Approved
		A.V. VALVES LTD	Approved
12.	DUAL PLATE CHECK VALVES	VENUS PUMP & ENGG. WORKS	Approved
		FLUIDLINEVALVES COMPANY PRIVATE LTD.	Approved
13.	FLOAT VALVES	H.SARKER & COMPANY	Approved
		G.M.DALUI & SONS PVT.LTD.	Approved
		LEADER VALVES LTD.	Approved
14	CONDENSATE PUMP-LP	SAM TURBO INDUSTRY PVT LIMITED	Approved
		SULZER PUMPS INDIA PVT LTD	Approved
		KIRLOSKAR BROTHERS LTD	Approved
		CLYDE PUMPS INDIA PVT LTD,	Approved
15.	FUEL OIL PUMPS (POSITIVE DISPLACEMENT PUMPS)	TUSHACO PUMPS PVT. LTD.,	Approved
		ALEKTON ENGG.INDUSTRIES PVT.LTD.	Approved
		U.T.PUMPS & SYSTEMS (P) LTD.	DF
		ALLWEILER INDIA PVT.LTD.,	Approved
16.	PGB SPECIAL OIL-ISO VG 320	INDIAN OIL CORPN.LTD.,	Approved
		HINDUSTAN PETROLEUM CORPN. LTD.	Approved
		CASTROL INDIA LIMITED	Approved
		EXXONMOBIL LUBRICANTS PVT LTD	Approved
		SHELL INDIA MARKETS PRIVATE LIMITED	Approved
17.	JACKING OIL PUMPS WITH MOTOR (SCREW TYPE) FOR MAIN TURBINE	TUSHACO PUMPS LIMITED	Approved
		ALLWEILER AG ,GERMANY	Approved

Sagardighi Extn. U#5 (PRO13)

Mech Equipments

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
19.	AUX. OIL PUMP (AOP) & EMERGENCY OIL PUMP WITH MOTOR (EOP) FOR MAIN TURBINE	KSB PUMPS LIMITED	Approved
		MATHER & PLATT PUMPS	Approved
		KBL	Approved
20.	VACUUM PUMPS	EDWARDS LIMITED, UK	Approved
		NI-TECH INC. USA	DR
		NASH ELOM INDUSTRIES, GERMANY	Approved
21	LUB OIL TRANSFER PUMPS	MATZ PUMPS PVT.LTD.	DR
		TUSHACO PUMPS PVT.LT	Approved
		IDEX INDIA PVT LTD	DR
		DELTA P D PUMPS PVT LTD	Approved
		ALLWEILER INDIA PRIVATE LIMITED	Approved
22	CONCRETE VOLUTE PUMP	KIRLOSKAR BROS. LTD.	Approved
		CLYDE UNION PUMPS	Approved
		FLOWSERVE CORPORATION	Approved
		BHEL HYD BASED ON MHI COLLABORATION	DR
23.	MISC.PUMPS (VERTICAL)	KIRLOSKAR BROS. LTD.	Approved
		KSB PUMPS LTD.	Approved
		SULZER PUMPS INDIA LTD.	Approved
		WEIR,UK	Approved
		WPIL LIMITED	Approved
		FLOWMORE	Approved
		BHARAT PUMPS & COMPRESSORS LTD	Approved
WILO MATHER & PLATT PUMPS PVT. LTD.	Approved		
24.	BOILER WATER RECIRCULATION PUMP	TORISHIMA PUMP MFG CO.LTD, Japan	Approved
		KSB AKTIENGESELLSCHAFT, Germany	DR
25.	PUMPS (HORIZONTAL) Type-I (FLOW<300 CMH)	KIRLOSKAR BROS. LTD.	Approved
		MATHER & PLATT PUMPS LTD.	Approved
		KSB PUMPS LTD.	Approved
		SULZER PUMPS INDIA LTD.	Approved
		WEIR,UK	Approved
26.	PUMPS (HORIZONTAL) Type- II (FLOW>300 CMH)	FLOWMORE LTD.	Approved
		WPIL LIMITED	Approved
27.	SUMP PUMPS / SUBMERSIBLE PUMPS/ SLUDGE PUMP	KISHOR PUMPS PVT.LTD	Approved
		KIRLOSKAR BROS. LTD.	Approved
		KSB PUMPS LTD.	Approved
		FLOWMORE LTD.	Approved
		JASCO PUMP PVT. LTD.	Approved
		SAM TURBO	Approved
28.	OIL MODULE AND ACCESSORIES	HYDAC (INDIA) PVT. LTD.	Approved
		ALLWEILER INDIA PRIVATE	Approved
		AEL APPARATEBAU GMBH LEISNIG	Approved
		VDL DELMAS GMBH	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
		FLENCO FLUID SYSTEM S.R.L (FOR KELAG AG	Approved Approved
29.	LUBE OIL PUMPS (CENTRIFUGAL)FOR TDBFP	KSB PUMPS LTD. KIRLOSKAR EBARA, KIRLOSKARWADI SULZER, MUMBAI. FLOWSERVE SANMAR LTD.,	Approved Approved Approved Approved
30.	LUBE OIL PUMPS (SCREW TYPE) FOR TDBFP	ALLWEILER, GERMANY IMO PUMP, USA TUSHACO, DAMAN LEISTRITZ (EMPIRE), GERMANY	Approved Approved Approved Approved
31.	JACKING OIL PUMP TDBFP	HAGULLAND DENSON TUSHACO PUMPS PVT. LTD., DELTA P D PUMPS PVT LTD	Approved Approved Approved
32.	EHA FOR TURBINE VALVES	BOSCH REXROTH AG HORST THIELE MASCHINENBAU HYDRAULISCHE GERATE GMBH, GERMANY	Approved Approved
33.	HPSU FOR TURBINE VALVES	HYDAC (INDIA) PVT LTD REINEKE MESS-UND REGELTECHNIK GMBH BOSCH REXROTH (INDIA) PRIVATE LIMITED; HYDAC SYSTEM GMBH KEICHER ENGINEERING AG	Approved Approved Approved Approved Approved
34.	OIL ACCUMALATOR	BOLENZ & SCHAFFER MASCHINENFABRIK, Germany HYDAC INDIA PVT LTD, Navi Mumbai PARKER HANNIFIN CORPORATION, USA	Approved Approved Approved
35.	VACUUM BREAKER VALVE ASSY	MULLER CO-AX AG INSTRUMENTATION LIMITED CRANE PROCESS FLOW	Approved Approved DF
36.	SCANNER AIR FAN	C.DOCTOR & CO.PVT.LTD. PATELS AIRFLOW LTD. AIR CONTROL & CHEMICAL ENGG. CO.LTD.	Approved Approved Approved
37.	OIL PURIFICATION UNIT (OIL CENTRIFUGE)/PORTABLE OIL PURIFIERS	ALFA LAVAL LIMITED, INDIA SERVIZIO INDUSTRIAL, ITALY ALFA-LAVALSEPARATION AB - SWEDEN	Approved DF Approved
38.	ELECTRICAL HOIST	REVA INDUSTRIES LTD CONSOLIDATED HOIST PVT LTD TUOBRO FURGUSON(INDIA)PVT.LTD HERCULES HOISTS LTD. UNIVERSAL HOIST - O- FABRIK BRADY & MORRIS ENGINEERING CO. LTD. TRACTEL TIRFOR INDIA PVT. LTD.	Approved Approved Approved Approved Approved Approved Approved
		UNIVERSAL HOIS -O-FABRIK HERCULES HOISTS LTD. TUOBRO FURGUSON(INDIA)PVT.LTD	Approved Approved Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
39	CHAIN PULLEY BLOCK	BRADY & MORRIS ENGINEERING CO. LTD.	Approved
		TRACTEL TIRFOR INDIA PVT. LTD.	Approved
		UNIVERSAL HOIS -O-FABRIK	Approved
		HERCULES HOISTS LTD.	Approved
		TUOBRO FURGUSON(INDIA)PVT.LTD	Approved
40	DOUBLE GIRDER EOT CRANES UPTO 50T	UNIQUE INDUSTRIAL HANDLERS PVT.LTD	Approved
		MUKAND LIMITED,	Approved
		REVA INDUSTRIES LTD.	Approved
		HEAVY ENGG. CORPORATION LTD.	Approved
		UNIVERSAL HOIST-O-FABRIK,	Approved
		CONSOLIDATED HOISTS PVT LIMITED	Approved
41	D/G EOT CRANES UP TO 100T	FURNACE & FONDRY EQUIPMENT CO.	Approved
		FURNACE & FONDRY EQUIPMENT CO.	Approved
		Grip Engineers Pvt. Ltd.,	Approved
		HEAVY ENGG. CORPORATION LTD.	Approved
		MUKAND LIMITED	Approved
		REVA INDUSTRIES LTD.	Approved
		TUOBRO FURGUSON (INDIA) PVT LTD	Approved
UNIQUE INDUSTRIAL HANDLERS PVT LTD.	Approved		
42	D/G EOT CRANES ABOVE 100T	FURNACE & FONDRY EQUIPMENT CO.	Approved
		HEAVY ENGG. CORPORATION LTD.	Approved
		MUKAND LIMITED	Approved
		REVA INDUSTRIES LTD.	Approved
		UNIQUE INDUSTRIAL HANDLERS PVT LTD.	Approved
43	Single Girder EOT / HOT Misc. Cranes	BRADY & MORRIS ENGINEERING CO. LTD.	Approved
		CONSOLIDATED HOISTS PVT LTD	Approved
		REVA INDUSTRIES LTD.	Approved
		TRACTEL TIRFOR INDIA PVT. LTD.	Approved
		Universal Hoist-O-Fabrik	Approved
44	MILL HANDLING EQUIPMENT	GRIP ENGINEERS PVT LTD, HYDERABAD	Approved
		LIFTING EQUIPMENT & ACCESSORIES ,NEWDELHI	Approved
		REVA INDUSTRIES LIMITED,FARIDABAD	Approved
		CONSOLIDATED HOIST,PUNE	Approved
		EDDYCRANES ENGINEERS PVT,MUMBAI	Approved
		CENTURY CRANE ENGINEERS (P) LTD.	Approved
UNIVERSAL HOIST-O- FABRIK,MUMBAI	Approved		
45	FURNACE MAINTENANCE PLATFORM	N.V.SKY CLIMBER EUROPE S.A	Approved
		N.V.SKY MAN INTERNATIONAL S.A.	Approved
		ALTREX B.V, Netherlands	DR
46	QUICK ERECT SCAFFOLD	INSTANT UPRIGHT LIMITED,DUBLIN	Approved
47	ELEVATOR-PASSENGER CUM GOODS	KONE ELEVATOR INDIA LTD.	Approved
		OTIS ELEVATOR	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
48.	CASTABLE REFRACTORY	BASKAR REFRACTORIES AND S.W PIPES(P)LTD	Approved
		THE ACE REFRACTORIES LTD.	Approved
		DALMIA REFRACTORIES	Approved
		SOUVENIOR CERAMICS	Approved
		MAHAKOSHAL REFRACTORIES PVT. LTD,	DF
		CASTWEL INDUSTRIES	DF
49.	POURABLE INSULATION	BASKAR REFRACTORIES & STONEWARE PIPES(P)LTD	Approved
		THE ACE REFRACTORIES LTD.	Approved
		DALMIA REFRACTORIES	Approved
		INDUSTRIAL ASSOCIATES,	Approved
		CASTWEL INDUSTRIES	DF
50.	FIRE BRICKS	BASKAR REFRACTORIES AND STONEWARE PIPES (P) LTD	Approved
		DALMIA REFRACTORIES	Approved
51.	WOOL MATTRESS	ROCKWOOL INDUSTRIES LTD	Approved
		MINWOOL ROCK FIBRES LTD	Approved
		LAPINUS ROCKWOOL PVT. LTD	Approved
		ROCKWOOL INDIA LTD.	Approved
		LLOYD INSULATION (I) LTD.	Approved
		LLOYD ROCKFIBRES LTD.	Approved
		DHANBAD ROCKWOOL INSULATION PVT LTD	Approved
		GOENKA ROCKWOOL (INDIA) PVT LTD.,	Approved
JAMSHEDPUR MINERAL WOOL MFG.CO.	Approved		
52.	MINERAL WOOL MATTRESS	JAMSHEDPUR MINERAL WOOL MFG.CO.	Approved
		ROCKWOOL (INDIA) PVT LTD.	Approved
		ROCKWOOL INDUSTRIES	Approved
		DHANBAD ROCKWOOL INSULATION PVT LTD	Approved
		GOENKA ROCKWOOL (INDIA) PVT LTD.,	Approved
53.	THERMAL INSULATION OF STEAM TURBINE/THERMAL INSULATION OF TURBINE INTEGRAL PIPING/THERMAL INSULATION-ROCKWOOL MATTRESSES/ PIPE SECTIONS	LLOYD INSULATIONS	Approved
		ROCKWOOL	Approved
		HEINRICH TAPP GMBH	Approved
		EUGEN ARNOLD GMBH	Approved
		Dhanbad Rockwool Insulation (P) Ltd.	Approved
		GOENKA ROCKWOOL (INDIA) PVT.LTD.	Approved
54.	THERMAL INSULATION - ANCILLARY MATERIAL	LLOYD INSULATIONS (INDIA) LIMITED	Approved
		ALLIED INSULATIONS (INDIA), GHAZIABAD	Approved
		ENERGY SAVING & ALLIED PRODUCTS	Approved
55.	INSULATION:BED MATERIALS	BHASKAR REFRACTORIES&SW PIPES P LTD, Faridabad	Approved
		SOUVENIOR CERAMICS, Faridabad	Approved
		ALWAR REFRACTORIES PVT LTD, Jaipur	Approved
		CHAMPION CERAMICS PVT LTD, Champa	DR

Sagardighi Extn. U#5 (PROJ3)

Mech.Equipments

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
56	INSULATION:CALCIUM SILICA	HYDERABAD INDUSTRIES LTD., Faridabad	DR
		NEWKEM PRODUCTS CORPORATION, Mumbai	DR
57.	INSULATION:CERAMIC WOOL	LLOYD INSULATIONS (INDIA) LIMITED, Chennai	Approved
58.	INSULATION:WOVEN WIRE CLO	BANARASWALA METAL CRAFTS PVT.,COIMBATORE	Approved
		BOKARIA WIRENETTING INDUSTRIES,CHENNAI	Approved
		JEETMULL JAICHANDLALL (MADRAS),CHENNAI	Approved
		KIRAN WIRE NETTING CO.,CHENNAI	Approved
		QUALITY WIRE PRODUCTS,NAVI MUMBAI	Approved
59	STEAM TRAPS	SPIRAX MARSHALL PVT.LTD.	Approved
		PENNANT ENGINEERING PVT.LTD.	Approved
		ESCO STEAMCON PVT. LTD.	Approved
		FORBES MARSHALL PVT. LTD.	Approved
60	AIR TRAPS	PENNANT ENGINEERING PVT.LTD.	Approved
		SPIRAX MARSHALL PVT.LTD.	Approved
		ESCO STEAMCON PVT. LTD.	Approved
		FORBES MARSHALL PVT. LTD.	Approved
61	GRAVIMETRIC FEEDER	STOCK INDIA	Approved
62	COMPRESSED AIR SYSTEM	ATLAS COPCO (INDIA) LTD.	Approved
63	SELF CLEANING STRAINERS	FILTRATION ENGINEERS (I) PVT. LTD.	Approved
		GEA BGR ENERGY SYSTEM INDIA LTD.	Approved
		MULTITEX FILTRATION ENGINEERS LIMITED	Approved
64	DEBRIS FILTER	GEA BGR ENERGY SYSTEM INDIA LTD.	Approved
		MULTITEX FILTRATION ENGINEERS LIMITED	Approved
		TAPROGGE GmbH	Approved
65	ALUMINIUM SHEETS/ COILS/CLADDING	BHARAT ALUMINIUM CO.LTD.	Approved
		INDIAN ALUMINIUM CO.LTD.	Approved
		HINDALCO INDUSTRIES LTD.	Approved
		NATIONAL ALUMINIUM COMPANY LTD.	Approved
		JINDAL ALUMINIUM LIMITED	Approved
66	CORRUGATED AL SHEET	HINDALCO INDUSTRIES LTD.,Chennai	Approved
		JINDAL ALUMINIUM LIMITED, Bangalore	Approved
		MPIL STEEL STRUCTURES LTD.,Thane	Approved
67	HOC TYPE GAS DRIER	DELAIR INDIA PVT. LTD.	Approved
		ATLAS COPCO (INDIA) LTD.	Approved
68	REFRIGERATION TYPE GAS DRIER	DELAIR INDIA PVT. LTD.	Approved
		SUMMIT	Approved
		SAVRO	Approved
		JINDAL ELECTRONICS PVT. LTD.	Approved
		SPAN MANUFACTURING CO. PVT.	DR
		MELLCON ENGINEERS PVT. LTD.	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
69	MISC. TANKS (SHOP)	GENERAL MECHANICAL WORKS	Approved
		UNITECH MACHINES LTD.	Approved
		TECHNO ELECTRIC & ENGG. CO. LTD.	Approved
		THERMOPADS PVT LIMITED	Approved
		VIJAY TANKS & VESSELS LTD	Approved
		THERMOSYSTEMS PVT. LTD.	Approved
70	MISC. TANKS(SITE FABRICATED)	TECHNO ELECTRIC and ENGG. CO. LTD.	Approved
		THERMOSYSTEMS PVT. LTD. HYDERABAD	Approved
		UNITECH MACHINES LTD.	Approved
71.	FLAME ARRESTOR (MISCELLANEOUS TANKS)	PROCESS INSTRUMENTS	Approved
		ASIAN INDUSTRIAL VALVES	Approved
		ACCOUSTICS INDIA PVT. LTD.	Approved
		MULTITEX FILTERS PVT. LTD.	Approved
72	M.E. BELLOWS	FLUIDINE ENGRS.INDIA PVT.LTD	Approved
		EXPANSION JOINT SYSTEMS INC. USA	Approved
		MUNRO & MILLER FITTINGS LTD., U.K	Approved
		SENIOR FLEXONICS, U.K.	Approved
		SUR INDUSTRIES PVT.LTD.,KOLKATA	Approved
		CORBIS	Approved
		FLEXATHERM EXPANLLOW PVT LTD	Approved
		MB METALLIC BELLOWS PVT. LTD,	Approved
FLEXICAN BELLOWS & HOSES (P) LTD	Approved		
		LONE STAR INDUSTRIES	Approved
73	EXPANSION BELLOWS-NON METALLIC	EAGLE BURGMANN K.E. PVT.LTD, Chennai	Approved
		AIROCHEM ENGINEERING COMPANY, Kolhapur	Approved
		PATELS AIRFLOW LIMITED,Ahmedabad	Approved
		MECHWELL INDUSTRIES LTD, Mumbai	Approved
74	HEAT EXCHANGERS (PLATE TYPE)	ALFA LAVAL (INDIA) LTD.	Approved
		GEA ECOFLEX INDIA PVT LTD	Approved
		TRANTER INDIA PRIVATE LIMITED	Approved
		L&T	Approved
		IDMC LIMITED	Approved
75	JOURNAL BEARING BFP & BP/THRUST CUM JOURNAL BEARING FOR CEP/THRUST BEARING (BFP & BP)	COLHERENE, UK	Approved
		WAUKESHA BEARINGS (GLACIER), UK	Approved
		KINGSBURY, USA	Approved
		MITCHELL, UK	Approved
76	THRUST BEARING FOR CWP	MICHELL BEARINGS,	Approved
		OSBORNE ENGINEERING LIMITED	DR
		OSAKA ASAHI METAL MFG. CO. LTD.	DR
		MICHELL BEARINGS (INDIA) LLP	Approved
77.	HYDRAULIC COUPLING	VOITH TURBO PVT LTD	Approved
		VOITH TURBO PVT. LTD. - HYDERABAD, INDIA	Approved
		VOITH TURBO GMBH & CO. KG. - GERMANY	Approved
78.	DISCONNECTING COUPLING FOR TDBFP	ZURN INC, USA	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
79.	SUCTION STRAINERS (BFP, BP & CEP)	OTOKLIN	Approved
		MULTITEX	Approved
		GUJARATH OTOFILT	Approved
		FILTRATION ENGINEERS INDIA PVT LTD	Approved
		JAY-EESH ENGINEERING COMPANY	Approved
80.	MECHANICAL SEAL (BFP/BP & CEP)	BURGMANN, GERMANY.	Approved
		EAGLE POONAWALA LTD.PUNE	Approved
		FLOWSERVE SANMAR, CHENNAI	Approved
81.	CONNECTING COUPLING FOR CEP , DRIP PUMP , CWP, BFP & BP	FLEXIBOX LTD., UK	Approved
		TURBOFLEX, UK	Approved
		BIBBY TURBOFLEX (FORMERLY EUROFLEX), UK	Approved
		EUROFLEX TRANSMISSION LTD., HYDERABAD.	Approved
		CUBIC TRANSMISSION PVT. LTD.	DR
		JOHN CRANE SEALING SYSTEMS, UK	Approved
82.	CONNECTING COUPLING (MEMBRANE TYPE/GEAR TYPE) FOR TDBFP	EUROFLEX TRANSMISSION, HYDERABAD.	Approved
		RENK AG,GERMANY	Approved
		JOHN CRANE, UK	Approved
		KOPFLEX, USA	Approved
		BIBBY TURBOFLEX (FORMERLY EUROFLEX), UK	Approved
		AMERIDRIVES (ZURN), USA	Approved
		LUFKIN, USA/FRANCE	Approved
		BHS, GERMANY	Approved
		FLENDER GRAFFENSTADEN, FRANCE	Approved
		RENK AKTIENGESELLSCHAFT -	Approved
83.	GEAR BOX FOR TDBFP	WALCHAND NAGAR, PUNE	Approved
		RENK AG,GERMANY	Approved
		LUFKIN, USA/FRANCE	Approved
		FLENDER GRAFFENSTADEN, FRANCE	Approved
		BHS, GERMANY	Approved
		VOITH TURBO BHS - GETRIEBE GMBH,	Approved
		RENK AKTIENGESELLSCHAFT -	Approved
		TRIVENI ENGG & IND LTD	Approved
84.	BARE RUBBER BELLOWS	CORI ENGINEERS PVT. LTD CHENNAI.	Approved
		SRM ESOFLEX PVT. LTD. KOLKATTA	Approved
		CORBIS	Approved
85.	SPRING SUPPORTS / HANGERS	SARATHI ENGG. ENTERPRISES PVT. LTD.	Approved
		HYDERABAD PIPING & ENERGY PRODUCTS (P) LTD. NEW DELHI	Approved
		SHAPE BAHADARABAD	Approved
		DARSHANI-INDIA	Approved
		PAL ENGINEERING YAMUNANAGAR	Approved
86.	SELF LUBRICATING BEARING	TEN MAT LTD UK	Approved
		(FEROFORM T 814 TUBES)	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
	TUBES FOR BF VALVES	THORDON	Approved
		THORPLAS TUBES, CANADA	Approved
87	KNIFE GATE VALVES	VAAS	Approved
		TYCO, USA	Approved
		VELAN, UK/USA	Approved
		INDURE PVT. LTD.	Approved
		ORBINOX INDIA (P) LTD.	Approved
		JASH ENGINEERING LIMITED	Approved
		GALAXY CONTROLS PVT LTD.,	Approved
88	MS AND GI PIPES	SAIL	Approved
		JINDAL	Approved
		INDUS TUBES	Approved
		SURYA ROSHNI	Approved
		TATA	Approved
89	STAINLESS STEEL PIPES	RATNAMANI METAL & TUBES	Approved
90	VACUUM PUMP / MECHANICAL EXHAUSTER (LIQUID RING TYPE)	VACUNAIR	Approved
		GARDNER DENVER,KOREA	Approved
		EDWARDS LIMITED, UK	Approved
91	STRAINER	STRAINWELL INDIA	Approved
		ACME FLUID SYSTEMS	Approved
		SRK STRAINERS & VALVES INDIA	Approved
		FILTRATION ENGINEERS INDIA PVT LTD	Approved
		GUJARAT OTOFILT,	Approved
92	CONICAL STRAINERS	FILTRATION ENGINEERS (I) PVT. LTD.	Approved
		GUJARAT OTOFILT	Approved
		JAY-EESH ENGINEERING COMPANY	Approved
		MULTITEX FILTRATION ENGINEERS LIMITED	Approved
		OTOKLIN GLOBAL BUSINESS LIMITED	Approved
93	CONDENSER TUBES	RATNAMANI METALS & TUBES LTD	Approved
		REMI EDELSTAHL TUBULARS LTD	Approved
		RATNADEEP METAL & TUBES LTD.	Approved
94	GRINDING ROLLS	AIA Engineering Ltd., Ahmedabad	Approved
		Magotteaux Industries Pvt. Ltd.,Rajkot	Approved
95	BULL RING SEGMENTS	AIA Engineering Ltd., Ahmedabad	Approved
		Magotteaux Industries Pvt. Ltd.,Rajkot	Approved
96	PGB SPECIAL OIL-ISO VG 320	INDIAN OIL CORPN.LTD.,	Approved
		HINDUSTAN PETROLEUM CORPN. LTD.	Approved
		CASTROL INDIA LIMITED	Approved
		EXXONMOBIL LUBRICANTS PVT LTD	Approved
		SHELL INDIA MARKETS PRIVATE LIMITED	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
97	CANISTER DRAINAGE PUMP SUBMERSIBLE/ BOOSTER PUMPS OF CVP	KIRLOSKAR BROTHERS LTD	Approved
		KSB PUMPS LIMITED,	Approved
		SULZER PUMPS INDIA LIMITED	Approved
		CLYDE PUMPS LTD.	Approved
98	SPIRAL WOUND GASKETS	CHAMPION SEALS (INDIA) PVT LTD.,	Approved
		STARFLEX SEALING (I) PVT .LTD	DR
		DYNAMIC GASKETS PVT LTD	DR
		SPIRASEAL GASKETS PVT LTD	DR
		GOODRICH GASKET PRIVATE LIMITED,	DR
99	PTFE SHEETS	As per BHEL Approved Sources	
100	AVERAGING PITOT TUBE	TECHNOMATIC	Approved
		EMERSON PROCESS MANAGEMENT (I) PVT	Approved
		MINCO (INDIA) PVT. LTD.	DR
		SWITZER PROCESS INSTRUMENTS	Approved
101	SEALING COMPOUND	As per BHEL Approved Sources	
102	H2, N2 & CO2 CYLINDERS (EMPTY)	BHARAT PUMPS AND COMPRESSORS	Approved
		SARJU IMPEX LTD	Approved
		EVEREST KANTO CYLINDER LIMITED	Approved
		RAMA CYLINDERS PVT LTD.	DR
103	STROBOSCOPE	ZENTRONIC SYSTEMS	Approved
		BEM-MESSTECHNIK GMBH	Approved
		IAG AUTOMATION PVT LTD	Approved
104	AIR CYLINDER	EASTERN PNEUMATICS PRIVATE LTD., Kolkata	Approved
		INSTRUMENTATION LTD.,Kerala	Approved
		KELTRON CONTROLS,Aroor	Approved
		NUCON PNEUMATICS PVT.LTD. Medak	Approved
		VELJAN HYDRAIR LIMITED, Hyderabad	Approved
		DUNCAN ENGINEERING LIMITED, Pune	Approved
		NEWTON PNEUMATICS, Chennai	Approved
105	SLIDING BEARING	Avi Oilless die Components India Pvt. Ltd, Pune	DR
		NEXGEN FLUOROPOLYMERS PVT.LTD, Alwar	DR
106	BLOWERS	ACME AIR EQUIPMENTS CO PVT LTD,Ahmedabad	Approved
		AERZEN MACHINES INDIA PVT.LTD., Vadodara	Approved
		RKR,GEBLASE UND VERDICHTER GMBH, Germany	Approved
		SWAM PNEUMATICS PVT LTD.	Approved
107	DIRECT WATER LEVEL GUAGE	CLARK RELIANCE CORPN, USA	Approved
		IGEMA GmbH, Munster Germany	Approved
		NISAN SCIENTIFIC PROCESS,Mumbai	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description	Vendor Name	Remarks
		PENTAIR VALVES & CONTROLS INDIA, Baroda	Approved
108	HEA IGNITOR ASSY	UNISON INDUSTRIES, USA	Approved
		IGNITION SYSTEM Inc., USA	Approved
		DURAG, Germany	Approved
		FIVES COMBUSTION SYSTEMS PVT. LTD	Approved
		TESI SPA, Italy	Approved
		TURBINE TECHNICS, INC., Florida USA	Approved
109	HP FILL & PURGE FILT	PALL INDIA PVT LTD, Mumbai	Approved
		VENS HYDROLUFT (P) LTD, Chennai	Approved
110	VARIABLE ORIFICE	BMW STEELS LTD., UTTAR PRADESH	DF
		ELECTRO PORCELAIN DIVN., BANGALORE	DF
		PROMECON GmbH., GERMANY	Approved
111	Lub oil system for FANS (ID, FD & PA)	PSI ENGINEERING Systems pvt ltd	Approved
		SOUTHERN LUBRICATION PVT LTD	Approved
		YUKEN INDIA LTD	Approved
112	STEAM COIL AIR PRE HEATR	C DOCTOR INDIA PVT LTD	Approved
		PATEL AIR TEMP(INDIA) LTD	Approved
		BARODA EQUIPMENT &VESSEL PVT LTD	Approved
		NU WAY HEATRANSFER PVT LTD	Approved
		CHINTAMANI THERMAL TECHNOLOGIES PVT LTD	Approved
		PAR ENERGY INFRA PVT.LTD	Approved
113	AIR RECEIVER	VEE SONS ENERGY SYSTEM PVT LTD	Approved
		PATEL AIR TEMP(INDIA) LTD	Approved
		C DOCTOR INDIA PVT LTD	Approved
		AIRCON HANDLING SYSTEMS PVT LTD	Approved
		BARODA EQUIPMENT &VESSELS PVT LTD	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

SL. NO.	Item Description	Vendor Name	Remarks
1	Slurry Recirculation pumps	BHEL, Hyderabad	DR
		Duchting Pumpen, Germany	Approved
		KSB, Germany	Approved
		KSB India	DR
		Weir Minerals, Australia	Approved
		Weir Minerals, India	DR
		Andritz China	
		Andritz India	DR
		Xiangyang WuerWu China	
2	Oxidation Blowers	BHEL, Hyderabad	DR
		ITO, Japan	Approved
		GEMSL, UK	Approved
		Aerzen, Germany	Approved
		Aerzen, India	Approved
		Howden, India	Approved
		Boldrocchi, India	Approved
		Siemens, Italy/Germany	Approved
		Boldrocchi, Italy	Approved
3	Slurry pumps	Duchting Pumpen, Germany	Approved
		Weir Minerals, Australia	Approved
		Weir Minerals, India	DR
		Andritz China	
		Andritz India	DR
		Metso Minerals USA	Approved
		Metso Minerals India	DR
		KSB Germany	Approved
		KSB India	DR
		Krebs USA	Approved
		Krebs India	DR
		Xiangyang WuerWu China	
4	Agitators	Ekato, Germany	Approved
		Ekato, India	DR
		STC, Germany	Approved
		REMI-STC, India	DR
		Nippon Gears, Japan	Approved
		SPX, USA	Approved
		SPX, India	DR

SL. NO.	Item Description	Vendor Name	Remarks
		Zhejiang Great wall mixers china	
		Mixing Solutions, USA	Approved
		Mixing Solutions, India	DR
		Milton Roy Mixing, France	Approved
		Milton Roy Mixing, India	Approved
		Tschamber, Germany	Approved
5	Mist Eliminator	REA Plastik Tech GmbH, Berlin Germany	Approved
6	Wet Ball Mills	Christian Pfeiffer, Germany	Approved
7	Vacuum Belt Filter and Hydrocyclone	Xuhe, Japan	Approved
8	Rubber lining	Steuler-KCH GmbH	Approved
		Rubber Source Inc.	Approved
		Blair Rubber Company	Approved
9	Rubber lining Applicator	Labrex, Puducherry	Approved
10	Alloy C276/Alloy 59 liner	ATI, Relentless Innovation	Approved

Sagardighi Extn. U#5 (PROJ3)

FGD Package

Ref: SGMPO3/AV/8/047

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

SL. NO.	Item Description	Vendor Name	Remarks
1	PIPES & CONDUITS/ACCESSORIES	As per BHEL approved source.	
2	EM BRAKES	SIEGERLAND-BREWSEN, GERMANY	Approved
		STROM KRAFT CONTROLS, MUMBAI	Approved
		BCH Electric Limited	Approved
		SIEMENS India Ltd.	Approved
	Caliper Brakes,EHT Gear Boxes,Industrial Valves,	KATEEL Engineering Industry Pltd	DR
3	SOLENOID VALVES	ASCO, Chennai	Approved
4	AIR CONDITIONING SYSTEMS	shall be as per approved sources listed in Package items in Main Plant Package area.	
5	VENTILATION SYSTEM	shall be as per approved sources listed in Package items in Main Plant Package area.	
6	VALVES	shall be as per approved sources listed in Mechanical Equipment in Main Plant Package area.	
7	DUST EXTRACTION SYSTEM	C.Doctor & Company Privae Ltd.,	Approved
		DUSTVEN Pvt .Ltd., Bangalore	Approved
		THERMEX	Approved
		Batlboi Environmental Engg Ltd.,	Approved
		TPS,DELHI	Approved
		F. Harley	Approved
8	DUST SUPPRESSION SYSTEM	SPRAYING SYSTEMS INDIA PVT. LTD	Approved
KAVERI ULTRA POLYMER LTD.		Approved	
F. HARLEY & COMPANY. PVT. LTD.		Approved	
TPS INFRASTRUCTURE LTD.		Approved	
9	E O T CRANE / MANUAL HOIST	shall be as per approved sources listed in Mechanical Equipment in Main Plant Package area.	
10	PUMPS & ACCESSORIES	shall be as per approved sources listed in Mechanical Equipment in Main Plant Package area.	
		PHOENIX CONVEYOR BELT INDIA PVT LTD	Approved
		SEMPERTRANS INDIA PRIVATE LIMITED	Approved
		HILTON-FORECH	Approved

Sagardighi Extn. U#5 (PROJ3)

CHP-Mech. Package

Ref: SGMPO3/AV/8/047

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

11	CONVEYOR BELT	MRF	Approved
		YOKOHAMA	Approved
		FORECH INDIA LTD, KOLKATA	Approved
		HINDUSTAN RUBBERS, SILVASA	Approved
		NORTHLAND RUBBER MILLS, NEW	Approved
		ORIENTAL RUBBER INDUSTRIES PVT LTD.	DR
		JONSON RUBBER INDUSTRIES	Approved
		EUREKA COVEYOR BELTINGS PVT LTD.	Approved
		FLEXER RUBBER PVT LTD	Approved
12	BELT VULCANIZER	SHAW ALMEX	Approved
		S. V. DATTAR	Approved
		NILOS	Approved
13	STRUCTURAL STEEL	Follow Civil Structural Vendor Approval List.	
14	COAL SAMPLING UNIT	ADVANCED SYSTEMS SAMPLING PVT LTD	Approved
		THERMO RAMSAY, AUSTRALIA	Approved
		ERIEZ MAGNETICS EUROPE LTD., CAERPHILLY	Approved
		EASTMAN CRUSHER Co. (P) Ltd.	Approved
15	BELT WEIGHER SCALES	THERMO RAMSAY, AUSTRALIA	Approved
		AVERY INDIA LTD., NEW DELHI	Approved
		TRANSWEIGH	Approved
		SCHENCK PROCESS INDIA LIMITED	Approved
16	FLAP GATES	PRECISION PROCESSING EQUIPMENT CO.	Approved
		DA ENGG.	Approved
		MERIT CHENNI	Approved
		MMHE	Approved
		MSE	Approved
		HINDUSTAN M/C TOOLS CORPORATION, KOLKATA	Approved
		CONTINENTAL PROFILES LTD., FARIDABAD	Approved
17	Flow elements, Condensate pots, Manifolds etc for process instrumentation	shall be as per approved sources listed in C&I in Main Plant Package area.	
18	GRATINGS	PATNY SYSTEMS, HYDERABAD	Approved
		PINAX STEEL INDUSTRIES PVT LTD	Approved
		INDIANA GRATINGS PVT. LTD	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

		CAUVERY ENGINEERING WORKS	Approved
19	GEAR BOXES	R&D MULTIPLES (METAL CAST) PVT. LTD.	Approved
		ESSENTIAL POWER TRANSMISSION PVT.LTD	Approved
		FLENDER	Approved
		NEW ALLENBURY	Approved
		KATEEL Engineering Industry Pltd	DR
		PREMIUM TRANSMISSION LIMITED	Approved
		SHANTHI GEARS LIMITED	Approved
20	ERW PIPES	STEEL AUTHORITY OF INDIA LTD.	Approved
		WELSPUN GUJARAT STAHL ROHERN LTD	Approved
		TUBES INDIA	Approved
		JCO GAS PIPE LIMITED	Approved
		RATNAMANI METALS & TUBES LTD	Approved
		MAHARASHTRA SEAMLESS LIMITED	Approved
		JINDAL PIPES LIMITED	Approved
21	COMPRESSORS	ATLAS COPCO (INDIA) LIMITED	Approved
		ELGI EQUIPMENTS LTD	Approved
		INGERSOLL- RAND (INDIA) LIMITED	Approved
22	Bull Dozer	BHARAT EARTH MOVERS LIMITED	Approved
23	Twin Wagon Trippler	THYSSENKRUPP INDUSTRIES INDIA PV	Approved
24	Feeders (Apron ; Grizzly; Vibrating; Paddle)	FL Smidth	
		Metso Minerals(I) Pvt.Ltd.	Approved
		LARSEN & TOUBRO LTD, ECC DIVN	Approved
		ELECON ENGINEERING COMPANY LTD	Approved
		TRF LTD., JAMSHEDPUR	Approved
		THYSSENKRUPP INDUSTRIES INDIA PV	Approved
25	Crusher	LARSEN & TOUBRO LTD	Approved
		TRF LIMITED	Approved
		ELECON ENGINEERING COMPANY LTD	Approved
		THYSSENKRUPP INDUSTRIES INDIA PV	Approved
		SANDVIK ASIA PRIVATE LIMITED	DR
		MCNALLY SAYAJI ENGINEERING LIMITED	Approved
		Amps Engineering & Equipments Pvt Ltd	DR
		Devas Engineering Systems	DR
		GOLDEN ENGINEERING INDUSTRIES	DR
		INDIANA CONVEYORS PVT LTD	DR
		VISHWA INDUSTRIAL COMPANY LTD.,	DR
		NEW ERA CONVEYORS PVT LTD.,	DR

Sagardighi Extn. U#5 (PROJ3)

CHP-Mech. Package

Ref: SGMPO3/AV/8/047

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

26	Idlers	TURBO ENGINEERS (CBE),	DR
		ROLLWELL CONVEYOR COMPONENTS PVT LTD	DR
		ELECON ENGINEERING CO. LTD.	Approved
		ARUDRA	Approved
		TRF LIMITED	Approved
		MCNALLY BHARAT, ENGG. CO. LTD.	Approved
		TEGA	Approved
		BENGAL TOOLS.	Approved
		ARYAN CLEAN COAL TECHNOLOGIES PVT LTD.,	DR
		Bevcon Wayors Pvt Ltd	DR
		I & B ENGINEERS PVT LTD	DR
TECHNO IMPEX	DR		
27	Pulleys	INDIANA CONVEYORS PVT LTD	DR
		AMPS ENGINEERING & EQUIPMENTS PVT LTD	DR
		Devas Engineering Systems	DR
		VISHWA INDUSTRIAL COMPANY LTD.,	DR
		NEW ERA CONVEYORS PVT LTD.,	DR
		TURBO ENGINEERS (CBE),	DR
		BENGAL TOOLS	Approved
		MCNALLY BHARAT ENGG. CO. LTD.	Approved
		ELECON	Approved
		ARUDRA	Approved
		ROLLWELL CONVEYOR COMPONENTS PVT LTD	DR
		ARYAN CLEAN COAL TECHNOLOGIES PVT LTD.,	DR
		BEVCON WAYORS PVT.LTD.	DR
		I & B ENGINEERS PVT LTD	DR
TECHNO IMPEX	DR		
28	Internal / External Scrapers & Skirt Board Sealing System	As per BHEL approved source.	
29	Roller SCREENS	POSCO PLANT ENGINEERING CO., LTD.,	DR
		ELECON	Approved
		msei	Approved
		Thyssen	Approved
		Electro Zavod (India) Pvt Ltd.	DR
30	RPG GATES	BENGAL TOOL	Approved
		MSEL	Approved
		DA ENGG.	Approved
		HMTC ENGINEERING CO (KOLKATA) PVT LTD	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

31	HVAC System	shall be as per approved sources listed in Package items in Main Plant Package area.	
32	REDUCTION GEAR BOX	PREMIUM ENERGY TRANSMISSION	Approved
		FLENDER LIMITED	Approved
		ELECON ENGINEERING CO. LTD.	Approved
33	FLUID COUPLING	VOITH	Approved
		PREMIUM ENERGY TRANSMISSION	Approved
		FLUIDOMAT	Approved
34	FLEXIBLE GEAR COUPLING	GMB MFG. (P) LTD., KOLKATA	Approved
		HI-CLIFF	Approved
		FENNER	Approved
		LOVEJOY	Approved
		WELLMAN	Approved
		CONCORD	Approved
		ELECON ENGINEERING COMPANY LIMITED	Approved

Sagardighi Extn. U#5 (PROJ3)

CHP-Mech. Package

Ref: SGMPO3/AV/8/047

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

SL. NO.	Item Description	Vendor Name	Remarks
1	Ash Slurry Pumps	SAM TURBO INDUSTRY PRIVATE LTD	Approvec
		WIER MINERALS (India) Pvt. Ltd	Approvec
		INDURE PVT. LTD.	Approved
		METSO MINERALS (INDIA) PVT LTD.,	Approvec
2	Water Pumps & Accessories	KIRLOSKAR BROTHERS LIMITED	Approvec
		Flowmore Limited, Gurgaon	Approvec
		BEACON WEIR LTD, CHENNAI	Approvec
		Kishor Pumps Pvt. Ltd., Chennai	Approvec
		Maxflow pumps india Pvt Ltd.	Approvec
		Wilo Mather and Platt Pumps Pvt Ltd	Approvec
3	ERW Pipes	STEEL AUTHORITY OF INDIA LTD.	Approvec
		WELSPUN GUJARAT STAHL ROHERN LTD	Approvec
		TATA	Approved
		JCO GAS PIPE LIMITED	Approvec
		TUBES INDIA	Approvec
		RATNAMANI METALS & TUBES LTD	Approvec
		MAHARASHTRA SEAMLESS LIMITED	Approvec
		JINDAL PIPES LIMITED	Approvec
4	Compressors	ATLAS COPCO (INDIA) LIMITED	Approvec
		ELGI EQUIPMENTS LTD	Approvec
		INGERSOLL- RAND (INDIA) LIMITED	Approvec
5	FLUIDIZING AIR HEATER	ESCORTS	Approved
		SPHEREHOT	Approved
		RAYCOLD	Approvec
		INDURE PVT. LTD.	Approvec
6	Cast Basalt Lined bends/ fittings/ pipes	TURBO ENGINEERS (CBE)	Approvec
		INDURE PVT. LTD.	Approvec
		DEMECH	Approvec
		ENVIRO ABRASION	Approvec
		Densen Technologies, Thane	Approvec
		Deccan Mechanical and Chemical Industries Pvt. Ltd.,	Approvec
7	ALLOY C.I. FITTINGS & LINERS	MENON METALLIKS	Approvec
		CRAWLEY & RAY	Approvec
		SAM CASTINGS	Approvec
		CRESENT	Approvec

8	E O T CRANE / MANUAL / Electric HOIST	shall be as per approved sources listed in Mechanical Equipment in Main Plant Package area.	
9	Gear Box	R&D MULTIPLES (METAL CAST) PVT. LTD.	Approved
		ESSENTIAL POWER TRANSMISSION PVT.LTD	DR
		KATEEL Engineering Industry Pltd	DR
		PREMIUM TRANSMISSION LIMITED	Approved
		New Allenburry	Approved
10	Couplings	ESCO COUPLINGS & TRANSMISSIONS PVT LTD	Approved
		PREMIUM TRANSMISSION LIMITED	Approved
		ELECON ENGINEERING COMPANY LIMITED	Approved
11	Air conditioning	shall be as per approved sources listed in Package items in Main Plant Package area.	
12	Ventilation System	shall be as per approved sources listed in Package items in Main Plant Package area.	
13	Valves/Gate	shall be as per approved sources listed in Mechanical Equipment in Main Plant Package area.	
14	TWIN LOBE TYPE ROTARY FLUDIZING AIR BLOWER	SWAM PNEUMATICS	Approved
		KAY INTERNATIONAL	Approved
		EVEREST	Approved

SAGARDIGHI THERMAL Power EXTENSION PROJECT PHASE-III, UNIT#5 (1 x660 MW)			
Sl. NO.	Item Description	Vendor Name	Remarks
1	Electrical Valve Actuators	AUMA (I) LTD., BANGALORE	Approved
		AUMA, GERMANY	Approved
		LIMITORQUE (I) LTD, FARIDABAD	Approved
		LIMITORQUE, US	Approved
		ROTORK CONTROLS (I) LTD, CHENNAI & BANGALORE	Approved
		ROTORK, UK	Approved
		NIPPON GEAR CO., JAPAN	DR
2	OIL FILLED TRANSFORMER (More than 10 MVA)	BHEL	Approved
		GE	Approved
		AREVA T & D INDIA LIMITED	Approved
		FUJI	Approved
		ABB	Approved
3	OIL FILLED SERVICE TRANSFORMER (Applicable only for less than 10 MVA)	KIRLOSKAR ELECTRIC CO.LTD. Mysore	Approved
		BHEL	Approved
		SCHNEIDER ELECTRIC INFRASTRUCTURE LIMITED	DR
		TOSHIBA TRANSMISSION & DISTRIBUTION SYSTEMS(i) PVT.LTD.,MEDAKH	DR
		CROMPTON GREAVES LTD.	Approved
		AREVA T & D INDIA LIMITED ,	Approved
		MARSONS LIMITED	Approved
		VOLTAMP TRANSFORMERS LTD.	Approved
4	SEGREGATED PHASE BUSDUCTS	BHEL	Approved
		L&T	Approved
		SIEMENS	Approved
		ALSTOM LTD.	Approved
		BEST & CROMPTON	Approved
5	ISOLATED PHASE BUSDUCT	BHEL	Approved
		SIMELECTRO, FRANCE	Approved
6	HT MOTORS (above 500 kW)	ABB	Approved
		BHEL	Approved
		SIEMENS	Approved
7	HT MOTORS (upto 500 kW)	ABB	Approved
		BHEL	Approved
		SIEMENS	Approved
		CROMPTON GREAVES	Approved

8	ELECTRIC LT MOTOR (ABOVE 90 KW)	CG POWER AND INDUSTRIAL SOLUTIONS LIMITED	Approved
		MARATHON ELECTRIC MOTORS INDIA LIMITED	Approved
		ABB	Approved
		SIEMENS	Approved
9	ELECTRIC LT MOTOR (UPTO 90 KW)	CG POWER AND INDUSTRIAL SOLUTIONS LIMITED	Approved
		MARATHON ELECTRIC MOTORS INDIA LIMITED	Approved
		ABB	Approved
		SIEMENS	Approved
		KIRLOSKAR	Approved
		BHARAT BIJLEE	Approved
10	HT SWITCHGEAR (11KV, 3.3 KV)	AREVA LTD.	Approved
		BHEL.	Approved
		Schneider	Approved
		SIEMENS LTD	Approved
11	LT Switch Gear Panel [PMCC, PCC & MCC]	Siemens India ltd	Approved
		GE India Industrial pvt ltd	Approved
		Schneider Electric India pvt ltd	Approved
		ABB	Approved
		AREVA LTD.	Approved
		LARSEN & TOUBRO LTD.	Approved
12	TRANSFORMER (DRY TYPE)	VOLTAMP	Approved
		AREVA	Approved
		CGL	Approved
		BHEL	Approved
13	NON SEGREGATED PHASE BUS DUCTS	KGS Engineering Limited	Approved
		L&T	Approved
		SIEMENS	Approved
		ALSTOM LTD.	Approved
		BEST & CROMPTON	Approved
14	ACDB, DCDB, , MLDB, ELDB, PDB, WELDING DB, VENTILATION DB	Siemens India ltd	Approved
		GE India Industrial pvt ltd	Approved
		Unilec Engineers ltd	Approved
		Schneider Electric India pvt ltd	Approved
		ABB	Approved
		AREVA LTD.	Approved
		LARSEN & TOUBRO LTD.	Approved
15	LOCAL STARTER PANEL, LOCAL CONTROL PANEL, LIGHTING PANEL	L & T	Approved
		Schneider	Approved
		L & T	Approved
		Siemens	Approved
		UNILEC ENGINEERS LTD.	Approved
		AREVA LTD.	Approved
		PYROTECH	Approved
16	VacuumInterrupter,3.6kV40kA	BharatElectronicsLtd.	Approved
17	VacuumInterrupter,12kV50kA	EatonIncorporation	Approved

18	Air Circuit Breaker (ACB)	ABB	Approved
		Schneider	Approved
		L & T	Approved
		Siemens (3WL model only)	Approved
		AREVA LTD.	Approved
		GE-POWER	Approved
19	Molded case circuit breakers (MCCB)/Motor Protection Circuit Breaker (MPCB)/ Power Contactor/Aux. Contactor/ Thermal Overload Relay (OLR)/SFU	ABB	Approved
		Schneider	Approved
		L & T	Approved
		Siemens	Approved
		GE-POWER	Approved
20	Miniature Circuit Breaker (MCB)	ABB	Approved
		Schneider	Approved
		L & T	Approved
		Siemens	Approved
		GE-POWER	Approved
		LEGRAND	Approved
21	Electronic Motor Protection Relay (EMPR)	ABB	Approved
		Schneider	Approved
		Siemens	Approved
		GE-POWER	Approved
22	Current transformer / Voltage Transformers (VT/PT)/ Control Transformers(CST) upto 1.1KV	Automatic Electric	Approved
		Prayog Electricals	Approved
		Precise Electricals	Approved
		Kappa Electricals	Approved
		Pragati Electricals	Approved
		Indcoil	Approved
23	Interposing Relays	Jyoti	Approved
		OEN	Approved
		PLA	Approved
		Schneider	Approved
		GUARDIAN	Approved
		OMRON	Approved
24	Numerical Relay	Asea Brown Boveri Ltd., Vadodara	Approved
		Asea Brown Boveri Limited, Bangalore	Approved
		GE (Alstom)	Approved for MICOM Series
		Siemens Ltd.	Approved for SIPROTEC Series
		Schnieder Electric Infrastructure limited	Approved for MICOM Series

25	Static / Electromechanical / Auxiliary / Tripping Relays	Asea Brown Boveri Ltd., Vadodara	Approved
		Asea Brown Boveri Limited, Bangalore	Approved
		Schnieder Electric Infrastructure limited	Approved
		GE T & D India Limited	Approved
		Siemens Ltd.	Approved
		Alstom, Chennai	Approved
26	Energy Meters	SCHNEIDER CONZERVE	Approved
		Secure Meters (SEMS)	Approved
27	Multifunction Meter	Secure Meters (SEMS)	Approved
		SIEMENS Ltd.	Approved
		Schneider	Approved
28	Alarm Annunciators	MINILEC India Pvt Ltd.	Approved
		Accord Electro-Technics Pvt. Ltd.	Approved
		Alan Instrumentation Pvt. Ltd.	Approved
		JVS Electronics Pvt. Ltd.	Approved
		PROCON Instrumentation (P) Ltd.	Approved
		VESTAL Electronics	Approved
29	Timer/ TIME DELAY RELAY	ABB	Approved
		Schneider	Approved
		L & T	Approved
		Siemens	Approved
		GE-POWER	Approved
30	Digital Indicating meters	Automatic Electric Limited (AEL)	Approved
		RISHABH Instruments Pvt Ltd.	Approved
		L&T	Approved
		MECO Instrument Pvt. Ltd.	Approved
		MASIBUS AUTOMATION & INSTRUMENTATIO, GANDHI NAGAR	Approved
		Secure	Approved
Schneider/conzerv	Approved		
31	Analog Indicating meters	Automatic Electric Limited (AEL)	Approved
		MECO Instrument Pvt. Ltd.	Approved
		RISHABH Instruments Pvt Ltd.	Approved
		ABB	Approved
		GOSSSEN	Approved
		YOKOGAWA	Approved
		PYROTECH Electronics Pvt. Ltd.	Approved
SELEC Controls Pvt. Ltd.	Approved		
32	Transducers	Camille Bauer, Germany	Approved
		Automatic Electric Limited (AEL)	Approved
		ELSTER Metering Pvt Ltd, Mumbai	Approved
		Siemens	Approved
		MASIBUS Automation and Instruments (P) Ltd.	Approved
		Southern Transducers Pvt. Ltd.	Approved
33	Control / Selector Switches	KAYCEE Industries Ltd., Mumbai	Approved
		L & T (Salzer)	Approved
		Reliable Electronic Components Pvt. Ltd (RECOM)	Approved
		SETON Electrical Products	Approved
		SWITRON Devices	Approved

34	Discrepancy switch	Asea Brown Boveri Limited(ABB)	Approved
		Control Dynamics	Approved

35	FUSE Base with holder	ABB	Approved
		Schneider	Approved
		L & T	Approved
		Siemens	Approved
		GE-POWER	Approved
36	FUSES (Power/Control)	GE-Power	Approved
		Siemens	Approved
		L & T	Approved
		Schneider	Approved
		COPPER BUSSMANN	Approved
		ABB	Approved
37	Indicating Lamp	Siemens	Approved
		Vaishno	Approved
		L & T (ESBEE)	Approved
		Schneider	Approved
		ABB	Approved
		SECO	Approved
		TEKNIK	Approved
38	Push Button	Siemens	Approved
		Vaishno	Approved
		L & T (ESBEE)	Approved
		TEKNIK	Approved
		Schneider	Approved
		ABB	Approved
39	Disturbance Recorders / Event Logger	Asea Brown Boveri Limited (ABB)	Approved
		Alstom T&D India Ltd. Chennai	Approved
		Ametek Power Instruments, USA	Approved
		QUALITROL HATHWAY, UK	Approved
40	Time Synchronizer	SERTEL, Chennai	Approved
		ARBITER, USA	Approved
		SEL, USA	Approved
		MASIBUS Automation and Instruments (P) Ltd.	Approved
41	(Indoor) CT / PT up to 11 kV, CBCT,Aux. CT / PT (ICT)	Prayog Electricals (P) Ltd.	Approved
		Pragati Electricals Pvt. Ltd.	Approved
		Silkaans Elect. Mfg. Co. Pvt. Ltd.	Approved
42	Surge Suppressor/Arrestor (Less than 15KV)	Raychem	Approved
		CGL	Approved
		Elpro	Approved
		Oblum Electrical Industries (P) Ltd.	Approved
43	Bus Transfer Scheme Panel(Numerical)	Aartech Solonics Ltd.	Approved
		Asea Brown Boveri Ltd.	Approved
44	Data Concentrator	ABB	Approved
		Schneider	Approved
		SIEMENS	Approved
		GE(ALSTOM)	Approved

45	Ethernet Switches	RUGGEDCOM	Approved
		NETGEAR	Approved
		HIRSCHMANN	Approved
		MOXA	Approved
		CISCO	Approved
46	Terminals Block	Phoenix	Approved
		Connect well	Approved
		Elemex	Approved
		Wago	Approved
47	Cable Glands	HEX	Approved
		Commet	Approved
		DOWELLS	Approved
		Jainson	Approved
		3D	Approved
		Sunil & Co.	Approved
48	Cable Lugs	HEX	Approved
		Commet	Approved
		DOWELLS	Approved
		Jainson	Approved
		3D	Approved
		Sunil & Co.	Approved
49	Local Motor Starter	L & T	Approved
		Schneider	Approved
		ABB	Approved
		BCH	Approved
50	LPBS (NON-FLAME PROOF)	L&T	Approved
		SCHNEIDER	Approved
		Tecknic Controls	Approved
		SIEMENS	Approved
51	LPBS(FLAME PROOF)	BALLIGA	Approved
		EX-PROTECTA	Approved
52	Industrial Switch & Socket / Receptacles	Schneider	Approved
		Anchor	Approved
		Bajaj	Approved
		Philips	Approved
		crompton Greaves	Approved
		BEST & CROMPTON ENGG. LIMITED	Approved
		AJMERA INDUSTRIES & ENGG. WORKS	Approved
		BCH Electric	Approved
53	ISOLATING SWITCH	SALZER, L&T	Approved
		SIEMENS	Approved
		ALSTOM LTD.	Approved
		GE – POWER	Approved
		SCHNEIDER	Approved
		ABB	Approved
		KAYCEE	Approved

54	SYNCHROSCOPE	AUTOMATIC ELECTRIC	Approved
		GEC - ALSTHOM	Approved
55	EARTH LEAKAGE CB	SCHNEIDER	Approved
		L&T	Approved
		SIEMENS	Approved
		ABB	Approved
56	EARTH LEAKAGE RELAY [ELR] ALONGWITH CBCT	AREVA	Approved
		PRO'KDEVICES	Approved
57	EARTH LEAKAGE RELAY [ELR] ALONGWITH CBCT	AREVA	Approved
		PRO'KDEVICES	Approved
58	PANEL SPACE HEATER	C&S ELECTRIC	Approved
		SPACEAGE	Approved
59	Neutral Grounding Transformer	Pragati Electricals Pvt. Ltd., Thane	Approved
		Prayog Electricals Pvt. Ltd., Pune	Approved
60	Lightning Arrester for Busduct	Elpro International Ltd., Pune	Approved
		Oblum Electronics, Hyderabad	Approved
61	Surge Capacitor	ABB Ltd., Bangalore	Approved
		Madhav Capacitor Pvt. Ltd., Pune	Approved
62	NEUTRAL GROUNDING RESISTOR	LACHHMAN ELECTRONICS, NEW DELHI	Approved
		RSI SWITCHGEAR PVT. LTD., Bhiwadi Extn, INDIA	Approved
		RESITECH ELECTRICALS PVT.LTD. KOLKATA	Approved
		S.R.NARKHEDE ENGG.PVT.LTD. PUNE	Approved
63	TREFOIL CLAMPS	AJMERA INDUSTRIAL & ENGINEERING WORKS, MUMBAI	Approved
		ELECTROMAC INDUSTRIES, MUMBAI	Approved
		MOULDED FIBREGLASS PRODUCTS, KOLKATA	Approved
		SUMIP COMPOSITES PVT.LTD. Ahmedabad	Approved
64	CABLE TRAYS & ACC	INDUSTRIAL PERFORATION (I) PVT.LTD.	Approved
		PREMIER POWER PRODUCTS (CAL) PVT. LTD., Howrah	Approved
		PATNY SYSTEMS (P) LTD	Approved
		PARMAR METALS PVT.LTD.	Approved
		UNITECH FABRICATORS and ENGINEERS PVT LTD	Approved
		RATAN PROJECTS & ENGINEERING CO. PVT.LTD., Howrah	Approved
RABI ENGINEERING WORKS PVT. LTD., Kolkata	Approved		

65	CABLE TRAY SUPPORT SYSTEM- WELDED(GALV)	INDUSTRIAL PERFORATION (I) PVT.LTD., Kolkata	Approved
		PREMIER POWER PRODUCTS (CAL) PVT. LTD., Howrah	Approved
		UNITECH FABRICATORS and ENGINEERS PVT LTD	Approved
		PATNY SYSTEMS (P) LTD	Approved
		RATAN PROJECTS & ENGINEERING CO. PVT.LTD., Howrah	Approved
		RABI ENGINEERING KOLKATA	Approved
		HOWRAH	Approved
66	ABOVE GROUND EARTHING MATERIALS	INDUSTRIAL PERFORATION (I) PVT.LTD., Kolkata	Approved
		PREMIER POWER PRODUCTS (CAL) PVT. LTD., Howrah	Approved
		PATNY SYSTEMS (P) LTD, HYDERABAD	Approved
		UNITECH FABRICATORS and ENGINEERS PVT LTD	Approved
		RATAN PROJECTS & ENGINEERING CO. PVT.LTD., Howrah	Approved
		RABI ENGINEERING WORKS PVT. LTD.	Approved
67	CABLE TERM.& JOINT KITS	3M Electro and Communication India P.Ltd	Approved
		RAYCHEM RPG PRIVATE LIMITED	Approved
68	FIRE SEALING SYSTEM	3M INDIA LIMITED, Bangalore	Approved
		HILTI India Pvt. Ltd., New Delhi	Approved
		LLOYD INSULATIONS (INDIA) LIMITED, Chennai	Approved
		MULTI KILFIRE PVT LTD, VADODARA	Approved
		VIJAY SYSTEMS ENGINEERS PVT.LTD.,MUMBAI	Approved
69	ELECTRICAL - HEAT TRACING	THERMOPADS PVT.LTD.,	Approved
		XICON INTERNATIONAL LTD.	Approved
		THERMON INDIA PVT. LTD.	Approved
		RAYCHEM RPG LIMITED	Approved
70	HT XLPE CABLES	CABLE CORPORATION OF INDIA LTD.	Approved
		UNIVERSAL CABLES LTD.	Approved
		KEC INTERNATIONAL LIMITED	Approved
		RAVIN CABLES LIMITED	Approved
		KEI INDUSTRIES LTD., ALWAR	Approved
		POLYCAB WIRES PVT. LTD. Daman	Approved
		UNIVERSAL CABLES LTD., SATNA	Approved
71	LT XLPE POWER CABLE	GEMSCAB INDUSTRIES LTD.	Approved
		SUYOG ELECTRICALS LTD.	Approved
		RAVIN CABLES LIMITED	Approved
		CORDS CABLE INDUSTRIES LTD., BHIWADI DIST.	Approved
		CMI LTD.	Approved
		CRYSTAL CABLE INDUSTRIES LTD., HOWRAH	Approved
		KEI INDUSTRIES LTD., ALWAR	Approved
		KEC INTERNATIONAL LIMITED, Silvassa	Approved

	POLYCAB WIRES PVT. LTD., Daman	Approved
--	--------------------------------	----------



72	LT PVC CONTROL CABLE	Advance Cable Technologies (P) Ltd., Bengaluru	Approved
		CORDS CABLE INDUSTRIES LTD., BHIWADI DIST.	Approved
		CMI LTD.	Approved
		CRYSTAL CABLE INDUSTRIES LTD., HOWRAH	Approved
		KEI INDUSTRIES LTD., ALWAR	Approved
		KEC INTERNATIONAL LIMITED, Silvassa	Approved
		POLYCAB WIRES PVT. LTD., Daman	Approved
		RAVIN CABLES LIMITED	Approved
		UNIVERSAL CABLES LTD., SATNA	Approved
73	SCREENED CONTROL CABLES	CORDS CABLE INDUSTRIES LTD., BHIWADI DIST.	Approved
		DELTON CABLES LTD. FARIDABAD	Approved
		KEI INDUSTRIES LTD., ALWAR	Approved
		POLYCAB WIRES PVT. LTD., Daman	Approved
		THERMO CABLES LTD. HYDERABAD	Approved
74	LT XLPE FIRE SURVIVAL CABLES	KEI INDUSTRIES LTD., ALWAR	Approved
		POLYCAB WIRES PVT. LTD., Daman	Approved
75	DC LEAD ACID BATTERIES	EXIDE INDUSTRIES LTD, KOLKATA	Approved
		HOPPECKE BATTERIEN GMBH & CO.KG,	Approved
76	DC Ni-Cd BATTERIES	HBL Power Systems Ltd Hyderabad	Approved
77	DC BATTERY CHARGER	CHHABI ELECTRICALS PVT.LTD.(.)	Approved for Capacity < 100 AH
		AMAR RAJA POWER SYSTEMS, TIRUPATHI	Approved for Capacity < 100 AH
		Chloride Power Systems & Solutions Ltd., Kolkata	Approved
		HBL POWER SYSTEMS LTD ,	Approved
		STATCON ENERGIAA PRIVATE LIMITED,Hapur	Approved
78	MS ROD FOR BELOW GROUND EARTHING	RASHTRIYA ISPAT NIGAM LIMITED	Approved
		STEEL AUTHORITY OF INDIA LTD.	Approved
79	STATION LIGHTING SYSTEM	BAJAJ ELECTRICALS LTD., PUNE	Approved
		CROMPTON GREAVES LTD.	Approved
		PHILIPS INDIA LTD.	Approved
80	LIGHTING TRANSFORMERS	SUDHIR TRANSFORMERS LIMITED	Approved
		INDCOIL TRANSFORMERS PVT LTD	Approved
81	LIGHTING MAST	BAJAJ ELECTRICALS LIMITED	Approved
		CROMPTON GREAVES CONSUMER ELECTRICALS LIMITED	Approved

82	LIGHTING POLE	BOMBAY TUBE & POLES CO..	Approved
		BAJAJ ELECTRICALS LTD.	Approved
83	LIGHTING WIRE	CORDS CABLE INDUSTRIES LTD	Approved
		DELTON CABLES LTD.	Approved
		KEC	Approved
		KEI INDUSTRIES LTD.	Approved
		NICCO CORPORATION LTD.	Approved
		POLYCAB WIRES PVT.LTD	Approved
		TORRENT CABLES LTD.	Approved
		UNIVERSAL CABLES D.	Approved
		Finolex	Approved
		CMI Energy India Pvt. Ltd.	Approved
		Elkay Telelinks Ltd.	Approved
		Havells India Ltd	Approved
		Paramount Communications Ltd.	Approved
		Ravin Cables Ltd	Approved
		Special Cables Pvt. Ltd.	Approved
Anchor	Approved		
CABLE CORPORATION OF INDIA	Approved		
RR Kabel Limited	Approved		
Thermo Cables Limited	Approved		
84	HVR Transformer and EC Panel	ADOR POWERTRON LTD.,	DR
		BHARAT HEAVY ELECTRICALS LIMITED	Approved
		KRAFT POWERCON INDIA PRIVATE LTD	DR
85	Rubber Bellow for Bus Duct	Cori Engineers Pvt. Ltd., Chennai	Approved
		Resistoflex Pvt. Ltd., Noida	Approved
		United Rubber Industries, Mumbai	Approved
86	Epoxy Insulator for Bus Duct Package	A-Bond Strands Pvt. Ltd., Chennai	Approved
		Baroda Bushing & insulator, Vadodara	Approved
		Baroda Mould & Dies, Vadodara	Approved
		Ganpati Fibertech India (P) Ltd.	Approved
87	Epoxy Seal Off Bushing for Bus Duct Package	A-Bond Strands Pvt. Ltd., Chennai	Approved
		Baroda Bushing & insulator, Vadodara	Approved
		Baroda Mould & Dies, Vadodara	Approved
88	Current Transformer for Bus Duct Package	Instrans Engg & Mfg, Bangalore	Approved
		Pragati Electricals Pvt. Ltd., Thane	Approved
		Prayog Electricals Pvt. Ltd., Pune	Approved
		Silkaans Electrical Mfg. Co. Pvt. Ltd., Bangalore	Approved
89	Voltage/ Potential Transformer for Bus Duct Package	Instrans Engg & Mfg, Bangalore	Approved
		Pragati Electricals Pvt. Ltd., Thane	Approved
		Prayog Electricals Pvt. Ltd., Pune	Approved
		Silkaans Electrical Mfg. Co. Pvt. Ltd., Bangalore	Approved

90	Hot Air Blowing Equipment for Bus Duct	Elmech Pneumatic Industries	Approved
		Melcon Engg, New Delhi	Approved
		Powergear Ltd	Approved
91	Air Pressurization Equipment for Bus Duct Package	Elmech Pneumatic Industries, New Delhi	Approved
		Mellcon Engineers Pvt. Ltd., New Delhi	Approved
		Powergear Ltd	Approved
92	LAVT & NG Cubicle Assembly for Bus Duct Package	BHEL-RUDRAPUR	Approved
		Pyrotech Electronics Pvt. Ltd., Udaipur	Approved
		RSI Switchgear Pvt. Ltd., Gurgaon	Approved
		Busbar Systems India Ltd.	Approved
		Powergear Ltd.	Approved

93	Copper Strip Flexible/Copper Braided Flexible for Bus Duct Package	B.B. Electro Technique, Mumbai/Thane	Approved
		Shree Cable & Conductors Pvt. Ltd., Bhopal	Approved
94	DG SET ENGINE	CUMMINS	Approved
		MITSHUBISHI	DR
		CATERPILLAR	Approved
95	ALTERNATOR	NIDEC-LEROY SOMER	Approved
		CATERPILLAR	Approved
		KIRLOSKAR ELECTRIC	Approved
		CUMMINS GEN TECH.(STAMFORD)	Approved
96	DG SET ASSEMBLERS	JAKSON LTD.	Approved
		POWERICA LTD.	Approved
97	DG SET BATTERY BANK	EXIDE	Approved
		HBL	Approved
		CUMMINS	Approved
98	DG SET CONTROL PANELS / AUX.DIST. BOARD	JAKSON LTD	Approved
		PYROTECH	Approved
99	ALUMINUM TUBE	Hindalco Industries Limited	Approved
		Jindal Aluminium Ltd Bangalore Karnataka	Approved
		Balco	Approved
		Alom Extrusions Ltd.	Approved
100	CLAMPS & CONNECTORS	Electromech & Transtech Private Limited Kolkata West Bengal	Approved
		Klemmen Engineering Corporation Chennai Tamil Nadu	Approved
		Peevee Engineering Enterprises Bangalore Karnataka	Approved
		Utsav Electro-Mech Pvt Ltd Vadodara Gujarat	Approved

101	SWITCHYARD CONTROL PANELS	ABB India Limited	Approved
		GE T&D India Limited Noida Uttar Pradesh	Approved
		Schneider Electric Infrastructure Limited Noida Uttar Pradesh	Approved
		Siemens Ltd	Approved
102	SPACER COUPLING (REGIFLEX TYPE)	SIEMENS LTD	Approved
		ESCO COUPLING NV	Approved
		KTR Couplings (India) pvt.ltd	Approved
		UNIQUE TRANSMISSION INDIA P LTD.	Approved
		ESCO COUPLING & TRANSMISSION PVT LTD.	Approved
		Cubic Transmission pvt ltd unit-II	Approved
		RATHI TURBOFLEX PVT LTD	Approved
		Dipl.ing.Herwarth Reich GMBH	Approved
		Reich India ltd	Approved
KTR KUPPLUNGSTECHNIK Gmbh	Approved		
103	BAY CONTROL UNIT	ALSTOM	Approved
		SIEMENS	Approved
		ABB	Approved
104	FRP JUNCTION BOXES/ JUNCTION BOXES(POWER/CONTROL), LIGHTING JB	Jakson Engineers Limited	Approved
		Jasper Engineers Private Limited	Approved
		Mika Engineers	Approved
		Popular Switchgears Pvt Ltd	Approved
		Pyrotech Electronics Pvt Ltd	Approved
		RSI Switchgear Private Limited	Approved
		Sarvana Switchgears	Approved
		Unilec Engineers Ltd	Approved
105	MARSHALLING KIOSK	Mika Engineers Thane Maharashtra [MSE: MICRO]	Approved
		Popular Switchgears Pvt Ltd Nashik Maharashtra	Approved
		Pyrotech Electronics Pvt Ltd Udaipur Rajasthan	Approved
		RSI Switchgear Private Limited Bhiwadi Rajasthan	Approved
		RST Electricals Pvt. Ltd. Sahibabad Uttar Pradesh	Approved
		Sarvana Switchgears Bangalore Karnataka	Approved
		Unilec Engineers Ltd Gurgaon Haryana	Approved
106	PIPE STRUCTURE	Advance Steel Tubes Ltd. Ghaziabad Uttar Pradesh	Approved
		Associated Power Structures Pvt. Ltd. Vadodara Gujarat upto 400 kV System	Approved
		Goodluck India Limited Sikandrabad Uttar Pradesh	Approved
		Vijay Transmission Pvt. Ltd Raipur Chhattisgarh	Approved
		New Modern Technomech Pvt Ltd	Approved
		Rs Infraprojects Pvt. Ltd. Noida Uttar Pradesh	Approved
		UTKARSH TUBES & PIPES LIMITED Kolkata	Approved
		DEEPAK FASTNERS LTD	Approved

107	STRUCTURE HARDWARE	NAVEEN METAL INDUSTRIES, KOLKATA	Approved
		NEW INDIA ENGINEERING CORPORATION	Approved
		TECHMAN (INDIA)	Approved
108	SHIELD WIRE	Bharat Wire Ropes Ltd	Approved
109	STRING INSULATOR HARDWARE	Asbesco (India) Pvt. Ltd.	Approved
		Electromech & Transtech Private Limited	Approved
		EMC	Approved
		ITPPL	Approved
		TYCO	Approved
		Tag Corporation, Chennai	Approved
		IAC	Approved

110	400 kV SF6 BREAKERS	ABB	Approved
		CGL	Approved
		SIEMENS	Approved
		GE T&D India Limited	Approved
111	400 kV SWITCHYARD CURRENT TRANSFORMER	ABB	Approved
		CGL	Approved
		GE T&D India Limited	Approved
		BHEL	Approved
		SIEMENS	Approved
112	400 kV SWITCHYARD PT/POTENTIAL TRANSFORMER/VOLTAGE TRANSFORMER	ABB	Approved
		CGL	Approved
		SIEMENS	Approved
		ALSTOM	Approved
		BHEL	Approved
113	400 kV ISOLATOR	SIEMENS	Approved
		ABB	Approved
		GE T&D India Limited	DR
114	400 kV EARTH SWITCH	SIEMENS	Approved
		ABB	Approved
115	400 kV LATTICE STRUCTURE	GOOD LUCK STEEL TUBES LTD., BULANDSHAHR (UP)	Approved
		UTKARSH TUBES AND PIPES LIMITED, KOLKATA, WEST BENGAL	Approved
		Richardson & Cruddas (1972) Ltd, NAGPUR	Approved
116	ACSR CONDUCTOR	HINDUSTAN VIDYUT PRODUCTS LTD., HARYANA	Approved
		GUPTA POWER INFRASTRUCTURE LTD., BHUBANESWAR	Approved
		HIREN ALUMINIUM Ltd., SILVASSA DADRA & NAGAR HAVELI	Approved
117	RAIL POLE	SAIL	Approved
		RINL	Approved
		TATA	Approved
118	CABLE for ROLLED -E-CHAIN BAY CONTROL UNIT	IGUS	Approved
		ALSTOM	DR
		SIEMENS	DR
		ABB	DR

119	Control and Relay Panel / SAS	ABB India Limited	Approved
		GE T&D India Limited	Approved
		Siemens Ltd	Approved
120	400KV LIGHTNING ARRESTOR	Crompton Greaves Ltd	Approved
		Elpro International Ltd	Approved
		Oblum Electrical Industries Pvt Ltd	Approved
121	400 kV DISC INSULATOR/ LONG ROD INSULATOR (120KN)/ BUS POST INSULATOR(For Switchyard)	BHEL	Approved
		NGK BIRLA, JAYASHREE	Approved
		W.S. INDUSTRIES LTD,CHENNAI	Approved
		INDIAN POTTERIES	Approved
		Saravana Global Energy Limited	Approved
		Aditya Birla Insulators (A unit of Aditya Birla Nuvo Ltd.)	Approved
		Modern Insulators Ltd.	Approved
ESP/HVR (Jhansi Works)			
122	CRGO Steel-ESP/HVR TRANSFORMERS UPTO 95 KVP, 1400 mAmps	Bralco Resources,Canada (Mill-A K Steel, USA)	Approved
		Nippon Steel Corporation , Japan	Approved
		Kawasaki Steel , Japan	Approved
		TKES , Germany	Approved
		POSCO, Korea	Approved
		Viz Stal, Russsia	Approved
123	PICC (PAPER INSULATED COPPER CONDUCTOR)Conductor-ESP/HVR TRF	Shree Cables & Conductor, Bhopal	Approved
		BCPL , Raisen / Mandideep	Approved
		Shakti Insulated Wires, Ankleshwar / Mumbai	Approved
		Delta Trans Conductors Pvt. Ltd. Mumbai	Approved
		KSH Internationa,l Mumbai	Approved
		Signet Conductors, Rewa	Approved
		NKM Sales, Mandideep	Approved
		Electromech, Rewa	Approved
		Chandra Metals, Allahabad	Approved
		Malwa Strips, Dewas	Approved
		Precision Wires India Ltd,	Approved
		Mimani Indore.	Approved
		RIMA TRANSFORMER	Approved
124	Press Board	Senapathy Whitley, Bangalore	Approved
		Raman Boards, Mysore	Approved
		H Weidman / Weidman Systems, Switzerland	Approved

125	Transformer Oil (Mineral Oil)-ESP/HVR TRF	Apar Industries, Mumbai	Approved
		Savita Oil Tech. Ltd. Mumbai	Approved
		Raj Petro Specialties Mumbai	Approved
		COLOMBIA PETRO CHEM, INDIA	Approved
		Savita Chemicals India Pvt. Silvasa	Approved
126	Transformer Oil (Silicon Oil)	GE Momentive Silicon, USA	Approved
		DOW Corning, USA	Approved
		Shin-ETSU, Singapore	Approved
127	Synthetic Rubber Bonded Cork Sheet	James Walker, UK	Approved
		NU Cork Product, Gurgaon	Approved
		Gujrat Cork And Rubber, Valsad	Approved
		Indian Cork Industries	Approved
128	OTI	Perfect Control, Chennai	Approved
		Precimeasure, Bangalore	Approved
129	Buchholz Relay	ATVUS Industries, Kolkata	Approved
		Press-N-Forge, Mumbai	Approved
		A.J Service, Mumbai	Approved
130	MOG	Sukrut Udyog, Pune	Approved
		ATVUS Industries, Kolkata	Approved
		Yogya Enterprises, Jhansi	Approved
		Press-N-Forge, Mumbai	Approved
Power Transformers Oil Filled(JHANSI WORKS)			
131	CRGO STEEL (Supplier)	AK STEEL, Netherlands/ USA	Approved
		NIPPON STEEL, JAPAN	Approved
		VIZSTAL, RUSSIA (Only M4 grade)	Approved
		POSCO, KOREA	Approved
132	PAPER INSULATED COPPER CONDUCTOR (PICC)	SHREE CABLES & CONDUCTORS BHOPAL	Approved
		KSH INTERNATIONAL CHAKAN,PUNE	Approved
		RIMA TRANSFORMER & CONDUCTORS BANGALORE	Approved
		BCPL, MANDIDEEP	Approved
		PRECISION WIRES INDIA LTD, SILVASSA.	Approved
		SHAKTI INSULATED WIRES PVT LTD, ANKLESHWAR	Approved
		CHANDRA METALS LTD. TELIARGANJ	Approved
		DELTA TRANS CONDUCTORS(P)LTD. MUMBAI	Approved

133	CONTINUOUSLY TRANSPOSED CONDUCTOR	ASTA INDIA PVT LTD	Approved
		KSH INTERNATIONAL PVT LTD	Approved
		PRECISION WEIR INDIA LTD	Approved
		SAMDONG	Approved
134	PRECOMPRESSED PRESSED BOARDS	ABB INDIA LIMITED, MYSORE	Approved
		ABB AB, SWEDEN.	Approved
		SENAPATHY WHITELEY PVT.LTD. BANGALORE	Approved
135	INSULATING OIL	Apar Industries, Mumbai	Approved
		Savita Oil Tech. ltd. Mumbai	Approved
		Raj Petro Specialties Mumbai	Approved
		BPCL	Approved
136	BUCCHOLZ RELAY	P&B WEIR ELECTRICAL-UNIT 10, U.K	Approved
		PRESS-N-FORGE, MUMBAI	Approved
		A.J .SERVICES (PRAYOG), MUMBAI	Approved
		SUKRUT ELECTRIC CO.PVT.LTD. PUNE	Approved
		VIAT INSTRUMENTS PVT. LTD. KOLKAT/AHMEDABAD	Approved
137	PRESSURE RELIEF VALVE	MESSKO GMBH GERMANY	Approved
		QUALITROL COMPANY LLC USA	Approved
		RAJSHI ENGINEERS JHANSI	Approved
		Atvus, Kolkata	Approved
		SUKRUT UDYOG PUNE	Approved
138	AIR CELL	PRONAL ASIA MANUFACTURING MALAYSIA	Approved
		UNIRUB TECHNO INDIA PVT. LTD. PUNE	Approved
139	MOLG	QUALITROL COMPANY LLC, USA	Approved
		MESSKO GMBH GERMANY	Approved
		Atvus, Kolkata	Approved
		PRESS-N-FORGE, MUMBAI	Approved
		YOGYA ENTERPRISES, JHANSI	Approved
		SUKRUT UDYOG PUNE	Approved
140	OTI / WTI/ RTD	PRECIMEASURE CONTROLS (PVT.) LTD., BANGALORE	Approved
		PERFECT CONTROL, CHENNAI	Approved
141	OFI/WFI	SUKRUT UDYOG	Approved
		VIAT INSTRUMENTS PVT LTD	Approved

142	CONDENSER BUSHING-OIP	BHEL	Approved
		CGL	Approved
		GE T&D	Approved
143	ON LOAD TAP CHANGER	M/S BHEL BHOPAL	Approved
144	RADIATORS	TTP TECHNOLOGIES PVT LTD	Approved
		CTR MANUFACTURING INDUSTRIES LTD	Approved
		GURURAJ RADIATORS PVT LTD	Approved
		HI-TECH RADIATORS PVT LTD	Approved
		P.E. ENGINEERS PVT LTD	Approved
		TRANSPARES LIMITED	Approved
		BHEL, BHOPAL	Approved
145	N ₂ FIRE PROTECTION SYSTEM	As per Approved Vendors of Fire Detection system Package for the Main Plant.	
146	BUSHING-RIP	NANJING, CHINA	DR
		HSP, GERMANY	DR
		TRENCH, CHINA	DR
		ABB, SWITZERLAND	DR
		MOSER GLAZER, SWITZERLAND	DR
		YASH HIGH VOLTAGE INSULATORS (up to 145 kV), VADODARA	DR
		Dry Type Transformers(JHANSI WORKS)	
147	CRGO STEEL (Supplier)	Mill-A K Steel, USA/ Netherlands	Approved
		Metal One Corp.(Mill-Nippon Steel, Japan)	Approved
		TKES , Germany	Approved
		Novex Trading, Switzerland (Mills - Viz Stahl	Approved
		POSCO IPPC, Pune (Mill-Posco, Korea)	Approved
148	COPPER CONDUCTOR	Mimani Wires, Indore	Approved
		Malwa Strips, Dewas	Approved
		Copral Insulated, Hosur	Approved
		BCPL, Raisen/ Mandideep	Approved
		M P Cupro metals, Bhopal	Approved
		SCR Wires, Tunkur	Approved
		Chandra Metals, Allahabad	Approved
		Pearl, Bangalore	Approved
		COSMOS Conductors, Tunkur	Approved
		Vimlesh Industries, Sonipat	Approved
		Permali Wallace Ltd. Bhopal	Approved
		Mica Ply, Bhopal	Approved

149	Fiber Glass Sheet	Glass Fiber Ltd. Mumbai	Approved
		Surendra Engg. Bhopal	Approved
		Texplas, Haridwar	Approved

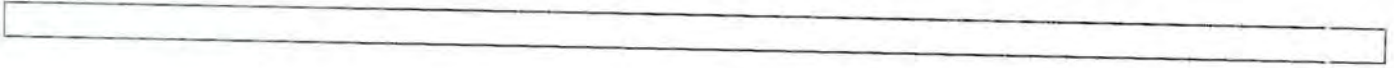
150	Epoxy Insulators	Baroda Mould and Die, Vadodara	Approved
		Baroda Bushing, Baroda	Approved
		India Insulator, Miraj	Approved
		Epothane Civelec, Ghaziabad	Approved
		Quality Engg. & In sulation products, Bhopal	Approved
		A-Bond Strands PVI. Ltd, Chennai	Approved
151	Epoxy Casting Materials	Huntsmann Chennai	Approved
		Atul Ltd, Val sad	Approved
152	Sheet Metal Enclosure	Electro Auto Bhopal	Approved
		Shrao Engg. Bhopal	Approved
		Bansal Fabwel, Jhansi	Approved
		Anupam Industries, Jhansi	Approved
		R Industries, Bhopal	Approved
		Bharat Fabricators, Bhopal	Approved
		Mahadev Ind. Bhopal	Approved
153	Temperature Scanner	Pecon, Ahemdabad	Approved
		Precimeasure, Bangalore	Approved
Power Transformer (Bhopal Works)			
154	PRECOMPRESSED PRESSED BOARDS	ABB INDIA LIMITED, MYSORE	Approved
		ABB AB, SWEDEN.	Approved
		KOKUSAI PULP AND PAPER CO. LTD. JAPAN	Approved
		KREMPEL GMBH GERMANY	Approved
		OJI F-TEX CO. LTD. JAPAN	Approved
		SENAPATHY WHITELEY PVT.LTD. BANGALORE	Approved
		WEIDMANN ELEC.TECHNOLOGY A.G. SWITZERLAND	Approved
		ENPAY ENDUSTRIYEL PAZARLAMA VE YATIRIM A.S. TURKIYE	Approved

155	TRANSFORMER TANK	BHARAT HEAVY ELECTRICALS LTD BHOPAL	Approved
		BHOPAL ENGINEERING GOVINDPURA BHOPAL	Approved
		DUNHIL PRODUCTS GOVINDPURA BHOPAL	Approved
		ELECTRO AUTO INDUSTRIES GOVINDPURA BHOPAL	Approved
		E.M. ELECTRO MECHANICALS PVT.LTD GOVINDPURA BHOPAL	Approved
		GTV ENGINEERING LTD. GOVINDPURA BHOPAL	Approved
		MECH & FAB INDUSTRIES GOVINDPURA BHOPAL	Approved
		SIGMA HEAVY ENGG. INDUSTRIES GOVINDPURA BHOPAL	Approved
		SATYAM (FAB) INDUSTRIES PVT. LTD., BHOPAL	Approved
		SHRAO ENGG.WORKS GOVINDPURA BHOPAL	Approved
156	STEEL PLATE	STEEL AUTHORITY OF INDIA LTD	Approved
		IISCO	Approved
		RINL	Approved
		TISCO	Approved
157	CRGO STEEL (Supplier)	AK STEEL INTERNATIONAL B.V., USA (Regd. office at Netherlands)	Approved
		JFE SHOJI TRADE CORPORATION, JAPAN (Auth. Agent POSCO PUNE)	Approved
		NIPPON STEEL, JAPAN (Auth. Trader METAL ONE JAPAN)	Approved
		VIZSTAL, RUSSIA (Auth. Trader NOVEX TRADING	Approved
		POSCO KOREA (Auth. Agent POSCO-PUNE)	Approved
158	INSULATING OIL	APAR INDUSTRIES LTD., CHEMBUR, MUMBAI	Approved
		RAJ PETRO SPECIALITIES PVT LTD MUMBAI	Approved
		SAVITA OIL TECHNOLOGIES LTD. MUMBAI	Approved
159	PAPER INSULATED COPPER CONDUCTOR (PICC)	SHREE CABLES & CONDUCTORS BHOPAL	Approved
		KSH INTERNATIONAL CHAKAN,PUNE	Approved
		RIMA TRANSFORMER & CONDUCTORS BANGALORE	Approved
		BCPL, MANDIDEEP	Approved
		BHANDARY POWER LINE, MANIPAL	Approved
		PRECISION WIRES INDIA LTD, SILVASSA.	Approved
		SHAKTI INSULATED WIRES PVT LTD, ANKLESHWAR	Approved
		CHANDRA METALS LTD. TELIARGANJ	Approved
		M.P.CUPRO METALS PVT.LTD.BHOPAL.	Approved
DELTA TRANS CONDUCTORS(P)LTD. MUMBAI	Approved		

160	CONTINUOUSLY TRANPOSED COPPER CONDUCTOR (CTC)	KSH INTERNATIONAL CHAKAN,PUNE	Approved
		PRECISION WIRES INDIA LTD, SILVASSA.	Approved
		SAMDONG KOREA	Approved
		ASTA, INDIA VADODARA	Approved
161	UNIMPREGNATED DENSIFIED WOOD	PERMALI WALLACE PVT. LTD. GOVINDPURA, BHOPAL	Approved
		SURENDRA COMPOSITES PVT LTD RAISEN	Approved
162	ON LOAD TAP CHANGER/ OFF CIRCUIT TAP CHANGER	BHEL BHOPAL	Approved
		ABB AB COMPONENTS SWEDEN	Approved
		MASCHINENFABRIK REINHAUSEN GERMANY	Approved
163	OIL CONDENSOR BUSHING	BHEL BHOPAL	Approved
		GE T&D INDIA LIMITED, HOSUR	Approved
		GRID SOLUTIONS, A GE AND ALSTOM JOINT VENTURE, ITALY	Approved
		ABB AB COMPONENTS, SWEDEN	Approved
		CG POWER & INDUSTRIAL SOLUTIONS LTD, NASHIK	Approved
164	BUCHLOZ RELAY	P&B WEIR ELECTRICAL-UNIT 10, U.K	Approved
		SUKRUT ELECTRIC CO.PVT.LTD. PUNE	Approved
		VIAT INSTRUMENTS PVT. LTD. KOLKATA	Approved
		VIAT INSTRUMENTS PRIVATE LIMITED UNIT- II SANAND	Approved
165	OTI / WTI/ RTD	PRECIMEASURE CONTROLS (PVT.) LTD., BANGALORE	Approved
		PERFECT CONTROL, CHENNAI	Approved
166	PRESSURE RELIEF VALVE	MESSKO GMBH GERMANY	Approved
		QUALITROL COMPANY LLC USA	Approved
		RAJSHI ENGINEERS JHANSI	Approved
		SUKRUT UDYOG PUNE	Approved
167	AIR CELL	PRONAL ASIA MANUFACTURING MALAYSIA	Approved
		UNIRUB TECHNO INDIA PVT. LTD. PUNE	Approved
168	MOLG	QUALITROL COMPANY LLC, USA	Approved
		MESSKO GMBH GERMANY	Approved
		SUKRUT UDYOG PUNE	Approved
169	OIL FLOW INDICATOR	SUKRUT UDYOG, PUNE	Approved
		VIAT INSTRUMENTS PRIVATE LIMITED UNIT- II AHMEDABAD	Approved

170	OIL PUMP	FLOW OIL PUMPS PVT. LTD. BANGALORE	DR
		NXL FLOW INSTRUMENTS BANGALORE	DR
		SPP PUMPS LIMITED ENGLAND	DR
171	COOLING FAN & MOTOR ASSLY	EPC ELECTRICAL PVT.LTD. KOLKATA	Approved
		MARATHON ELECTRIC MOTORS(INDIA)LTD KOLKATA	Approved
172	RADIATOR	BHEL BHOPAL	Approved
		CTR MANUFACTURING INDUSTRIES LTD. PUNE	Approved
		TTP TECHNOLOGIES PVT. LTD. BANGALORE	Approved
173	MARSHALLING BOX / CONTROL CABINET/RTCC	ASHOKA ELECTRONICS, BHOPAL	Approved
		ENTERPRISING ENGINEERS,BHOPAL	Approved
		PURNIMA ELECTRICAL INDUSTRIES , BHOPAL	Approved
		PYROTECH ELECTRONICS PVT. LTD. (UNIT-IV), UDAIPUR	Approved
		R.S.I.SWITCH GEAR PVT LTD. BHIWADI	Approved
174	TERMINAL CONNECTOR	KLEMMEN ENGINEERING CORPN., CHENNAI	Approved
		PEE VEE ENGG. ENTERPRISES, BANGALORE	Approved
175	GAS COLLECTING DEVICE	SUKRUT UDYOG, PUNE	Approved
		YOGYA ENTERPRISES, JHANSI	Approved
176	N2 BASED FIRE PROTECTION SYSTEM	CTR MANUFACTURING INDUSTRIES LTD. NAGPUR	DR
		EASUN-MR TAP CHANGERS (P) LTD, CHENNAI	DR
		SERGI TRANSFORMER EXPLOSION PREVENTION, GURGAON (HARYANA)	DR
		VENDERE SALES SERVICES (I) PVT. LTD. AURANGABAD	DR
		GK POWER TRANSMISSION COMPANY PVT. LTD., NAGPUR	DR
177	FIBRE OPTIC HOT SPOT TEMP MONITORING SYSTEM	LUXTRON CORPORATION DBA LUMASENSE TECHNOLOGIES, USA	DR
		MACHTECH ENGINEERING SOULUTIONS LLP, VASAI	DR
		PRECIMEASURE CONTROLS (PVT.) LTD, BANGALORE	DR
		QUALITROL COMPANY LLC, USA	DR

178	ONLINE DGA	A.EBERLE GMBH AND CO. KG GERMANY	DR
		MTE METER TEST EQUIPMENT AG SWITZERLAND (Installation & Commissioning of DGA by MTE-INDIA, New Delhi)	DR
		MORGAN SCHAFFER INC CANADA (M/S Doble)	DR
		GE KELMAN (Auth. Agent PCI PRECISION CASTING LIMITED DELHI)	DR
		QUALITROL COMPANY LLC USA	DR
		CHROMATOGRAPHY & INSTRUMENTS COMPANY, VADODARA	DR
179	INSULATOR	M/S BHEL ELECTRO-PORCELAIN DIVN. BANGALORE	Approved
		M/S CJI PORCELAIN PVT. LTD. KHURJA	DR
		M/S KHYATI CERAMICS. KALOL	DR
HT MOTOR COMPONENTS (Bhopal Works)			
180	CACA COOLER	FITWELL CORPORATION	Approved
		KARNATAKA ENGINEERING ENTERPRISES	Approved
		LAXMI ENGG. IND.	Approved
		MEHTA INDUSTRIES	Approved
181	CACW COOLER	FITWELL CORPORATION	Approved
		KARNATAKA ENGINEERING ENTERPRISES	Approved
		LAXMI ENGG. IND.	Approved
		MEHTA INDUSTRIES	Approved
182	ANTIFRICTION BEARING	SKF	Approved
		FAG	Approved
183	COPPER SECTION/ ROUND/FLAT ROTOR BAR	BHANWARDEEP COPPER STRIPS(P)LTD	Approved
		COPPER STRIPS PVT LTD	Approved
		CHANDRA METALS LTD.	Approved
		MALWA STRIPS PVT.LTD.	Approved
		OMEGA ROLLING MILLS PVT LTD.	Approved
184	FORGED SHAFT	BHARAT FORGE LIMITED	Approved
		BAY-FORGE LTD.	Approved
		BHARAT HEAVY ELECTRICALS LTD	Approved
		GHAZIABAD ISPAT UDYOG LTD	Approved
		KISCO CASTINGS (INDIA) LTD.	Approved
		KISAAN STEELS PVT.LTD	Approved
		PUNJAB HAMMERS PVT.LTD.	Approved
		PAHLADRAI STEEL FORGING WORKS, STEEL AUTHORITY OF INDIA LIMITED	Approved
185	ENAMELLED MICA TAPED COPPER CONDUCTOR.	M.P.CUPRO METALS PVT.LTD.	Approved
		NKM CABLES & STRIPS(PVT)LTD.	Approved
		SHREE CABLES & CONDUCTORS (P) LTD	Approved
		VIMLESH INDUSTRIES(P)LTD.	Approved



186	MICA TAPED CONDUCTORS	BHANWARDEEP COPPER STRIPS(P)LTD	Approved
		BCPL CONDUCTORS PVT.LIMITED	Approved
		COSMOS CONDUCTORS PVT.LTD.	Approved
		COPRAL INSULATED CONDUCTORS PVT.,LTD.	Approved
		CHANDRA METALS LTD.	Approved
		MIMANI WIRES PVT LTD	Approved
		MALWA STRIPS PVT.LTD.	Approved
		M.P.CUPRO METALS PVT.LTD.	Approved
		NKM CABLES & STRIPS(PVT)LTD.	Approved
		SHREE CABLES & CONDUCTORS (P) LTD	Approved
		VIMLESH INDUSTRIES(P)LTD.	Approved
187	RTD/BTD	JINDAL ELECTRONICS PRIVATE LIMITED	Approved
		TECHNO INSTRUMENTS	Approved
Note:-			
1	SUB ITEMS (not covered specifically in the Vendor List) for Power Transformer, DTT and HVR Transformer from BHEL Units.		BHEL Approved sources
2	SUB ITEMS (not covered specifically in the Vendor List) for HT Motors to be supplied from IS Motors.		BHEL Approved sources
3	SUB ITEMS (not covered specifically in the Vendor List) FOR Busduct package, supplies from BHEL-Rudrapur Unit		BHEL Approved sources

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl No	Item	Vendor Name	Status
1	Severe Service Control Valve for BFP Re-Circulation / SH & RH Attenuation Control Valve	DRESSER VALVE INDIA PVT. LTD, Coimbatore	Approved
		CONTROL COMPONENTS INC.	Approved
		KSB MIL CONTROLS LIMITED	Approved but only for 9000 Series Valves
2	Oil Trip Valves (FUEL OIL SYSTEM)	INSTRUMENTATION LTD., KERALA	Approved
		KSB MIL CONTROLS LIMITED, THIRISSUR DIST	Approved
		Kuehne Armaturen GmbH, Germany	DR
		SAMSON CONTROLS PRIVATE LIMITED	Approved
		MASCOT VALVES PVT. LTD, AHMEDABAD	Approved
3	NORMAL SERVICE CONTROL VALVE	DRESSER VALVE INDIA PVT. LTD, Coimbatore	Approved
		EMERSON PROCESS MANAGEMENT CHENNAI LIMITED, Chennai	Approved
		INSTRUMENTATION LTD., PALAKKAD	Approved
		Koso India Private Limited, Nashik	Approved
		PARCOL S.P.A.	Approved
		SEMPELL GmbH.	Approved
		DAUME REGELARMATUREN GMBH	DR
		KSB MIL CONTROLS LTD. Thrissur	Approved
		Valvitalia S.P.A. , Italy	Approved
		WALDEMAR PRUSS ARMATURENFABRIK GMBH, Germany	Approved
4	Severe Service Control Valve for AUX PRDS	Control Component India Pvt. Ltd. Chittoor	Approved
		Daume Regelarmaturen GmbH, Isernhagen, Germany	Approved
		HOLTER REGELARMATUREN GmbH & CO., HOLTESTUKENBR OCK	Approved
		Koso India Private Limited, Nashik	Approved
		PARCOL S.p.A Canegrate MI, ITALY	Approved
5	VALVE:SOOT BLOWER PR	DRESSER VALVE INDIA PVT. LTD, Coimbatore	Approved
		CONTROL COMPONENTS INC.	Approved
		KSB MIL CONTROLS LIMITED	Approved
6	LP STARTUP CONTROL VALVES	CONTROL COMPONENT INDIA PVT LTD	Approved
		INSTRUMENTATION LTD.,	Approved
		EMERSON PROCESS MANAGEMENT CHENNAI	DR
		WELLAND & TUXHORN AG	Approved
		KOSO INDIA PRIVATE LIMITED.	Approved
		KSB MIL CONTROLS LIMITED	Approved

Sl No	Item	Vendor Name	Status
7	HIGH PR. STARTUP SCV	CONTROL COMPONENT INDIA PVT LTD, Bangalore	Approved
		SEMPELL GmbH., Germany	Approved
		KOSO INDIA PRIVATE LIMITED., Nashik	Approved
		PARCOL S.P.A., Milan Italy	Approved
8	HPBP Control Valve	SULZER-CCI AG, SWITZERLAND	Approved
		CONTROL COMPONENT INDIA PVT LTD, Bangalore	Approved
9	LP BYPASS SYSTEM	SULZER-CCI AG, SWITZERLAND	Approved
		CONTROL COMPONENT INDIA PVT	Approved
		WELLAND & TUXHORN AG	Approved
		HOLTER REGELARMATUREN GMBH & CO.	DR
10	SEAL STEAM VALVE/ LEAK STEAM VALVE WITH PNEUMATIC ACTUATOR	SAMSON CONTROLS PVT. LTD.	Approved
		INSTRUMENTATION LIMITED	Approved
		KSB MIL CONTROLS LIMITED	Approved
		GE OIL & GAS INDIA PRIVATE LIM	Approved
		WELLAND & TUXHORN AG	Approved
		HOLTER REGELARMATUREN GMBH & CO.	Approved
11	Air Filter Regulator [Either from OEM/Authorised Source]	Parker Hannifin, Lebonon	Approved
		SHAVO NORGREN(INDIA)PVT LTD, BANGALORE	Approved
		JRU INSTRUMENTS (Formerly PLACKA)	Approved
12	HPT STEAM EVACUATION VALVE	GE OIL & GAS INDIA PRIVATE LTD	Approved
		HOLTER REGELARMATUREN GMBH & CO., GERMANY	Approved
		KSB MIL CONTROLS LIMITED, INDIA	Approved
		INSTRUMENTATION LIMITED	Approved
13	SOLENOID VALVE	ASCO (I) LTD.	Approved
		ROTEX AUTOMATION LTD.	Approved
		NUCON INDUSTRIES PVT LTD	Approved
		IMI NORGREN HERION PVT. LTD.	Approved
14	Bypass Rotameter	EUREKA INDLEQUIPMENT PVT., LTD., PUNE	Approved
		FLUIDYNE INSTRUMENTS PVT. LTD., CHEMBUR, MUMBAI	Approved
		PLACKA INSTRUMENTS INDIA PVT LTD, CHENNAI	Approved

SI No	Item	Vendor Name	Status
		INSTRUMENTATION ENGINEERS PVT LTD,JEEDIMATLA,HYDERABAD	Approved
		TRANSDUCER & CONTROL PVT LTD, HYDERABAD	Approved
15	C&I Laboratory Furniture/ Computer Furniture	ADARSHA CONTROL SYSTEMS PVT. LTD., BANGALORE	Approved
		COSMOS MEDIA PRODUCTS PVT. LTD,GREATER NOIDA,UP	Approved
		FEATHERLITE OFFICE SYSTEMS PVT. LTD,BANGALORE	Approved
		GODREJ AND BOYCE MANUFACTURING CO.,ROORKEY, UTTARAKAND.	Approved
		HARMONY SYSTEMS, GREATER NOIDA, UP	Approved
		OTS OFFICETECH SYSTEMS (P) LTD,BANGALORE	Approved
		PYROTECH WORKSPACE SOLUTIONS PVT. LTD, UDAIPUR	Approved
16	CBLM Sys (3D Type)	APM, Israel	Approved
		EIP TECHNOLOGIES PVT. LTD.NOIDA/ Process Management Mumbai	Approved
17	CBLM Sys (Ultrasonic Or RADAR Type) Panel	ENDRESS + HAUSER INDIA PVT. LTD. MUMBAI	Approved
		KISTLER MORSE AUTOMATION LTD.,HYDERABAD	Approved
		KROHNE MARSHALL PVT LTD.,PUNE	Approved
		VEGA INDIA LEVEL & PRESSURE MEASUREMENT PVT LTD.,MUMBAI.	Approved
		EMERSON PROCESS MANAGEMENT ,MUMBAI.	Approved
		SIEMENS LIMITED, BANGALORE	Approved
18	CBLM Sys(StrainGauge Type) Sensor & Panel	KISTLER - MORSE AUTOMATION LTD., HYDERABAD	Approved
		VENTURE MEASUREMENT,US	Approved
		THERMO RAMSEY INC ,CHICAGO,US	Approved
19	CO Analyser	CHEMTROLS INDUSTRIES LIMITED, POWAI, MUMBAI	Approved
		FORBES MARSHALL CODEL PVT. LTD., PUNE	Approved
		SICK INDIA PVT LTD,MUMBAI.	Approved
		MARVEL ENGG COMPANY, CHENNAI	Approved

SI No	Item	Vendor Name	Status
20	Compression Fittings	PARKER HANNIFIN INDIA PVT. LTD.,CHENGAL PATTU,TAMILANADU	Approved
		PRECISION ENGG INDUSTRIES, MUMBAI	Approved
		SWAGELOCK,USA	Approved
		TROUVAY & CAUVIN FRANCE	Approved
		HOKE	Approved
		METPRESS ENGINEERING WORKS, KOLKATA	DR
21	Condensate Pots	BALDOTA VALVE AND FITTING COMPANY PVT LTD,MUMBAI	Approved
		FLOWTECH, KOLKATA	Approved
		PRECISION ENGG INDUSTRIES, MUMBAI	Approved
		EXCEL HYDRO-PNEUMATICS PVT LTD,MUMBAI	DR
		PMT ENGINEERS,N.H.NO.-8, NARODA, AHMEDABAD	DR
		HP VALVES & FITTINGS (INDIA) PVT. L,MOGAPPAIR WEST, CHENNAI	DR
		ARCELLOR CONTROLS (INDIA), Ahmedabad	DR
22	Dust Density (Opacity) Monitor(Analyzer)	CODEL INTERNATIONAL LTD ,UK	Approved
		DURAG GMBH AND CO KG, HUMBURG,GERMANY	Approved
		LAND INSTRUMENTS INTERNATIONAL, ENGLAND (UK)	Approved
		SICK MAIHAK GMBH,GERMANY	Approved
23	Dust Density (Opacity) Monitor(panel)	CHEMTROLS INDUSTRIES LIMITED, POWAI,	Approved
		DURAG INDIA INSTRUMENTATION PVT LTD,BANGALORE	Approved
		SICK INDIA PVT LTD,MUMBAI.	Approved
		MARVEL ENGG COMPANY, CHENNAI	Approved
24	E/P Convertor(if required)	FAIRCHILD INDIA PRIVATE LIMITED, NOIDA	Approved
		WATSON SMITH LTD ,UK	Approved
25	Smart Positioner	EMERSON PROCESS MANAGEMENT	Approved
		SIMENS	Approved
		ABB	Approved
		ASTEC VALVE & FITTINGS PVT. LTD,MUMBAI	Approved
		AURA INC, NEW DELHI	Approved
		BALDOTA VALVE AND FITTINGS PVT LTD,MUMBAI	Approved
		EXCEL HYDRO-PNEUMATICS PVT LTD, MUMBAI	Approved
		FLOWTECH, KOLKATA	Approved

SI No	Item	Vendor Name	Status
26	Erection Material	FLUID CONTROLS PVT. LTD,PUNE	Approved
		HP VALVES & FITTINGS (INDIA) PVT LTD, CHENNAI	Approved
		MET LOK HYDRO PENUMATICS PVT LTD,MUMBAI	Approved
		METPRESS ENGINEERING WORKS, KOLKATA	Approved
		PANAM ENGINEERS LTD,MUMBAI	Approved
		PMT ENGINEERS,AHMEDABAD	Approved
		PRECISION ENGG INDUSTRIES, MUMBAI	Approved
		V.K.INDUSTRIES, BANGALORE	Approved
		VIKAS INDUSTRIAL PRODUCTS, NOIDA	Approved
		PAUL INDUSTRIES,HOWRAH	Approved
		NAV DURGA FORGING AND FITTINGS,THANE,MAHARASTRA	Approved
		SANDEEP INDUSTRIES,JALANDHAR,PUNJAB	Approved
27	FGA Insitu (SOX/NOX/CO/CO2)(Analyzer)	CODEL INTERNATIONAL LTD ,UK	Approved
		SICK MAIHAK GMBH,GERMANY	Approved
		CODEL INTERNATIONAL LTD ,UK	Approved
		SICK MAIHAK GMBH,GERMANY	Approved
28	FGA Insitu (SOX/NOX/CO/CO2)(panel)	CHEMTROLS INDUSTRIES LIMITED, POWAI, MUMBAI	Approved
		FORBES MARSHALL CODEL PVT. LTD., PUNE	Approved
		SICK INDIA PVT LTD,MUMBAI.	Approved
		ICE (ASIA) PRIVATE LIMITED, MUMBAI	Approved
29	FGA Sys(SOX/NOX/CO)Samplg Type(Analyzer)	ABB INSTRUMENTATION LTD,GLOUCESTERSHIRE,UK	Approved
		EMERSON PROCESS MANAGEMENT INDIA PVT LTD, MUMBAI	Approved
		FUJI ELECTRIC SYSTEMS CO. , LTD,SHINAGAWA-KU, TOKYO	Approved
		SICK MAIHAK GMBH,GERMANY	Approved
		SIEMENS LIMITED, BANGALORE	Approved
		YOKOGAWA ELECTRIC CORPORATION,TOKYO,JAPAN	Approved
30	FGA Sys(SOX/NOX/CO)Sampling Type(panel)	ABB LTD, Bangalore	Approved
		ADAGE AUTOMATION PRIVATE LIMITED, KHAIRANE MIDC, NAVI MUMBAI	DR
		CHEMTROLS INDUSTRIES LIMITED, POWAI, MUMBAI	Approved
		EMERSON PROCESS MANAGEMENT INDIA PVT LTD, MUMBAI	Approved

Sl No	Item	Vendor Name	Status
		YOKOGAWA INDIA LIMITED, BANGALORE	Approved
31	H ₂ GAS ANALYSER CABINET	SIEMENS LTD.	Approved
		YOKOGAWA INDIA LIMITED	Approved
		ABB INDIA LTD	Approved
32	GI Pipes	BALDOTA VALVE AND FITTINGS PVT LTD, MUMBAI	Approved
		BHUWALKA PIPES LIMITED, BANGALORE.	Approved
		FLOWTECH, KOLKATA	Approved
		JINDAL INDUSTRIES LIMITED, NEW DELHI	Approved
		METPRESS ENGINEERING WORKS, KOLKATA	Approved
		NATHMAL DAGA & CO, BANGALORE	Approved
		PIPE CORPORATION PVT LTD, BANGALORE	Approved
		PRECISION ENGG INDUSTRIES, MUMBAI	Approved
		SURYA ROSHNI LTD, BAHADURGARH, HARYANA.	Approved
		V.K. INDUSTRIES, BANGALORE	Approved
		VIKAS INDUSTRIAL PRODUCTS, NOIDA	Approved
		SANDEEP INDUSTRIES, JALANDHAR, PUNJAB	Approved
		MKK METAL SECTIONS PVT LTD, VELLORE, TAMILANADU	Approved
		RIDDHI STEEL AND TUBE LIMITED, AHMEDABAD	Approved
		INDUS TUBES LTD, GHAZIABAD, UP	Approved
33	Impulse Pipes (Alloy steel)	BHARAT HEAVY ELECTRICALS LTD, TIRUCHIRAPALLI, TAMILANADU	Approved
		EVERGREEN SEAMLESS PIPES & TUBES PVT LTD, BANGALORE	DR
		GANPAT METALS PVT. LTD., MUMBAI	DR
		JINDAL SAW LTD, CHENNAI	Approved
		RIDHI SIDDHI STEEL CORPORATION, MUMBAI	DR
		TROUVAY CAUVIN, GULF	Approved
		SUMITOMO CORPORATION, JAPAN.	Approved
		TPS TECHNITUBE ROHREN WERKE	Approved
		BHARAT HEAVY ELECTRICALS LTD, TIRUCHIRAPALLI, TAMILANADU.	Approved
		EVERGREEN SEAMLESS PIPES & TUBES PVT LTD, BANGALORE	DR
		GANPAT METALS PVT. LTD., MUMBAI	DR
		HEAVY METAL AND TUBES LTD, AHMEDABAD/MUMBAI	DR

Sl No	Item	Vendor Name	Status
34	Impulse Pipes(Carbon Steel)	INDIAN SEAMLESS METAL TUBES LTD,PUNE.	Approvec
		JINDAL SAW LTD,CHENNAI	Approvec
		RIDHI SIDDHI STEEL CORPORATION,MUMBAI	DR
		TROUVAY CAUVIN,GULF	Approved
		SUMITOMO CORPORATION,JAPAN.	Approved
		SUMITOMO CORPORATION ASIA & OCEANIA PTE. LTD.,SINGAPORE	Approved
		TPS TECHNITUBE ROHREN WERKE GMBH,DAUN,GERMANY	Approved
35	Impulse Pipes(Stainless Steel)	RATNAMANI METALS & TUBES LTD, AHMEDABAD	Approved
		SUMITOMO CORPORATION,JAPAN.	Approved
		TPS TECHNITUBE ROHREN WERKE	Approved
		EVERGREEN SEAMLESS PIPES & TUBES PVT	DR
		GANPAT METALS PVT. LTD.,MUMBAI	DR
		RIDHI SIDDHI STEEL CORPORATION,MUMBAI	DR
		SUMITOMO CORPORATION,JAPAN.	Approved
36	Instrument Valve	TROUVAY CAUVIN,GULF	Approved
		BALDOTA VALVE AND FITTINGS PVT LTD,MUMBAI	Approved
		BHARAT HEAVY ELECTRICALS LTD, TIRUCHIRAPALLI,TAMILANADU.	Approved
		EXCEL HYDRO-PNEUMATICS PVT LTD, MUMBAI	Approved
		INSTRUMENTATION LIMITED, PALGHAT	Approved
		METPRESS ENGINEERING WORKS, KOLKATA	Approved
37	Lab Items Mechanical	PRECISION ENGG INDUSTRIES, MUMBAI	Approved
		FLUKE TECHNOLOGIES PVT. LTD., ANDHERI(EAST), MUMBAI	Approved
		GE OIL AND GAS INDIA PVT. LTD,PUNE.	Approved
		ISOTHERMAL TECHNOLOGY PVT. LTD., DELHI	Approved
		NAGMAN INSTMTS. & ELECTRONICS (P) L, CHENBARAMBAKKAM,CHENNAI.	Approved
		WIKA INSTRUMENTS INDIA PVT. LTD., VILLAGE KESNAND, PUNE	Approved
		CHEMTROLS ENGG. (P) LTD.	Approved
		LEVCON INSTRUMENTS (P) LTD.	Approved
		S. B. ELECTRO-MECHANICALS PVT. LTD.	Approved
		V. AUTOMAT & INSTRUMENTS PVT. LTD.	Approved

SI No	Item	Vendor Name	Status
38	LEVEL GAUGE	DK INSTRUMENTS	Approved
		SIGMA INSTRUMENTS COMPANY	Approved
		IGEMA GMBH	Approved
		ASIAN INDUSTRIAL VALVES AND	Approved
		CESARE BONETTI S.P.A	Approved
39	Level Switch Capacitance Type	LEVCON INSTRUMENTS PVT. LTD.	Approved
		ENDRESS & HAUSER	Approved
40	Level Switch Conductivity Type	EMERSON PROCESS MANAGEMENT(I)PVT. L, M.I.D.C.PAWANE,NAVI MUMBAI	Approved
		IGEMA GMBH,MUNSTER,GERMANY.	Approved
		LEVELSTATE SYSTEMS LTD,U.K	Approved
		SOLARTRON TRANSDUCER, U.K	Approved
41	Level Switch Float Type	CHEMTROLS INDUSTRIES LIMITED, POWAI, MUMBAI	Approved
		IGEMA GMBH,MUNSTER,GERMANY.	Approved
42	Level Switch Top mounted	CHEMTROLS INDUSTRIES LIMITED, POWAI, MUMBAI	Approved
		D.K.INSTRUMENTS PVT. LTD., DHAKURIA, KOLKATA	Approved
		LEVCON INSTRUMENTS Pvt LTD, KOLKATA	Approved
		PUNE TECHTROL PVT LTD,PUNE	Approved
		IGEMA GMBH,MUNSTER,GERMANY.	Approved
		SBEM PRIVATE LIMITED, PUNE	Approved
		SIGMA INSTRUMENTS COMPANY,BHANDUP(WEST),MAHARASTRA.	Approved
		V.AUTOMAT & INSTRUMENTS PVT. LTD., NEW DELHI	Approved
43	LIE/LIR	CHEMIN CONTROLS AND INSTRUMENTATION, PONDICHERRY	Approved
		PYROTECH ELECTRONICS (P) LTD.,UDAIPUR	Approved
44	LOCAL GAUGE BOARD (LGBs)	PANAM CONTROLS - HYDERABAD, INDIA	Approved
		NAGARJUNA FABRICATORS - HYDERABAD, INDIA	DR
		INSTRUMENTATION LTD. - KOTA, INDIA	Approved
		PYROTECH ELECTRONICS PVT.LTD. - UDAIPUR, INDIA	Approved
		PROCON INSTRUMENTATION PVT.LTD - CHENNAI, INDIA	Approved

SI No	Item	Vendor Name	Status
45	Oxygen Analyser (LT)	EMERSON PROCESS MANAGEMENT INDIA PVT LTD, MUMBAI	Approved
		EMERSON PROCESS MANAGEMENT INDIA PVT LTD, MUMBAI	Approved
46	Oxygen Analyser (LT) Panel & Accessories	EMERSON PROCESS MANAGEMENT INDIA PVT	Approved
47	Pneumatic Actuator	EMERSON PROCESS MANAGEMENT CHENNAI, CHENNAI	Approved
		INSTRUMENTATION LIMITED, PALGHAT	Approved
		MIL CONTROLS LIMITED, ALWAYS , KERALA	Approved
48	SNUBBERS	LISEGA SE	Approved
		MAURER SOHNE GMBH & CO.KG	Approved
		JIANGSU ROAD DAMPING TECHNOLOGY CO.	Approved
		PIPE SUPPORT SYSTEMS GMBH INTL.	Approved
		QUIRI HYDROMECHANIQUE,	Approved
		SANWA TEKKI CORPORATION	Approved
49	Pressure & Differential Pressure Gauges	A.N.INSTRUMENTS PVT LTD, CHENNAI	Approved
		PRECISION MASS PRODUCTS PVT. LTD,GANDHI NAGAR,GUJARAT.	Approved
		BAUMER TECHNOLOGIES INDIA LTD,VAPI	Approved
		FORBES MARSHALL(HYD) LTD., HYDERABAD	Approved
		GAUGES BOURDON (INDIA) PVT. LTD, MUMBAI.	Approved
		GOA THERMOSTATIC INSTRUMENTS, GOA	Approved
		MANOMETER (INDIA) PVT. LTD.,, MUMBAI	Approved
50	Pressure & Differential Pressure Switch (Critical/Tripping applications of Boiler & Turbine)	DELTA CONTROLS LTD	Approved
		SOR INC.	Approved
		ASCROFT, USA	Approved
		DRESSER INDUSTRIES INC.	Approved
51	Pressure & Differential Pressure Switch (Non Critical applicaion)	PRECISION MASS PRODUCTS PVT. LTD,GANDHI NAGAR,GUJARAT.	Approved
		SWITZER PROCESS INSTRUMENTS PVT. LT, T Nagar, CHENNAI	Approved
		ASHCROFT INDIA	Approved
		TRAFAG CONTROLS INDIA PVT. LTD., IMT MANESAR, GURGAON	Approved
		CHEMTROLS SAMIL (INDIA) PVT. LTD., POWAI , MUMBAI	Approved
		INSTRUMENTATION ENGINEERS PVT LTD	Approved

SI No	Item	Vendor Name	Status
52	Sight Flow Indicator	SIGMA INSTRUMENTS CO.	Approved
		D.K.INSTRUMENTS PVT. LTD.	Approved
		LEVCON INSTRUMENTS Pvt LTD, KOLKATA	Approved
		V.AUTOMAT & INSTRUMENTS PVT LTD.	Approved
		FORBES MARSHALL LTD.	Approved
53	FLOW SWITCH	GENERAL INSTRUMENTS CONSORTIUM	Approved
		KROHNE MARSHALL	Approved
		SWITZER INSTRUMENT CO.	Approved
54	FLOW ELEMENTS (ORIFICE/NOZZLE)	MICRO PRECISION PRODUCTS	Approved
		M/S ESPL KOLKATA	Approved
		IL PALGHAT	Approved
55	IMPACT HEAD TYPE ELEMENT	DETRIECH / EMERSON PROCESS	Approved
		MIDWEST	Approved
		STARMECH	Approved
		SWITZER INSTRUMENT CO.	Approved
		VERIS INC.	Approved
		EMERSON PROCESS MANAGEMENT (INDIA) PVT. LTD.	Approved
56	RRI FOR CVP	BRAUN GMBH INDUSTRIE - ELEKTRONIK	Approved
		SHINKAWA ELECTRIC CO LTD.,	Approved
		BENTLY NEVADA, LLC	Approved
57	Socket Weld Fittings	BALDOTA VALVE AND FITTINGS PVT LTD,MUMBAI	Approved
		METPRESS ENGINEERING WORKS, KOLKATA	Approved
		V.K.INDUSTRIES, BANGALORE	Approved
		MULTIMETAL INDUSTRIES,	DR
		COMFIT & VALVES PVT LTD.	DR
		DYNAFLUID VALVES AND FLOW	DR
		PRESHZINGER ENGINEERING CO PVT LTD.	DR
		FLUID CONTROLS PRIVATE LTD.,	DR
		VALTEX INDIA,	DR
		H.P.VALVES & FITTINGS INDIA PVT LTD	DR
VIKAS INDUSTRIAL PRODUCTS, NOIDA	Approved		
58	Steam and Water analysis Sys(Analyzer)	ABB INDUSTRIES ,SWITZERLAND.	Approved
		ABB INDUSTRIES ,SWITZERLAND.	Approved
		HACH LANGE S.A.R.L,VESENAZ,SWITZERLAND.	Approved
		METTLER-TOLEDO INDIA PVT. LTD., POWAI, MUMBAI	Approved
		EMERSON PROCESS MANAGEMENT,USA	Approved

SI No	Item	Vendor Name	Status
		SWAN ANALYTISCHE INSTRUMENTE AG, SWITZERLAND.	Approved
		THERMO ORION INC., CHELMSFORD	Approved
59	Steam and Water analysis System(Panel)	ABB LIMITED, PEENYA INDL. AREA, BANGALORE.	Approved
		EMERSON PROCESS MANAGEMENT INDIA PVT LTD,MUMBAI.	Approved
		FORBES MARSHALL PVT LTD, PUNE	Approved
60	THERMOWELL	INDUSTRIAL INSTRUMENTATION	Approved
		GENERAL INSTRUMENTS CONSORTIUM	Approved
		MICRO PRECISION PRODUCTS (P) LTD.	Approved
		DETRIV INSTRUMENTATION &	Approved
		TEMPESENS INSTRUMENTS (I) PVT.LTD.,	Approved
		GOA INSTRUMENT INDUSTRIES PVT LTD.	Approved
		BAUMER TECHNOLOGIES INDIA PVT.LTD,	Approved
61	Temperature Elements	DETRIV INSTRUMENTATION AND ELECTRONICS	Approved
		OKAZAKI MANUFACTURING COMPANY,JAPAN.	Approved
		PYRO ELECTRIC INSTRUMENTS GOA PVT.LTD,GOA.	Approved
		TECHNO INSTRUMENTS,GANDHINAGAR,GUJARAT.	Approved
		TEMPESENS INSTRUMENTS (I) PVT LTD,UDAIPUR,RAJASTHAN	Approved
		BAUMER TECHNOLOGIES INDIA LTD,MUMBAI/VAPI	Approved
		WIKA INSTRUMENTS INDIA PVT. LTD,PUNE	Approved
62	Temperature Gauges	A.N.INSTRUMENTS PVT LTD, CHENNAI	Approved
		PRECISION MASS PRODUCTS PVT. LTD,GANDHI NAGAR(Earlier Aschcroft)	Approved
		BAUMER TECHNOLOGIES INDIA LTD,MUMBAI/VAPI	Approved
		FORBES MARSHALL(HYD) LTD., HYDERABAD	Approved
		GOA THERMOSTATIC INSTRUMENTS, GOA	Approved
		WIKA INSTRUMENTS INDIA PVT. LTD,PUNE	Approved
		BALDOTA VALVE AND FITTINGS PVT LTD,MUMBAI	Approved
		EXCEL HYDRO-PNEUMATICS PVT LTD, MUMBAI	Approved
		FLOWTECH, KOLKATA	Approved

SI No	Item	Vendor Name	Status
63	Valve Manifolds	Parker HANNIFIN INDIA PVT. LTD,LEBANON (M/s Super technical dealer for Parker)	Approved
		METPRESS ENGINEERING WORKS, KOLKATA	Approved
		MICRO PRECISION PRODUCTS PVT LTD, FARIDABAD	Approved
64	Vibration Monitoring System (Sensors, Monitors & Panel)	BENTLY NEVADA INC, MINDEN, U.S.A.	Approved
		MEGGITT SA,SWITZERLAND.	Approved
		SHINKAWA ELECTRTIC CO., LTD, TOKYO, JAPAN	Approved
65	Mercury Analyzer	DURAG ,BANGALORE(MAKE OF DURAG GERMANY)	Approved
		THERMO FISHER INDIA ,MUMBAI(MAKE OF THERMO FISHER SCIENTIFIC CONTROL,USA)	Approved
		ANALYSER INSTRUMENTATION CO PVT LTD,KOTA,RAJASTHAN(MAKE OF PS ANALYTICAL ,UK)	Approved
		SICK INDIA PVT LTD,MUMBAI.(MAKE OF SICK GMBH,GERMANY)	Approved
66	24 V DC SMPS based Battery Charger	CHHABI ELECTRICALS PVT. LTD.,JALGAON	Approved
		VERTIV ENERGY PVT LTD (FORMERLY EMERSON NETWORK POWER INDIA), Ambernath	Approved
67	24 V DC thyristor based Battery Charger	CHHABI ELECTRICALS PVT. LTD.,BANGALORE	Approved
		CHLORIDE POWER SYSTEMS & SOLUTIONS LTD, Kolkata	Approved
		STATCON POWER CONTROLS LTD.,KULICHNAGAR, DHAULANA, HAPUR	Approved
68	Cable trays	shall be as per approved sources listed in Electrical Equipment list in Main Plant Package area.	
69	Electronic Transmitter - Pr. / Diff. Pr.	EMERSON PROCESS MANAGEMENT, Navi Mumbai	Approved
		FUJI ELECTRIC CO., LTD,OSAKI 1-CHOME, SHINAGAWA-KU, TOKYO	Approved
		HONEYWELL AUTOMATION INDIA LTD.,PUNE	Approved
		YOKOGAWA ELECTRIC CORPORATION,TOKYO 180	Approved

SI No	Item	Vendor Name	Status
		YOKOGAWA INDIA LIMITED,BANGALORE	Approved
70	Nickel-Cadmium Battery (Fiber type/Pocket type) for UPS and Charger	HBL POWER SYSTEMS LTD,Hyderabad	Approved
71	Flexible conduit (Lead Coated)	BANSAL LABORATORIES AND,GOVINDPURA INDL. AREA, BHOPAL	Approved
		PLICA INDIA PVT LTD,GHAZIABAD, U.P.	Approved
72	Flexible conduit (Zinc Coated)	BANSAL LABORATORIES AND,GOVINDPURA	Approved
		PLICA INDIA PVT LTD,GHAZIABAD, U.P.	Approved
73	HART Communicator	ABB LIMITED,PEENYA INDL. AREA, BANGALORE.	Approved
		EMERSON PROCESS MANAGEMENT, Navi Mumbai	Approved
		HONEYWELL AUTOMATION INDIA LTD.,PUNE	Approved
		YOKOGAWA INDIA LIMITED,BANGALORE	Approved
74	Instrumentation & Control cables (PVC, FRLS Type)	ADVANCE CABLE TECHNOLOGIES (P) LTD.,GEDDALAHALLI,ASWATHNAGAR,BANGAL ORE	Approved
		DELTON CABLES LIMITED, FARIDABAD	Approved
		KEI INDUSTRIES LIMITED,BHIWADI	Approved
		LAPP INDIA PVT. LTD.,PHASE II, ANEKAL TALUK, BANGALORE	Approved
		POLYCAB WIRES PVT. LTD, DAMAN	Approved
		THERMO CABLES LIMITED, HYDERABAD	Approved
75	Junction Box (Explosion Flame Proof)	CHEMIN CONTROLS AND INSTRUMENTATION,PONDICHERRY	Approved
		ELECTRO MECHANICAL (INDIA),KOLKATA	Approved
		FLAMEPACK, Mumbai	Approved
		K.S.INSTRUMENTS PVT LTD,Yeshwantpur, Bangalore	Approved
		KHODAY CONTROL SYSTEMS PVT. LTD.,PEENYA INDUSTRIAL ESTATE, BANGALORE	Approved
		MANISHA COMPOSITEK PVT. LTD.,PUNE	Approved
		PRAMMEN INDUSTRIES,PUDUKKOTTAI	Approved
		PYROTECH ELECTRONICS (P) LTD.,UDAIPUR	Approved
76	Junction Box (FRP)	K.S.INSTRUMENTS PVT LTD,Bangalore	Approved
		CHEMIN CONTROLS AND INSTRUMENTATION,PONDICHERRY	Approved

SI No	Item	Vendor Name	Status
		MANISHA COMPOSITEK PVT. LTD.,PUNE	Approved
77	Junction Box (Metal)	CHEMIN CONTROLS AND INSTRUMENTATION,PONDICHERRY	Approved
		ELECTRO MECHANICAL (INDIA),KOLKATA	Approved
		K.S.INSTRUMENTS PVT LTD,BANGALORE	Approved
		KHODAY CONTROL SYSTEMS PVT. LTD, BANGALORE	Approved
		MANISHA COMPOSITEK PVT. LTD.,PUNE	Approved
		PRAMMEN INDUSTRIES,PUDUKKOTTAI	Approved
		PYROTECH ELECTRONICS (P) LTD.,UDAIPUR	Approved
78	Junction Boxes (Die cast aluminium)	PYROTECH ELECTRONICS (P) LTD.,UDAIPUR	Approved
		K.S.INSTRUMENTS PVT LTD,Yeshwantpur, Bangalore	Approved
		MANISHA COMPOSITEK PVT. LTD.,PUNE	Approved
79	Lead Acid - Plante Battery for UPS and Charger	shall be as per approved sources listed in Electrical Equipment list in Main Plant Package area.	
80	Lead Acid - Tubular Battery for UPS and Charger	shall be as per approved sources listed in Electrical Equipment list in Main Plant Package area.	
81	ULTRASONIC FLOW METERS	FLEXIM Flexible Industriemesstechnik GmbH	Approved
		NIVUS GMBH	Approved
82	Level Transmitter (RADAR type)	EMERSON PROCESS MANAGEMENT, Navi Mumbai	Approved
		ENDRESS + HAUSER (I) PVT. LTD.,L.B.S. Marg, Vikhroli (West), Mumbai	Approved
		MAGNETROL INTERNATIONAL NV,BELGIUM	Approved
		VEGA GRIESHABER K.G,SCHILTACH	Approved
83	Level Transmitter (Ultrasonic type)	SIEMENS,BANGALORE	Approved
		EMERSON PROCESS MANAGEMENT, Navi Mumbai	Approved
		ENDRESS + HAUSER (I) PVT. LTD.,L.B.S. Marg, Vikhroli (West), Mumbai	Approved
		ENDRESS+HAUSER GMBH+CO.KG,WEIL AM RHEIN	Approved

SI No	Item	Vendor Name	Status
84	LT Power Cables (PVC / XLPE Insulation)	shall be as per approved sources listed in Electrical Equipment list in Main Plant Package area.	
85	Maintenance & Calibration Equipments (Electrical Package)	shall be as per approved sources listed in Electrical Equipment list in Main Plant Package area.	
86	Rigid Conduit	shall be as per approved sources listed in Electrical Equipment list in Main Plant Package area.	
87	RTD - TT Junction Box (FRP)	K.S.INSTRUMENTS PVT LTD,Yeshwantpur, Bangalore	Approved
		MANISHA COMPOSITEK PVT. LTD.,PUNE	Approved
88	RTD - TT Junction Box (Metal)	CHEMIN CONTROLS AND INSTRUMENTATION,PONDICHERRY	Approved
		ELECTRO MECHANICAL (INDIA),KOLKATA	Approved
		K.S.INSTRUMENTS PVT LTD,Yeshwantpur, Bangalore	Approved
		KHODAY CONTROL SYSTEMS PVT. LTD.,PEENYA INDUSTRIAL ESTATE, BANGALORE	Approved
		MANISHA COMPOSITEK PVT. LTD.,PUNE	Approved
		PRAMMEN INDUSTRIES,PUDUKKOTTAI	Approved
		PYROTECH ELECTRONICS (P) LTD.,UDAIPUR	Approved
89	Thermocouple extension cables (PVC, FRLS Type)	ADVANCE CABLE TECHNOLOGIES (P) LTD.,GEDDALAHALLI,ASWATHNAGAR,BANGALORE	Approved
		DELTON CABLES LIMITED,FARIDABAD	Approved
		KEI INDUSTRIES LIMITED,BHIWADI	Approved
		POLYCAB WIRES PVT. LTD, DAMAN	Approved
		THERMO CABLES LIMITED HYDERABAD	Approved
89	UPS System with ACDB	VERTIV ENERGY PRIVATE LIMITED	Approved
		HITACHI HI-REL POWER ELECTRONICS,Gandhinagar	Approved
90	UPS System with ACDB ((3Ph I/p, 1Ph O/p) IGBT based Rectifier	VERTIV ENERGY PRIVATE LIMITED	Approved
		HITACHI HI-REL POWER ELECTRONICS,Gandhinagar	Approved

SI No	Item	Vendor Name	Status
91	CCTV SYSTEM (IP BASED-OEM) WITH ACCESSORIES .	PELCO, USA	Approved
		BOSCH	Approved
		HONEYWELL, USA	Approved
92	CCTV SYSTEM (IP BASED) SYSTEM INTEGRATORS	HARITASA CHECKMATE ELECTRONICS, BANGALORE	Approved
		SCHNEIDER ELECTRIC, BANGALORE	Approved
		TYCO FIRE AND SECURITY, BANGALORE	Approved
		HONEYWELL AUTOMATION, BANGALORE	Approved
		Siemens, BANGALORE	Approved
		SCORE INFORMATION TECHNOLOGIES LTD, KOLKATA	Approved
		WIPRO INFOTECH, BANGALORE	Approved
		ECIL, HYDERABAD	Approved
93	Public Addressing System (IP BASED-OEM)	COMMEND, AUSTRIA	Approved
		INDUSTRONICS, GERMANY	Approved
		ARMTEL, RUSSIA	Approved
		ZENITEL, SWEDEN	Approved
94	Public Addressing System (IP BASED) SYSTEM INTEGRATORS	AISHAN TECHNOLOGIES INDIA PVT LTD, BANGALORE	Approved
		INDUSTRONIC & INDCOM ENGINEERS	Approved
95	Large Video Screen	BARCO ELECTRONICS ,NOIDA	Approved
		PLANER-USA /PYROTECH-UDAIPUR	Approved
		CHRISTIE-USA	Approved
96	MODULAR DESK/CRT Desk	PYROTECH WORKSPACE SOLUTIONS PVT LTD , UDAIPUR	Approved
		CHEMIN CONTROLS AND INSTRUMENTATION , PONDICHERRY	Approved
		COSMOS MEDIA PRODUCTS PVT LTD ,NOIDA	Approved
		HARMONY SYSTEMS ,NEWDELHI	Approved
97	CONTROL PANEL/RACK	PYROTECH	Approved
		RITTAL	Approved
		BHEL	Approved
98	Dot matrix Printer	WIPRO	Approved
		EPSON	Approved
		TVS	Approved
		LEXMARK	Approved
99	WORKSTATIONS , SERVER, PC'S	DELL	Approved
		HP	Approved

Sagardighi Extn. U#5 (PROJ3)

Control and Inst. List

Ref: SGMPO3/AV/8/047

SI No	Item	Vendor Name	Status
100	PRINTERS (Laser/Inkjet)	HP	Approved
101	TFT MONITOR	DELL	Approved
		HP	Approved
102	MINI UPS FOR HMI	HITACHI HI-REL POWER ELECTRONICS, BANGALORE	Approved
		POWERTRONIX SYSTEMS LTD., BANGALORE.	Approved
		SCHNEIDER ELECTRIC, BANGALORE	Approved
		EMERSON NETWORK INDIA, BANGALORE	Approved
		EMERSON NETWORK, PUNE	Approved
103	GIU	DIGITAL INSTRUMENTS & CONTROL SYSTEMS	Approved
		SSM INFOTECH SOLUTIONS PVT LTD.	Approved
		SCHNEIDER ELECTRIC INDIA PVT LTD, BANGALORE	Approved
		ROCKWELL AUTOMATION INDIA PVT LTD.	Approved
		ADVANCE TECH CONTROLS PVT. LTD.	Approved
104	STATION LAN EQUIPMENT	BHEL Approved Makes	
105	OFC	AKASH SOLAR	Approved
		SYSTIMAX	Approved
		BIRLA ERICSSON, REWA	Approved
		MOLEX	Approved
		TYCO	Approved
106	Turbine Supervisory System	MEGGITT SA, SWITZERLAND.	Approved
		BENTLY NEVADA INC. (GE OIL & GAS), U.S.A.	Approved
		SHINKAWA ELECTRIC CO. LTD., JAPAN	Approved
107	FEP insulated cables	DELTON CABLES, NEW DELHI	Approved
		HABIA CABLES, SWEDEN/CHINA	Approved
		LAPP CABLES, GERMANY	Approved
		LEONI KERPEN, GERMANY	Approved
		THERMOELECTRIC, USA	Approved
108	PTFE insulated Cables	ADVANCE CABLES TECHNOLOGIES, BANGALORE	Approved
		DELTON CABLES, NEW DELHI	Approved
		THERMOCABLES LIMITED	Approved
		CORDS CABLE INDUSTRIES LIMITED.,	Approved
		TEMPESENS INSTRUMENTS (I) PVT LTD, UDAIPUR	Approved
		UNIVERSAL CABLES LIMITED, SATNA	Approved

Sl No	Item	Vendor Name	Status
109	CONVERTERS/ INVERTORS AC, DC DRIVES	ROCKWELL AUTOMATION INDIA PVT., LTD.,	Approved
		SIEMENS INDIA LTD.	Approved
		KIRLOSKAR ELECTRIC COMPANY LIMITED.,	Approved
		LARSEN & TOUBRO LIMITED	Approved
		HIREL ELECTRONICS, GANDHINAGAR	Approved
		ABB LIMITED	Approved
110	PULSE JET CONTROLLER	SWITCHING CIRCUIT	Approved
		ADVANCE CONCEPT	Approved
		VOLTCRAFT	Approved
		SQUARE M	Approved
		MICRO SYSTEM	Approved
111	PLC / SCADA	ROCKWELL AUTOMATION INDIA PVT., LTD.,	Approved
		GE INTELLIGENT PLATFORMS PVT LTD	Approved
		SIEMENS INDIA LTD.	Approved
		LARSEN & TOUBRO LIMITED	Approved
		ABB LIMITED	Approved
		SCHNEIDER ELECTRIC INDIA PVT.LTD.	Approved
112	LIMIT SWITCHES	KA SCHMERSAL, GERMANY	Approved
		JOHAN VOLLENBROICH, GERMANY	Approved
		IFM ELECTRONIC, GERMANY	Approved
		JAYASHREE ELECTRON PVT. LTD,	Approved
		SIEMENS INDIA LTD.	Approved
		BCH ELECTRIC LIMITED	Approved
		PEPPERL+FUCHS(INDIA) PVT LTD	Approved
		JAI BALAJI & CO., CHENNAI	Approved
		ELECTRO MECHANICAL INDIA, KOLKATA	Approved
		AG SYSTEMS, (AG ELECTRONICS)MUMBAI	Approved
		BETA SYSTEMS ENGINEERING	Approved
113	PULLCHORD SWITCHES/BELT SWAY SWITCHES (BELT MONITORING / CONVEYOR SAFETY SWITCHES , AC/DC TACHOGENERATORS , SERVOMOTORS, DIGITAL DRIVES AND SELSYN MOTORS)	JAYASHREE ELECTRODEVICES PVT. LTD.,	Approved
		BETA SYSTEMS ENGINEERING	Approved
		PROTOCONTROL INSTRUMENTS (I) PVT LTD	Approved
		KANTA RUBBER PVT. LTD	Approved
		MAHAVEER ENGINEERING	Approved
		SUMAN CONTROLS, BANGALORE	Approved
		JYOTHI RUBBER UDYOG, GHAZIABAD	Approved
		SLN ENTERPRISES, BANGALORE	Approved

Sl No	Item	Vendor Name	Status
114	SAFETY ITEMS (RUBBER MATS,DANGER BOARDS ETC.)	PROGRESSIVE RUBBER WORKS	Approved
		VARDHAMAN HOSES PRIVATE LIMITED	Approved
		PREMIER POLYFILM LTD	Approved
		RMG POLY VINLY INDIA LTD	Approved
		KAN POWER RUBBER INDUSTRIES, BANGALORE	Approved
		ARADHANA AGENCY	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

SL. NO.	Item Description	Vendor Name	Remarks
1	FIRE PROTECTION, FIRE DETECTION AND ALARM SYSTEM PACKAGE	TECHNICO (INDIA) PVT. LTD.	Approved
		AGNICE FIRE PROTECTION PVT. LTD.	Approved
		HITEK ENGINEERING SERVICES	Approved
		STERLING AND WILSON PVT LTD	Approved
		MX SYSTEMS INTERNATIONAL PVT. LTD.	Approved
		UTC FIRE & SECURITY INDIA LIMITED.	Approved
		NITIN FIRE PROTECTION INDUSTRIES LI	Approved
		TYCO FIRE & SECURITY INDIA	Approved
		FIREPRO SYSTEMS PVT. LTD.	Approved
		CONSILIUM MIDDLE EAST (FZC)	Approved
		DE S TECHNICO PRIVATE LIMITED	Approved
		THERMOSYSTEMS PRIVATE LIMITED.	Approved
2	HYDRANT VALVES	SHAH BHOGILAL	Approved
		SUKAN	Approved
		NEWAGE	Approved
		VENUS	DR
		WINCO	DR
		ASCO STRUMECH PVT. LTD.	Approved
3	FIRE HOSES	NEWAGE	Approved
		CHATTARIA RUBBER	Approved
		Sukan Equipments Pvt Ltd	Approved
		SHAH BHOGILAL JETHALAL & BROTHERS	Approved
4	WATER MONITOR & WATER-CUM FOAM MONITORS	SHAH BHOGILAL	Approved
		HD FIRE	Approved
		NEW AGE	Approved
5	BRANCH PIPE, NOZZLES, COUPLINGS & FIRE BRIGDAE CONNECTIONS	SUKAN	Approved
		VENUS	Approved
		NEW AGE	Approved
		WINCO	DR
		ASCO STRUMECH PVT. LTD.	Approved
		SHAH BHOGILAL JETHALAL & BROTHERS	Approved
6	DELUGE VALVES	HD FIRE	Approved
		TYCO (GRINELL)	Approved
		KIDDE (I) LTD.	Approved
7	HVW/ MVW SPRAY NOZZLE	KIDDE (I) LTD.	Approved
		TYCO	Approved
		HD FIRE	Approved
		ASCO STRUMECH PVT. LTD.	Approved
		NEWAGE FIRE FIGHTING CO. LTD.	Approved
		SHAH BHOGILAL JETHALAL & BROTHERS	Approved

SL. NO.	Item Description	Vendor Name	Remarks
8	QUARTZOID BULB SPRINKLERS/DETECTORS	TYCO(GRINELL)	Approved
		HD FIRE	Approved
		NEWAGE INDUSTRIES	Approved
9	HYDRO PNEUMATIC TANK	ARC WELD ENGINEERS	Approved
10	MICROPROCESSOR BASED FIRE ALARM PANEL	SIMPLEX	DR
		SCHRACK	Approved
		DETECTOMAT	Approved
		GENT	DR
11	LHS CABLE (FO Type)	AP SENSING,Germany	Approved
		SENSA,UK	Approved
	LHS CABLE (Intelligent Addressable Thermal Sensor Based)	Listec (Schrack)	Approved
12	FOAM PUMP	DEL PD PUMPS & GEARS	Approved
13	FOAM TANKS	ARC WELD ENGINEERS	Approved
		HD FIRE PROTECT PVT. LTD.	DR
14	ADDRESSABLE MULTISENSOR TYPE DETECTORS	SIMPLEX	DR
		SCHRACK	Approved
		DETECTOMAT	Approved
		GENT	DR
15	ADDRESSABLE PHOTO ELECTRIC TYPE DETECTORS	SIMPLEX	DR
		SCHRACK	Approved
		DETECTOMAT	Approved
		GENT	DR
16	ADDRESSABLE HEAT DETECTORS	SIMPLEX	DR
		SCHRACK	Approved
		DETECTOMAT	Approved
		GENT	DR
17	INFRA RED DETECTORS	PATOL	Approved
		SYSTEM SENSOR	Approved
18	COATING & WRAPPING MATERIAL/ TAPE (COAL TAR BASED)	IWL LTD.	Approved
		RUSTECH	Approved
19	INERT GAS SYSTEM	GINGEKERR	Approved
		ANSUL	Approved
		SRI	Approved
		SIEMENS	Approved
		UTC FIRE & SECURITY INDIA LIMITED. / (KIDDE)	Approved
20	BATTERY	EXIDE	Approved
		AMCO	Approved
		HOPPECKE BATTERIEN GMBH & CO KG	DR
		AMARA RAJA POWER SYSTEMS LTD	Approved

Sl. NO.	Item Description	Vendor Name	Remarks
21	FIRE SURVIVAL CABLES	POLYCAB	Approved
		RRKABEL	Approved
		KEI	Approved
		DELTON	Approved
22	HOSE REEL	SIEMENS	DR
		WINCO	Approved
		NEWAGE FIRE FIGHTING CO. LTD.	Approved
		Sukan Equipments Pvt Ltd	Approved
23	FIRE EXTINGUISHER (BIS APPROVED SOURCES WITH VALID LICENSE)	NITIN FIRE PROTECTION INDUSTRIES LI	DR
		KANADIA FYR FYTER PVT. LTD.	Approved
		SAFEX FIRE SERVICES LTD.	Approved
		KIDDE	Approved
24	PROBE TYPE HEAT DETECTOR	TYCO	Approved
Additional Items			
25	LT MOTORS	As per Approved Electrical Vendor List	
26	H.T. MOTORS (SAFE/HAZARDOUS AREA)	SIEMENS LTD	Approved
		ABB INDIA LIMITED, HYD	Approved
		KIRLOSKAR ELECTRIC CO. LTD.	Approved
		CG POWER & INDUSTRIAL SOLUTIONS	Approved
		BHEL BHOPAL	Approved
27	CABLE TRAYS	As per Approved Electrical Vendor List	
28	LEVEL GUAGES (MAGNETIC TYPE)	As per Approved C&I Vendor List	
29	PRESSURE GAUGES	As per Approved C&I Vendor List	
30	SAFETY RELIEF VALVES	INSTRUMENTATION LTD	Approved
		FORBES MARSHALL LTD.,	Approved
		UNI KLINGER LTD.	DR
		ANDERSON GREENWOOD CROSBY	Approved
31	GASKETS	BHEL Approved Sources	
32	FLANGES	BHEL Approved Sources	
33	STRAINERS (Y-TYPE / T-TYPE /	As per Approved Mechanical Vendor List	
34	VALVES- GATE/GLOBE/REG.GLOBE/NON- RETURN; MAT: CS/AS/SS; PR.CL.#150,#300,#800	LEADER VALVES LIMITED	Approved
		INTERVALVE POONAWALLA LIMITED	Approved
		MICON VALVES (I) PVT. LTD.	Approved
		WEIR BDK VALVES	Approved
		FLOTEK INDUSTRIES	Approved
		L & T VALVES LIMITED	Approved
		FOURESS ENGINEERING (I)PVT.LTD	Approved
		Any other Vendors as per Approved Mechanical Vendor List	

SL. NO.	Item Description	Vendor Name	Remarks
35	BUTT WELDED PIPE FITTINGS	BHEL Approved Sources	
36	BOLTING MATERIAL	BHEL Approved Sources	
37	WELDED PIPES UP TO 14" (M.S & G.I)	BHEL Approved Sources	
38	FOAM POURER AND GENERATION EQUIPMENTS FOR FIRE PROTECTION SYSTEMS	SHAH BHOGILAL JETHALAL & BROTHERS	Approved
		NEWAGE FIRE FIGHTING CO. LTD.	Approved
		HD FIRE PROTECT PVT. LTD.	Approved
39	BALANCE PROPORTIONER FOR FIRE PROTECTION SYSTEMS	HD FIRE PROTECT PVT. LTD.	Approved
		SHAH BHOGILAL JETHALAL & BROTHERS	Approved
40	FIRE WATER PUMPS	WPIL LIMITED	Approved
		WILO MATHER AND PLATT PUMPS	Approved
		KIRLOSKAR BROTHERS LTD	Approved
41	HOSE CABINETS FOR FIRE PROTECTION SYSTEMS	SHAH BHOGILAL JETHALAL & BROTHERS	Approved
		NEWAGE FIRE FIGHTING CO. LTD.	Approved
		Sukan Equipments Pvt Ltd	Approved
		ASCO STRUMECH PVT. LTD.	Approved
42	AIR RELEASE VALVES FOR FIRE PROTECTION SYSTEMS	SHAH BHOGILAL JETHALAL & BROTHERS	Approved
		NEWAGE FIRE FIGHTING CO. LTD.	Approved
43	CAST IRON VALVES (GATE/SLUICE AND CHECK)	As per Approved Mechanical Vendor List	
44	SOCKET WELDED / SCREWED WELDED PIPE FITTINGS	BHEL Approved Sources	
45	SOLENOID VALVES	As per Approved C&I Vendor List	
46	PRESSURE AND DIFFERENTIAL	As per Approved C&I Vendor List	
47	N2 BASED FIRE PROTECTION SYSTEM	CTR MANUFACTURING INDUSTRIES LTD. NAGPUR	Approved
		EASUN-MR TAP CHANGERS (P) LTD, CHENNAI	DR
		SERGI TRANSFORMER EXPLOSION PREVENTION, GURGAON (HARYANA)	Approved

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description		Remarks
1	AIRCONDITIONING SYSTEM	Blue Star Ltd.	Accepted
		ADVANCE VENTILATION PVT.LTD.	DR
		ROOTS COOLING SYSTEMS PVT. LTD.	DR
		STERLING AND WILSON PRIVATE LIMITED	Accepted
		VOLTAS LTD.	Accepted
2	VENTILATION SYSTEM	ADVANCE VENTILATION PVT.LTD.,Sonepat	DR
		C.DOCTOR and CO. PVT.LTD , Kolkata	Accepted
		HYDERABAD POLLUTION CONTROLS LIMITED, HYDERABAD	Accepted
		STERLING AND WILSON PRIVATE LIMITED	Accepted
		ROOTS COOLING SYSTEMS PVT. LTD., Noida	DR
		VOLTAS LTD. , THANE WEST	Accepted
3	AIR WASHER & UAF	HYDERABAD POLUTION CONTROL	Approved
		ADVANCE VENTILATION	Approved
		DRAFT AIR	Approved
		BLUE STAR	Approved
		VOLTAS	Approved
		STERLING WILSON	Approved
		ROOTS COOLING SYSTEM	Approved
		C DOCTOR	Approved
4	CENTRIFUGAL FAN	FLAKT	Approved
		KRUGER	Approved
		DRAFT AIR	Approved
		HYDERABAD POLUTION CONTROL	Approved
		ADVANCE VENTILATION	Approved
		PATEL AIR	Approved
		MARATHON	Approved
		C DOCTOR	Approved
		SARLA	Approved
5	FRESH AIR/ SUPPLY/ EXHAUST/ RE UNIT FANS / PROPELLAR	HYDERABAD POLUTION CONTROL	Approved
		ADVANCE VENTILATION	Approved
		KRUGER	Approved
		NICOTRA	Approved
		MARATHON	Approved
		FLAKT	Approved
		C DOCTOR	Approved
6	PUMPS	BEST & CROMPTON	Approved
		JYOTI	Approved
		SAM TURBO	Approved
		KBL	Approved
		KSB	Approved
		M&P	Approved
		VOLTAS	DR
		WORTHINGTON	Approved

Sagardighi Extension (BROJ3)

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description		Remarks
1	AIRCONDITIONING SYSTEM	Blue Star Ltd.	Accepted
		ADVANCE VENTILATION PVT.LTD.	DR
		ROOTS COOLING SYSTEMS PVT. LTD.	DR
		STERLING AND WILSON PRIVATE LIMITED	Accepted
		VOLTAS LTD.	Accepted
2	VENTILATION SYSTEM	ADVANCE VENTILATION PVT.LTD.,Sonepat	DR
		C.DOCTOR and CO. PVT.LTD , Kolkata	Accepted
		HYDERABAD POLLUTION CONTROLS LIMITED, HYDERABAD	Accepted
		STERLING AND WILSON PRIVATE LIMITED	Accepted
		ROOTS COOLING SYSTEMS PVT. LTD., Noida	DR
		VOLTAS LTD. , THANE WEST	Accepted
		FLowsERVE INDIA CONTROL PVT LTD	Approved
7	LV MOTORS (NON FLAME PROOF)	SIEMENS	Approved
		ABB	Approved
		CGL	Approved
		MARATHON	Approved
		KEC	DR
		BHARAT BIJLEE	Approved
		NGEF	Approved
8	AIR FILTER	PUROLATOR	Approved
		FMI	Approved
		ANFILCO	Approved
		JOHN FOWLER	Approved
		SPECTRUM	Approved
		AIR TECH	Approved
		PUROMATIC	Approved
9	INSULTATION MATERIAL	BEARDSHEL	Approved
		ARMAFLEX	Approved
		LLOYDS	Approved
		UP TWIGA	Approved
		AEROCELL	Approved
10	FIRE DAMPER	CARRYAIRE	Approved
		RAVISTAR (SYSTEM AIR)	Approved
11	GRILL/ DIFFUSER/ VOLUME CONTROL DAMPER	CARRYAIRE	Approved
		RAVISTAR (SYSTEM AIR)	Approved
12	HUMIDISTAT	JHONSON CONTROL	Approved
		HONEYWELL AUTOMATION	Approved
		PENN	Approved
		CARRIER	Approved
		BLUE STAR	Approved

Sagardighi Exten. Unit#5 (PROJ3)

HVAC System

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description		Remarks
1	AIRCONDITIONING SYSTEM	Blue Star Ltd.	Accepted
		ADVANCE VENTILATION PVT.LTD.	DR
		ROOTS COOLING SYSTEMS PVT. LTD.	DR
		STERLING AND WILSON PRIVATE LIMITED	Accepted
		VOLTAS LTD.	Accepted
2	VENTILATION SYSTEM	ADVANCE VENTILATION PVT.LTD.,Sonepat	DR
		C.DOCTOR and CO. PVT.LTD , Kolkata	Accepted
		HYDERABAD POLLUTION CONTROLS LIMITED, HYDERABAD	Accepted
		STERLING AND WILSON PRIVATE LIMITED	Accepted
		ROOTS COOLING SYSTEMS PVT. LTD., Noida	DR
		VOLTAS LTD. , THANE WEST	Accepted
13	SCREW CHILLER	VOLTAS	Approved
		MCQUAY (DAIKIN)	Approved
		CLIMAVENETA	Approved
14	PRECISION AC	UNIFLAIR	Approved
		BLUEBOX	Approved
		EMERSON PROCESS MANAGEMENT	Approved
		CLIMAVENETA	Approved
15	SPLIT AC	VOLTAS	Approved
		BLUE STAR	Approved
		CARRIER	Approved
		HITACHI	Approved
		DAIKIN	Approved
16	AIR HANDLING UNITS	ZECO	Approved
		CARRYAIRE (flakt)	Approved
		EDGE TECH	Approved
		SYSTEM AIR	Approved
17	AHU FAN (CENTRIFUGAL FAN)	C DOCTOR	Approved
		FLAKT	Approved
		KRUGER	Approved
		NICOTRA	Approved
		COMEFRI	Approved
		MARATHON	Approved
		ADVANCE	Approved
		DRAFT AIR	Approved
		HYDERABAD POLLUTION	Approved
18	PUMPS	JYOTI	Approved
		SAM TURBO	Approved
		KBL	Approved
		KSB	Approved
		M&P	Approved
		VOLTAS	Approved

Sagardighi Ext. Unit#5 (1 x 660 MW)
Approved

HVAC System

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description		Remarks
1	AIRCONDITIONING SYSTEM	Blue Star Ltd.	Accepted
		ADVANCE VENTILATION PVT.LTD.	DR
		ROOTS COOLING SYSTEMS PVT. LTD.	DR
		STERLING AND WILSON PRIVATE LIMITED	Accepted
		VOLTAS LTD.	Accepted
2	VENTILATION SYSTEM	ADVANCE VENTILATION PVT.LTD.,Sonepat	DR
		C.DOCTOR and CO. PVT.LTD , Kolkata	Accepted
		HYDERABAD POLLUTION CONTROLS LIMITED, HYDERABAD	Accepted
		STERLING AND WILSON PRIVATE LIMITED	Accepted
		ROOTS COOLING SYSTEMS PVT. LTD., Noida	DR
		VOLTAS LTD. , THANE WEST	Accepted
		BEACON-WEIR	Approved
		WORTHINGTON	Approved
		SULZER PUMPS INDIA LTD.	Approved
		FLOWERVE INDIA CONTROL PVT LTD	Approved
19	COOLING TOWER	PAHARPUR COOLING TOWER	Approved
20	LV MOTORS (NON FLAME PROOF)	SIEMENS	Approved
		ABB	Approved
		CGL	Approved
		MARATHON	Approved
		BHARAT BIJLEE	Approved
		NGEF	Approved
		JYOTI	Approved
21	AIR FILTER	PUROLATOR	Approved
		FMI	Approved
		ANFILCO	Approved
		TENACITY	Approved
		JOHN FOWLER	Approved
		SPECTRUM	Approved
		AIR TECH	Approved
		PUROMATIC	Approved
22	BALANCING VALVE	ADVANCE	Approved
23	4 WAY MIXING VALVE WITH ACTUATING MOTOR	SIEMENS BUILDING TECHNOLOGY	Approved
		JOHNSON	Approved
		HONEYWELL AUTOMATION	Approved
24	Y / POT STRAINER	MULTITEX	Approved
		GREAVES COTTON	Approved
		JAYPEE	Approved
		OTOKLIN	Approved
		GUJARAT OTOFILT	Approved
		SAROJINI ENTERPRISE	Approved

Sagardighi Extn. Unit#5 (PROJ3)

HVAC System

**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Item Description		Remarks
1	AIRCONDITIONING SYSTEM	Blue Star Ltd.	Accepted
		ADVANCE VENTILATION PVT.LTD.	DR
		ROOTS COOLING SYSTEMS PVT. LTD.	DR
		STERLING AND WILSON PRIVATE LIMITED	Accepted
		VOLTAS LTD.	Accepted
2	VENTILATION SYSTEM	ADVANCE VENTILATION PVT.LTD.,Sonepat	DR
		C.DOCTOR and CO. PVT.LTD , Kolkata	Accepted
		HYDERABAD POLLUTION CONTROLS LIMITED, HYDERABAD	Accepted
		STERLING AND WILSON PRIVATE LIMITED	Accepted
		ROOTS COOLING SYSTEMS PVT. LTD., Noida	DR
		VOLTAS LTD. , THANE WEST	Accepted
		FILTRATION ENGINEERS INDIA PVT LTD	Approved
25	STRIP HEATER	ESCORTS	Approved
		RACOLDS	Approved
		ALCO	Approved
		HEATCO	Approved
26	PAN HUMIDIFIER	RAPID COOL	Approved
		HOTSET	Approved
		ALCO	Approved
27	RELIEF / PURGE VALVE	BRASSOMATIC	Approved
28	THERMOSTATS	HONEYWELL AUTOMATION	Approved
		RANCO	Approved
		PENN	Approved
		DANFOSS	Approved
		RANUTROL	Approved
		INDFOSS JHONSON CONTROL	Approved
29	ANTI FREEZE THERMOSTAT	RANCO	Approved
		HONEYWELL AUTOMATION	Approved
		PENN	Approved
		DANFOSS	Approved
		INDFOSS	Approved
30	RH SENSOR/TEMP SENSOR	HONEYWELL AUTOMATION	Approved
		JOHNSON	Approved
		SIEMENS	Approved
		GENERAL INSTRUMENT CONSORTIUM	Approved
31	WATER SOFTENING PLANT	THERMAX	Approved
		ION EXCHANGE	Approved


**SAGARDIGHI THERMAL Power EXTENSION PROJECT
PHASE-III, UNIT#5 (1 x660 MW)**

Sl. No.	Package Description	Vendor Name	Remarks
1	Civil Sub-structure pkg. (Piling & pile cap)	M/s SIMPLEX INFRASTRUCTURES LIMITED	Approved
		BRIDGE & ROOF CO. (INDIA) LTD.	Approved
		PARESH CONSTRUCTION AND FOUNDATIONS PVT. LTD.	Approved
		L&T GEOSTRUCTURE LLP.	Approved
		AKASHGANGA INFRAVENTURES INDIA LTD.	Approved
		M/s NAVAYUGA ENGINEERING COMPANY LIMITED	DR
2	Civil Super-structure pkg.	M/s JMC PROJECTS (INDIA) LIMITED.	DR
		M/s SIMPLEX INFRASTRUCTURES LIMITED	Approved
		M/s BRIDGE & ROOF CO. (INDIA) LIMITED	Approved
3	Boiler Aux.	M/s POWER MECH PROJECTS LIMITED	Approved
		M/s BRIDGE & ROOF CO. (INDIA) LIMITED	Approved
		M/s INDWELL CONSTRUCTIONS PVT. LIMITED	Approved
		M/s BHAVANI ERECTORS PVT. LIMITED	Approved
4	STG & Aux.	M/s POWER MECH PROJECTS LIMITED	Approved
		M/s INDWELL CONSTRUCTIONS PVT. LIMITED	Approved
5	C&I	M/s POWERTRONIX ENGINEERING PVT. LIMITED	Approved
		M/s EDAC ENGINEERING LIMITED	Approved
6	Electrical	M/s POWERTRONIX ENGINEERING PVT. LIMITED	Approved
		M/s PRV CONSTRUCTIONS PVT LIMITED	Approved
		M/s SIGMA CONSTRUCTION	Approved
		M/s TECHNO ELECTRIC & ENGINEERING CO LIMITED	Approved
		M/s EDAC ENGINEERING LIMITED	Approved
		M/s PACE PROCESS CONTROLS PVT. LIMITED	DR


Sagardighi Extn.U#5(PROJ3)
PSER ERECTION
Ref: SGMPO3/AV/8/047

MANUFACTURER'S NAME & ADDRESS :		STANDARD QUALITY PLAN					PROJECT :		1x660 MW SAGARDIGHI TPS				
		ITEM : CW CHEMICAL TREATMENT.			OP.NO :			PACKAGE :					
					REV. : 0			CONTRACT NO. :					
					DATE :			COTRACTOR :					
					PAGE : 1 OF 10								
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY**			REMARKS	
1	2	3	4	5	6	7	8	9	M	C	N	11	
1.0	WELDER'S QUALIFICATION								D*		10		
1.1	WELDING PROCEDURE SPECIFICATION (WPS)	CORRECTNESS	MA	SCRUTINY	100%	ASME IX	ASME IX	QW 482		P	V	V	
1.2	WELDER PERFORMANCE QUALIFICATION RECORD (PQR)	WELD SOUNDNESS	MA	PHYSICAL TEST	ASME IX	ASME IX	ASME IX	QW 483 QW 484		P	V	V	
2.0	TANKS, BOTTOM ENDS, FLANGES												
2.1	RAW MATERIAL :												
2.1.1	PLATE	CHEMICAL & PHY. PROPERTIES	MA	CHEMICAL & PHY. TEST	1/PLATE	APPD. DWG/DATA SHEET	APPD. DWG/DATA SHEET	MFG.TC/LAB REPORT		P	V	V	IDENTIFICATION BY BHEL
		INTERGRANULAR CORROSION TEST	MI	CORROSION TEST	1/PLATE	APPD. DWG/DATA SHEET	APPD. DWG/DATA SHEET						
2.1.2	PIPE FOR NOZZLE	CHEMICAL & PHY. PROPERTIES	MA	CHEMICAL & PHY. TEST	1/HEAT/SIZE	APPD. DWG/DATA SHEET	APPD. DWG/DATA SHEET	MFG.TC/LAB REPORT		P	V	V	\$ REFER NOTE-6
		MICRO STRUCTURE	MI	GRAIN	1/HEAT/SIZE	FOR HEAT TREATMENT	FOR HEAT TREATMENT	DO		P	V	V	
		CORROSION TEST	MI	CORROSION TEST	1/HEAT/SIZE	ASTM A 262 PR.'E'	ASTM A 262 PR.'E'	DO		P	V	V	
		HYDRO TEST	NA	LEAKAGE	100%	NO LEAKAGE	NO LEAKAGE	MFG. TC/IR		P	V	V	
		FOR BHEL	LEGEND :					FOR CUSTOMER USE	DOC NO.				
		* RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.											
		** M : MANUFACTURER/SUB-CONTRACTOR											
		C : CONTRACTOR/NOMINATED INSPECTION AGENCY					N: OWNER						
MANUFACTURER/ SUB CONTRACTOR		CONTRACTOR		INDICATE "P" PERFORM, "W" WITNESS, AND "V" VERIFICATION									
SIGNATURE		AS APPROPRIATE, "CHP" CUSTOMER SHALL IDENTIFIED IN COLUMN "N".					REVIEWED BY		NAME & SIGN OF APPROVING AUTHORITY				

469360/2021/BAP-WS(CON)

MANUFACTURER'S NAME & ADDRESS :		STANDARD QUALITY PLAN					PROJECT		1x660 MW SAGARDIGHI TPS					
		ITEM :	CW CHEMICAL TREATMENT.		QP.NO :			PACKAGE :						
					REV. :	0		CONTRACT NO. :						
					DATE :			COTRACTOR :						
					PAGE :	2 OF 10								
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/ METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY**			REMARKS		
									M	C	N			
1	2	3	4	5	6	7	8	9	D*	10		11		
2.2	IN PROCESS													
2.2.1	BOTTOM ENDS	DIMENSIONS	MA	MEASUREMENT WITH TEMPLATE	100%	APPD.DWG.	APPD.DWG.	MFG.TC./LAB REPORT		P	V	V		
		SURFACE DEFECTS ON WELDMENTS		DP TEST	100%	ASTM E 165	NO SURFACE DEFECTS	MFG.TC		P	V	V		
2.3	FINAL ASSEMBLY :													
		DIMENSIONS & ORIENTATION	MA	MEASUREMENT	100%	APPD.DWG.	APPD.DWG.	MFG.TC		P	V	V		
2.3.1		LEAKAGE	MA	WATER FILL FOR 2 HOURS	100%	APPD.DWG.(BY BHEL)	NO LEAKAGE	MFG.TC		P	V	V		
3.0	STIRRER :													
3.1	RAW MATERIAL FOR SHAFT	CHEMICAL & PHY. PROPERTIES	MA	CHEMICAL & PHY. TEST	1/BAR/ HEAT	APPD. DWG/DATA SHEET	APPD. DWG/DATA SHEET	MFG.TC/LAB REPORT	}	P	V	V		
		INTERGRANULAR CORROSION TEST	MA	CORROSION TEST	DO	ASTM A 262 PR.'E'	ASTM A 262 PR.'E'	DO						
3.2	IMPELLER	CHEMICAL PROP.	MA	CHEMICAL MECHANICAL TEST	1/PLATE	ASTM A 240 GR.TP 304	ASTM A 240 GR.TP 304	MFG.TC/LAB REPORT			P	V	V	
		FOR BHEL	LEGEND :					FOR CUSTOMER USE		DOC NO.				
			* RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.											
			** M : MANUFACUTRER/SUB-CONTRACTOR											
			C : CONTRACTOR/NOMINATED INSPECTION AGENCY			N: OWNER								
MANUFACTURER/ SUB CONTRACTOR		CONTRACTOR		INDICATE "P" PERFORM, "W" WITNESS, AND "V" VERIFICATION										
SIGNATURE		AS APPROPRIATE, "CHP" CUSTOMER SHALL IDENTIFIED IN COLUMN "N".					REVIEWED BY		NAME & SIGN OF APPROVING AUTHORITY					


469360/2021/BAP-WS(CON)

MANUFACTURER'S		STANDARD QUALITY PLAN				PROJECT		1x660 MW SAGARDIGHI TPS						
NAME & ADDRESS :		ITEM : CW CHEMICAL TREATMENT.		QP.NO :	REV. :	0	PACKAGE							
				DATE :			CONTRACT NO.							
				PAGE :	3 OF 10		COTRACTOR							
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY**			REMARKS		
1	2	3	4	5	6	7	8	9	D*	10			11	
3.3	COMPLETE UNIT WITH MOTOR	PERFORMANCE IN WATER FILL TANK	MA											
		- VIBRATION		MEASUREMENT	100%	APPD.DWG/DATA SHEET	APPD.DWG/DATA SHEET	MFG.TC	}	P	V	V		
		- WOBBLING		VISUAL	100%									
		- POWER CONSUMPTION OR CURRENT DRAWN		MEASUREMENT	100%	APPD.DWG/DATA SHEET	APPD.DWG/DATA SHEET	MFG.TC						
4.0	MOTORS :													
		ROUTINE & TYPE TEST,	MA	VERIFICATION OF	100% FOR	APPD.DATA SHEET	APPD.DATA SHEET	MFG.TC/LAB		P	V	V	MAKE OF MOTOR	
		DEGREE OF PROTECTION		TEST CERTIFICATES	ROUTINE TEST & 1/SIZE FOR TYPE TEST & DEGREE OF PROTECTION			REPORT					SHALL BE AS PER APPD.LIST	
5.0	METERING PUMP & PRESSURE RELIEF VALVE :													
	(PUMPS SHALL BE PROCURED FROM BHEL APPD.SOURCE)													
5.1	RAW MATERIAL :													
5.1.1	WETTED PARTS	CHEMICAL & PHY. PROPERTIES	MA	CHEMICAL. & MECH. TEST	1/BAR	APPD.DWG/DATA SHEET	APPD.DWG/DATA SHEET	MFG.TC/LAB REPORT	}	P	V	V		
		SURFACE TEST		UT ON BAR>25 MM DIA	100%	ASTM A 388	REF. NOTE # 1	MFG.TC/LAB REPORT						
				DP ON M/C SURFACE	100%	ASME - E - 165	NO SURFACE DEFECTS	MFG.TC/LAB REPORT						
		FOR BHEL	LEGEND :											
			* RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.					FOR CUSTOMER USE						
			** M : MANUFACUTRER/SUB-CONTRACTOR											
			C : CONTRACTOR/NOMINATED INSPECTION AGENCY											
			N: OWNER											
MANUFACTURER/ SUB CONTRACTOR	CONTRACTOR	INDICATE "P" PERFORM, "W" WITNESS, AND "V" VERIFICATION												
SIGNATURE		AS APPROPRIATE, "CHP" CUSTOMER SHALL IDENTIFIED IN COLUMN "N".					REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY						


469360/2021/BAP-WS(CON)

MANUFACTURER'S NAME & ADDRESS :		STANDARD QUALITY PLAN					PROJECT		1x660 MW SAGARDIGHI TPS			
		ITEM : CW CHEMICAL TREATMENT.			QP.NO :		PACKAGE :					
					REV. : 0		CONTRACT NO. :					
					DATE :		COTRACTOR :					
					PAGE : 4 OF 10							
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/ METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY**			REMARKS
1	2	3	4	5	6	7	8	9	D*	10		11
5.2	FINAL INSPECTION											
5.2.1	PUMP WITH MOTOR	CAP/STROKE	MA	PERFORMANCE	100%	APPD DRG/. DATA SHEET (BY OWNER), API-675	APPD DRG/. DATA SHEET (BY OWNER), API-675	INSPECTION REPORT	P W V			
		ACCURACY		SHOP TEST								
		REPEATABILITY		SHOP TEST								
		POWER DRAWN @ 100% STROKE		MEASURED AT WORK								
		LEAKAGE & DIMENSIONS,		HYDRO TEST MEASUREMENT			1.5X DES. PRSS.					
		NOISE,		MEASUREMENT			NOISE < 85 dbA					
		VIBRATION		MEASUREMENT			≤45 MICRONS (PEAK TO PEAK)					
5.2.2	RELIEF VALVE	PERFORMANCE	MA	SET & RESET PR.	100%	APPD DRG/. DATA SHEET (BY OWNER)	APPD DRG/. DATA SHEET (BY OWNER)	INSPECTION REPORT	P V V			
		DIMENSIONS		MEASUREMENT		APPD DRG/. DATA SHEET (BY OWNER)	APPD DRG/. DATA SHEET (BY OWNER)	INSPECTION REPORT				
		LEAKAGE DURING PERFORMANCE TEST		VISUAL		NO LEAKAGE	NO LEAKAGE	INSPECTION REPORT				
		HYDRO TEST				APPD DRG/. DATA SHEET	APPD DRG/. DATA SHEET					
		FOR BHEL	LEGEND :									
			* RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.				FOR CUSTOMER USE	DOC NO.				
			** M : MANUFACUTRER/SUB-CONTRACTOR									
			C : CONTRACTOR/NOMINATED INSPECTION AGENCY				N: OWNER					
MANUFACTURER/ SUB CONTRACTOR		CONTRACTOR		INDICATE "P" PERFORM, "W" WITNESS, AND "V" VERIFICATION								
SIGNATURE		AS APPROPRIATE, "CHP" CUSTOMER SHALL IDENTIFIED IN COLUMN "N".					REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY				


469360/2021/BAP-WS(CON)

MANUFACTURER'S NAME & ADDRESS :		STANDARD QUALITY PLAN				PROJECT :		1x660 MW SAGARDIGHI TPS					
		ITEM : CW CHEMICAL TREATMENT.			OP.NO :		PACKAGE :						
					REV. : 0		CONTRACT NO. :						
					DATE :		COTRACTOR :						
					PAGE : 5 OF 10								
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY**			REMARKS	
1	2	3	4	5	6	7	8	9	D*	10		11	
6	VALVES												
6.1	RAW MATERIAL :												
6.1.1	BODY, BONNET COVER	CHEMICAL & MECH PROPERTIES	MA	CHEMICAL & MECH TEST	1/HEAT	APPD.DWG./DATA SHEET (BY BHEL)	APPD.DWG./DATA SHEET (BY BHEL)	MFG. TC/LAB REPORT	}	P	V	V	
6.1.2	TRIM MATERIAL	CHEMICAL PROPERTIES	MA	CHEMICAL TEST	1/HEAT	DO	DO	LAB REPORT/MGF TC					
6.2	ASSEMBLY												
		HYDRO TEST		LEAKAGE (BODY SEAT, AIR SEAT)	100%	} APPD.DWG./DATA SHEET (BY BHEL)	NO LEAKAGE	MFG TC	}	P	V	V	
		AIR TEST					NO LEAKAGE	MFG TC					
		DIMENSIONS		MEASUREMENT			APPD.DWG./DATA SHEET (BY BHEL)	MFG TC					
7.0	FITTING :												
7.1	RAW MATERIAL	CHEMICAL & MECH PROPERTIES	MA	CHEMICAL & MECH TEST	1/HEAT	APPD DRG/. DATA SHEET	APPD DRG/. DATA SHEET	MFG.TC/LAB REPORT	}	P	V	V	
		HEAT TREATMENT	MA	HEAT TREATMENT	100%	APPD DRG/. DATA SHEET	APPD DRG/. DATA SHEET	MFG.TC/LAB REPORT					
		INTERGRANULAR CORROSION TEST	MI	CORROSION TEST	1/HEAT	ASTM A 262 PR. 'E'		MFG.TC/LAB REPORT	}				
								MFG.TC/INSP REPORT					
	FINAL INSPECTION	DIMENSIONS	NA	MEASUREMENT	100%	APPD.DWG./DATA SHEETS/ANSI B 16.11/16.5	APPD.DWG./DATA SHEETS/ANSI B 16.11/16.5	MFG.TC/INSP.REPORT	}				
		FOR BHEL	LEGEND :						DOC NO.				
			* RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.					FOR CUSTOMER USE					
			** M : MANUFACUTRER/SUB-CONTRACTOR										
			C : CONTRACTOR/NOMINATED INSPECTION AGENCY				N: OWNER						
MANUFACTURER/ SUB CONTRACTOR	CONTRACTOR	INDICATE "P" PERFORM, "W" WITNESS, AND "V" VERIFICATION AS APPROPRIATE, "CHP" CUSTOMER SHALL IDENTIFIED IN COLUMN "N".					REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY					
SIGNATURE													


469360/2021/BAP-WS(CON)

MANUFACTURER'S NAME & ADDRESS :		STANDARD QUALITY PLAN				PROJECT :		1x660 MW SAGARDIGHI TPS									
		ITEM : CW CHEMICAL TREATMENT.		OP.NO :		PACKAGE :											
				REV. : 0		CONTRACT NO. :											
				DATE :		COTRACTOR :											
				PAGE : 6 OF 10													
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY**			REMARKS					
1	2	3	4	5	6	7	8	9	D*	M	C	N	10	11			
8.0	STRAINERS :																
8.1	RAW MATERIAL FOR BODY	PHY.& CHEM. PROPERTIES	MA	PHY. & CHEM.TEST	1/BAR/SIZE	APPD.DWG./DATA SHEETS	APPD.DWG./DATA SHEETS	LAB REPORT	}	P	V	V					
8.2	SCREEN	CHEMICAL	MA	CHEMICAL	1/SIZE	APPD.DWG./DATA SHEETS	APPD.DWG./DATA SHEETS	MFG.TC/LAB REPORT		P	V	V					
		MESH SIZE	MA	MEASUREMENT	1/SIZE	APPD.DWG./DATA SHEETS	APPD.DWG./DATA SHEETS	MFG.TC/LAB REPORT									
8.3	FINAL INSPECTION	DIMENSIONS	MA	MEASUREMENT	100%	APPD.DWG./DATA SHEETS	APPD.DWG./DATA SHEETS	MFG.TC	}	P	V	V					
		LEAKAGE		HYDRO TEST	100%	APPD.DWG./DATA SHEETS	NO LEAKAGE	MFG.TC									
9.0	PIPE (SEAMLESS)																
	MATERIAL (REF. NOTE -2)	CHEMICAL	MA	CHEMICAL	1/HEAT/SIZE	APPD.DWG./DATA SHEETS	APPD.DWG./DATA SHEETS	MFG.TC/LAB REPORT	}	P	V	V	IDENTIFICATION BY BHEL				
		MENICAL TEST		MENICAL TEST	1/HEAT/SIZE	APPD.DWG./DATA SHEETS	APPD.DWG./DATA SHEETS	MFG.TC/LAB REPORT		P	V	V	\$ REFER NOTE-6				
		MICRO STRUCTURE		GRAINS STRUCTURE	1/HEAT/SIZE	FOR HEAT TREATMENT	FOR HEAT TREATMENT	MFG.TC/LAB REPORT		P	V	V					
		INTERGRANULAR CORROSION TEST		CORROSION TEST	1/HEAT/SIZE	ASTM A 262 PR 'E'	ASTM A 262 PR 'E'	MFG.TC/LAB REPORT		P	V	V					
		HTDRO TEST		LEAKAGE	100%	NO LEAKAGE	NO LEAKAGE	MFG.TC/LAB REPORT		P	W	V					
		FOR BHEL		LEGEND :													
				* RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.			FOR CUSTOMER USE										
				** M : MANUFACUTRER/SUB-CONTRACTOR													
				C : CONTRACTOR/NOMINATED INSPECTION AGENCY			N: OWNER										
MANUFACTURER/ SUB CONTRACTOR		CONTRACTOR		INDICATE "P" PERFORM, "W" WITNESS, AND "V" VERIFICATION				SIGNATURE		AS APPROPRIATE, "CHP" CUSTOMER SHALL IDENTIFIED IN COLUMN "N".				REVIEWED BY		NAME & SIGN OF APPROVING AUTHORITY	


469360/2021/BAP-WS(CON)

MANUFACTURER'S		STANDARD QUALITY PLAN				PROJECT		1x660 MW SAGARDIGHI TPS						
NAME & ADDRESS :		ITEM : CW CHEMICAL TREATMENT.		OP.NO :	REV. :	0	PACKAGE	CONTRACT NO.						
				DATE :			COTRACTOR							
				PAGE :	7 OF 10									
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY**			REMARKS	
1	2	3	4	5	6	7	8	9		M	C	N	11	
10.0	LEVEL GAUGE :													
10.1	RAW MATERIAL	CHEM.PROPERTIES	MA	CHEM.TEST	1/BAR	APPD.DWG./DATA SHEETS	APPD.DWG./DATA SHEETS	LAB REPORT	}	P	V	V		
10.2	FINAL INSPECTION	DIMENSION LEAKAGE	MA	MEASUREMENT HYDRO TEST	100% 1/SIZE	APPD.DWG./DATA SHEETS APPD.DWG./DATA SHEETS	APPD.DWG./DATA SHEETS APPD.DWG./DATA SHEETS	MFG.TC						
11.0	PRESSURE GAUGE & DIFF PRESSURE GAUGE													
11.1	MAT. FOR WETTED PARTS& BOURDEN	CHEM.PROPERTIES	MA	CHEM.TEST	1/HEAT	APPD.DWG./DATA SHEETS	APPD.DWG./DATA SHEETS	MFG.TC/LAB REPORT/ COC	}	P	V	V		
		DIMENSIONS	MA	MEASUREMENT	SIZE	APPD.DWG./DATA SHEETS	APPD.DWG./DATA SHEETS	MFG.TC/LAB REPORT						
11.2	CALIBRATION	ACCURACY, OVER PRESSURE	MA		100%	APPD.DATA SHEET	APPD.DATA SHEET	MFG. TC	}	P	V	V		
		OVERLOAD PROT. TYPE TEST CERT. FOR DEGREE OF PROTECTION	MA	VARIFICATION	TYPE TEST			MFG.TC/LAB REPORT						
		FOR BHEL	LEGEND :											
			* RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.					FOR CUSTOMER USE	DOC NO.					
			** M : MANUFACUTRER/SUB-CONTRACTOR											
			C : CONTRACTOR/NOMINATED INSPECTION AGENCY											
			N: OWNER											
MANUFACTURER/ SUB CONTRACTOR	CONTRACTOR	INDICATE "P" PERFORM, "W" WITNESS, AND "V" VERIFICATION												
SIGNATURE		AS APPROPRIATE, "CHP" CUSTOMER SHALL IDENTIFIED IN COLUMN "N".					REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY						


469360/2021/BAP-WS(CON)

MANUFACTURER'S		STANDARD QUALITY PLAN				PROJECT		1x660 MW SAGARDIGHI TPS					
NAME & ADDRESS :		ITEM : CW CHEMICAL TREATMENT.		OP.NO :	REV. :	0	PACKAGE						
				DATE :			CONTRACT NO.						
				PAGE :	8 OF 10		COTRACTOR						
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY**			REMARKS	
1	2	3	4	5	6	7	8	9	D*	10		11	
12.0	LEVEL SWITCH :												
12.1	MAT. FOR WETTED PARTS INCLUDING FLOAT	CHEM.PROPERTIES	MA	CHEM.TEST	1/HEATR	APPD.DATA SHEET/DWG.	APPD.DATA SHEET/DWG.	MFG.TC/LAB REPORT		P	V	V	
12.2	PERFORMANCE	FUNCTIONAL	MA	VISUAL	100%	APPD.DATA SHEET/DWG.	APPD.DATA SHEET/DWG.	MFG.TC		P	V	V	
		IR-HV-IR		ELECTRICAL		DO	DO	MFG.TC					
		DIMENSIONS		MEASUREMENT		DO	DO	MFG.TC					
		DEGREE OF PROTEC.		TYPE TEST		DO	DO	MFG.TC/LAB REPORT					
13.0	DIFF PRESSURE SWITCH												
	MATERIAL FOR WETTED		MA	VERIFICATION		APPD.DATA SHEET/DWG.	APPD.DATA SHEET/DWG.	MFG COMPLIANCE CERTIFICATE		P	V	V	
	PARTS PERFORMANCE	CALIBRATION	MA	PERFORMANCE	100%	APPD.DATA SHEET/DWG.	APPD.DATA SHEET/DWG.	MFG TC		P	V	V	
14.0	CONTROL PANEL :	DIMENSIONS, CONTINUITY, IR-HV-IR FUNCTIONAL, DEGREE . OF PROT, VERIFICATION OF MAKE, RATING OF COMPONENTS SIMULATION TEST \$\$ PAINT SHADES, THICK ADHESION	MA	MEASUREMENT, ELECTRICAL	100%	APPD.DWG./DATA SHEETS	APPD.DWG./DATA SHEETS	LAB REPROT		P	W	V	\$\$ REFER TEST PROCEDURE NOTE-4
15.0	COMPLETE SKID ASSEMBLY :	DIMENSIONS & ORIENTATION LEAKAGE, CHECK ON WELDMENTS FUNCTIONAL TEST\$\$	CR	MEASUREMENT VISUAL & HYDRO TEST	-100%	APPD.DWG/ DATA SHEET DISCH.PIPING - 1.5 x DISCH.PR. OF PUMP SUCTION PIPING -3 KG/CM2	APPD.DWG/ DATA SHEET NO LEAKAGE NO LEAKAGE	INSPECTION REPORT		P	W	W	\$\$ REFER TEST PROCEDURE NOTE-5
			LEGEND :					DOC NO.					
			* RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.				FOR CUSTOMER USE						
			** M : MANUFACUTRER/SUB-CONTRACTOR										
			C : CONTRACTOR/NOMINATED INSPECTION AGENCY			N: OWNER							
MANUFACTURER/ SUB CONTRACTOR		CONTRACTOR		INDICATE "P" PERFORM, "W" WITNESS, AND "V" VERIFICATION									
SIGNATURE		AS APPROPRIATE, "CHP" CUSTOMER SHALL IDENTIFIED IN COLUMN "N".					REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY					

469360/2021/BAP-WS(CON)

MANUFACTURER'S		STANDARD QUALITY PLAN					PROJECT		1x660 MW SAGARDIGHI TPS			
NAME & ADDRESS :												
		ITEM : CW CHEMICAL TREATMENT.			OP.NO :		PACKAGE :					
					REV. : 0		CONTRACT NO. :					
					DATE :		COTRACTOR :					
					PAGE : 9 OF 10							
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY**			REMARKS
1	2	3	4	5	6	7	8	9	D*	10		11
		PAINING	MA	VISUAL & MEASUREMENT	-100%	APPD DWN/PAINTING SCHEME	APPD DWN/PAINTING SCHEME	INSPECTION REPORT		P	V	V
		PACKING	MA	VISUAL DFT	-100% -100%	BHEL SPEC BHEL SPEC	BHEL SPEC BHEL SPEC	INSPECTION REPORT		P	V	
		LEGEND :										
		* RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.					FOR CUSTOMER USE					
		** M : MANUFACUTRER/SUB-CONTRACTOR										
		C : CONTRACTOR/NOMINATED INSPECTION AGENCY					N: OWNER					
MANUFACTURER/ SUB CONTRACTOR		CONTRACTOR										
		INDICATE "P" PERFORM, "W" WITNESS, AND "V" VERIFICATION										
SIGNATURE		AS APPROPRIATE, "CHP" NTPC SHALL IDENTIFIED IN COLUMN "N".					REVIEWED BY		NAME & SIGN OF APPROVING AUTHORITY			

469360/2021/BAP-WS(CON)

MANUFACTURER'S		STANDARD QUALITY PLAN			PROJECT		1x660 MW SAGARDIGHI TPS	
NAME & ADDRESS :		ITEM : CW CHEMICAL TREATMENT.			QP.NO :	PACKAGE		
					REV. : 0	CONTRACT NO.		
					DATE :	COTRACTOR		
					PAGE : 10 OF 10			
P - PERFORMANCE	W - WITNESS							
V - VARIFICAITON	MA - MAJOR	MI - MINOR						
CR - CRITICAL	CHP--D :CUSTOMER(BHEL/OWNER) HOLD POINT							
NOTE:1 : WHEN BACK WALL ECHO IS SET TO 100% OF FSH IN SOUND AREA, DEFECT ECHO SHALL NOT EXCEED 20% OF FSH. MAX BACH WALL ECHO IS 20% OF FSH. TOTAL NO OF DEFECTS SHALL BE MAX. 5 NO IN ONE METER LENGTH. DISTANCE BETWEEN TWO DEFECTS SAHLLA BE 3 MIN TIMES THE DIA OF BAR.								
NOTE: 2 : NDT REQUIREMENT ON THE PIPING WELDING SHALL BE AS a) ON BUTT WELD 25% FP AND 25% RT FOR PUMP SUCITON SIDE AND FOR PUMP DISCHARGE SIDE 100% RT AND 100% DP TEST. b) 100% DP ON FILLER WELD JOINTS NORMS SHALL BE AS PER ASME SECTION VIII.								
NOTE:3: LEVEL GAUGE, PRESSURE GAUGE , LEVEL SWITCH, CONTROL PANEL & ALL INSTRUMENTS SHALL BE PROCURED FROM OWNER/BHEL APPROVED MAKE.								
NOTE 4: SIMULATION TEST WILL BER CARRIED OUT WITH 24 VDC SUPPLY TO CONTROL PANEL AT THE CONTROL PANEL MANUGACTURER'S PLACE.								
NOTE 5 FUNTIONAL TEST WILL BE CARRIED OUT WOTHOUT 24 VDC I.e, ONLY CONTINUITY TEST WILL BE SHOWN AT VENDOR WORK.								
NOTE 6 FOR PIPES PURCHESED DIRECTLY FROM MANUFACTURER'S OR AUTHORISED DEALERS, APART FROM TC REVIEW, CHECK WILL BE AS PER CLASS 2.1.2 AND 10.0; HOWEVER FOR HYDRAULIC TEST MANUFACTURER TC SHALL BE REVIEWED . IN CASE ON IMPORTED PIPES PURCHASED FROM OPER MARKET CHECK TESTION AS PER CLAUSE 2.1.2 AND 10.0 (INCLUDING HYDRAULIC TEST) SHALL BE CARRIED OUT ON EACH LENGTH ;P HYDRAULIC TEST SHALL BE WITNESS BY BHEL.								
NOTE 7 FOR RAW MATERIAL (BARS/PIPES/CASTINGS/FORGINGS) WHERE HEAT TREATMENT ARE CARRIED OUT BY MATERIAL OPRODUCERS ON BULK QUANTITIES, THEIR TEAT CERTIFICATE SHALL BE REVIEWD (EXCEPT TIME TEMPERATURE CHART).								
FOR BHEL		LEGEND :			FOR CUSTOMER USE		DOC NO.	
		* RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.						
		** M : MANUFACUTRER/SUB-CONTRACTOR						
		C : CONTRACTOR/NOMINATED INSPECTION AGENCY			N: OWNER			
MANUFACTURER/	CONTRACTOR							
SUB CONTRACTOR	INDICATE "P" PERFORM, "W" WITNESS, AND "V" VERIFICATION							
SIGNATURE		AS APPROPRIATE, "CHP" CUSTOMER SHALL IDENTIFIED IN COLUMN "N".			REVIEWED BY		NAME & SIGN OF APPROVING AUTHORITY	

WBPDCCL - 1X660 MW Sagardighi TPP, Extension, Unit-5				
S. No	Type of Doc D-Drawing Q-Quality Plan V-Vendor List	Drawing No	BHEL DRG NO.	Title
Water treatment package - Gas Chlorination System				
1	D	RP-DC-445-WTP-A074	4-WT-040-01613	DESIGN PHILOSOPHY FOR CW GAS CHLORINATION PLANT
2	D	RP-DG-445-WTP-A075	1-WT-040-01922	P&I DIAGRAM FOR CW GAS CHLORINATION PLANT
3	D	RP-DG-445-WTP-A076	1-WT-040-01923	EQUIPMENT & CONTROL ROOM LAYOUT ALONGWITH CABLE SPREADER FOR CW CHLORINATION SYSTEM
4	D	RP-DC-445-WTP-A077	4-WT-040-01614	CONTROL PHILOSOPHY/WRITE - UP FOR CW GAS CHLORINATION SYSTEM
5	D	RP-DC-445-WTP-A078	4-WT-040-01615	PG TEST PROCEDURE FOR CHLORINATION PALNT
6	D	RP-DG-445-WTP-A079	4-WT-040-01616	DATA SHEET & GAD OF HORIZONTAL CENTRIFUGAL PUMPS WITH MOTOR.
7	D	RP-DG-445-WTP-A080	4-WT-040-01617	DATA SHEET & GAD OF BLOWER WITH MOTOR
8	D	RP-DC-445-WTP-E081	4-WT-040-01618	DATA SHEET OF TONNER &TRUNNION
9	D	RP-DG-445-WTP-A082	1-WT-040-01924	PIPING LAYOUT OF CHLORINATION PLANT
10	D	RP-DG-445-WTP-A083	1-WT-040-01925	GA OF ABSORPTION TANK AND TOWER
11	D	RP-DC-445-WTP-A084	4-WT-040-01926	VALVE SCHEDULE
12	D	RP-DG-445-WTP-A085	1-WT-040-01927	CIVIL ASSIGNMENT DRAWING FOR CW GAS CHLORINATION PLANT
13	Q	RP-MQ-445-WTP-A086	4-WT-040-01619	QAP FOR CW GAS CHLORINATION SYSTEM
14	D	RP-DG-445-WTP-A087	4-WT-040-01620	DATA SHEET OF EXHAUST FAN ALONG WITH MOTOR
15	D	RP-DG-445-WTP-I088	4-WT-040-01621	INSTRUMENT HOOKUP DIAGRAM FOR GAS CHLORINATION SYSTEM
16	D	RP-DG-445-WTP-I089	4-WT-040-01622	INSTRUMENT DATASHEET OF GAS CHLORINATION SYSTEM
17	D	RP-DG-445-WTP-I090	4-WT-040-01623	ANALYSER DATASHEET OF GAS CHLORINATION SYSTEM
18	D	RP-DG-445-WTP-I091	4-WT-040-01624	INSTRUMENT SCHEDULE FOR GAS CHLORINATION SYSTEM
19	D	RP-DG-445-WTP-E092	1-WT-040-01928	CABLE TRAY AND EARTHING LAYOUT FOR GAS CHLORINATION SYSTEM
20	D	RP-OM-445-WTP-A093	4-WT-040-01625	O&M MANUAL FOR GAS CHLORINATION SYSTEM
21	D	RP-DG-445-WTP-E105	4-WT-040-01629	GA AND DATASHEET OF ELECTRICAL CHAIN HOIST
22	D	RP-DG-445-WTP-A106	4-WT-040-01630	DATASHEET OF SAFETY ITEMS
23	D	RP-DG-445-WTP-A107	4-WT-040-01631	DATASHEET OF VALVES (ALL VALVE TYPES)

469360/2021/BAP-WS(CON)

S. No	Type of Doc D-Drawing Q-Quality Plan V-Vendor List	Drawing No	BHEL DRG NO.	Title
24	D	RP-DG-445-WTP-A108	4-WT-040-01632	GAD AND DATASHEET OF BOOSTER PUMP ALONG WITH MOTOR
25	D	RP-DG-445-WTP-A109	4-WT-040-01633	GAD AND DATASHEET OF PP CIRCULATION PUMP ALONG WITH MOTOR
26	D	RP-DG-445-WTP-A110	4-WT-040-01634	GAD AND DATASHEET OF BLOWER ALONG WITH MOTOR
27	D	RP-DG-445-WTP-A111	4-WT-040-01635	DATASHEET OF INJECTOR
28	D	RP-DG-445-WTP-A112	4-WT-040-01636	DATASHEET OF AUTOMATIC VACUUM REGULATOR
29	D	RP-DG-445-WTP-A113	4-WT-040-01637	DATASHEET OF SAFETY RELIEF VALVE
30	D	RP-DG-445-WTP-A114	4-WT-040-01638	DATASHEET OF CHLORINE EVAPORATOR
31	D	RP-DG-445-WTP-A115	4-WT-040-01639	DATASHEET OF AGITATOR ALONG WITH MOTOR
32	D	RP-DG-445-WTP-A116	4-WT-040-01640	DATASHEET OF BYPASS FLOWMETER
33	D	RP-DG-445-WTP-I117	4-WT-040-01641	INSTRUMENTATION CABLE SCHEDULE FOR CW CHLORINATION PLANT
34	D	RP-DG-445-WTP-I118	4-WT-040-01642	DATA SHEET OF INSTRUMENT JUNCTION BOX FOR CWBD TREATMENT PLANT
35	D	RP-DG-445-WTP-E119	4-WT-040-01643	SCHEDULE OF JB FOR CWBD TREATMENT PLANT
36	D	RP-DG-445-WTP-I120	4-WT-040-01644	DATA SHEET OF INSTRUMENT JUNCTION BOX FOR CW TREATMENT PLANT
37	D	RP-DG-445-WTP-E121	4-WT-040-01645	SCHEDULE OF JB FOR CW TREATMENT PLANT
38	D	RP-DG-445-WTP-I122	4-WT-040-01646	DATA SHEET OF INSTRUMENT JUNCTION BOX FOR CW CHLORINATION SYSTEM
39	D	RP-DG-445-WTP-E123	4-WT-040-01647	SCHEDULE OF JB FOR CW CHLORINATION SYSTEM
40	D	RP-DG-445-WTP-I124	4-WT-040-01648	IO LIST OF CW TREATMENT PLANT.
41	D	RP-DG-445-WTP-I125	4-WT-040-01649	IO LIST OF CW CHLORINATION PLANT.
42	D	RP-DG-445-WTP-I126	4-WT-040-01650	IO LIST OF CWBD TREATMENT PLANT.
43	D	RP-DC-445-WTP-E127	4-WT-040-01651	ELECTRICAL LOAD LIST FOR CWBD WATER TREATMENT PLANT
44	D	RP-DC-445-WTP-E128	4-WT-040-01652	ELECTRICAL LOAD LIST FOR CW TREATMENT PLANT
45	D	RP-DC-445-WTP-E129	4-WT-040-01653	ELECTRICAL LOAD LIST FOR CW CHLORINATION PLANT

Performance Guarantee Test Procedure

- a. Gas chlorination plant outlet water guarantee shall be as per approved attached Design memorandum document
- b. The duration of the test shall not be less than 72 hours on continuous basis. These tests will be carried out within a reasonable period from the date of commissioning of the plant. The tests shall be conducted by the Bidder to prove beyond doubt the guaranteed performance of the plant to the satisfaction of the Purchaser.
- c. Chlorination:
 - i. Each evaporator shall be guaranteed for the rated capacity.
 - ii. Each chlorinator shall be guaranteed for the rated capacity.
 - iii. Emergency Leaked Chlorine Absorption System
 - a) The outlet air from the Leaked Chlorine Absorption System must not have free residual chlorine more than 0.1 ppm
 - b) The caustic solution flow rate through the absorber shall be such that chlorine from one leaked chlorine ton container (completely filled) content can be absorbed within one hour maximum time.
 - c) The capacity of Blowers shall be sufficient to suit the above requirement.
 - d) Each pump shall be guaranteed for capacity, total dynamic head and power consumption.
 - e) All blowers shall be guaranteed for head and power consumption
 - f) The test procedures shall be as per relevant equivalent standards from recognized origins.

Performance

1. Necessary pumps shall be started and flow shall be established through all the streams. Valves shall be adjusted so as to have equal and rated distribution of flow through all the streams.
2. Random samples will have to be collected from the down- stream of chlorinator and it has to be observed whether the chlorine content of each sample shall be within $\pm 25\%$ of the average value of the samples.
3. Capacity of the chlorinator as indicated by the flow indicator shall be compared with the value determined from the flow rate of chlorinated water.
4. Capacity of the chlorinator shall be tested both at the highest and lowest gas Disposal rates. The difference shall not exceed 5%.



PERFORMANCE GUARANTEES AND TESTS





CONTENT

CLAUSE NO.	DESCRIPTION
1.00.00	PERFORMANCE GUARANTEES, PERFORMANCE/ ACCEPTANCE TESTS & LIQUIDATED DAMAGES FOR SHORTFALL IN PERFORMANCE
2.00.00	START-UP, INITIAL OPERATION, TRIAL OPERATION AND PERFORMANCE TESTS
3.00.00	SCHEDULE OF GUARANTEES WHICH ATTRACT LIQUIDATED DAMAGES [CATEGORY-A]
4.00.00	SCHEDULE OF GUARANTEES WHICH DO NOT ATTRACT LIQUIDATED DAMAGES [CATEGORY-B]
5.00.00	SCHEDULE OF DEMONSTRATION
6.00.00	PERFORMANCE/ ACCEPTANCE TESTS PROCEDURES





PERFORMANCE GUARANTEES AND TESTS

1.00.00 PERFORMANCE GUARANTEES, PERFORMANCE/ACCEPTANCE TESTS & LIQUIDATED DAMAGES FOR SHORTFALL IN PERFORMANCE

1.01.00 The Bidder shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment covered in this specification. The guarantees are categorised as:

- a) Those, which attract liquidated damages, as listed below (Category-"A"). The Bidder shall furnish signed declarations in the manner prescribed in the bid proposal schedules for these guarantees.
- b) Those, which do not attract liquidated damages, as listed below (Category-"B"). This guarantee list indicated in this section is not exhaustive and the Owner reserves the right to call upon the Bidder to demonstrate any parameter, operation, etc. of any equipment as specified and as required to meet the duty conditions.

1.02.00 The Bidder shall demonstrate all the guarantees as specified in this section. In case during tests it is found that the equipment/system has failed to meet the guarantees, the Contractor shall carry out all necessary modifications to make the equipment/systems comply with guaranteed requirements. However, if the Contractor is not able to demonstrate the guarantees, even after the modifications within ninety (90) days of notification by the Owner, the Owner will at his discretion:

- i) reject the equipment and recover the payment already made or engage other agencies for making good all the deficiencies, the cost to be borne & recovered from the contractor or accept the equipment only after levying liquidated damages upto a ceiling 10% of contract price as identified in this section for those guarantees which are covered under category "A".
- ii) reject the equipment and recover the payment already made or engage other agencies for making good all the deficiencies, the cost to be borne & recovered from the contractor or accept the equipment only after assessing and deducting from the contract price an amount equivalent to the deficiency of the equipment/system as assessed by the Owner, for those guarantees which are covered under Category-B.

For equipment/systems not covered under this section Bidder shall demonstrate the functionality and the rated performance for such equipment/systems before handover to the owner.

1.03.00 All guaranteed parameters shall necessarily be quoted by the Bidder based on the established proven results obtained from similar units in successful operation. Evidence for this shall necessarily include the test codes used, acceptance test results, and accuracies of various instruments used for the





performance test, details of tolerances, if allowed, etc. While quoting the guaranteed parameters, the Bidder shall keep in view the requirements specified in the specification especially regarding the reliability, operability and maintainability of the equipment proposed. The Owner reserves the right to evaluate the parameters quoted by the Bidder based on his experience and published material available.

- 1.04.00 The liquidated damages shall be calculated prorata for the fractional parts of the unit unless stated otherwise.
- 1.05.00 The turbine generator, boiler, auxiliaries, and all other plant equipment and system shall perform continuously without the noise level (individual or collectively) exceeding the values specified in respective equipment specification over the entire range of output and operating frequencies.
- 1.06.00 **Performance/Acceptance Tests**
- 1.06.01 The performance/acceptance tests for various equipment and systems shall be carried out as specified under the respective equipment specifications and those specified below shall be specifically applicable. All the guarantees shall be tested together as far as practicable.
- 1.06.02 In case of systems with stand-by equipment the liquidated damages for non-performance will be levied for normal operating number of equipment only. However, for this purpose all the equipment including standby equipment shall be tested and average values arrived at.
- 1.06.03 For instrument in-accuracies during PG Test, refer subsequent clauses of this section.
- 1.06.04 For Total Auxiliary Power Consumption of BTG island, Off site BOP facilities and the transformers listed under the respective clauses, shall be taken together for purposes of guarantee and not individually.
- 2.00.00 **START-UP, INITIAL OPERATION, TRIAL OPERATION AND PERFORMANCE TESTS**
- 2.01.00 The Contractor shall provide commissioning & start-up supervisory engineering staff specially identified for the period commencing with start-up and extending through initial & trial operation and all performance tests. During this period, the Contractor shall furnish the calibration devices, special test instruments, etc. required to prepare for and conduct the performance tests. The Owner will associate his operating personnel and necessary supporting staff and shall make available fuel, and the system electrical load. Contractor's commissioning, & start-up supervisory engineering personnel shall conduct training for the Owner's personnel prior to and during this period and shall train them so that they will be able to operate and maintain the new equipment satisfactorily after acceptance by the Owner.
- 2.02.00 The Owner proposes to carry out in association with the Contractor, the following field inspections and tests in the sequence detailed below, and the





successful performance and completion of all the tests taken together shall constitute the Owner acceptance tests. The Contractor shall provide supervisory services during field inspection and tests.

2.02.01 Inspection and Checking of the Unit

After completion of erection and/or installation, and before being put into operation, the unit and all its appurtenances shall be thoroughly cleaned and then inspected, for correctness and completeness of installation and acceptability for placing in operation. All piping system shall be flushed, chemically cleaned; steam blown, air blown as required and cleanliness demonstrated using acceptable industry standards. Procedures to accomplish this work shall be subject to Owner's approval.

The checkouts during the pre-commissioning period should be programmed to follow the construction completion schedule. Each system, as it is completed by construction and turned over to the commissioning (start-up) engineer(s), should be checked out and cleaned. The checking and inspection of individual systems should then follow a prescribed schedule. Also refer specification clause on commissioning management specified elsewhere.

On completion of inspection, checking and after the pre-commissioning tests are satisfactorily over, the complete equipment shall be placed on Initial Operation during which period the complete equipment shall be operated integral with sub-systems and supporting equipment as a complete plant.

When the equipment is operating properly, its characteristics shall be recorded on the start-up report sheets. Copies of typical start-up report shall be given to the Owner. Start-up reports for all equipment shall be completed before the start of the trial operation period.

2.02.02 Initial Operation, Reliability Run/Trial Run

The plant shall be on Trial Operation during which period all necessary adjustments shall be made while operating over the full load range enabling the plant to be made ready for performance and guarantee tests.

The duration of Trial Operation of the complete equipment, systems, sub-systems and their control system shall be in Automatic mode for fourteen (14) days out of which at least seventy two (72) hours shall be in continuous operation on full load or any other duration as may be agreed to between the Engineer, and the Contractor. The Trial Operation shall be considered successful, provided such item of the equipment can be operated, continuously at the specified operating characteristics for the period of Trial Operation.

For the period of Trial Operation, the time of operation with any load shall be counted; minor interruptions not exceeding four (4) hours at a time caused during the continuous operation shall not affect the total duration of trial operation. However, if in the opinion of the Owner, the interruption is long, the Trial Operation shall be prolonged for the period equivalent to the duration of interruption.





A trial Operation report comprising observations and recordings of various parameters to be measured, in respect of the above Trial Operation shall be prepared by the Contractor. This report besides recording the details of the various observations during trial run shall also include the dates of start and finish of the Trial Operation and shall be signed by the representatives of both the parties. The report shall have sheets, recording and print out of all the details of interruption occurred, adjustments made, any minor repairs done during the Trial Operation. Based on the observations, necessary modifications/ repairs to the plant shall be carried out to the full satisfaction of the Engineer to enable the later to accord permission to carry out Performance and Guarantee Tests on the plant. However, it is the prerogative of the Owner to grant permission for aforesaid test with minor defects, which do not endanger the safe operation of the equipments. .

Should any major failure or interruption occur in any portion of the plant due to or arising from faulty design, materials, workmanship or omissions or incorrect erection, sufficient to prevent safe and full commercial use of the plant, the reliability run shall be considered void and the reliability test period of 14 days shall recommence after the Contractor has remedied the cause of defect to the satisfaction of the owner

2.02.03

Performance and Guarantee Test

- a) The final tests as to the performance and guarantees shall be conducted at site, by the Contractor with full involvement of the Owner. The necessary operating inputs shall be provided by the Owner. The Contractor's engineering staff for commissioning and start-up shall ensure that the equipment are ready for such tests. The Owner shall associate his necessary supporting staff with the Contractor to carry out the various activities related to P-G tests.

The necessary labour/supporting staff etc. shall be provided by the Contractor. Such tests will be conducted within a period of three (3) months after the successful completion of Trial Operation. Any extension of time beyond the above three (3) months shall be mutually agreed upon.

- b) These tests shall be binding on both the parties of the Contract to determine compliance of the equipment with the performance guarantees.

The Contractor shall submit the test procedure for Owner's approval within thirty six (36) months from the date of letter of award of the contract. The test shall be carried out by the test grade instruments as stipulated in the applicable test code. These instruments shall be calibrated by the Contractor in a laboratory duly approved by Owner. Batch calibration will not be acceptable. The available instrumentation and control equipment in the plant if found suitable could also be used with the prior approval of the Owner after calibrations in the plant/outside laboratory. The tests will be conducted at the specified load points, and as near the specified cycle conditions as practicable. Proper corrections in calculations to take into account the conditions





which do not correspond to the specified conditions will be applied in the test report as brought out under the respective sections of the specification.


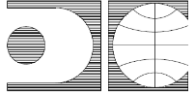
- c) All special test grade instruments, equipment, tools and tackles, required for the successful completion of the Performance and Guarantee Tests shall be brought for the purpose of test, free of cost by the Contractor.
- d) The guaranteed performance figures of the equipment shall be proved by the Contractor during these Performance and Guarantee Tests. The Contractor shall submit a detailed test report in the manner, already agreed to within one (1) month time of completion of the test, for Owner's approval. Should the Owner's assessment of these tests show any deterioration from the guaranteed values the Contractor/Owner shall modify the equipment as required to enable it to meet the guarantees to the satisfaction of the Owner. In such case, the Performance and Guarantee Tests shall be repeated within one (1) month, from the date the equipment is ready for retest and all costs for modifications including labour, materials and the cost of additional testing to prove that the equipment meets the guarantees, shall be borne by the Contractor.
- e) The specific tests to be conducted on equipment have been brought out in the technical specifications. The procedure to be submitted by the Contractor should include the detailed methodology to conduct these tests/verify the guarantees offered by the Contractor notwithstanding whether these attract liquidated damages or not.
- f) Instrument accuracies shall be in accordance with the relevant test codes. All instrument in-accuracies if applicable shall be computed as per the code and values will be corrected to the advantage of the Owner. No negative tolerance will be allowed. For example, if the inaccuracy of instrumentation has been worked out to be 1%, the measured values will be assessed to be 1% inferior for purpose of LD.
- g) The Bidder shall establish the following modes of operation to the satisfaction of the Owner before acceptance test :
 - i) Operation of each system by remote manual control.
 - ii) Operation of the entire system in integrated manner on auto control.
 - iii) Operation of the entire plant with auto-control loops fully implemented including different modes of load control with the help of control system.
- h) Ten (10) copies of the test reports are to be furnished by the Contractor to the Owner backed up with jointly signed data sheets.



DRAWINGS & DOCUMENTS ATTACHED

The following drawing/document are enclosed as a part of the specification:

1. Approved Design memorandum (BHEL DOC NO.: 4-WT-040-01613, WBPDCCL DOC NO.: RP-DC-445-WTP-A074) Rev 02
2. P& ID for CW Gas Chlorination System (BHEL DOC NO.: 1-WT-040-01922, WBPDCCL DOC NO.: RP-DG-445-WTP-A075) Rev 02
3. Layout drawings: (BHEL DOC NO.: 1-WT-080-01916, WBPDCCL DOC NO.: RP-DG-445-WTP-A058) Rev 02
4. UPVC / CPVC JOINING PROCEDURE (2-WT-220-00057)

02	20.07.2021	DBN/MEGA	MSM/VNS	MRK	Fresh Issue	
01	23.06.2021	DBN/MEGA	MSM/VNS	MRK	Fresh Issue	
00	20.11.2020	DBN/MEGA	MSM/VNS	MRK	Fresh Issue	
Rev.No	Date	Prepared	Checked	Approved	Remarks	
 WBPDC	WEST BENGAL POWER DISTRIBUTION CORPORATION LTD WEST BENGAL STATE, INDIA 1 X 660 MW UNIT No-5, PHASE-III SAGARDIGHI THERMAL POWER STATION					
 OWNER'S CONSULTANT	DEVELOPMENT CONSULTANTS PRIVATE LIMITED KOLKATA					
 BHEL	BHARAT HEAVY ELECTRICALS LTD BOILER AUXILIARIES PLANT RANIPET – 632 406.					
COPY RIGHT AND CONFIDENTIAL		DEPT CODE		NAME	SIGN	DATE
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED and it must not be used directly or indirectly in any way detrimental to the interest of the company.		9776	PRPD	DBN/MEGA	Sd/-	20.11.2020
			CHD	MSM/VNS	Sd/-	20.11.2020
			APPD	MRK	Sd/-	20.11.2020
TITLE DESIGN PHILOSOPHY FOR CW CHLORINATION SYSTEM			WBPDC DOC NO. RP-DC-445-WTP-A074 BHEL DOCUMENT NO. 4-WT-040-01613		REV.NO 02	

INDEX

SL NO.	DESCRIPTION	PAGE NO.
1.0	SCOPE	3
2.0	DESIGN PHILOSOPHY OF CW CHLORINATION PLANT	3
	- CALCULATION FOR CW CHLORINATION - EQUIPMENT DESIGN CRITERIA - CHLORINE LEAK ABSORPTION SYSTEM FOR CW CHLORINATION SYSTEM	
3.0	OPERATION CONTROL PHILOSOPHY & INSTRUMENTATION	9
4.0	DATA SHEET FOR CW CHLORINATION SYSTEM	10
5.0	MANDATORY SPARES	25

1.0 SCOPE

The scope of this design memorandum covers the basis of design, system philosophy, equipment selection and layout aspects and Control Philosophy of Gas Chlorination Plant for CW Chlorination plant and Chlorine Absorption System for **1X660 MW WBPDCS SAGARDIGHI TPS**.

2.0 DESIGN PHILOSOPHY FOR CW CHLORINATION PLANT

Gas Chlorination Plant has been designed to dose required quantity of chlorine to Cooling Water system. Chlorine gas shall be mixed thoroughly with the water in the ejector provided in the system. The chlorine solution thus obtained shall be dosed to CW forebay. System has been designed for continuous dosing of 1 ppm for 7 Hrs in a shift and shock dosing of 3 ppm for 1 Hr. in a shift. However, the actual dosing level shall be set by the operator based on residual chlorine measurement at the CW sump.

2.1 CALCULATION FOR CW CHLORINATION PLANT CAPACITY

CW & ACW Flow Capacity (max)	=	80000 m ³ /hr
Chlorine dosing rate (shock)	=	3 ppm
Total Chlorine consumption rate as per shock dose	=	(80000X 3)/1000 Kg./hr
Chlorine requirement as per shock dose	=	240 Kg./hr
Chlorinator selected based on shock dosing	=	3 @ 120 kg/hr (2W +1S)
Frequency and Period of shock dosing	=	1 hr in each shift (i. e, 1 hr in 8 hrs)
Daily Chlorine requirement as per shock dose	=	3 hrs X 240 Kg./hr
	=	720 Kg/Day
Chlorine requirement as per continuous dose		(80000 X 1)/1000 Kg/hr
	=	80 Kg/hr
Daily Chlorine requirement as per continuous dose	=	80 X 21 hrs = 1680 Kg/Day.
Total Chlorine requirement	=	(720+1680) Kg/Day.
	=	2400 Kg/Day.
No. of tonners provided (as per contract)	=	40 Nos
Total chlorine quantity (@900 Kg each)	=	40x900 = 36000kg

2.2 EQUIPMENT DESIGN CRITERIA

CW Chlorination plant shall consist of the following main equipment & accessories

- Chlorine ton containers,
- Pipe manifold with accessories

- Evaporator
- Chlorinator
- Booster pumps
- Basket Strainers
- Chlorine gas leak detector & safety equipment
- Chlorine gas absorption system
- Lifting & handling devices
- Associated piping, instrumentations & necessary controls.

2.2.1. Chlorine Ton Container

Chlorine Ton Containers are provided with isolation valves, eductor tubes, two (2) numbers Roller Supports, safety accessories and Automatic Switch over valve for each chlorine line. Details on number of Ton containers are specified in datasheet.

The design, fabrication and testing of ton container shall conform to the Chief Controller of Explosives, Government of India, Department of Explosives. Nagpur

2.2.2. Pipe manifold with accessories

12Nos. of Chlorine Manifolds (12 tonners) each with all accessories for CW Chlorination shall be taken in service. However, the total number of Manifolds will be decided based on recommendations of Gas chlorination vendor. Flexible connector with valve ends joining chlorine ton-container to the pipe manifold shall be constructed of annealed copper tubing with cadmium plated for internal and external surfaces. Copper tubing with suitable expansion loop shall be provided with silver soldered copper nipples on each end connected by ammonia type union. Alternatively, flexible metal hose, constructed of corrugated metal with moneltire braid and monel nipples may be supplied. Tubing shall be hydraulically tested to 40 Kg/ Sq.cm.

2.2.3. Evaporator

3Nos. of electrically heated water bath type Chlorine Evaporators, each with all accessories shall be provided for CW Chlorination system.

2.2.4. Chlorinator

3Nos. of Chlorinators with vacuum operated aqueous solution feed type complete with all accessories are provided. Each Chlorinator have the items as follows:

- 1) Remote Vacuum Regulator.
- 2) Cabinet with:
 - a) Chlorine Gas Flow meter.
 - b) Differential Pressure Regulator.
 - c) Flow Control Valve.
- 3) Fixed throat type Remote Ejector

2.2.5. Booster water pumps

Water Supply Booster Pumps, each complete with electrical drive motor and all other accessories to supply motive water to the Evaporators and Chlorinators.

2.2.6. Basket strainers

Two (2) numbers (1W+1S) at upstream of Suction Header of each booster water pump.

2.2.7. Diffuser

Diffuser shall be designed to dose concentrated chlorine solution in required quantity at each dosing point. Perforated type diffuser shall be designed to meet the process requirement of adequate flow and velocity.

2.2.8. Hoist mono-rails

Electrically operated monorail hoist shall be provided for lifting the ton container in the CW chlorination building. Lifting bar to grab the empty or full ton container during handling (1 No.) shall have suspension type load indicator of minimum capacity (Net) 3000 Kg.

2.2.9. Weighing scale

One number Weighing scale of 2-ton capacity of platform dial type shall be provided. Weighing scale shall be suitable for fixing on the ground.

2.2.10. Other misc. Accessories

System shall also have following:

- Associated piping and valves required for the system.
- All necessary instruments and controls required for easy and safe operation of the system.

2.2.11. Safety & supervisory instrument**Gas mask & oxygen breathing equipment**

Gas mask along with breathing apparatus tank complete with full mask, full vision face pieces, air flow regulating valves & all accessories shall be provided. In addition to above, canister type breathing apparatus shall be provided in which moisture content from the wearer exhaled air react with granular chemical in breathing apparatus & liberates oxygen. The released oxygen enters a breathing bag from which the wearer can inhale.

Chlorine detector.

Refer Datasheet CI.4.0

Emergency kit

Emergency kit with all accessories shall be provided to seal off Chlorine Ton Containers.

2.3 CHLORINE LEAK ABSORPTION SYSTEM FOR CW CHLORINATION

An automatic chlorine leak absorption system has been provided for Chlorination plant for the tonner in service & standby tonners. All vent lines of chlorine shall be connected to absorption system. The chlorine leak absorption system shall absorb leaked chlorine from the hood by means of blowers provided at the end of the duct. In the event of leakage in chlorine ton container, the alkali recirculation pump and fan shall start automatically by a signal from leak detector. The blower shall suck the leaked chlorine gas through FRP Hood & duct and shall direct chlorine to the absorption tower bottom. In the absorption tower chlorine shall be absorbed by the circulating alkali solution. The chlorine leak absorption system shall be sized for absorption & neutralisation of about one-ton chlorine leakage in one hour. in the event of leak detection in the chlorinator room, the ventilation fan shall be stopped.

Minimum capacity of each caustic solution tank shall be suitable to absorb Two (2) No. of completely leaked chlorine ton container plus 20% margin. Caustic concentration in tank shall not exceed 20% W/W. Tank shall be provided with caustic charging platform with handrails & staircase, level gauges, overflow, drain with valves, sampling connection, level transmitter, water filling connection etc.

The absorption system shall mainly comprise of:

Equipment & Accessories for C.W. Chlorine Absorption system: 1 set of leak absorption system shall be provided for the CW chlorination plant. The following items shall be provided:

- a) Total 40 Nos Chlorine Ton containers. 12 numbers of full FRP hoods to enclose Chlorine Ton Containers connected to the manifolds each with flexible hose arrangement for connection to FRP Duct Work.
- b) 28 Nos Half hood shall be provided for rest of the cylinders (which are not connected).
- c) Two (2x100) number of exhaust/Ventilation fan along with damper shall be provided.
- d) Two (2x100) numbers Blowers, each complete with electrical drive motor and all other accessories for leak absorption system.
- e) One (1) number Chlorine Absorption Tower complete with all accessories for leak absorption system.
- f) One (1) number Caustic Solution preparation cum Recirculation Tank, complete with agitator as well as its drive motor & all other accessories for leak absorption system.

- g) Two (2x100) numbers Caustic Solution Preparation cum Recirculation Pumps, each complete with electrical drive motor and all other accessories for leak absorption system.
- h) FRP Duct Work to Absorption System with all accessories as required for leak absorption system.
- i) Interconnecting piping valves, ducts, control and instrumentation.
- j) Painting procedure will be as per tender specification
- k). Chlorine extraction system in chlorinator room will be provided based on the system supplier recommendations.
- l). Chlorine regulation from control room will be provided based on the system supplier recommendations

2.4 GUARANTEE OF CHLORINATION SYSTEM

- (a). CW Chlorination System
 - Evaporator shall be guaranteed for the rated capacity.
 - Chlorinator shall be guaranteed for the rated capacity.
- (b). Chlorine Absorption System
 - 1. The outlet air from the absorber shall not have free residual chlorine more than 0.1ppm.
 - 2. The caustic solution flow rate through the absorber system shall be cater one completely leaked chlorine ton- container content can be absorbed within one hour (maximum) time.

2.4 PUMPS AND PIPE SELECTION CRITERIA

Pump and pipeline carrying water and chemicals etc. shall generally be sized on the following velocities. However, wherever minimum pipe sizes are defined in the drawing/datasheets, the selected size shall not be less than the specified size.

Pipe Size	Velocity in m/sec		
	Below 50 mm	50 mm - 150 mm	200 mm & above
Pump Suction for Water		1.2 - 1.5	1.2 - 1.8
Pump Discharge for Water	1.2 - 1.8	1.8 - 2.4	2.1 - 2.5
Header for water		1.5 - 2.4	2.1 -2.4
Gravity flows	1.0 (maximum)		
Compressed air below 2 Kg/cm ² (g)	15 - 20	20 - 30	25 - 35
Compressed air 2 Kg/cm ² (g) & above	20 - 30	25 - 40	35 - 45
Suction to compressor/ Blowers		7-8	
Pump Suction for Chemical Solution	0.8 - 1.2	0.8 - 1.3	-
Pump Discharge for Chemical Solution	1.2 - 1.4	1.3 - 1.5	-

Note:

- All piping system shall be capable of withstanding the maximum pressure in the corresponding line.
- TDH of all pumps shall be decided by the supplier assuming the following 'C' values in Hazen Williams equation for calculation of friction loss.

MS Pipes – 120

CPVC Pipes – 140

3.0 OPERATION CONTROL PHILOSOPHY & INSTRUMENTATION

3.1 CW CHLORINATION

The operation of the Circulating Water Chlorination System shall be semi-automatic through the DCS based control system with LED screen based Operator Work Station located in Control Room.

Each manifold shall have pressure switch which shall be interlocked with auto changeover valve. The pressure switch shall immediately send a signal to the Auto Changeover Valve when the chlorine pressure at operating manifold falls below the set point. This is to ensure uninterrupted flow of chlorine to the system. Annunciation signal provided indicates that the tonner under service is empty and has to be replaced.

Expansion chamber shall have a pressure switch to provide High Alarm signal in the DCS when the pressure at the inlet of the Evaporator exceeds the set point value. The solenoid valve at water inlet line of Evaporator shall open/close with reference to low/high water level in Evaporator. The auto shut-off valve will get closed when the temperature of chlorine gas reaches below the set point value or the pressure at the downstream of evaporator is high or the discharge pressure of the related Booster Pumps reaches below the set point value.

The dual redundant Vacuum Switch will give signal to DCS if the system fails to create specified vacuum. In the event of chlorine leakage, the Chlorine Leak Detector shall provide alarm and activate the Caustic Circulation Pump (pre-selected via DCS). After preset time delay the Blower (pre-selected via DCS) will start automatically and the process of neutralization shall be set into operation. Dampers of blowers and valves of Caustic Circulation Pump shall always be kept open manually.

Chlorine Tonner Storage Area and Chlorination Room will be properly ventilated by continuous running ventilation fans. When Blowers of Absorption System come into operation through detection of dangerous level of chlorine leakage, the normal ventilation fans should stop and the same will again restart when Blowers stop.

ON/OFF/TRIP status of all pumps, blowers, agitators, ventilation fans and drive motors wherever required shall be displayed in DCS Operator work station.

All drive motors & valves shall be connected to DCS and signal exchange as described in Drive Control Philosophy (PE-DM-445-145-I002) and Mechanical Auxiliary packages (PE-DM-445-145-I900). For cable tray layout refer Drg. No. RP-DG-445-WTP-E072.

4.0 DATA SHEETS FOR CHLORINATION SYSTEMS

4.1 DATA SHEET FOR CW CHLORINATION WITH ABSORPTION SYSTEM

1.0	CHLORINE TON-CONTAINERS	
1.1	Number	Twelve (12) numbers Ton Containers will be connected to manifolds and other Twenty-eight (28) numbers Ton Containers will be kept as storage.
1.2	Description for each Chlorine Ton Container	
1.3	Chlorine capacity, each	Not less than 900 Kg.
1.4	Material of construction	ASTM-A-285 Gr.C/ASTM A 515 Gr.70.
1.5	Design pressure	19.9 Kg/cm ² (g).
1.6	Design Temperature	65°C
1.7	Corrosion allowance	1.5 mm (minimum).
1.8	Radiography	100 %.
1.9	Heat treatment	Fully stress relieved.
1.10	Mounting	Each Chlorine Ton-Container shall be mounted on two (2) numbers metallic bracket type Roller Supports. However, the Chlorine Cylinder will be mounted on trolley with chain as holding material. These brackets will be mounted on civil foundation and all necessary anchor bolts, inserts, nuts etc.
1.11	Applicable Code	Design, fabrication and testing to conform to the regulations of Chief Controller of Explosives, Govt. of India/ Chlorine Institute, U.S.A.
1.12	Accessories	
1.12.1	Container valves	
1.12.1.1	Number	One set for each Chlorine Ton-Container.
1.12.1.1	Design Standard	IS-3224 or Equivalent.
1.12.2	Eductor Tubes	
	Number	Two (2) numbers eductor pipes shall be provided for each, each terminating into an isolating valve.
	Purpose	One eductor tube will be used for chlorine gas withdrawal while the other shall deliver liquid chlorine.
1.13	Instrumentation and Control	Shall be provided as per specification and Approved P&ID
2.0	EVAPORATORS	

2.1	Number	Three (3) (2W+1S) numbers
2.2	Description for each Evaporator	
2.3	Location	Indoor.
2.4	Capacity	Not less than 120 Kg/Hr.
2.5	Type	Electrically heated constant temperature immersion water bath type.
2.6	Material of construction	
2.6.1	Liquid Chlorine inlet pipe	Seamless steel tube as per ASTM A 106 Gr.B (Sch.80)
2.6.2	Bottom flange(inlet chamber)	SA 105
2.6.3	Counter Flange	IS 2062 Gr.B
2.6.4	Flange: Outlet Chamber	IS 2062 Gr.B
2.6.5	Outlet Chamber Pipe	IS: 3589 2001 ERW pipe
2.6.6	Gas outlet pipe	SA 106 Gr. B Seamless (Sch.80)
2.6.7	Top Flange (Inner Chamber)	SA 105
2.6.8	Gasket	Asbestos free gasket as per ISO 14001
2.6.8.1	Inner chamber pipe	SA 106 Gr. B
2.6.9	Super heat baffle pipe	SA 106 Gr. B
2.6.10	Base plate	IS 2062 Gr.B
2.6.11	Inlet and outlet pipe flange	SA 105
2.6.12	Overflow and drain piping	MS IS: 1239 Heavy (Galv)
2.7	Corrosion Allowance	3 mm (minimum)
2.8	Radiography	100 %.
2.9	Heat treatment	Fully stress-relieved.
(a)	Hydraulic test pressure for vaporizer	40 Kg/Sq. cm (g).
2.9	Accessories	
2.9.1	Rupture Disc	
2.9.1.1	Number	One (1) for each Evaporator.
2.9.1.2	Type	Bellow/Diaphragm type with local facility for adjustment of set point.
2.9.1.3	Size	Suitable.
2.9.1.4	Allowable Pressure	As per system requirement.
2.9.1.5	Material of construction	Body – Silver coated Carbon Steel.
2.9.2	Expansion Chamber	
2.9.2.1	Number	One (1) for each Evaporator complete with pipe works, unions, isolation valve, nuts and bolts, support brackets and all other accessories.
2.9.2.2	Size	Suitable as per process/system requirement by manufacturer
2.9.2.3	MOC	Carbon Steel body with 100% radiography.
2.9.2.4	Design code	ASME SEC VIII Div 1
2.9.2.5	Fluid Handled	Chlorine Gas/ Chlorine Liquid

2.9.2.6	Body test Pressure	40 Kg/cm ² (g).
2.9.2.7	Radiography	100% on all butt weld joints
2.9.3	Heating element.	
2.9.3.1	Number/ Unit	As per manufacturer standard
2.9.3.2	Capacity	As per manufacturer standard
2.9.3.3	Type	Immersion type, 3-phase, 415 V, 50 Hz.
2.9.3.4	MOC	Body - Carbon Steel as per ASTM A 105, Diaphragm - PTFE. Trim - Monel.
2.9.4	Pressure Relief Valve	
2.9.4.1	Number	One (1) for each stream.
2.9.4.2	Type	Spring Loaded type and provided with Rubber Disc for protection from chlorine gas
2.9.4.3	Size	Suitable
2.9.4.4	Vent Line	The chlorine gas vented from Pressure Relief Valve, will be led to absorption system.
2.9.4.5	Material of construction	Body - Carbon Steel as per ASTM A 105. Diaphragm - PTFE. Trim - Monel.
2.9.4.6	Body Test Pressure	40 Kg/cm ² .
2.9.5	Water Chamber	
2.9.5.1	Size and thickness	As per manufacturer standard.
2.9.5.2	Insulation Material	As per manufacturer standard
2.9.5.3	Temp of water bath	80 °C
2.9.5.4	Fluid handled	Water
2.9.5.5	Design pressure	Water
2.9.5.6	Hydro-test pressure	Water fill test
2.9.5.7	Joint efficiency	0.7
2.9.5.8	Radiography	Nil
2.9.5.9	Corrosion allowance	1.5 mm
2.9.6	Electrically interlocked shut-off valve at the gas discharge line from Evaporator	Shall be provided.
2.9.7	Cathodic protection system	
2.9.7.1	Type	One set Sacrificial type.
2.9.7.2	Purpose	Shall be provided to protect Water Bath and outside of Evaporator.
2.9.8	One (1) number Control Cubicle complete with necessary contactors, fuses, push buttons, indication lamps, ammeters and	Shall be provided.

	other instruments for each Evaporator	
2.9.9	Instrumentation and Control	Will be provided as per the specification and approved P&ID
3.0	CHLORINE GAS STRAINERS	
3.1	Number	Six (6) [Four (4) in operation and two (2) as stand-by].
3.2	Description for each Strainer	
3.3	Application	To trap any liquid chlorine "Mist" and solid impurities from reaching the chlorinator.
3.4	Capacity	100 % for each Chlorinator.
3.5	Material of construction	Carbon steel SA 105
3.6	Filter Media	As per manufacturer standard
3.7	Instrumentation and Control	Will be provided as per the specification and approved P&ID
4.0	PRESSURE REGULATING VALVE	
4.1	Number	One (1) for each stream.
4.2	Description for each Valve	
4.3	Type	As per the Standard of the Manufacturer
4.4	Material of construction	
4.4.1	Body	Carbon Steel as per ASTM A 105.
4.4.2	Diaphragm	PTFE.
4.4.3	Trim	Monel.
4.5	Size	Suitable
4.6	Location and mounting	Gas line from evaporator to chlorinator to Subject chlorinators to less pressure during operation.
4.7	Spring range	0-8 Kg/cm ² .
4.8	Flange	Ends shall be flanged and flange sealing done by lead gasket.
4.9	Body Test Pressure	40 Kg/cm ² .
5.0	CHLORINATORS	
5.1	Number	Three (3) (2W+1S) numbers
5.2	Description for each Chlorinator	
5.3	Location	Indoor.
5.4	Capacity, Kg/hr	120 Kg/hr.
5.5	Type	Vacuum solution feed type. Each Chlorinator Cabinet shall be fiberglass, self-colored, resistant to corrosion by chlorine gas and chlorinated water solution.
5.6	Design Standard	IS: 10553 Part 2
5.7	Accessories for each chlorinator	
5.7.1	Inlet Chlorine Pressure Reducing	Provided

	Valve	
5.7.1.1	Number	1 number
5.7.1.2	Type & MOC	As per manufacturer standard
5.7.2	Chlorine Feed Rate Adjuster	
5.7.2.1	Number/ Unit	1 number
5.7.2.2	Type & MOC	As per manufacturer standard
5.7.3	Automatic pressure vacuum relief valve	Provided
5.7.3.1	Number/Unit	1 number
5.7.3.2.	Type & MOC	As per manufacturer standard
5.7.4	Vacuum regulating valve	Shall be provided.
5.7.4.1.	Number/Unit	1 number/ unit with each set
5.7.4.2.	Type & MOC	As per manufacturer standard
5.7.5	Flow rate indicator	
5.7.5.1	Number/Unit	1 number
5.7.5.2	Type	Rota meter
5.7.5.3	Material	Borosilicate Glass & Float: PTFE
5.7.6	Injector	
5.7.6.1	Number/Unit	1 number/ each Chlorinator
5.7.6.2	Type	Fixed type
5.7.6.3	MOC	CI (IS-210 grade) with FRP/RL inside. The injector will include ebonite jet. The throat studs will be SS-316 and gasket will be of rubber
5.7.11	Chlorine Detector	Details will be provided after finalization of Vendor
5.7.12	Diffuser	Details will be provided after finalization of Vendor
5.7.13	Instrumentation and Control	Will be provided as per the specification and approved P&ID
6.0	SUCTION STRAINERS FOR CHLORINATOR WATER BOOSTER PUMPS	
a	Qty	6 nos for chlorinator water booster pump (For Each pump 2x100% Capacity) Basket Strainer with all accessories shall be provided
b	Capacity	100% each
	Pressure gauge	
c	Number	Two (2) for each Chlorination System
d	Location	At suction and discharge of Strainer Assembly
d	Type	Bourdon Gauge with diaphragm seal.

6.0	CHLORINATOR WATER SUPPLY BOOSTER PUMPS	
6.1	Number	Three (2W+1S) numbers
6.2	Description for each Pump	
6.3	Type of Pump	Horizontal Centrifugal Non Clog type
6.4	Location	Indoor.
6.5	Fluid to be handled	Circulating Water Cooling Water
6.6	Service	To supply motive water for Chlorinator.
6.7	Duty	Continuous and to be suitable for parallel operation.
6.8	Suction Condition	Flooded.
6.9	void	
6.10	Type of Impeller	Semi Open or Open
6.11	Design standard	As per IS-5659 & IS-5120.
6.12	Service temperature, in °C	60 maximum.
6.13	Rated Capacity, m ³ /hr	To suit the requirement of the each Chlorinator and shall be decided as per supplier recommendation during detailed engineering & as per process requirement.
6.14	Permissible tolerance in rated capacity, in %	As per IS-5659 & IS-5120.
6.15	Range of operation	20 % - 120 %.
6.16	Suction Condition	Flooded.
6.17	Tentative head to be developed at rated capacity	Cap : 60 m ³ /hr & Head : 60 MWC
6.18	Material of construction	
6.18.1	Casing	CI as per IS 210 FG 260
6.18.2	Impeller	Bronze as per IS 318
6.18.3	Shaft	EN 8 as per BS 970
6.18.4	Stuffing Box and Gland	C.I.
6.18.5	Gland Packing	Graphite free Teflon.
6.18.6	Common Base plate	Fabricated Steel as per IS 2062.
6.18.7	Nuts and bolts	SS-316
6.19	Type of drive & selection criteria	Electrical Motor. 15 % margin over BKW at rated duty point.
6.20	Rated speed (RPM)	1500 (Sync.) maximum.
6.21	Voltage, Phase & Frequency (± % Variation)	415 V (± 10%), 3 Phase, 50 HZ (± 5).
6.22	Type of coupling between Pump & Motor	Flexible Spacer.
6.23	Noise level (for complete set of Pump & Motor)	Not more than 85 db (At a distance of 1.0 m from the outer surface of Motor).

6.24	Painting for complete set of Pump & Motor	Surface preparation shall be as per SA 2-1/2 Swiss Standard.
	a) Primer	As per tender specification
	b) Finish paint	As per tender specification
	c) Shade	Grey color
6.25	Tests and Inspection	
	a) Material Test required for	Casing, Impeller, Shaft and Shaft Sleeve.
	b) Hydro-test.	As per IS-5120
	c) Dynamic Balancing Test	Will be provided
6.26	Performance Test	
	a) Test Code	Hydraulic Institute Standard.
	b) Tests to be done for determination of	Head-Capacity Curve, BHP-Capacity Curve and Efficiency - Capacity Curve and NPSH - Capacity Curve.
	c) Test to be carried out	On prototype model at rated speed.
	d) Test for satisfactory operation of pump at site	Will be provided
6.27	Instrumentation & Control	Shall be provided as per specification and approved P&ID
6.28	Start and stop facility provided both at local and Room	Will be provided.
6.29	Trip interlock	Provided.
7.0	CHLORINATED WATER DIFFUSER AND MIXING SYSTEM	
7.1	Location for injection of chlorinated water	Individual pump sumps
7.2	Device for injection of chlorinated water	Diffusers / Mixing Tee
7.3	Location of diffusers	Forebay and individual pump sump (Well below minimum water level).
7.4	Material of construction	Rubber Lined Perforated Steel Tubes/ Polypropylene Diffusers/HDPE/CPVC
7.5	Number	12 Nos.
7.6	Dimensions	As per manufacturer standard
8.0	LIFTING AND HANDLING DEVICES	
8.1	Monorail hoist	
8.1.1	Number	One (1) number in CW Chlorination Building
8.1.2	Type	Electrically operated.
8.1.3	Duty	To handle Chlorine Ton-Container.
8.1.4	Safe working load	3000 kg maximum.
8.2	Weighing Scale	
8.2.1	Number	One (1) number

8.2.2	Type	Platform Dial Type.
8.2.3	Duty	To handle Chlorine Ton-Container.
8.2.4	Range	0 - 2000 kg
9.0	SAFETY AND SUPERVISORY EQUIPMENT	
9.1	Gas Mask and Oxygen Breathing equipment along with Breathing Apparatus	
9.1.1	Number	Two (2) numbers
9.1.2	Capacity	One (1) hour minimum.
9.1.3	Accessories Shall be provided.	Full mask, full vision face pieces, flow regulating valves and all other accessories.
9.2	Canister Type Breathing Apparatus	
9.2.1	Number	Two (2) numbers
9.2.2	Type	The moisture content from exhaled air of the User should react with granular chemical in Breathing Apparatus and liberates oxygen. The released Oxygen should enter a breathing bag from which the User can inhale.
9.3	Ammonia bottles	
9.3.1	Number	Four (4) numbers (min.) Will be provided based on layout
9.3.2	Capacity	500 ml each.
9.3.3	Accessories Shall be provided.	Filled up with commercial grade ammonia solution (26 degree Be) to detect leakage of chlorine.
9.4	Chlorine Residual Test Kit	
9.4.1	Number	Two (2) Nos
9.4.2	Type	Colorimetric Test Comparator
9.4.3	Range	One 0 to 0.5 ppm in steps of 0.05 ppm and second 0.5 to 6 ppm in steps of 0.5 ppm.
10.0	CHLORINE LEAK DETECTOR	
10.0.1	Number	Seven (7) nos. (4 for Chlorine Ton-Container Storage Room and 3 for Chlorination Room).
10.0.2	Type	Electronic type.
10.0.3	Alarm	Shall be provided. in case of leakage of Chlorine.
10.0.4	Interlock	Shall be provided.
10.1	Emergency Kit	
10.1.1	Number	Two (2) numbers

10.1.2	Accessories Shall be provided.	All accessories Shall be provided to seal off Chlorine Ton-Containers.
10.2	Weather Cock	
10.2.1	Number	One (1) number
10.3	Safety shower with eye wash	
10.3.1	Number	One (1) number
10.3.2	Location	Out door
10.4	Goggles	
10.4.1	Number	Two (2) numbers
10.5	Gloves	
10.5.1	Number	Two (2) numbers
10.6	Colored Vest	
10.6.1	Number	Two (2) numbers
10.7	FRP Hood with Hose	40 Nos shall be provided
11.0	LEAKED CHLORINE ABSORPTION SYSTEM	
11.1	EXHAUST FANS	
11.2	Number	Shall be as per requirement & as per manufacturer standard
11.3	Description for each Fan	
11.4	Location	Indoor.
11.5	Fluid to be handled	Ambient Air mixed with Chlorine Gas leaked from Chlorine Ton Container.
11.6	Service	To transfer Ambient Air mixed with Chlorine Gas leaked from Chlorine Ton Container & Chlorinator room, to suction of Blowers of Chlorine Absorption System.
11.7	Duty	Intermittent.
11.8	Type	Bifurcated type.
11.9	Rated Capacity	Will be provided as per the requirement of the system.
11.10	Head to be developed at rated capacity	Will be provided as per the requirement of the system.
11.11	Material of construction	Polypropylene or FRP.
11.12	Type of drive	Electrical Motor
11.13	Criteria for selection of drive motor	Minimum 15 % margin over BKW at rated duty point shall be taken and standard motor with next higher KW as available shall be selected. This shall in no be less than the maximum power required by the Blower.
11.14	Rated speed (RPM)	1500 (Sync.)
11.15	Voltage, Phase & Frequency (\pm % Variation)	415 V (\pm 10%), 3 Phase, 50 HZ (+3 to -5%).

11.16	Noise level (for complete set of Blower & Motor)	Not more than 85 db (At a distance of 1.0 m from the outer surface of Motor).
11.17	Painting for complete set of Fan & Motor	As per painting specification (details will be provided in equipment data sheet after ordering on sub-supplier as per tender specification)
11.18	Start and stop facility provided both at local and panel	Shall be provided. in conjunction with Auto Start Facility.
11.19	Start interlock	Shall be provided. In case of leakage of Chlorine, the Atmospheric Ventilation Fans will stop and Exhaust Fans will take automatic start. However, the Atmospheric Ventilation Fans will be started and Exhaust Fans will be stopped in manual mode.
11.20	Accessories Shall be provided.	Exhaust Fan Shall be provided with damper (as per manufacturer recommendations.) The complete electrical wiring and interlock facility as mentioned above shall be provided for both Exhaust Fans as well as Atmosphere Ventilation Fans.
12.0	BLOWERS OF CHLORINE ABSORPTION SYSTEM	
12.1	Number	Two (2) [One (1) number to be under operation and the other as standby].
12.2	Description for each Blower	
12.3	Location	Outdoor.
12.4	Fluid to be handled	Ambient Air mixed with Chlorine Gas leaked from Chlorine Ton Container.
12.5	Service	To transfer Ambient Air mixed with Chlorine Gas leaked from Chlorine Ton Container & Chlorinator room to Chlorine Absorption Tower.
12.6	Duty	Intermittent.
12.7	Type of Blower	Centrifugal.
12.8	Type of Impeller	Fan Blade.
12.9	Design standard	IS 4894
12.10	Service temperature, in °C	60 maximum.
12.11	Rated Capacity for each, m ³ /hr	Adequate for absorption of chlorine leaked from one (1) number completely filled Chlorine Ton Container, within one hour (maximum).
12.12	Permissible tolerance in rated capacity, in %	As per IS-4894.

12.13	Head to be developed at rated capacity	Will be provided after finalization of Vendor
12.14	Permissible tolerance in efficiency at rated capacity, in %	As per IS-4894.
12.15	Material of construction	
12.15.1	Casing	Polypropylene or FRP.
12.15.2	Impeller	Polypropylene or FRP.
12.15.3	Shaft	EN-8 to BS-970.
12.15.4	Common Base plate	Fabricated Steel as per IS 2062.
12.15.5	Coupling Guard	Carbon Steel.
12.15.6	Nuts and bolts	Haste Alloy -C
12.16	Type of drive	Electrical Motor
12.17	Criteria for selection of drive motor	Minimum 15 % margin over BKW at rated duty point shall be taken and standard motor with next higher KW as available shall be selected. This shall in no be less than the maximum power required by the Blower.
12.18	Rated speed (RPM)	1500 (Sync.)
12.19	Voltage, Phase & Frequency (\pm % Variation)	415 V (\pm 10%), 3 Phase, 50 HZ (+3 to -5%).
12.20	Type of coupling between Blower & Motor	Direct.
12.21	Noise level (for complete set of Blower & Motor)	Not more than 85 db (At a distance of 1.0 m from the outer surface of Motor).
12.22	Painting for complete set of Blower & Motor	Painting details will be provided along with equipment data sheet after ordering the equipment on sub-supplier as per tender specification.
12.23	Tests and Inspection	
12.24	Material Test required for	Casing, Impeller and Shaft.
12.25	Hydro-test	As per IS-4894. If applicable.
12.26	Dynamic Balancing Test	Shall be provided.
12.27	Performance Test	
12.28	Test Code	As per IS-4894.
12.29	Tests to be done for determination of	Head-Capacity Curve and BHP-Capacity Curve.
12.30	Test to be carried out	On prototype model at rated speed.
12.31	Test for satisfactory operation of Blower at site	Required.
12.32	Start and stop facility provided both at local and panel	Shall be provided. in conjunction with Auto Start Facility.
12.33	Start interlock	Shall be provided.
12.34	Accessories Shall be provided.	Common Base Frame, Suction Filter, Suction Silencer, Discharge Silencer,

		Discharge Damper. Instruments shall be as per approved P&ID.
13.0	CHLORINE ABSORPTION TOWER	
13.1	Numbers Shall be provided.	One (1).
13.2	Description	
13.3	Type	Vertical Cylindrical Packed Absorption Tower. The Absorption Tower will be mounted on the Caustic Solution Preparation cum recirculation Tank.
13.4	Type of fluid to be handled	20% w/w (maximum) caustic solution and chlorine gas.
13.5	Rated Absorption Capacity, kg of chlorine/hr	Adequate for absorption of chlorine leaked from one (1) number completely filled Chlorine Ton Container within one hour (maximum).
13.6	Fill	Polypropylene Raschig / Pall rings along with baffle plates to keep entrainment loss less than 0.1% of circulating liquid flow rate.
13.7	Caustic Flow Rate, m ³ /hr	Adequate for absorption of chlorine leaked from one (1) number completely filled Chlorine Ton Container within one hour (maximum).
13.8	Cl ₂ content at outlet of Chlorine Absorption Tower	Free residual chlorine shall not be more than 0.1 ppm.
13.9	Design Temperature, °C	80
13.10	Location	The absorber shall be mounted on the caustic solution preparation-cum recirculation tank.
13.11	Design Code	As per manufacturer standard
13.12	Material of Construction	FRP
13.13	Protection	
13.14.1	Internal	Not required.
13.14.2	External	Not required.
13.15	Provided with accessories as follows:	
13.15.1	Dissolving Basket	Not required.
13.15.2	Inlet	Shall be provided.
13.15.3	Outlet	Shall be provided.
13.15.4	Drain	Shall be provided.
13.15.5	Overflow	Not required.
13.15.6	Vent	Shall be provided.
13.15.7	Manhole	Shall be provided.

13.15.8	Rain protection	Necessary arrangement in order to prevent rain water entry needs Shall be provided.
14.0	CAUSTIC SOLUTION PREPARATION-CUM-RECIRCULATION TANK	
14.1	Numbers Shall be provided.	One (1).
14.2	Description	
14.3	Type	Vertical cylindrical with flat bottom.
14.4	Type of fluid to be handled	20% w/w (maximum) caustic solution.
14.5	Effective capacity, in m3	10 m3. Adequate to absorption of chlorine leaked from two (2) number completely filled Chlorine Ton Container +20% margin
14.6	Minimum Free Board, in mm	300.
14.7	Void	
14.8	Design Pressure kg/cm2	Atmospheric
14.9	Design Temperature, °C	80
14.10	Design Code	IS803
14.11	Code for Tests and inspections	IS803
14.12	Material of Construction	Carbon steel as per IS 2062 or ASTM A 515 Gr.70.
14.13	Protection	
14.13.1	Internal	Natural rubber [thickness - 4.5 mm in three (3) layers, shore hardness 60o – 70o A], suitable to withstand the design temperature.
14.13.2	External	As per approved painting specification
14.14	Provided with accessories as follows:	
14.14.1	Agitator along with drive motor and other accessories	Shall be provided. Agitator shall be motor driven through reduction gear. All wetted parts of the agitator shall be of SS-316 construction.
14.14.2	Dissolving Basket	Shall be provided. Dissolving Basket shall be of SS-316 construction.
14.14.3	Inlet	Shall be provided.
14.14.4	Outlet	Shall be provided.
14.14.5	Drain	Shall be provided.
14.14.6	Overflow	Shall be provided.
14.14.7	Vent	Shall be provided.
14.14.8	Manhole	Shall be provided.
14.14.9	Sample Collection Point	Shall be provided.

14.14.10	Isolation Gates	Not required.
14.14.11	Platform complete with handrails for operation	Shall be provided.
14.14.12	Staircase	Shall be provided. for access from finished ground level to top of Operation Platform.
14.14.13	Instrumentation and Control	Shall be provided as per Specification and approved P&ID
15.0	CAUSTIC SOLUTION PREPARATION-CUM-RECIRCULATION PUMPS	
15.1	Number	Two (2) [One (1) number to be under operation and the other as standby].
15.2	Description for each Pump	
15.3	Type of Pump	Horizontal Centrifugal
15.4	Location	Outdoor.
15.5	Fluid to be handled	20% w/w (maximum) caustic solution at operating temperature 80 degree maximum
15.6	Service	To absorb chlorine leaked from Chlorine Ton Containers.
15.7	Duty	Intermittent
15.8	Suction Condition	Flooded.
15.9	Type of Pump	Horizontal Centrifugal Non Clog type
15.10	Type of Impeller	Semi Open or Open
15.11	Design standard	As per IS-5659 & IS-5120.
15.12	Service temperature, in degree C	80 maximum.
15.13	Rated Capacity, in m ³ /hr	Suitable for absorption of chlorine leaked from one (1) completely filled Chlorine Ton Container, within one hour (Maximum) plus 20% margin.
15.14	Permissible tolerance in rated capacity, in %	As per IS-5659.
15.15	Range of operation	20 % - 120 %.
15.16	Suction Condition	Flooded.
15.17	Tentative head to be developed at rated capacity, MLC	20 mwc minimum. If necessary, higher value needs to be considered to meet the requirements of Chlorine Absorption System as per Tender Specification.
15.18	Permissible tolerance in efficiency at rated capacity, in %	As per IS-5659.
15.19	Material of construction	
15.19.1	Casing	SS 316
15.19.2	Impeller	SS 316
15.19.3	Shaft	EN-8 as per BS-970 / SS 316.

15.19.4	Mechanical Seal	SS-316.
15.19.5	Common Base plate	Fabricated Steel as per IS 2062.
15.19.6	Nuts and bolts	SS-316
15.20	Type of drive	Electrical Motor
15.21	Criteria for selection of drive motor	Minimum 15 % margin over BKW at rated duty point shall be taken and standard motor with next higher KW as available shall be selected. This shall in no way be less than the maximum power required by the Pump.
15.22	Rated speed (RPM)	1500 (Sync.) maximum.
15.23	Voltage, Phase & Frequency (\pm % Variation)	415 V ($\pm 10\%$), 3 Phase, 50 HZ (+3 to -5%).
15.24	Type of coupling between Pump & Motor	Flexible Spacer.
15.25	Noise level (for complete set of Pump & Motor)	Not more than 85 dB (At a distance of 1.5 m from the outer surface of Motor).
15.26	Painting for complete set of Pump & Motor	Shall be as per tender specification
15.27	Suction Strainer along with flushing connection	Shall be provided.
15.28	Start and stop facility provided both at local and Room	Shall be provided. in conjunction with Auto Start Facility.
15.29	Trip interlock	Shall be provided.
15.30	Testing	Shall be provided to meet the specification
15.31	Instrumentation and Control	Shall be provided as per Specification and approved P&ID
16	Piping & Valves	
16.1	Piping	(a) Dry Chlorine gas under pressure; - ASTM A 106 Schedule 80 (b) Chlorinated Water and Wet Chlorine Gas : UPVC as per IS 4985 (c) Chlorine gas under vacuum: UPVC as per IS 4985 (d) Sodium hydroxide Solution: UPVC (e) Potable Water, Service Air, Instrument Air ; ASTM 53 Gr.B/IS:1239, Part-I, heavy grade.
16.2	Valves	
16.2.1	Type	Ball/Rising stem globe
16.2.2	Body	Steel/ Bronze (silver plated)
16.2.3	Seat, stem & Ball	Monel
16.2.4	Disc	Haste-alloy/ Monel

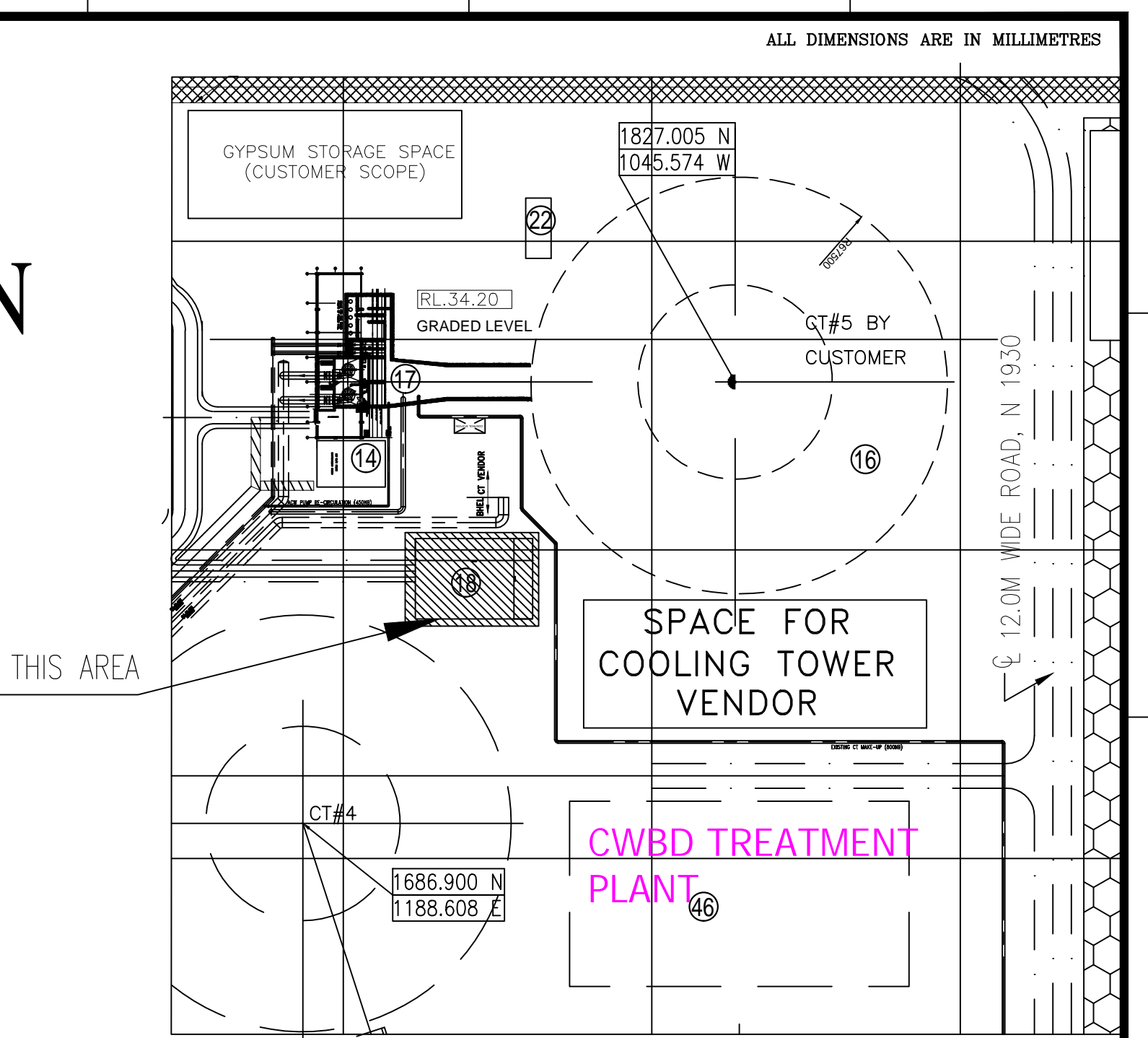
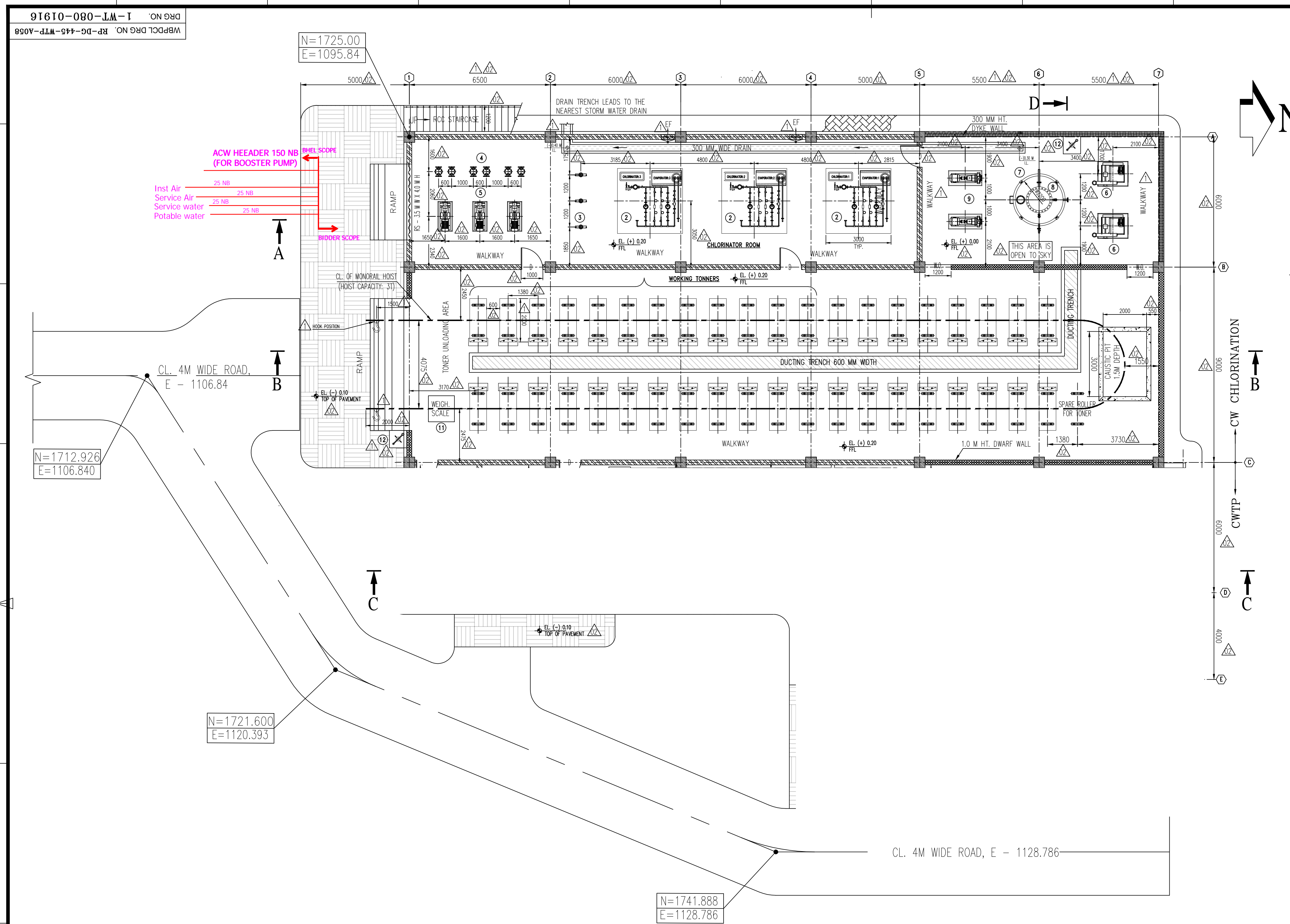
5.0 MANDATORY SPARES

S.No.	Equipment/ Package Name	Quantity to be supplied
	C.W. Chlorination Plant	
1	Flexible connector	2Nos.
2	Rupture Disc	2Nos.
3	Evaporator Immersion Heater	1No.
4	Pressure-Vacuum Relief Valve	1No.
5	Pressure-Vacuum Relief Valve Spring	2Nos.
6	Filter element refill pack	4packs
7	Pressure regulating Valve (PRV)	1No.
8	Vacuum Regulating Valve	1No.
9	SS-Solenoid Valve	2Nos.for each type and rating
10	Coil for Solenoid Valve	2Nos.for each type and rating
11	Gate Valve	2Nos.for each type,size,& class
12	Globe Valve	2Nos.for each type,size,& class
	Check Valve	2Nos.for each type,size,& class
14	Diaphragm Valve	2Nos.for each type,size,& class
15	Ball Valve	2Nos.for each type,size,& class
16.1	Centrifugal Pump-Booster pump	
(i)	Impeller complete Assembly	1Set for each Type and rating of Pump
(ii)	Shaft sleeve	1Set for each Type and rating of Pump
(iii)	Complete Set of Pump Bearing	1Set for each type and rating
(iv)	Electrical Spares	
a.	Motor of each type and rating (Note: motors covered in mechanical spare items need not be included here again)	10% of the installed quantity or minimum 1 number whichever is higher
b.	Bearings (DE and NDE) for each type and rating of motors	2 Sets
c.	Motor terminal block	1 No. for each type and rating of motor
16.2	Centrifugal Pump-Recirculation pump	
(i)	Impeller complete Assembly	1Set for each Type and rating of Pump
(ii)	Shaft sleeve	1Set for each Type and rating of Pump

(iii)	Complete Set of Pump Bearing	1Set for each type and rating
(iv)	Electrical Spares	
a.	Motor of each type and rating (Note: motors covered in mechanical spare items need not be included here again)	10% of the installed quantity or minimum 1 number whichever is higher
b.	Bearings (DE and NDE) for each type and rating of motors	2 Sets
c.	Motor terminal block	1 No. for each type and rating of motor
17	Chlorine Gas Filter	One (1) complete set
18	Diaphragm assembly of Safety shut off valve	2Sets
19	Liquid chlorine evaporator	
(i)	valve	4Nos.each type and size
20	Blowers	
(i)	Rotating Assembly	1Set for each type and rating
(ii)	Electrical Spares	Applicable Item
a.	Motor of each type and rating (Note: motors covered in mechanical spare items need not be included here again)	10% of the installed quantity or minimum 1 number whichever is higher
b.	Bearings (DE and NDE) for each type and rating of motors	2 Sets
c.	Motor terminal block	1 No. for each type and rating of motor
21	Strainer	1No. for each type
22.00	Electrical Spares	
22.01	Motorised Actuator	
(i)	Actuator for auto shutoff valve in chlorine gas line	1 No.
(ii)	Actuator for auto changeover valve for chlorine tonner manifold.	1 No.
22.02	Motor for caustic tank Agitator	1 No.
23.0	C&I Field Instruments & Others	
23.01	Electronic transmitters	
(i)	Pressure	1 (one) no. complete set for each type and model/range used in the system
(ii)	Level	1 (one) no. complete set for each type and model/range used in the system

23.02	Different type of switches	
(i)	Pressure switch	2 (two) no. of each type and model/range used in the system
(ii)	Differential pressure switch	2 (two) no. of each type and model/range used in the system
(iii)	Level switch	2 (two) no. of each type and model/range used in the system
(iv)	Temperature switch	2 (two) no. of each type and model/range used in the system
23.03	Solenoid valve	
(i)	Complete solenoid valve assembly	2 (two) no. for each type and rating used in the system
(ii)	Coil (single or double coil type)	10% of total nos. used in the system or minimum 5 (five) no. whichever is more for each type of rating.
23.04	Different types of Gauge	
(i)	Pressure gauge	10% of total nos. used in the system or minimum 1 (one) no. whichever is more for each type and rating.
(ii)	Differential pressure gauge	10% of total nos. used in the system or minimum 1 (one) no. whichever is more for each type and rating.
(iii)	Temperature gauge	10% of total nos. used in the system or minimum 1 (one) no. whichever is more for each type and rating.
23.05	Rotameter	10% of total nos. used in the system or minimum 2 (Two) no. whichever is more for each type, rating/ model and size used in the system
23.06	Gauge glass	1 No. of each type and size
23.07	Erection hardware	
(i)	Transmitter's Manifold	10% of total nos. used in the system or minimum 2 (Two) no. whichever is more for each type, rating/ model and size used in the system
(ii)	Impulse line isolation valve	10% of total nos. used in the system or minimum 4 (Four) no. whichever is more for each type, rating/ model and size used in the system
(iii)	Impulse line fittings	Each type/ size 25 Nos
(iv)	Impulse pipe	Each type/ size 100 Mtrs

23.08	Liquid chlorine evaporator	
i	Water level gauge glass	1 No.
ii	Water bath level control switch	1 No.
iii	Thermostatic switch water temperature controller	1 No.
iv	Temperature switch- water temperature high	1 No.
23.09	Chlorine leak detector system	
(i)	Sensor unit (complete)	2 No.
(ii)	Transmitter/ processing unit (complete)	2 No.



KEY-PLAN

EQUIPMENT DETAILS. (CW CHLORINATION)

EQPT. TAG	DESCRIPTION	APPROX. DIMENSION	APPROX. WT. IN Kg.	QTY.
1.	CHLORINE TONER - 900 KG.	Ø780 x 2000 L	1700	40(12w+28s)
2.	CHLORINATORS (SKID) - 120 Kg/Hr.	3000L X3000W X1600H	10	3(2w+1s)
3.	EJECTOR	Ø254 X 610 L	30	3w
4.	BASKET STRAINER - 60 Cum / Hr	Ø350 X 750H	138	6(4w+2s)
5.	CW BOOSTER PUMP - 60 Cum / Hr	670L X1400W X525H	150	3(2w+1s)
6.	BLOWER - 1500 Cum/ Hr	1400L X1150W X1300H	100	2(1w+1s)
7.	ABSORPTION TANK - 10 Cum.	Ø2200 X2600H	1500	1
8.	ABSORPTION TOWER	Ø900 X2300H	195	1
9.	CAUSTIC RE-CIR. PUMP - 15 Cum/Hr	700L X1550W X500H	120	2(1w+1s)
10.	ELECTRICAL HOIST (3 TONS)	700L X600W X800H	--	1
11.	WEIGHING SCALE	860L X960W X250H	--	1
12.	SAFETY SHOWER	--	--	1
13.	SAFETY EQUIPMENT RACK	--	--	1

EQUIPMENT DETAILS. (CWTP)

EQPT. TAG	DESCRIPTION	APPROX. DIMENSION	APPROX. WT. IN Kg.	QTY.
A	H2S04 UNLOADING PUMP	960L X450W X400 H	150	2(1W+1S)
B	H2S04 STORAGE TANKS - 52 CUM	Ø3500 X 5000 L	4250	2W
C	H2S04 DAY TANK - 3.5 CUM	Ø2000 X 1600 H	1000	1W
D	H2S04 DOSING PUMP	450L X 300W X 250H	100	2(1W+1S)
E	BIOCIDE INHIBITOR TANK - 6 CUM	Ø2000 X 2300H	750	1W
F	BIOCIDE INHIBITOR DOSING PUMP	45 L X 300W X 250H	100	2(1W+1S)
G	SCALE INHIBITOR TANK - 1 CUM	Ø1200 X 1200H	750	1W
H	SCALE INHIBITOR DOSING PUMP	450L X 300W X 250H	100	2(1W+1S)
J	CORROSION INHIBITOR TANK - 1 CUM	Ø1200 X 1200H	750	1W
K	CORROSION INHIBITOR DOSING PUMP	450L X 300W X 250H	100	2(1W+1S)
L	LIME PIT - 1 CUM	1000L x 1000W x 1000H	--	1
M	LIME PIT TRF. PUMP - 10 CUM/HR	Ø400 X 1000H	100	1
M	LCP	3000L X 1000W X 2100H	100	1

- NOTES :**
- FINISHED GRADED LEVEL (FGL) ELEVATION OF THIS AREA IS -0.300 M WHICH CORRESPONDS TO RL (+)34.20 FROM MSL.
 - CWTP & GAS CHLORINATION BUILDING FINISHED FLOOR LEVEL (FFL) EL. IS (+)0.20M.
 - CHEMICAL STORE ROOM IS PROVIDED NEAR CWTP DOSING ARE FOR STORAGE OF CWTP CHEMICALS.
 - ALL THE DOSING SYSTEM ARE KEPT IN CHEMICAL DOSING ROOM.
 - EQUIPMENT LOCATION DIMENSION & PIPE LINE ROUTING ARE FOR INFORMATION. FINAL DIMENSION WILL BE FURNISHED DURING DETAILED ENGINEERING.
 - DRAIN CHANNEL, TRENCH AND PIPE LINE SHOWN ARE TENTATIVE AND THESE SHALL BE UPDATED DURING DETAILED ENGINEERING.
 - ALL THE DRAIN CHANNELS INSIDE THE BUILDING SHALL BE COVERED WITH PRECAST SLAB.
 - PUNTH PROTECTION OF 1.0 M WIDTH SHALL BE PROVIDED AROUND BUILDING.
 - FULL HOOD FOR 12 NOS. WORKING TONNERS & HALF HOOD FOR BALANCE TONNERS ARE CONSIDERED.
 - CANOPY FOR OUTDOOR ELECTRICAL DRIVES WILL BE PROVIDED.
 - THE NO. OF EXHAUST/SUPPLY FANS SHOWN HERE FOR VENTILATION IS TENTATIVE ONLY, NO OF FANS & THEIR LOCATION WILL BE FINALIZED AS PER VENDOR RECOMMENDATION.

- LEGEND :**
- ▒ - PLATFORM
 - ▒ - 1.0 M HT. DWARF WALL
 - ▒ - DRAIN CHANNEL
 - ▒ - AR TILED FLOOR
 - ▒ - PLINTH PROTECTION OF 1.0M WIDTH ALL AROUND BUILDING
 - ▒ - 300 MM HT. D'YKE WALL
 - ▒ - 500 MM HT. D'YKE WALL
 - ▒ - FULL HEIGHT WALL
 - ▒ - PAVED LEVEL

- FGL - FINISHED GRADED LEVEL
 FFL - FINISHED FLOOR LEVEL
 DD - DOUBLE DOOR
 D - SINGLE DOOR
 W.O. - WALL OPENING
 RS - ROLLING SHUTTER
 TOC - TOP OF CONCRETE
 EF - EXHAUST FAN
 SF - SUPPLY FAN

DOOR & ROLLING SHUTTER SCHEDULE :

DESCRIPTION	LEGEND	W X H
DOUBLE DOOR	DD	2.0x2.1
SINGLE DOOR	D	1.0x2.1
TOILET DOOR	D1	0.75x2.1
ROLLING SHUTTER	R.S.	3.5x4.0

- REFERENCE DRAWINGS :**
- KEY PLAN : PE-DG-445-100-M001 LAT. REV.
 - P&ID FOR GCP : 1-WT-040-01922 / RP-DG-445-WTP-A075
 - P&ID FOR CWTP : 1-WT-080-01064 / RP-DG-445-WTP-A057
 - CABLE TRAY AND EARTHING LAYOUT FOR CWTP : RP-DG-445-WTP-A072

REV	DATE	ALTERED BY	DATE	ALTERED BY
02	13.08.2021	CHECKED: A. KARMAKAR	01	09.06.2021
ZONE REVISD BASED ON CONSULTANT (DCPL) COMMENT DATED 05.07.2021		ZONE REVISD BASED ON CONSULTANT (DCPL) COMMENT DATED 13.05.2021		

CUSTOMER: THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD.(WBPDC) 1X660MW.SAGARDIGHI THERMAL POWER EXTENSION PROJECT (UNIT #5)

CONSULTANT: DEVELOPMENT CONSULTANTS PRIVATE LIMITED KOLKATA

CLIENT: BHARAT HEAVY ELECTRICALS LTD. BOILER AUXILIARIES PLANT RANIPET - 632 406

TITLE: EQUIPMENT LAYOUT FOR GAS CHLORINATION & COOLING WATER TREATMENT PLANT

DEPT. SIGN: [Signature] SCALE: N.T.S. WBPDC DRG NO. RP-DG-445-WTP-A058 DRG NO. 1-WT-080-01916 SHEET 1 of 2 REV. 02

2-WT-220-00057
DRAWING NO.

ALL DIMENSIONS ARE IN MILLIMETRES

SUGGESTED PROCEDURE FOR JOINING UPVC/CPVC PIPES AND FITTINGS

I. GENERAL POINTS

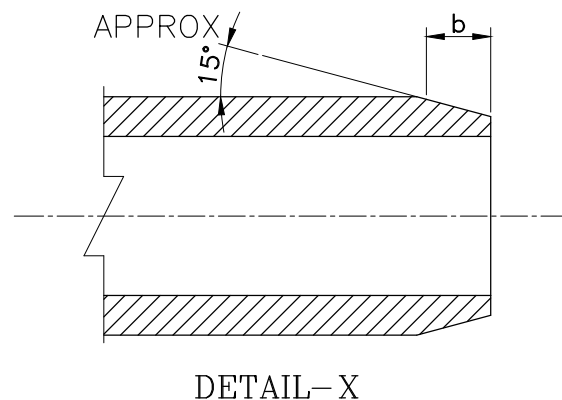
- 1) ALWAYS CAREFULLY INSPECT THE PIPES, FITTINGS AND VALVES FOR ANY EXTERNAL DAMAGE BEFORE JOINING.
- 2) TRIAL ASSEMBLE ALL PIPES AND FITTINGS WITHOUT SOLVENT CEMENTING. THIS WILL ENSURE THE PERFECT MATCHING (ESPECIALLY FLANGED JOINTS)
- 3) ALL PIPES SHOULD BE CUT SQUARE.
- 4) USE CUTTING TOOLS DESIGNED FOR THE PIPES CUTTING.
- 5) DEBURR AND BEVEL ALL UPVC/CPVC PIPE BEFORE JOINING, AS PER DETAIL-X AND FOR THE CORRESPONDING 'B' VALUE GIVEN IN TABLE -1
- 6) LIST OF TOOLS AND EQUIPMENTS REQUIRED:
 - A) PIPE CUTTER
 - B) PIPE CHAMFERING TOOL
 - C) CLEANER FOR UPVC/CPVC (APPROVED MAKE)
 - D) SOLVENT CEMENT FOR UPVC/CPVC (APPROVED MAKE)
 - E) SCRAPER, PENCIL, BRUSH COVER, WHITE ABSORBENT PAPER

II. DETAILED PROCEDURE

- 1) CLEAN THE SURFACE ENDS OF ALL PIPES AND FITTINGS TO BE JOINED USING APPROVED CLEANING SOLUTION. THE JOINING SURFACES SHOULD BE FREE OF DIRT, GREASE, WATER, MOULD RELEASE, OR OTHER FOREIGN SUBSTANCES. SOLVENT CEMENT SOLUTION APPROVED BY THE PIPES AND FITTINGS' SUPPLIER SHALL BE USED FOR JOINING THE UPVC/CPVC ITEMS. NO OTHER LOCAL MAKE WILL BE ACCEPTED.
- 2) USING A NATURAL BRISTLE BRUSH OF THE CORRECT WIDTH, APPLY A COMPLETE COATING OF SOLVENT CEMENT TO THE ENTIRE OUTSIDE SURFACE OF THE PIPE END TO BE INSERTED INSIDE THE FITTING AND TO THE MATING INSIDE SURFACE OF THE CONNECTING SOCKET OF THE FITTING AS FOLLOWS.
 - A) ON THE PIPE - BRUSH LIBERALLY ONCE AROUND THE ENTIRE SURFACE OF THE PIPE OD
 - B) ON THE FITTING - BRUSH LIGHTLY BUT COMPLETELY AROUND THE ENTIRE DEPTH OF THE SOCKET SURFACE.
 - C) ON THE PIPE - APPLY ANOTHER LIBERAL COATING OF CEMENT AS BEFORE.
 - D) IF THE SIZE OF THE PIPE IS MORE THAN 110MM, SOLVENT CEMENT SHOULD BE APPLIED TO THE PIPE AND FITTINGS SIMULTANEOUSLY BY TWO PEOPLE.
- 3) IMMEDIATELY UPON FINISHING THE CEMENT APPLICATION, INSERT THE PIPE INTO THE FULL SOCKET DEPTH OF THE FITTING WITHOUT ANY ROTATION OF PIPE OR FITTING.
- 4) HOLD THE JOINT TOGETHER FOR A MINIMUM OF 10 TO 15 SECONDS TO ENSURE THAT THE PIPE DOES NOT BACK OUT OF THE SOCKET.
- 5) IMMEDIATELY AFTER JOINING, WIPE ALL EXCESS CEMENT FROM THE SURFACE OF THE PIPE AND FITTINGS INCLUDING ANY GLOBES OF CEMENT THAT MAY HAVE BEEN DROPPED ON TO THE PIPE OR FITTING.

TABLE-1

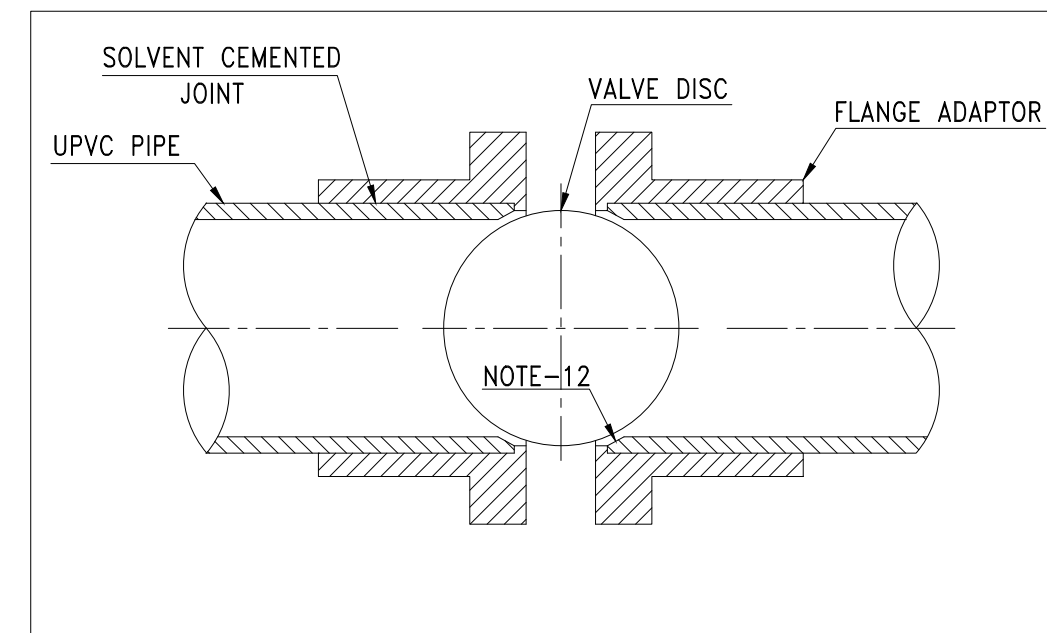
PIPE OD	DIM b
6-16 MM	1-2 MM
20-50 MM	2-4 MM
63-315 MM	4-6 MM



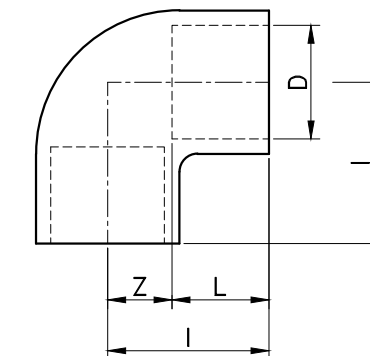
III. SPECIAL POINTS

- 1) DO NOT ATTEMPT TO CEMENT WET SURFACES. (DO NOT DO CEMENTING IN THE RAIN)
- 2) PIPE, FITTINGS AND SOLVENT CEMENT SHOULD BE KEPT AT THE SAME TEMPERATURE FOR ATLEAST AN HOUR PRIOR TO CEMENTING.
- 3) USE ONLY NATURAL BRISTLE BRUSHES FOR APPLYING SOLVENT CEMENT. DO NOT USE SYNTHETIC BRISTLE BRUSHES, AS THE SOLVENT SOLUTION WILL DISSOLVE SYNTHETIC BRISTLES.
- 4) WHEN THE AMBIENT TEMPERATURE IS ABOVE 38°C AND UNDER DIRECT EXPOSURE TO SUN, CEMENTING SHOULD BE DONE AS FOLLOWS.
 - A) SHADE THE JOINT SURFACES FROM EXPOSURE TO SUN'S RAYS FOR A MINIMUM OF ONE HOUR PRIOR TO JOINING AND CONTINUE JOINING IN THE SHADE.
 - B) APPLY CEMENT QUICKLY AND INSERT PIPE INTO THE SOCKET AS QUICKLY AS POSSIBLE AFTER APPLYING CEMENT.
- 5) DO NOT USE CLEANING AND SOLVENT CEMENTS DESIGNED FOR A PARTICULAR PLASTIC WITH ANOTHER PLASTIC MATERIAL. CPVC CLEANING AND SOLVENT CEMENT SHOULD BE USED ONLY FOR ALL CPVC JOINTS (CPVC SHOULD BE USED FOR ALL APPLICATIONS OF HOT WATER) DO NOT USE THE CEMENTS BEYOND THE DATE OF EXPIRY.
- 6) ON PIPES WITH OD 160MM OR MORE, ESPECIALLY IN HOT WEATHER, TWO MEN SHOULD APPLY CEMENT TO THE PIPE WHILE ONE MAN IS APPLYING CEMENT TO THE FITTINGS TO MINIMIZE APPLICATION TIME, THEREBY AVOIDING PREMATURE SETTING IN EARLIER COATS OF CEMENT.
- 7) DO NOT DISCARD EMPTY CEMENT CANS NEAR PLASTIC PIPE.
- 8) IF CEMENT BECOMES LUMPY AND STRING, THROW IT AWAY. DO NOT ATTEMPT TO THIN OUT SLUGGISH CEMENT WITH THINNER OR PRIMER. THROWING AWAY POTENTIALLY INEFFECTIVE CEMENT IS LESS COSTLY THAN FIXING A LEAK.
- 9) APPROPRIATE JOINT DRYING TIME SHOULD ELAPSE BEFORE THE CEMENT JOINT IS MOVED OR SUBJECTED TO INTERNAL OR EXTERNAL PRESSURE. (FOR ADDITIONAL INFORMATION, CATALOGUE OF THE SUPPLIER OF THE PIPES AND FITTINGS SHOULD BE REFERRED TO)
- 10) FOR DECIDING THE LENGTH OF THE PIPE BETWEEN FITTINGS THE LAYING LENGTH (Z) AND SOCKET DEPTH (L) OF THE FITTINGS ARE TO BE TAKEN INTO ACCOUNT. REFER TYPICAL FITTING DIMENSION DETAILS.
- 11) TANGIT MAKE OF BOTH SOLVENT CEMENT AND CLEANING SOLUTION MANUFACTURED BY GEORGE FISCHER SHOULD BE USED FOR ALL UPVC JOINTS. SEPARATE SOLVENT CEMENT AND CLEANING SOLUTION FOR CPVC SHOULD BE USED.
- 12) GRINDING OF THE INSIDE SURFACE OF THE PIPE FOR THE BVF SHOULD BE DONE TO THE REQUIRED DIMENSION PRIOR TO JOINING THE PIPE WITH SOLVENT CEMENT, FOR BVF OF SIZES DN150 AND ABOVE UNDER THE SUPERVISION OF BHEL ENGINEER.
- 13) ALL UPVC/CPVC PIPE LINE (EXCEPT ACID LINE) SUBJECTED TO A HYDRAULIC TEST PRESSURE OF 9 KG/SQ.CM AFTER COMPLETION OF ERECTION . ACID LINE SUBJECTED TO PNEUMATIC TEST PRESSURE OF 6 KG/SQ.CM. AIR LINE (HDPE) TO BE SUBJECTED TO A PNEUMATIC TEST PRESSURE OF 3 KG/SQ.CM.

PIPE CORRECTION DETAIL FOR BVF DISC MOVEMENT



TYPICAL FITTING DIMENSION DETAILS



Dim. (D)	Dim. (I)	Dim. (Z)	Dim. (L)
20	27	11	16
32	39	17	22
50	57	26	31
63	71	33	38
75	83	39.5	43.5
90	97	46	51
110	116	55	61
160	166	80	86
225	233	114	119
280	298	151	147
315	332	168	164

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.		TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT WATER TREATMENT PLANT			
		DEPT FANS CODE 864	GRADE OF UNTOL.DIM PR: QA: 500	SCALE 	WEIGHT (KG). REF. TO ASSY/OLD DRG. 2-BW-220-00196
TITLE UPVC/CPVC JOINING PROCEDURE		CARD CODE U 01	DRAWING NO. 2-WT-220-00057		REV

REV	DATE	ALTERED
		CHECKED
ZONE		

ELECTRIC OPERATED HOISTS

BHEL will provide one number 415 V (3ph, 4W) supply feeder only up to isolating switches for cranes. Any other voltage level (AC/DC) required will be derived by the vendor. Motor starter shall be part of crane control panel. Each hoist shall be provided with Isolating switch (Bidder scope) mounted at floor level and further cabling from isolator to hoist is in bidder scope. Motor shall be as per relevant motor specification should be suitable for hoist duty. However, motor shall be suitable for 240 starts per hour.

Electric hoist shall include but not be limited to the following: -

- a. Hoisting and CT drive arrangement
- b. All electrical equipment including isolator, cables, limit switches and control panel.
- c. Shrouded bus bar DSL/ Flexible trailing (festoon) cable
- d. Earthing arrangement.
- e. Fill of lubricant till commissioning.
- f. Painting of electric hoist and accessories.
- g. Maintenance tools & Tackles
- h. Erection & Commissioning spares
- i. Isolating switch in enclosure at operating floor for disconnecting supply to DSL while maintaining the electric hoist.

DESIGN CRITERIA

Capacity of electric and manual (Chain pulley block) hoists shall be decided keeping 25% margin over heaviest equipment to be handled.

For hand operated hoists, the hoists shall be suitable for operation from floor level. Hand chain shall be provided for long travel of trolley and the Hoisting mechanism. For electric hoist, operator shall be able to control the movement of the electrical hoist with the help of floor operated pendant.

Note

1. Area, type, capacity mentioned are minimum requirement and shall be finalized during detail engineering without any commercial implication
2. Travel and Lift are layout dependent and shall be finalized during detail engineering without any commercial implication
3. Additional electric/manual hoist required during detail engineering shall be provided as per design criteria given above without any commercial implication.

DEMONSTRATION TEST

Hoist along with its drives, controls and other accessories shall be demonstrated for the rated capacity against the rated speed of motions and for the service conditions specified as specified in QAP and as per IS 3938 for electric hoist and IS 3832 for manual hoist.

The bidder shall have the full responsibility for the safe and efficient operation of the hoist with associated accessories as a single unit.

If the shop/site performance tests indicate the failure of any of the components to achieve the guaranteed performance, the deficiency shall be made good at bidder's cost.

Demonstration tests shall be carried out each time after the rectification /modification is carried out.

TESTING AT SITE

A) ELECTRIC HOIST:

As required for statutory clearance for operating at site i.e., overload test, load test and other tests as per IS 3938.

Test for Operation -After the supply has been connected, tests shall be carried out to prove the following:

- a) The satisfactory operation of each controller, switch, contactor, relay and other control devices and in particular the correct operation of all limit switches under the most unfavorable conditions;
- b) The correctness of all circuits and interlocks and sequence of operation; and
- c) The satisfactory operation of all protective devices.

Overload Test - After test but before the hoist is put into service, it shall be tested with overload relays appropriately set, to lift and sustain a test load of 125 percent of the working load. During the overload test, the hoist shall sustain the load under full control. The specified speeds need not be attained but the hoist shall show itself capable of dealing with the overload without difficulty.

DRAWING/DOCUMENT SUBMISSION

The successful bidder shall submit the following drawings / documents during detail engineering for customer's approval /information:

- Manufacturing Quality Plan with Sub vendor list
- GA Drawing for Electric Hoist, DSL arrangement and painting details
- Schematic Circuit Diagram
- Mechanism Sizing Calculation
- Detailed BOM/BOQ for EOH

O& M Manual including Erection procedure



CONTENT

CLAUSE NO.	DESCRIPTION
1.00.00	GENERAL INFORMATION
2.00.00	CODES AND STANDARDS
3.00.00	SCOPE OF WORK
4.00.00	SPECIFIC DESIGN REQUIREMENTS
5.00.00	DESIGN AND CONSTRUCTION
6.00.00	INSPECTION AND TESTING
7.00.00	DRAWINGS, DATA AND INFORMATION





MISCELLANEOUS HOISTS

1.00.00 GENERAL INFORMATION

- 1.01.00 The hoists will be used for erection and maintenance of various equipment in different buildings under the scope of Entire Package, except FGD and Coal Handling Plant, of 1 x 660 MW Sagardighi Thermal Power Project Unit 5, Phase-III.
- 1.02.00 Hoists are divided into two separate groups - (a) Hand operated and (b) Electric operated.

2.00.00 CODES AND STANDARDS

The design, manufacture and testing of the equipment covered under this specification shall conform to the latest editions of the following Indian Standards:

- 2.01.00 IS : 3832 : Specification for Hand Operated Chain Pulley-blocks.
- 2.02.00 IS : 807 : Code of Practice for Design, Manufacture, Erection and Testing (Structural Portion) of Cranes and Hoists.
- 2.03.00 IS : 6216 : Short link Chain, Grade T(8) for Pulley-blocks & other Lifting Appliances.
- 2.04.00 IS : 2429 (part -I) : Non-calibrated Load Chain for Lifting Purposes.
- 2.05.00 IS : 15560 : Point Hook with Shank up to 160 tones - Specification
- 2.06.00 IS : 3938 : Specification for Electric Wire Rope Hoists.

and other Indian Standards referred to in the above standards.

3.00.00 SCOPE OF WORK

- 3.01.00 Hoists shall be provided in all areas under the scope of this specification (except the areas covered by E.O.T. cranes) where any equipment/component weighing above 100 kg is installed and needs to be handled for maintenance purposes. Number of monorail beams shall be such that the centre line of the hoist and the centre line of equipment to be handled shall be not more than 500 mm.





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

- 3.01.01 The location and no. of hoists is to be finalised during detailed engineering. Final arrangement is subject to approval of Owner/Consultant.
- 3.01.02 Monorail hoists shall at least be provided in the areas mentioned in Annexure-I. The list is indicative only and not an exhaustive one.
- 3.01.03 Besides monorail hoists, fixed Chain Pulley blocks of following capacities shall be provided:

Capacity (T)	Nos.
1	10
3	10
5	8
10	3

- 3.02.00 All drive motors and driving gears as necessary.
- 3.03.00 Limit switches for electrical hoist as necessary.
- 3.04.00 Trailing cable with all supporting fixtures as necessary for electric hoists.
- 3.05.00 Pendant control station with all accessories for electric hoists.
- 3.06.00 Lifting lug, eye bolts etc., for handling hoist parts.
- 3.07.00 Protection guard as specified.
- 3.08.00 Lifting hook block assembly for hoists.

4.00.00 SPECIFIC DESIGN REQUIREMENTS

- 4.01.00 Lifting capacity
- 4.01.01 Capacity of each hoist shall be 1.2 times the maximum working load.
- 4.01.02 Hoists of capacity below 3 tones shall be manual hoists.
- 4.01.03 Hoists of capacity equal and above 3 tones shall be electric hoists.
- 4.02.00 Effort for Mechanical Hoists
- 4.02.01 Hoisting
- Hoisting effort for hoists up to 3 tones capacity shall not be more than 20 kg.





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

- 4.02.02 Trolley Motion
- Effort for trolley motion for hoists upto 3 tones capacity shall not be more than 43 Kg.
- 4.02.03 For Electric operated hoist both hoisting and trolley motion shall be motor operated.
- 4.03.00 Lift
- 4.03.01 Lift above operating floor
- Highest position of the hook shall be such that during operation of hoists, the vertical distance between bottom of any equipment handled and top of any permanent structure or equipment in the operating area shall be at least one metre.
- 4.03.02 Approach below operating floor
- To be decided by the Bidder for safe and reliable handling of any equipment above half ton below the operating floor.
- 4.04.00 Length of monorail hoist
- To be decided by the Bidder depending on the floor and machine layout. The horizontal distance between the centre line of the hoist and centre line of any installed equipment in its operating shall not be more than half metre.
- 5.00.00 DESIGN AND CONSTRUCTION**
- 5.01.00 All parts requiring replacement or lubrication shall be easily accessible without the need for dismantling of other equipment and structures.
- Robust construction and ample rating merging which experience has shown to be necessary shall be ensured throughout manufacture.
- 5.02.00 All components of hoists of identical capacity and duty shall be interchangeable. The hoists of identical capacity and duty shall be identical in all respects unless otherwise required. The hoist design shall be such that these can be quickly removed from one monorail beam and fixed on another beam without disassembling major components.
- 5.03.00 All machinery and equipment included under this specification must be equipped with safety devices and clearances to comply with recognized standards and specification requirements.
- 5.04.00 Cast iron parts wherever used, shall conform to IS:210 - FG 260. Also no wood or other combustible materials shall be used.
- 5.05.00 Defects in material like fractures, cracks, blowholes, laminations, pitting etc. are not allowed. Rectifications of any such flaw is permissible only with the approval of the Owner.





WBPDCL

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

- 5.06.00 Each hoist shall be permanently and legibly stamped with the tag number, manufacturer's name, safe working load, grade of load chain (where applicable), range of lift etc.
- 5.07.00 Load chain (where applicable) shall be of grade T(8) as per IS:6216 and Hand chain shall be as per IS:2429 (Part-I) grade 30.
- 5.08.00 Wheels in trolley unit travel shall be single flanged with straight/tapper/barrel shaped tread to suit the monorail. Wheels should be preferably of forged steel construction. Material of construction for wheels of traversing block and hoist gear for hoist used in hazardous areas shall be of non-ferrous material to avoid spark during operation.
- 5.09.00 All gears shall be hardened and tempered steel with machine out teeth.
- 5.10.00 Hoist (Manually Operated)
- 5.10.01 Manually operated hoists shall be of spur gear chain pulley block type. It shall be suspended from the trolley by a hook. The design of the hoist shall conform to IS:3832 (Specification for hand operated chain pulley blocks).
- The hooks and brakes of hoist shall conform to the requirements stipulated in (a) and (b) below
- a) Hooks shall conform to IS:3832. The load hook shall be swiveling type fitted with a locking device.
 - b) The pulley blocks shall be fitted with an automatic mechanical load brake to prevent self-lowering of load in all working positions. The load brake shall also allow smooth lowering of load without serious overheating.
 - c) All manually operated hoists, unless stated otherwise, shall be trolley suspended type.
- 5.10.02 The trolley of hoists shall be manually operated.
- 5.10.03 The hoists shall be of Mechanism class 2 as per IS:3832.
- 5.11.00 Electric Hoist
- 5.11.01 Electric hoist shall be electric wire rope trolley suspended type. The design, operation, testing of electric hoist shall conform to IS:3938 (Specification for electric wire rope hoist).
- Minimum speed for hoisting shall be 3 m/min. and that of for trolley motion shall be 15 m/min.
- 5.11.02 Lifting hook shall conform to IS 15560 as applicable.
- 5.11.03 Wire rope for hoists shall conform to IS-2266.



Development Consultants Pvt. Ltd.

Page 4 of 8

Volume : II-K
Section : III
Miscellaneous Hoists



- 5.11.04 Electro-mechanical brakes of fail to safety type shall be provided for hoist motion as well as per trolley motion for electrically driven trolley. Load brake shall allow smooth lowering of load and arrangement shall be such as it can not be released accidentally. Capacity of brake and other relevant data shall conform to IS:3938.
- 5.11.05 The trolley of the hoists shall be electrically driven.
- 5.11.06 For other components of hoist such as rope, sheave, drum, bearings, gears etc. stipulations of IS: 3938 shall be followed.
- 5.11.07 Motor shall be rated for duty S4, CDF 40% and 150 starts per hour. Service class of motor shall be "4" as per IS:3938. Conditions given in IS:3938 for hoist motor shall be followed over and above the specification of electric motor in Volume II-F1/F2.
- In case of any contradiction of the aforesaid standard and the motor specification, the conditions, which are more stringent, shall be considered. All the motors shall be suitable for reversing, frequent starting and braking. Motors shall be provided with suitable space heating arrangement.
- 5.11.08 Hoist shall be designed so that remote control can be effected by means of pendant push button switch from the operating floor. Operation, arrangement etc. of pendant push button switch shall conform to IS:3938.
- 5.11.09 Micro-speed attachment in hoist shall be provided if considered necessary by the Bidder.
- 5.11.10 The hoists shall be of mechanism class 2 as per IS-3938.
- 5.12.00 Ball and roller bearings of reputed make shall be used throughout.
- 5.13.00 Suitable lubrication system shall be provided for all gear drives.
- 5.14.00 Other Electrical Items
- 5.14.01 The cross conductor on monorail for power supply to the hoist shall be of festoon type flexible insulated cable conductors. All fixtures and accessories shall be provided by the Bidder for this purpose.
- 5.14.02 Necessary insulators, supports, clamps and all other accessories shall be provided as per standard design.
- 5.14.03 Each hoist shall be provided with a starter panel with protective relays.
- 5.14.04 One main isolating switch shall be used to cut-off the supply to the hoist assembly.
- 5.14.05 One main electro-magnetic contactor together with magnetic overload relay (hand reset) for each motor circuit shall be housed in the protection panel.





WBPDCL

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

- 5.14.06 The operation of overload relay shall interrupt the main magnetic contactor.
- 5.14.07 Adequate short circuit protection shall be provided for main and individual circuits.
- 5.14.08 415V \pm 10%, 3 Phase, 4 Wire, 50 Hz \pm 5%, power supply for the hoist shall be arranged through switch fuse unit mounted at standing height at a convenient location near each hoist. The above switch fuse unit and the connecting cables between switch fuse unit and the cross conductor are included within the scope of this specification.
- 5.14.09 Transformers to step down the voltage and rectifiers as necessary shall be provided by the Bidder.
- 5.14.10 All external and internal power, control and auxiliary circuit wiring of the electrical drive and accessories and panels shall be provided. The wiring shall be done with 1100 V grade PVC insulated stranded aluminium conductor cable of suitable size not less than 2.5 sq.mm nominal equivalent copper area of cross-section. All control and auxiliary circuit wiring shall be done with 1100 V grade PVC insulated, 2.5 sq.mm. stranded copper conductor. Control wire terminations to the panels shall be made with compression type connectors. Multiway terminal blocks shall be furnished for terminating panel wiring and outgoing cable.
- 5.14.11 The hoist structure, motor frame and metal cases of all electrical equipment including metal conduit shall be effectively connected to earth. All grounding materials shall be supplied under this specification to grounding risers.
- 5.14.12 Single speed control shall be used for both hoist and trolley travel in each direction of motion.
- 5.15.00 Final painting at manufacturer's works shall be provided by the Bidder.

6.00.00 INSPECTION AND TESTING

- 6.01.00 The manufacturer shall conduct all tests required to ensure that the equipment furnished shall conform to the requirements of the specification and in compliance with the requirements of the latest edition of IS:3832 or equivalent standards for manually operated hoists and shall be as per IS:3938 for electrically operated hoist.
- 6.02.00 All hoists performance test shall be duly certified by govt. approved agency.

7.00.00 DRAWINGS, DATA AND INFORMATION

- 7.01.00 General arrangement drawings incorporating all dimensions information on head rooms, lift, wheel loads, hook suspension arrangement and other relevant data for all the hoists.



Development Consultants Pvt. Ltd.

Page 6 of 8

Volume : II-K
Section : III
Miscellaneous Hoists

**WBPDCL**

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

- 7.02.00 Design calculation for selection of electric motor capacities for electric hoist.
- 7.03.00 Complete list of location, number and capacity of hoists provided.





QUALITY ASSURANCE REQUIREMENTS





CONTENT

CLAUSE NO.	DESCRIPTION
1.00.00	QUALITY ASSURANCE PROGRAMME
2.00.00	GENERAL REQUIREMENTS QUALITY ASSURANCE
3.00.00	QUALITY ASSURANCE DOCUMENTS
4.00.00	INSPECTION, TESTING & INSPECTION CERTIFICATES



QUALITY ASSURANCE REQUIREMENTS

1.00.00 QUALITY ASSURANCE PROGRAMME

1.01.00 To ensure that the equipment and services under the scope of Contract whether manufactured or performed within the Successful Bidder's works or at his Sub-Vendor's premises or at the Owner's site or at any other place or work are in accordance with the specifications, the Successful Bidder shall adopt suitable quality assurance programme to control such activities at all points, as necessary. Such programmes shall be outlined by the Successful Bidder and shall be finally accepted by the Owner/Authorised representative after discussions before the award of contract. A quality assurance programme of the Successful Bidder shall generally cover the following :

- a) His organisation structure for the management and implementation of the proposed quality assurance programme.
- b) Documentation control system.
- c) Qualification data for Bidder's key personnel.
- d) The procedure for purchase of materials, parts, components and selection of Sub-Vendor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc.
- e) System for shop manufacturing and site erection control including process controls and fabrication and assembly controls.
- f) Control of non-conforming items and system for corrective actions.
- g) Inspection and test procedure both for manufacture and all site related works.
- h) Control of calibration and testing of measuring and testing equipments.
- i) System for quality audit.
- j) System for indication and appraisal of inspection status.
- k) System for authorising release of manufactured product to the Owner.
- l) System for handling storage and delivery.
- m) System for maintenance of records.



- n) Furnishing of quality plans for manufacturing and field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component as per format enclosed at Annexure-A to this section.

2.00.00 GENERAL REQUIREMENTS - QUALITY ASSURANCE

2.01.00 All materials, components and equipment covered under this specification shall be procured, manufactured and tested at all the stages, as well as Services provided for erection, commissioning and testing shall be as per a comprehensive Quality Assurance Programme. An indicative programme of inspection/tests to be carried out by the Bidder for some of the major items is given in the respective technical specification. This is however, not intended to form a comprehensive programme as it is the Bidder's responsibility to draw up and implement such programme and reviewed by by the Owner/Consultant. The detailed Quality Plans for manufacturing and field activities should be drawn up by the Bidder, separately in the format attached at Annexure-I and will be submitted to Owner/Owner's representative for review. Schedule of finalisation of such quality plans will be finalised before award.

2.02.00 Manufacturing Quality Plan will detail out for all the components and equipment, various tests/inspection, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by Bidder's Quality Control organisation, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing.

2.03.00 Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Bidder's site Quality Control organisation, during various stages of site activities from receipt of materials/equipment at site.

2.04.00 The Bidder shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans along with Quality Plans. These Quality plans and reference documents/standards etc. will be subject to Consultant's approval without which manufacture shall not proceed. In these approved quality plans, Owner/Authorised representative/Consultant shall identify Customer Hold Points (CHP), test/checks which shall be carried out in presence of the Owner/Consultant/Owners Owner's Engineer or his Authorised Representative and beyond which the work will not proceed without consent of Owner/Authorised representative/Consultant in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Owner/Authorised Representative/Consultant for acceptance and dispositioning.

2.05.00 The Bidder shall provide adequate notice to the Owner for inspection before the material is dispatched as per the provisions of the Contract. No material shall be despatched from the manufacturer's works before the same is accepted subsequent to pre-despatch final inspection including verification of records of





all previous tests/inspections by Owner's Owner's Engineer/Authorised representative, and duly authorised for despatch issuance of Material Despatch Clearance Certificate (MDCC).

2.06.00 All materials used or supplied shall be accompanied by valid and approved materials certificates and tests and inspection report. These certificates and reports shall indicate the sheet numbers or other such acceptable identification numbers of the material. The material certified shall also have the identification details stamped on it.

2.07.00 All the individual and assembled rotating parts shall be statically and dynamically balanced in the works.

Where accurate alignment is necessary for component parts of machinery normally assembled on site, the Bidder shall allow for trial assembly prior to despatch from place of manufacture.

2.08.00 Castings and forgings used for construction shall be of tested quality. Details of results of chemical analysis, heat treatment record, mechanical property test results shall be furnished.

2.09.00 All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section-IX/BS-4870 or other International equivalent standard acceptable to the Owner.

All brazers, welders etc. employed on any part of the contract at Bidder's/Sub-Vendor's works or at site shall be qualified as per ASME Section-IX or BS-4871 or equivalent international standard approved by the Owner. Such qualification tests shall be conducted in presence of Owner/his authorised representative.

For welding of pressure parts and high pressure piping the requirements of IBR shall also be complied with.

Under no circumstances any repair or welding of castings be carried out without the consent of the Owner. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Owner.

All pressure parts shall be subjected to hydraulic testing as per the requirements of IBR. Other parts shall be tested for one and half times the maximum operating pressure, for a period not less than thirty (30) minutes.

2.10.00 All non-destructive examination (NDT) shall be carried out in accordance with approved international standard. The NDT operator shall be qualified as per SNT-TC-IA (of American Society of non- destructive examination). Results of NDT shall be properly recorded and submitted for acceptance.

All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section-IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid

penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination and ultrasonic testing shall be employed wherever necessary/ recommended by the applicable code. At least 10% of all major butt welding joints shall be radiographed. Statutory payments in respect of IBR approvals including inspection shall be made by Bidder. Bidder's scope and responsibility shall also include preparation and submission of all necessary documents in the specific formats and manner stipulated by the statutory bodies, coordination and follow up for above approvals.

2.11.00 All the Sub-Vendors proposed by the Bidder for procurement of major bought out items including castings, forgings, semi-finished and finished components/equipment list of which shall be drawn up by the Bidder and finalised with the Owner shall be subject to Owner's review. Quality Plans of the successful Sub-Vendors shall be discussed, finalised and accepted by the Owner/Authorised representative and form part of the Purchase Order between the Bidder and the Sub-Vendor.

2.12.00 All the purchase specifications for the major bought-out items, list of which shall be drawn up by the Bidder and finalised with the Owner shall be furnished to the Owner for comments and subsequent acceptance before orders are placed.

Owner reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Bidder's or their Sub-Vendor's quality management and control activities. The Bidder shall provide all necessary assistance to enable the Owner carry out such audit and surveillance.

Quality audit/acceptance of the results of tests and inspection will not prejudice the right of the Owner to reject equipment not giving the desired performance after erection and shall not in no way limit the liabilities and responsibilities of the Bidder in earning satisfactory performance of equipment as per specification.

2.13.00 Quality requirements for main equipment shall equally apply for spares and replacement items.

2.14.00 Repair/rectification procedures to be adopted to make any job acceptable shall be subject to the acceptance of the Owner.

2.15.00 For quality assurance of all civil works refer to the specifications for civil works.

3.00.00 **QUALITY ASSURANCE DOCUMENTS**

3.01.00 The Bidder shall be required to submit two (2) copies and two (2) sets of microfilms of the following Quality Assurance documents within three (3) weeks after despatch of the equipment:

- a) Material mill test reports on components as specified by the specification.

- b) The inspection plan with verification, inspection plan check points, verification sketches, if used and methods used to verify that the inspection and testing points in the inspection plan were performed satisfactorily.
- c) Non-destructive examination results /reports including radiography interpretation reports.
- d) Factory tests results for testing required as per applicable codes and standards referred in the specification.
- e) Welder identification list listing welder's and welding operator's qualification procedure and welding identification symbols.
- f) Sketches and drawings used for indicating the method of traceability of the radiographs to the location on the equipment.
- g) Stress relief time temperature charts.
- h) Inspection reports duly signed by QA personnel of the Owner and Bidder for the agreed inspection hold points. During the course of inspection, the following will also be recorded :
 - i) When some important repair work is involved to make the job acceptable.
 - ii) The repair work remains part of the accepted product quality.
- i) Letter of conformity certifying that the requirement is in compliance with finalised specification requirements.

4.00.00 **INSPECTION, TESTING AND INSPECTION CERTIFICATES**

4.01.00 The Successful Bidder shall give the Owner's Engineer/Inspector fifteen (15) days written notice of any material being ready for testing. Such tests shall be to the Successful Bidder's account except for the expenses of the Inspector. The Owner's Engineer/Inspector, unless the witnessing of the tests is virtually waived, will attend such tests within fifteen (15) days of the date on which the equipment is notified as being ready for test/inspection failing which the Successful Bidder may proceed with test which shall be deemed to have been made in the Inspector's presence and he shall forthwith forward to the Inspector duly certified copies of test reports in six (6) copies.

4.02.00 The Owner's Engineer or Inspector shall within fifteen (15) days from the date of Inspection as defined herein give notice in writing to the Successful Bidder, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract. The Successful Bidder shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall confirm in writing to the Owner's Engineer/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.

- 4.03.00 When the factory tests have been completed at the Bidder's or sub-Vendor's works, the Owner/Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Owner/Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Bidder's test certificate by the Owner/Inspector. Failure of the Owner/Inspector to issue such a certificate shall not prevent the Bidder from proceeding with the works. The completion of these tests, or the issue of the certificates shall not bind the Owner to accept the equipment should it, on further tests after erection be found not to comply with the contract.
- 4.04.00 The Bidder shall furnish quarterly inspection programme indicating schedule dates of inspection at customer hold point and final inspection stages. Updated quarterly inspection plans will be made for each three consecutive months and shall be furnished before beginning of each calendar month.

FORMAT OF QUALITY ASSURANCE PROGRAMME

Name of Company / Successful Bidder	NAME OF CONTRACT PACKAGE			QUALITY PLAN FOR						
	Package No. : _____ Contractorr : _____			QP No. : _____ Date _____ Rev.No.: _____ Date _____						
Sl. No.	Component & Operation	Characteristics	Class	Type of Check	Quantum of Check	Reference Document	Acceptance Norm	Format of Record	Agency	Remarks

FIELD WELDING SCHEDULE

PROJECT : FWS NO :
 CONTRACTOR : REV NO. :
 PACKAGE : FIELD WELDING CODE :
 SYSTEM : PAGE NO. :

SI No	Drawing No. for Weld Locations & Identification mark	Description of parts to be welded	Material specification	Dimensions	Process of Welding	Type of Weld	Electrode Filler Specification	WPS No.	Minimum Pre-heat Temperature	Heat Treatment Temperature [Holding Time in secs]	NDT Method	Quantum	NDT Specification Number	Acceptance Norm Ref.	Remarks

The Field Welding Schedule should be submitted for :

- Pressure Parts
- Tanks/Vessels
- Piping
- Heavy/Important Structural Steel
- Heat Exchangers
- Bus Ducts

DRAWINGS & DOCUMENTS TO BE SUBMITTED

DRAWING DOCUMENTS REQUIREMENT (FOR MECHANICAL / ELECTRICAL / C&I / ETC)

After award of LOI, following drawings /documents shall be submitted by the bidder for BHEL/Customer approval. However, any additional drawing/document if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial implication.

- a) Detailed piping and instrument or engineering P&ID for process and utility, showing all equipment's, machinery, piping and instruments. All pipes should be indicated with diameter, pipe class, pipe number, fluid flowing through it as per the Employer's legend to be furnished later.
- b) Detailed configuration drawings, BOMs, Data Sheets, General arrangements and cross-sectional/assembly drags, along with the manufacturer's catalogue for all the items/equipment including control & instrumentation supplied by the bidder.
- c) Detailed installation drawings for all instruments and instrumentation schedule.
- d) Preparation and finalization of functional write-up and detailed logic diagram, for all control system, electrical wiring and schematic drgs for the development of logic diagrams, GA and layout drgs of control panels, junction boxes, bill of material for panel drgs and terminal, chart for all the panel drgs, inter connection diagram for cabling, cable schedule, earthing layout and cable tray layout drawings.
- e) Design calculation of process and mechanical design, equipment and systems. The bidder shall show, explain and prove the validity of the basis/procedures and methods used in these calculations.
- f) Details civil scope drawing for all civil works.
- g) Detailed piping layout drawings, pipe support drawings, complete bill of materials of the piping, valve schedule etc.
- h) Submission of O&M manual.
- i) P.G Test procedure shall be submitted by bidder during detail engineering and shall be subject to approval by BHEL/Customer.
- j) Against customer / BHEL comments bidder has to give replies point wise during detailed engineering after award of contract.
- k) Spec. for acid/alkali resistant lining and areas requiring such lining.
- l) Cable schedule in BHEL format (shall be handed over after award of contract)
- m) Project schedule shall be submitted.

DRAWING/DOCUEMNTS REQUIRED ALONG WITH THE BID (Please refer Electrical and C&I portion also).

- Technical Offer (including List of chemicals, Quantity of chemicals, Dosage rate, calculation, pump capacity etc.)
- Deviation/clarification, if any, in the BHEL format only (Annexure -A).
- Unpriced Schedule duly filled.
- Electrical load data format (filled).
- Documents in support of meeting the Qualification Requirement.
- Electrical Load List.
- Valve Schedule.
- Pipe Schedule.

469360/2021/BAP-WS(CON)

NOTE-1: - Any item/work either supply of equipment or erection material, which have not been specifically mentioned in but are necessary to complete the works for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The bidder shall provide the same without any extra charge.

Note-2: All major drawings/documents shall be approved by BHEL/Customer during detailed engineering Stage. Successful vendor shall comply with the comment of the BHEL/Customer without price & delivery implication.

Note-3: The above Note-1 and 2 shall be applicable for Electrical and C&I also.

Note-4: Chlorine is being dosed @ 3 ppm shock for one hour once in 7 hours. in each pump CW Pump pit and continuous dosing 1 ppm in CW Forebay by BHEL (Chlorination plant supplier).

469360/2021/BAP-WS(CON)



WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

Annexure - 10

**TECHNICAL SPECIFICATION
FOR
PROTECTIVE LINING AND PAINTING**



WBPDCL

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

CONTENTS

CLAUSE NO	DESCRIPTION
1.00.00	INTENT OF SPECIFICATION
2.00.00	CODES & STANDARDS
3.00.00	GENERAL REQUIREMENTS
4.00.00	EQUIPMENT, MATERIAL AND SERVICES TO BE FURNISHED BY THE BIDDER
5.00.00	COATING PROCEDURE AND APPLICATION
6.00.00	TEST REQUIREMENTS
7.00.00	INFORMATION / DATA REQUIRED



WBPDCL

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

PROTECTIVE LINING AND PAINTING

1.00.00 INTENT OF SPECIFICATION

- 1.01.00 This specification addresses the requirements of all labour, material, and appliances necessary with reference to preparations for lining / painting, application as well as finishing of all lining / painting for all mechanical and electrical equipment, piping and valves, structures etc. included under the scope of this Package.
- 1.02.00 The Bidder shall furnish and apply all lining, primers including wash primers if required, under-coats, finish coats and colour bands as described hereinafter or necessary to complete the work in all respects.

2.00.00 CODES & STANDARDS

- 2.01.00 The Bidder shall follow relevant Indian and International Standards wherever applicable in cleaning of surface, selection of lining material / paints and their application. The entire work shall conform to the following standards / specifications (latest revision or as specified).
- a) SSPC SP 10 / NACE 2 / : Near White Blast Cleaning
 - b) SSPC PA 2 : Measurement of dry film Coating Thickness with magnetic gauges.
 - c) ASTM D 4541 : Method for pull off strength using portable Adhesion Tester.
 - d) NACE RP 0274 – 2004 : High-Voltage Electrical Inspection of Pipeline Coatings
 - e) NACE SP 0188 – 2006 : Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
 - f) NACE RP 0169 – 2002 : Control of External Corrosion on Underground or Submerged Metallic Piping Systems
 - g) AWWA C 210 – 2007 : Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
 - h) IS 3589:2001 Annexure B : Steel Pipes for Water and Sewage Specification.



Development Consultants Pvt. Ltd.

Page 1 of 10

Volume : II-I2
Section : XIII
Protective Lining and Painting



WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

- i) AWWA C222-2000 : Polyurethane Coating for the Interior and Exterior of Steel Water Pipe and Fittings.
- j) IS 13213 : 2000 : Polyurethane Full Gloss Enamel (Two pack)

3.00.00 GENERAL REQUIREMENTS

- 3.01.00 The steel surface preparation prior to actual commencement of coating shall conform to SSPC SP 10 / NACE 2 / Sa2½ (near white metal) with sand blasting.
- 3.02.00 The contractor shall submit a detailed written description in the form of a manual covering coating equipment, procedures, materials inspection test, and repair etc. to Owner/Consultant for approval.
- 3.03.00 The contractor shall also provide copies of test reports from NABL approved laboratory (like National Test House, Kolkata) in support of the paint/primer materials to be used shall conform to the specification requirement.
- 3.04.00 The contractor shall also provide certificates from paint/primer manufacturer mentioning the batch numbers, date of manufacture and shelf life etc. of the materials to be used. In addition to that Manufacturing Quality Plan (MQP) and Field Quality Plan (FQP) shall also be submitted prior to commencement of supply of material and field application.
- 3.05.00 Paint/coating application work at site shall be done either by paint manufacturer or by their authorized applicator. The authorized applicator shall have proper training & certification from manufacturer. Applicator shall possess all the necessary specialized equipment and manpower experienced in similar job.
- 3.06.00 Applied coating shall be tested for dry film thickness, holiday (electrical inspection for continuity) and adhesion as per relevant standard such as SSPC PA 2, NACE RP 0274 and ASTM D 4541.
- 3.07.00 If necessary, the material may be heated and applied by airless spray / plural component spray system.
- 3.08.00 Manufacturer's specific recommendation, if any, shall be followed during application of lining / paints.
- 3.09.00 In areas where there is danger of spotting automobiles or other finally finished equipment or building by wind borne particles from paint spraying, a Purchaser approved method shall be adopted.
- 3.10.00 The colour scheme of the entire Plant, covered under this specification shall be approved by the Purchaser in advance before application.



Development Consultants Pvt. Ltd.

Page 2 of 10

Volume : II-I2
Section : XIII
Protective Lining and Painting



WBPDCL

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

- 3.11.00 All indoor and outdoor piping, insulated as well as uninsulated will have approved colour bands painted on the pipes at conspicuous places throughout the system, as approved by Purchaser.
- 3.12.00 Inside surfaces of vessels / tanks shall be protected by anticorrosive paints or rubber lining as required / specified elsewhere in the specification. External surfaces of all vessels / tanks shall be protected by anti corrosive painting.
- 3.13.00 For vessels / tanks requiring lining and epoxy painting all inside surface shall be blast cleaned using non-siliceous abrasive after usual wire brushing.
- 3.14.00 Natural rubber lining shall be provided on the inside of vessels / tanks as required / specified elsewhere in the specification, in three layers resulting in a total thickness not less than 4.5 mm.
- 3.15.00 Surface hardness of rubber lining shall be 65 +/- 5 deg. A (shore).
- 3.16.00 After the lining is completed, the vessels / tanks shall not be subjected to any prolonged exposure to direct sunlight in course of its transportation, erection etc. They shall not be stored in direct sunlight. No further lining or burning shall be carried out on the vessel, after application of the lining.
- 3.17.00 All lining projecting outside of the vessel shall be protected adequately from mechanical damages during shipment, handling storage etc.
- 3.18.00 Suitable warnings, indicating the special care that must be taken with respect to these lined vessels shall be stenciled on their outside surface with the letters at least 12 mm high.
- 3.19.00 All insulated piping shall have aluminium sheet jacketing.

4.00.00 **EQUIPMENT, MATERIAL AND SERVICES TO BE FURNISHED BY THE BIDDER**

- 4.01.00 After erection at site, the outside surfaces of all equipment having a shop coat shall be given further priming coat and finished coats of paint as detailed in following clauses. However, if the painting system is such that the shop coat and primer coat to be applied at site are not compatible, then shop coat has to be removed from the surface of equipment before application of primer coat with prior blasting.

All factory finished paints shall be touched up at site as required.

All uninsulated piping shall be finished with final paintings after use of proper wash primer and primer. Aluminium sheet jacketed piping need not be painted.





WBPDCL

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

Colour bands of Purchaser's approved shade shall however be applied on jacketed piping near walls or partitions, at all junctions, near valves and all other places as instructed by the Purchaser. All structures shall be painted with approved paint.

4.02.00 Surface Preparation

4.02.01 Unless mentioned otherwise, all rust and mill scale shall be removed by blasting to Sa 2-1/2 Swiss Standard before applying the primer.

4.02.02 Special care shall be taken to remove grease and oil by means of suitable solvents like Trichloroethylene or Carbon Tetrachloride.

4.02.03 The minimum degree of surface preparations for all equipment, piping, fittings, valves, structures etc. shall be "Near White" according to Steel Structure, Painting Council-SSPC-SP-10 before application of any primer/paint.

4.03.00 Painting

4.03.01 Specification for application of paints for external surfaces protection of vessels / tanks / equipment / piping / fittings / valves etc. to be installed indoor shall be as follows :

- a) Surface preparation shall be done either manually or by any other approved method.
- b) Primer Coat shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber based zinc phosphate.
- c) Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber based paint pigmented with Titanium Dioxide.
- d) Top Coat shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber paint of approved shade and colour with glossy finish.
- e) Total DFT of paint system shall not be less than 150 microns.

4.03.02 Specification for application of paints for external surfaces protection of vessels / tanks / equipment / piping / fittings / valves etc to be installed **outdoor** shall be as follows :

- a) Surface preparation shall be done by means of sand blasting, which shall conform to Sa 2-1/2 Swiss Standard.
- b) Primer Coat shall consist of one coat (minimum DFT of 100 microns) of epoxy resin based zinc phosphate primer.



Development Consultants Pvt. Ltd.

Page 4 of 10

Volume : II-I2
Section : XIII
Protective Lining and Painting



WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

- c) Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 100 microns) epoxy resin based paint pigmented with Titanium Dioxide.
- d) Top Coat shall consist of one coat (minimum DFT of 75 microns) of epoxy paint of approved shade and colour with glossy finish. Additional one coat (minimum DFT of 25 microns) of Finish Coat of polyurethane shall be provided.
- e) Total DFT of paint system shall not be less than 300 microns.

4.03.03 Specification for application of paints for external surfaces protection of steel pipes and fittings which are **buried underground / laid inside a hume pipe & or submerged Under Water and laid under Pipe Trenches** (in road/rail/pipe or trench crossings) shall be as follows :

External surface of the pipe, fittings, specialties etc. handling raw water/clarified water/filter water shall be painted with one coat of two part chemically cured polyurethane primer of min 50 micron dry film thickness followed by three or maximum four coats of two part solvent less polyurethane to build up coating of dry film thickness of 2000 micron including primer coat.

4.03.04 Specification for application of paints for **internal surface protection of large diameter pipes** (sizes above 600 mm NB and above) if any, shall be as follows :

- a) All Internal surfaces of steel pipes, fittings, specialties etc. buried underground or located within pipe trenches shall be given epoxy coating to protect them from (except for drinking water service, where the compatible painting shall be so selected to meet relevant quality standards) corrosion.
- b) Internal surface of the pipe should be coated with one coat of two part epoxy primer with not less than 50 micron DFT (dry film thickness) followed by two part polyamide cured solvent less epoxy.
- c) The minimum dry film thickness (DFT) of internal lining shall be 600 micron.

4.03.05 Specification for application of paints for protection of **internal surfaces of DM Water Storage Tank(s)** shall be as follows :

- a) Primer - One coat of epoxy primer containing high level of Zinc Phosphate anticorrosive pigment. Total Dry Film Thickness (DFT) of primer shall not be less than 125 microns.
- b) Finish Paint - Three (3) coats Polyamine HB Epoxy Paint. Total Dry Film Thickness (DFT) of finish paint shall not be less than 125 microns per coat.
- c) Total thickness of primer and paint should not be less than 500 microns.

4.03.06 All motors, local push button stations, cable racks, structures used for supports etc. are to be painted with acid proof paint.





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

- 4.03.07 The following surfaces shall not be painted - stainless steel, galvanized steel, aluminum, copper, brass, bronze and other nonferrous materials.
- 4.03.08 No painting or filler shall be applied until all repairs, hydrostatic tests and final shop inspection are completed.
- 4.03.09 All machined surfaces shall have two (2) coats of water repellent grease after thorough cleaning.

5.00.00 COATING PROCEDURE AND APPLICATION

5.01.00 Surface Preparation :

Pipe shall be blast cleaned by sand. The cleanliness achieved prior to application shall be in accordance with the requirement of SSPC SP 10 / NACE 2 / Sa2½ of ISO 8501 (near white metal)

- a) The blast pattern or profile depth shall be 40 to 100 micron and shall be measured by dial micrometer.
- b) Before sand blasting is started or during blasting or coating, temperature of the pipe surface should be more than 3°C above dew point temperature. Blast cleaned surface should be primed within 4 hours and shall be protected from rainfall or surface moisture and shall not be allowed to flash rust. If the rust occurs, the surface again to be prepared by sand blasting or wire brushing.

5.02.00 Application of Epoxy Coating

- a) Coating shall be applied when
 - i) When the pipe surface temperature shall be atleast 3°C above dew point temperature.
 - ii) The temperature of mixed coating material and the pipe at the time of application shall not be lower than 10°C or greater than 50°C.
- b) Material preparation shall be in accordance with manufacturer's recommendations.
- c) Application of epoxy coating system :

The epoxy coating system shall be applied as per recommendation of the manufacturer and shall be applied by airless spray / plural component spray machine. For more than one coat, the second shall be applied with the time limits as recommended by the manufacturer.



5.03.00 Application of PU Coating

- a) PU coating shall be applied when the pipe surface temperature atleast 3°C above dew point temperature (when R.H is more than 85%).
- b) Material preparation and application shall be done as per manufacturer recommendation.

6.00.00 TEST REQUIREMENTS

6.01.00 Measurement of dry film thickness

Measurement of dry film thickness of coating : Coating thickness shall be in the range of $\pm 20\%$ and as per SSPC PA 2.

6.01.01 Apparatus / Instrument:-

The instrument used for dry film thickness may be Type 1 pull of gauges or Type 2 electronic gauges.

6.01.02 Procedures:-

- a) Number of measurements:
For 100 square feet (9.29 square meters), five (5) spots per test area (each spot is 3.8 cm) in diameter. Three gauge readings per spot (average becomes the spot measurement).
- b) If the structure is less than 300 square feet, each 100 square feet should be measured.
- c) If the structure is between 300 and 1000 sq ft, select 3 random 100 square feet test areas and measure.
- d) For structure exceeding 1000 square feet, select 3 random 100 square feet testing areas for the first 1000 sq ft and select 1 random 100 square feet testing area for each additional 1000 square feet
- e) Coating thickness Tolerance: Individual reading taken to get a representative measurement for the spot are unrestricted (usually low or high readings are discarded). Spot measurements (the average of 3 gauge readings) must be within 80% of the minimum thickness and 120% of the maximum thickness. Area measurement must be within specified range.

6.02.00 **ELECTRICAL INSPECTION (HOLIDAY) TESTS**

6.02.01 All the coated / lined pipes shall be tested with an approved high voltage holiday detector preferably equipped with an audio visual signaling device to indicate any faults, holes, breaks or conductive particles in the protective coating.



WBPDCL

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

- 6.03.00 The applied output voltage of holiday detector shall have a spark discharge of thickness equal to at least twice the thickness of the coating to assure adequate inspection voltage and compensate for any variation in coating thickness. The electrode shall be passed over the coated surface at approximately half the spark discharge distance from the coated surface only one time at the rate of approximately 10 to 20m/min. The edge effect shall be ignored. Excessive voltage shall be avoided as it tends to induce holiday in the coated surface thereby giving erroneous readings.
- 6.04.00 While selecting test voltages, consideration should be given to the tolerance on coating thickness and voltage should be selected on the basis of maximum coating thickness likely to be encountered during testing of a particular pipe.
- The testing voltage shall be calculated by using following formula. (as per NACE 0274 : 2004)
- Testing Voltage $V = 7900 \sqrt{T} \pm 10$ percent where T is the average coating thickness in mm.
- 6.05.00 Any audio visual sound or spark leads to indicate pinhole, break or conductive particle.
- 6.06.00 **ADHESION PULL OFF TEST**
- After holiday the coated surface is subjected to adhesion pull off test as per ASTM D 4541.
- 6.06.01 Apparatus / Instrument: Adhesion tester consists of three basic components:
- A hand wheel, a black column containing a dragging indicator pin and scale in the middle and a base containing three legs and a pulling "Jaw" at the bottom and also dollies.
- 6.06.02 Prepare the test surface
- Once test area is selected, test area shall be free of grease, oil, dirt, water. The area should be flat surfaces and large enough to accommodate the specified number of replicate test.
- 6.06.03 Prepare Dolly (Test Pull Stub)
- The dolly is a round, two sided aluminium fixture. Both sides of the dolly looks same, however, one side sloped on top surface while flat on bottom surface. As the surface of the dolly is polished aluminium, roughen the same using a coarse sand paper.





WBPDC

**EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III**

6.07.00 Select an adhesive:

Use araldite, a 100% solid epoxy adhesive. This adhesive requires at least 24 hours at room temperature to cure.

6.08.00 Attach the dolly to the surface.

- a) Using a wooden stick, apply an even layer of adhesive to the entire contact surface area of the dolly.
- b) Carefully remove the excessive adhesive by using a cotton swab. Allow the adhesive to fully cure before performing the adhesion test.
- c) Attach the dolly to the coated surface and gently push downward to displace any excessive adhesive.
- d) Push the dolly inward against the surface, then apply tape across the head of the dolly.

6.09.00 Adhesion Test Procedure

- a) Attach the adhesion tester to the dolly by rotating the hand wheel counter clockwise to lower the jaw of the device.
- b) Slide the jaw completely under the head of the dolly. Position the three legs of the instruments so that they are sitting flat on the coated surface.
- c) Slide the dragging indicator pin on the black column to zero by pushing it downward.
- d) Firmly hold the base of the instrument in one hand and rotate the handwheel clockwise to raise the jaw of the device that is attached to the head of the dolly. The dragging indicator pin will move upward on the black column as the force is increased and will hold the reading. Apply the tension using a moderate speed. Continue to increase the tension on the head of the dolly until (a) the minimum PSI/MPa/Kg/cm² required by project specification is exceeded and the test is discontinued, (b) the maximum PSI/MPa/Kg/cm² of adhesion tester has been achieved and dolly is still attached, (c) The force applied by the adhesion tester causes the dolly to dislodge.
- e) Read the scale and record the adhesion value.

6.10.00 **COATING REPAIR**

Defective Coating shall be repaired in accordance with the following subsections.

6.10.01 Surface Preparation:

Accessible areas of pipe requiring coating repairs shall be cleaned to remove debris and damaged coating using surface grinders or other means. The





WBPDC

**EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III**

adjacent coating shall be feathered by sanding, grinding or other method. Accumulated debris shall be removed by blowing with contaminant free air or wiping with clean rags.

6.10.02 Areas not accessible for coating repair such as interior surfaces of small diameter pipe shall be reprocessed and recoated.

6.11.00 Coating Application

The coating system shall be applied to the prepared areas in accordance with procedure.

6.12.00 Repair Inspection

Repaired portion shall be electrically inspected using a holiday detector.

6.13.00 **WELDED FIELD JOINTS**

6.13.01 Preparation :

The weld joints shall be cleaned so as to be free from mud, oil, grease, welding flux, weld spatter and other foreign contaminants. The cleaned metal surfaces of the weld joint shall then be blasted or abraded using rotary abrading pads. The adjacent liquid Epoxy / PU coating shall be feathered by abrading the coating surface for a distance of 25 mm.


6.13.02 Electrical Inspection :

After curing the coating system applied to the welding joints shall be holiday tested. Any holidays indicated by the detector shall be marked with chalk to identify the area of repair.

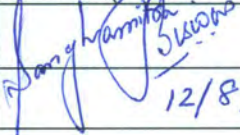
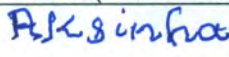

7.00.00 INFORMATION/DATA REQUIRED

The Bidder shall submit complete list of paints and primers proposed, giving detail information, such as, chemical composition, drying time etc. and also unit rates for application of each type of paint along with supply shall be furnished.



	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014

DOCUMENT ISSUE SHEET

	Prepared	Reviewed	Approved
Name	Sanghamitra B. Jayant	A.K. Sinha	Anuj Bhatnagar
Designation	Dy. Manager PSHQ(FQA & Safety)	GM PSHQ(FQA & Safety)	ED PSHQ(FQA & Safety)
Signature			
Date	12/8/14	12/8/14	12/8/14

HSE PLAN FOR SITE OPERATIONS BY BHEL'S SUBCONTRACTORS

AT A GLANCE

BEFORE START	SIGNING OF MOU Agree to comply to HSE requirement- Statutory and BHEL's	
PLAN	HSE ORGANISATION	
	<p style="text-align: center;">Manpower</p> <ul style="list-style-type: none"> • 1 (one) safety officer for every 500 workers or part thereof • 1(one) safety-steward/ supervisor for every 100 workers <p style="text-align: center;">Qualification As per Cl. 7.1</p>	<p style="text-align: center;">HSE Roles and responsibilities</p> <ul style="list-style-type: none"> • Site In-charge- As per clause 7.2.1 • Safety officer- As per clause 7.2.2
	HSE Planning for Man , Machinery/Equipment/Tools & Tackles	
PROVIDE	HSE INFRASTRUCTURE	
	<ul style="list-style-type: none"> • PPEs • Drinking Water • Washing Facilities • Latrines and Urinals • Provision of shelter for rest • Medical facilities 	<ul style="list-style-type: none"> • Canteen facilities • Labour Colony • Emergency Vehicle • Pest Control • Scrapyard • Illumination
TRAIN	HSE TRAINING , AWARENESS & PROMOTION	
	<p style="text-align: center;">Training</p> <ul style="list-style-type: none"> • Induction training • Height work and other critical areas • Tool Box talk & Pep Talk 	<p style="text-align: center;">Awareness & Promotion</p> <ul style="list-style-type: none"> • Signage • Poster • Banner • Competition • Awards
COMMUNICATE	HSE COMMUNICATION	
	<p style="text-align: center;">Incident Reporting</p> <ul style="list-style-type: none"> • Accident- Fatal & Major • Property damage • Near Miss 	<p style="text-align: center;">Event Reporting</p> <ul style="list-style-type: none"> • Celebrations • Training • Medical camp

EXECUTE SAFELY

OPERATIONAL CONTROL PROCEDURES	
PERMIT TO WORK Height work (above 2 metres), Hot Work, Heavy Lifting, Confined Space, Radiography, excavation(More than 4 metres)	
SAFETY DURING WORK EXECUTION	
<ul style="list-style-type: none"> • Welding • Rigging • Cylinder- storage & Movement • Demolition work • T&Ps • Chemical Handling • Electrical works 	<ul style="list-style-type: none"> • Fire • Scaffolding • Height work • Working Platform • Excavation • Ladder • Lifting • Hoisting appliance
HOUSE KEEPING	
WASTE MANGEMENT	
TRAFFIC MANAGEMENT	
ENVIRONMENTAL CONTROL	
EMERGENCY PREPAREDNESS AND RESPONSE PLAN	


CHECKS

HSE AUDITS & INSPECTION	
<ul style="list-style-type: none"> • Daily Checks • Inspection of PPEs • Inspection of T& Ps • Inspection of Cranes & Winches 	<ul style="list-style-type: none"> • Inspection of Height work • Inspection of Welding and Gas cutting • Inspection of elevators etc


HSE PERFORMANCE EVALUATION PARAMETERS
--

NON CONFORMANCE


<p>PENALTY for NON CONFORMANCE Refer Clause 16 Incremental penalty For repeated violation by the same person, the penalty would be double of the previous penalty For repeated fatal incident in the same Unit incremental penalty to be imposed. The subcontractor will pay 2 times the penalty compared to previously paid in case there are repeated cases of fatal incidents under the same subcontractor for the same package in the same unit.</p>

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00
		Date: 12.08.2014
		Page: 1 of 43


Sr. No.	Description	Page No.
1.0	PURPOSE	4
2.0	SCOPE	4
3.0	OBJECTIVES AND TARGETS	4
4.0	HEALTH, SAFETY & ENVIRONMENT POLICY	5
5.0	MEMORANDUM OF UNDERSTANDING	6
6.0	TERMS & DEFINITIONS	7
7.0	HSE ORGANIZATION	8
7.1	QUALIFICATION FOR HSE PERSONNEL	8
7.2	RESPONSIBILITIES	9
8.0	PLANNING BY SUBCONTRACTOR	11
8.1	MOBILISATION OF MACHINERY/EQUIPMENT/TOOLS	11
8.2	MOBILISATION OF MANPOWER BY SUBCONTRACTOR	11
8.3	PROVISION OF PPEs	12
8.4	ARRANGEMENT OF INFRASTRUCTURE	13
9.0	HSE TRAINING & AWARENESS	16
9.1	HSE INDUCTION TRAINING	16
9.2	HSE TOOLBOX TALK	17
9.3	TRAINING ON HEIGHT WORK	17
9.4	HSE TRAINING DURING PROJECT EXECUTION	17

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 2 of 43

9.5	HSE PROMOTION-SIGNAGE, POSTERS, COMPETITION, AWARDS ETC	18
10.0	HSE COMMUNICATION	18
10.1	INCIDENT REPORTING	18
10.2	HSE EVENT REPORTING	18
11.0	OPERATIONAL CONTROL	19
11.1	HSE ACTIVITIES	19
11.2	WORK PERMIT SYSTEM	20
11.3	SAFETY DURING WORK EXECUTION	20
11.4	ENVIRONMENTAL CONTROL	24
11.5	HOUSEKEEPING	24
11.6	WASTE MANAGEMENT	25
11.7	TRAFFIC MANAGEMENT SYSTEM	26
11.8	EMERGENCY PREPAREDNESS AND RESPONSE	28
12.0	HSE INSPECTION	29
12.1	DAILY HSE CHECKS	29
12.2	INSPECTION OF PPE	29
12.3	INSPECTION OF T&Ps	30
12.4	INSPECTION OF CRANES AND WINCHES	30
12.5	INSPECTION ON HEIGHT WORKING	30
12.6	INSPECTION ON WELDING AND GAS CUTTING OPERATION	30

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 3 of 43

12.7	INSPECTION ON ELECTRICAL INSTALLATION / APPLIANCES	31
12.8	INSPECTION OF ELEVATOR	31
13.0	HSE PERFORMANCE	31
14.0	HSE PENALTIES	32
15.0	OTHER REQUIREMENTS	32
16.0	NON COMPLIANCE	33
17.0	HSE AUDIT/INSPECTION	34
18.0	MONTHLY HSE REVIEW MEETING	34
19.0	FORMATS USED	34
20.0	Annexures	36

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 4 of 43

1.0 PURPOSE

- 1.1 The purpose of this HSE Plan is to provide for the systematic identification, evaluation, prevention and control of general workplace hazards, specific job hazards, potential hazards and environmental impacts that may arise from foreseeable conditions during installation and servicing of industrial projects and power plants.
- 1.2 This document shall be followed by BHEL's subcontractors at all installation and servicing sites. In case customer specific documents are to be implemented, this document will be followed in conjunction with customer specific documents.
- 1.3 Although every effort has been made to make the procedures and guidelines in line with statutory requirements, in case of any discrepancy relevant statutory guidelines must be followed.
- 1.4 In case the customer has any specific requirement, the same is to be fulfilled.


2.0 SCOPE

The document is applicable for BHEL's Subcontractors at all installation / servicing activities of BHEL Power Sector as per the relevant contractual obligations.

3.0 OBJECTIVES AND TARGETS

The HSE Plan reflects that BHEL places high priority upon the Occupational Health, Safety and Environment at workplaces.

- Ensure the Health and Safety of all persons at work site is not adversely affected by the work.
- Ensure protection of environment of the work site.
- Comply at all times with the relevant statutory and contractual HSE requirements.
- Provide trained, experienced and competent personnel. Ensure medically fit personnel only are engaged at work.
- Provide and maintain plant, places and systems of work that are safe and without risk to health and the environment.
- Provide all personnel with adequate information, instruction, training and supervision on the safety aspect of their work.
- Effectively control, co-ordinate and monitor the activities of all personnel on the Project sites including subcontractors in respects of HSE.
- Establish effective communication on HSE matters with all relevant parties involved in the Project works.
- Ensure that all work planning takes into account all persons that may be affected by the work.
- Ensure fitness testing of all T&Ps/Lifting appliances like cranes, chain pulley blocks etc. are to be certified by competent person.
- Ensure timely provision of resources to facilitate effective implementation of HSE requirements.
- Ensure continual improvements in HSE performance
- Ensure conservation of resources and reduction of wastage.
- Capture the data of all incidents including near misses, process deviation etc. Investigate and analyze the same to find out the root cause.
- Ensure timely implementation of correction, corrective action and preventive action.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 5 of 43

HSE TARGETS

EXPLOSION	ZERO
FATALITY	ZERO
LOST TIME INJURY	ZERO
FIRE	ZERO
VEHICLE INCIDENTS	ZERO
ENVIRONMENTAL INCIDENTS	ZERO

4.0 BHEL POWER SECTOR HEALTH, SAFETY & ENVIRONMENT POLICY

Power Sector HSE Policy

We, at BHEL Power Sector, reaffirm our belief that the Health and Safety of our stakeholders and conservation of Environment is of utmost importance and takes precedence in all our business decisions. In pursuit of this belief and commitment, we strive to:


- ✓ Ensure total compliance with applicable legislation, regulations and other requirements concerning Occupational Health, Safety and Environment.
- ✓ Ensure continual improvement in the Occupational Health, Safety and Environment Management System performance.
- ✓ Enhance Occupational Health, Safety and Environment awareness amongst employees, customers and suppliers by proactive communication and training.
- ✓ Review periodically and improve Occupational Health, Safety and Environment Management System to ensure its continuing suitability, adequacy and effectiveness in a continuously changing business environment.
- ✓ Develop a culture of safety through active leadership and provide appropriate training at all levels to enable employees to fulfill their Health, Safety and Environmental obligations.
- ✓ Incorporate appropriate Occupational Health, Safety and Environmental criteria into business decisions for selection of plant, technology and services as well as appointment of key personnel.
- ✓ Ensure availability at all times of appropriate resources to fully implement the Occupational Health, Safety and Environmental policy of the company.

This policy will be communicated to all employees and made available to interested parties.

Sd/-

Date: 01.05.2013

Director (Power)

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 6 of 43

5.0 MEMORANDUM OF UNDERSTANDING:

After award of work, subcontractors are required to enter into a memorandum of understanding as given below:

Memorandum of Understanding

BHEL, Power Sector _____ Region is committed to Health, Safety and Environment Policy (HSE Policy).

M/s _____ do hereby also commit to comply with the same HSE Policy while executing the Contract Number _____

M/s _____ shall ensure that safe work practices as per the HSE plan. Spirit and content therein shall be reached to all workers and supervisors for compliance.


In addition to this, M/S _____ shall comply to all applicable statutory and regulatory requirements which are in force in the place of project and any special requirement specified in the contract document of the principal customer.

M/s _____ shall co-operate in HSE audits/inspections conducted by BHEL /customer/ third party and ensure to close any non-conformity observed/reported within prescribed time limit.

Signed by authorized representative of M/s -----

Name :

Place & Date:

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 7 of 43

6.0 TERMS AND DEFINITIONS

6.1 DEFINITIONS

6.1.1 INCIDENT

Work- related or natural event(s) in which an injury , or ill health (regardless of severity), damage to property or fatality occurred, or could have occurred.

6.1.2 NEAR MISS

An incident where no ill health, injury, damage or other loss occurs, but it had a potential to cause, is referred to as "Near-Miss".

6.1.3 MAN-HOUR WORKED

The total number of man hours worked by all employees including subcontractors working in the premises. It includes managerial, supervisory, professional, technical, clerical and other workers including contract labours. Man-hours worked shall be calculated from the payroll or time clock recorded including overtime. When this is not feasible, the same shall be estimated by multiplying the total man-days worked for the period covered by the number of hours worked per day. The total number of workdays for a period is the sum of the number of men at work on each day of period. If the daily hours vary from department to department separate estimate shall be made for each department and the result added together.

6.1.4 FIRST AID CASES

First aids are not essentially all reportable cases, where the injured person is given medical treatment and discharged immediately for reporting on duty, without counting any lost time.

6.1.5 LOST TIME INJURY

Any work injury which renders the injured person unable to perform his regular job or an alternative restricted work assignment on the next scheduled work day after the day on which the injury occurred.

6.1.6 MEDICAL CASES


Medical cases come under non-reportable cases, where owing to illness or other reason the employee was absent from work and seeks Medical treatment.

6.1.7 TYPE OF INCIDENTS & THEIR REPORTING:

The three categories of Incident are as follows:

Non-Reportable Cases:

An incident, where the injured person is given medical help and discharged for work without counting any lost time.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00
		Date: 12.08.2014
		Page: 8 of 43

Reportable Cases:

In this case the injured person is disable for 48 hours or more and is not able to perform his duty.

Injury Cases:

These are covered under the heading of non-reportable cases. In these cases the incident caused injury to the person, but he still continues his duty.

6.1.8 TOTAL REPORTABLE FREQUENCY RATE

Frequency rate is the number of Reportable Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula read as:

$$\frac{\text{Number of Reportable LTI} \times 1,000,000}{\text{Total Man Hours Worked}}$$

6.1.9 SEVERITY RATE

Severity rate is the Number of days lost due to Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula reads as:

$$\frac{\text{Days lost due to LTI} \times 1,000,000}{\text{Total Man Hours Worked}}$$

6.1.10 INCIDENCE RATE

Incidence Rate is the Number of LTI per one thousand manpower deployed. Mathematically, the formula reads as:

$$\frac{\text{Number of LTI} \times 1000}{\text{Average number of manpower deployed}}$$


7.0 HSE ORGANISATION**Number of safety officers:**

The subcontractor must deploy one safety officer for every 500 workers or part thereof in each package. In addition, there must be one safety-steward/safety-supervisor for every 100 workers.

Deployment: The subcontractor should deploy sufficient safety officers and safety-steward/Safety-supervisor, as per requirement given above, since initial stage and add more in proportion to the added strength in work force. Any delay in deployment will attract a penalty of Rs.30,000/- per man month for the delayed period.

7.1 QUALIFICATION FOR HSE PERSONNEL

Sl.no	Designation	Qualification	Experience
1	Safety officer (Construction Agency)	Degree or Diploma in Engineering with full time diploma in Industrial Safety with construction safety as one of the subjects	Minimum two years for degree holder and five years for diploma holder in the field of Construction of power plant/ major industries


	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 9 of 43

2	Safety-Steward/ Supervisor	Safety-	Degree or diploma in any discipline with full time diploma in Industrial Safety with construction safety as one of the subjects	Minimum two years
---	-------------------------------	---------	---	-------------------

7.2 RESPONSIBILITIES

7.2.1 SITE IN -CHARGE OF SUBCONTRACTOR


- Shall sign Memorandum of Understanding (MoU) for compliance to BHEL's HSE Plan for Site Operations as per clause 5.0
- Shall engage qualified safety officer(s) and steward (s) as per clause 7.0
- Shall adhere to the rules and regulations mentioned in this code, practice very strictly in his area of work in consultation with his concerned engineer and the safety coordinator.
- Shall screen all workmen for health and competence requirement before engaging for the job and periodically thereafter as required.
- Shall not engage any employee below 18 years.
- Shall arrange for all necessary PPEs like safety helmets, belts, full body harness, shoes, face shield, hand gloves etc. before starting the job. Shall ensure that no working men/women carry excessive weight more than stipulated in Factory Rule Regulation R57.
- Shall ensure that all T&Ps engaged are tested for fitness and have valid certificates from competent person.
- Shall ensure that provisions stipulated in contract Labour Regulation Act 1970, Chapter V C.9, canteen, rest rooms/washing facilities to contracted employees at site.
- Shall adhere to the instructions laid down in Operation Control Procedures (OCPs) available with the site management.
- Shall ensure that person working above 2.0 meter should use Safety Harness tied to a life line/stable structure.
- Shall ensure that materials are not thrown from height. Cautions to be exercised to prevent fall of material from height.
- Shall report all incidents(Fatal/Major/Minor/Near Miss)to the Site engineer /HSE officer of BHEL.
- Shall ensure that Horseplay is strictly forbidden.
- Shall ensure that adequate illumination is arranged during night work.
- Shall ensure that all personnel working under subcontractor are working safely and do not create any Hazard to self and to others.
- Shall ensure display of adequate signage/posters on HSE.
- Shall ensure that mobile phone is not used by workers while working.
- Shall ensure conductance of HSE audit, mockdrill, medical camps, induction training and training on HSE at site.
- Shall ensure full co-operation during HQ/External /Customer HSE audits.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 10 of 43

- Shall ensure submission of look-ahead plan for procurement of HSE equipment's and PPEs as per work schedule.
- Shall ensure good housekeeping.
- Shall ensure adequate valid fire extinguishers are provided at the work site.
- Shall ensure availability of sufficient number of toilets /restrooms and adequate drinking water at work site and labour colony.
- Shall ensure adequate emergency preparedness.
- Shall be member of site HSE committee and attend all meetings of the committee
- Power source for hand lamps shall be maximum of 24 v.
- Temporary fencing should be done for open edges if Hand – railings and Toe-guards are not available.

7.2.2 HEALTH, SAFETY AND ENVIRONMENT OFFICER OF SUBCONTRACTOR

- Carry out safety inspection of Work Area, Work Method, Men, Machine & Material, P&M and other tools and tackles.
- Facilitate inclusion of safety elements into Work Method Statement.
- Highlight the requirements of safety through Tool-box / other meetings.
- Help concerned HOS to prepare Job Specific instructions for critical jobs.
- Conduct investigation of all incident/dangerous occurrences & recommend appropriate safety measures.
- Advice & co-ordinate for implementation of HSE permit systems, OCPs & MPs.
- Convene HSE meeting & minute the proceeding for circulation & follow-up action.
- Plan procurement of PPE & Safety devices and inspect their healthiness.
- Report to PS Region/HQ on all matters pertaining to status of safety and promotional program at site level.
- Facilitate administration of First Aid
- Facilitate screening of workmen and safety induction.
- Conduct fire Drill and facilitate emergency preparedness
- Design campaigns, competitions & other special emphasis programs to promote safety in the workplace.
- Apprise PS– Region on safety related problems.
- Notify site personnel non-conformance to safety norms observed during site visits / site inspections.
- Recommend to Site In charge, immediate discontinuance of work until rectification, of such situations warranting immediate action in view of imminent danger to life or property or environment.
- To decline acceptance of such PPE / safety equipment that do not conform to specified requirements.
- Encourage raising Near Miss Report on safety along with, improvement initiatives on safety.
- Shall work as interface between various agencies such customer, package-in-charges, subcontractors on HSE matters

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 11 of 43


8.0 PLANNING BY SUBCONTRACTOR

8.1 MOBILISATION OF MACHINERY/EQUIPMENT/TOOLS BY SUBCONTRACTOR

- As a measure to ensure that machinery, equipment and tools being mobilized to the construction site are fit for purpose and are maintained in safe operating condition and complies with legislative and owner requirement, inspection shall be arranged by in-house competent authority for acceptance as applicable.
- The machinery and equipment to be embraced for this purpose shall include but not limited to the following:
 - Mobile cranes.
 - Side Booms.
 - Forklifts.
 - Grinding machine.
 - Drilling machine.
 - Air compressors.
 - Welding machine.
 - Generator sets.
 - Dump Trucks.
 - Excavators.
 - Dozers
 - Grit Blasting Equipment.
 - Hand tools.
- Subcontractor shall notify the engineer, of his intention to bring on to site any equipment or any container, with liquid or gaseous fuel or other substance which may create a hazard. The Engineer shall have the right to prescribe the condition under which such equipment or container may be handled and used during the performance of the works and the subcontractor shall strictly adhere to such instructions. The Engineer shall have the right to inspect any construction tool and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition will be entertained.

8.2 MOBILISATION OF MANPOWER BY SUBCONTRACTOR

- The subcontractor shall arrange induction and regular health check of their employees as per schedule VII of BOCW rules by a registered medical practitioner.
- The subcontractor shall take special care of the employees affected with occupational diseases under rule 230 and schedule II of BOCW Rules. The employees not meeting the fitness requirement should not be engaged for such job.
- Ensure that the regulatory requirements of excessive weight limit (to carry/lift/ move weights beyond prescribed limits) for male and female workers are complied with.
- Appropriate accommodation to be arranged for all workmen in hygienic condition.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 12 of 43

8.3 PROVISION OF PPEs

- Personnel Protective Equipment (PPEs), in adequate numbers, will be made available at site & their regular use by all concerned will be ensured
- The following matrix recommends usage of minimum PPEs against the respective job.


Sl. No	Type of work	PPEs
1	Concrete and asphalt mixing	Nose mask, hand glove, apron and gum boot
2	Welders/Grinders/ Gas cutters	Welding/face screen, apron, hand gloves, nose mask and ear muffs if noise level exceeds 90dB. Helmet fitted with welding shield is preferred for welders
3	Stone/ concrete breakers	Ear muffs, safety goggles, hand gloves
4	Electrical Work	Rubber hand glove, Electrical Resistance shoes
5	Insulation Work	Respiratory mask, Hand gloves, safety goggles
6	Work at height	Double lanyard full body harness, Fall arrestor (specific cases)
7	Grit/Sand blasting	Blast suit, blast helmet, respirator, leather gloves
8	Painting	Plastic gloves, Respirators (particularly for spray painting)
9	Radiography	As per BARC guidelines

- The PPEs shall conform to the relevant standards as below and bear ISI mark.

Relevant is-codes for personal protection

IS: 2925 – 1984	Industrial Safety Helmets.
IS: 4770 – 1968	Rubber gloves for electrical purposes.
IS: 6994 – 1973 (Part-I)	Industrial Safety Gloves (Leather & Cotton Gloves).
IS: 1989 – 1986 (Part-I-II)	Leather safety boots and shoes.
IS: 5557 – 1969	Industrial and Safety rubber knee boots.
IS: 6519 – 1971	Code of practice for selections care and repair of Safety footwear.
IS: 11226 – 1985	Leather Safety footwear having direct molding sole.
IS: 5983 – 1978	Eye protectors.
IS: 9167 – 1979	Ear protectors.
IS: 1179-1967	Eye & Face protection during welding
IS: 3521 – 1983	Industrial Safety Belts and Harness
IS:8519 -1977	Guide for selection of industrial Safety equipment for body protection
IS:9473-2002,14166-1994,14746-1999	Respiratory Protective Devices

The list is not exhaustive. The safety officer may demand additional PPEs based on specific requirement.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 13 of 43

- Where workers are employed in sewers and manholes, which are in use, the subcontractor shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into manhole, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent incident to the public
- Besides the PPEs mentioned above, the persons shall use helmet and safety shoe. The visitors shall use Helmet and any other PPEs as deemed appropriate for the area of work.

Colour scheme for Helmets:

1. Workmen: Yellow
 2. Safety staff: Green or white with green band
 3. Electrician: Red
 4. Others including visitors: White
- All the PPEs shall be checked for its quality before issue and the same shall be periodically checked. The users shall be advised to check the PPEs themselves for any defect before putting on. The defective ones shall be repaired/ replaced.
 - The issuing agency shall maintain register for issue and receipt of PPEs.
 - The Helmets shall have logo or name (abbreviation of agency name permitted) affixed or printed on the front.
 - The body harnesses shall be serial numbered.

8.4 ARRANGEMENT OF INFRASTRUCTURE

8.4.1 DRINKING WATER


- Drinking water shall be provided and maintained at suitable places at different elevations.
- Container should be labeled as "Drinking Water"
- Cleaning of the storage tank shall be ensured atleast once in 3 months indicating date of cleaning and next due date.
- Potability of water should be tested as per IS10500 at least once in a year.

8.4.2 WASHING FACILITIES

- In every workplace, adequate and suitable facilities for washing shall be provided and maintained.
- Separate and adequate cleaning facilities shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition and dully illuminated for night use.
- Overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the painters and other workers to wash during the cessation of work.

8.4.3 LATRINES AND URINALS

- Latrines and urinals shall be provided in every work place.
- Urinals shall also be provided at different elevations.
- They shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times, by appointing designated person.
- Separate facilities shall be provided for the use of male and female worker if any.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 14 of 43

8.4.4 PROVISION OF SHELTER DURING REST

Proper Shed & Shelter shall be provided for rest during break

8.4.5 MEDICAL FACILITIES

8.4.5.1 MEDICAL CENTRE (As per Schedule V, X and XI of BOCW central Rules, 1998)

- A medical centre shall be ensured/identified at site with basic facilities for handling medical emergencies. The medical center can be jointly developed on proportionate sharing basis with permission from BHEL
- A qualified medical professional, not less than MBBS, shall be deployed at the medical centre
- The medical centre shall be equipped with one ambulance, with trained driver and oxygen cylinder.
- Medical waste shall be disposed as per prevailing legislation (Bio-Medical Waste –Management and Handling Rules, 1998)

8.4.5.2 FIRST AIDER

- Ensure availability of Qualified First-aider throughout the working hours.
- Every injury shall be treated, recorded and reported.
- Refresher course on first aid shall be conducted as necessary.
- List of Qualified first aiders and their contact numbers should be displayed at conspicuous places.


8.4.5.3 FIRST AID BOX (as per schedule III of BOCW)

- The subcontractor shall provide necessary first aid facilities as per schedule III of BOCW. At every work place first aid facilities shall be provided and maintained.
- The first aid box shall be kept by first aider who shall always be readily available during the working hours of the work place. His name and contact no to be displayed on the box.
- The first aid boxes should be placed at various elevations so as to make them available within the reach and at the quickest possible time.
- The first aid box shall be distinctly marked with a Green Cross on white background.
- Details of contents of first aid box is given in Annexure No. 01
- Monthly inspection of First Aid Box shall be carried out by the owner as per format no. HSEP:13-F01
- The subcontractor should conduct periodical first –aid classes to keep his supervisor and Engineers properly trained for attending to any emergency.

8.4.5.4 HEALTH CHECK UP (As per schedule VII and Form XI)

The persons engaged at the site shall undergo health checkup as per the format no. HSEP:13-F02 before induction. The persons engaged in the following works shall undergo health checkup at least once in a year:

- a. Height workers
- b. Drivers/crane operators/riggers

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 15 of 43

- c. Confined space workers
- d. Shot/sand blaster
- e. Welding and NDE personnel

8.4.6 PROVISION OF CANTEEN FACILITY

- Canteen facilities shall be provided for the workmen of the project inside the project site.
- Proper cleaning and hygienic condition shall be maintained.
- Proper care should be taken to prevent biological contamination.
- Adequate drinking water should be available at canteen.
- Fire extinguisher shall be provided inside canteen.
- Regular health check-up and medication to the canteen workers shall be ensured.

8.4.7 PROVISION OF ACCOMODATION/LABOUR COLONY

- The subcontractor shall arrange for the accommodation of workmen at nearby localities or by making a labour colony.
- Regular housekeeping of the labour colony shall be ensured.
- Proper sanitation and hygienic conditions to be maintained.
- Drinking water and electricity to be provided at the labour colony.
- Bathing/ washing bay
- Room ventilation and electrification.

8.4.8 PROVISION OF EMERGENCY VEHICLE

- Dedicated emergency vehicle shall be made available at workplace by each subcontractor to handle any emergency

8.4.9 PEST CONTROL


Regular pest control should be carried out at all offices, mainly laboratories, canteen, labour colony and stores.

8.4.10 SCRAPYARD

- In consultation with customer, scrapyard shall be developed to store metal scrap, wooden scrap, waste, hazardous waste.
- Scrap/Waste shall be segregated as Bio-degradable and non-bio-degradable and stored separately.

8.4.11 ILLUMINATION

- The subcontractor shall arrange at his cost adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. at various levels for safe and proper working operations at dark places and during night hours at the work spot as well as at the pre-assembly area.
- Adequate and suitable light shall be provided at all work places & their approaches including passage ways as per IS: 3646 (Part-II). Some recommended values are given below:

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 16 of 43

S. No.	Location	Illumination (Lux)
A. Construction Area		
1.	Outdoor areas like store yards, entrance and exit roads	20
2.	Platforms	50
3.	Entrances, corridors and stairs	100
4.	General illumination of work area	150
5.	Rough work like fabrication, assembly of major items	150
6.	Medium work like assembly of small machined parts	300
7.	rough measurements etc. Fine work like precision assembly, precision measurements etc.	700
8.	Sheet metal works	200
9.	Electrical and instrument labs	450
B. Office		
1.	Outdoor area like entrance and exit roads	20
2.	Entrance halls	150
3.	Corridors and lift cars	70
4.	Lift landing	150
5.	Stairs	100
6.	Office rooms, conference rooms, library reading tables	300
7.	Drawing table	450
8.	Manual telephone exchange	200

- Lamp (hand held) shall not be powered by mains supply but either by 24V or dry cells.
- Lamps shall be protected by suitable guards where necessary to prevent danger, in case of breakage of lamp.
- Emergency lighting provision for night work shall be made to minimise danger in case of main supply failure.

If the subcontractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions issued by the authorized BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the subcontractor


9.0 HSE TRAINING & AWARENESS

9.1 HSE INDUCTION TRAINING

All persons entering into project site shall be given HSE induction training by the HSE officer of BHEL /subcontractor before being assigned to work.

In-house induction training subjects shall include but not limited to:

- Briefing of the Project details.
- Safety objectives and targets.
- Site HSE rules.
- Site HSE hazards and aspects.
- First aid facility.
- Emergency Contact No.
- Incident reporting.
- Fire prevention and emergency response.
- Rules to be followed in the labour colony (if applicable)

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 17 of 43

- Proper safety wear & gear must be issued to all the workers being registered for the induction (i.e., Shoes/Helmets/Goggles/Leg guard/Apron etc.)
- They must arrive fully dressed in safety wear & gear to attend the induction.
- Any one failing to conform to this safety wear& gear requirement shall not qualify to attend.
- On completing attending subcontractor's in-house HSE induction, each employee shall sign an induction training form (format no. HSEP:13-F03) to declare that he had understood the content and shall abide to follow and comply with safe work practices. They may only then be qualified to be issued with a personal I.D. card, for access to the work site.

9.2 HSE TOOLBOX TALK

- HSE tool Box talk shall be conducted by frontline foreman/supervisor of subcontractor to specific work groups prior to the start of work. The agenda shall consist of the followings:
 - Details of the job being intended for immediate execution.
 - The relevant hazards and risks involved in executing the job and their control and mitigating measures.
 - Specific site condition to be considered while executing the job like high temperature, humidity, unfavorable weather etc.
 - Recent non-compliances observed.
 - Appreciation of good work done by any person.
 - Any doubt clearing session at the end.
- Record of Tool box talk shall be maintained as per format no. HSEP:13-F04
- Tool box talk to be conducted at least once a week for the specific work.


9.3 TRAINING ON HEIGHT WORK

Training on height work shall be imparted to all workers working at height by in-house/external faculty at least twice in a year. The training shall include following topics:

- Use of PPEs
- Use of fall arrester, retractable fall arrester, life line, safety nets etc.
- Safe climbing through monkey ladders.
- Inspection of PPEs.
- Medical fitness requirements.
- Mock drill on rescue at height.
- Dos & Don'ts during height work.

9.4 HSE TRAINING DURING PROJECT EXECUTION

- Other HSE training shall be arranged by BHEL/ subcontractor as per the need of the project execution and recommendation of HSE committee of site.
- The topics of the HSE training shall be as follows but not limited to:
 - Hazards identification and risk analysis (HIRA)
 - Work Permit System
 - Incident investigation and reporting
 - Fire fighting
 - First aid
 - Fire-warden training
 - EMS and OHSMS
 - T & Ps fitness and operation

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 18 of 43

- Electrical safety
- Welding, NDE & Radiological safety
- Storage, preservation & material handling.
- A matrix shall be maintained to keep an up-to-date record of attendance of training sessions carried out.

9.5 HSE PROMOTION-SIGNAGE, POSTERS, COMPETITION, AWARDS ETC

9.5.1 Display of HSE posters and banners

- Site shall arrange appropriate posters, banners, slogans in local/Hindi/English languages at work place

9.5.2 Display of HSE signage

- Appropriate HSE signage shall be displayed at the work area to aware workmen and passersby about the work going on and do's and don'ts to be followed

9.5.3 Competition on HSE and award

- Site will arrange different competition (slogan, poster, essay etc.) on HSE time to time (Safety day, BHEL day, World Environment Day etc.) and winners will be suitably awarded.

9.5.4 HSE awareness programme

- Subcontractor shall arrange HSE awareness programme periodically on different topics including medical awareness for all personnel working at site


10.0 HSE COMMUNICATION

10.1 INCIDENT REPORTING

- The subcontractor shall submit report of all incidents, fires and property damage etc to the Engineer immediately after such occurrence, but in any case not later than 24 hours of the occurrence. Such reports shall be furnished in the manner prescribed by BHEL. (Refer HSE procedure for incident investigation, analysis and reporting for details)
- In addition, periodic reports on safety shall also be submitted by the subcontractor to BHEL from time to time as prescribed by the Engineer. Compiled monthly reports of all kinds of incidents, fire and property damage to be submitted to BHEL safety officer as per prescribed formats.
- HSE incidents of site shall be reported to BHEL site Management as per Procedure for Incident Investigation and Reporting in format no. HSEP:14-F15. Corrective action shall be immediately implemented at the work place and compliance shall be verified by BHEL HSE officer and until then, work shall be put on hold by Construction Manager.

10.2 HSE EVENT REPORTING

- Important HSE events like HSE training, Medical camp etc. organized at site shall be reported to BHEL site management in detail with photographs for publication in different in-house magazines
- Celebration of important days like National Safety Day, World Environment Day etc. shall also be reported as mentioned above.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 19 of 43

11.0 OPERATIONAL CONTROL

All applicable OCPs (Operational control procedures) will be followed by subcontractor as per BHEL instructions. This will be done as part of normal scope of work. List of such OCPs is given below. In case any other OCP is found to be applicable during the execution of work at site, then subcontractor will follow this as well, within quoted rate. These OCPs (applicable ones) will be made available to subcontractor during work execution at site. However for reference purpose, these are kept with Safety Officer of BHEL at the Power Sector Regional HQ, or available in downloadable format in the website, which may be referred by subcontractor, if they so desire.

LIST OF OCPs


Safe handling of chemicals	Safety in use of cranes	Hydraulic test
Electrical safety	Storage and handing of gas cylinders	Spray insulation
Energy conservation	Manual arc welding	Trial run of rotary equipment
Safe welding and gas cutting operation	Safe use of helmets	Stress relieving
Fire safety	Good house keeping	Material preservation
Safety in use of hand tools	Working at height	Cable laying/tray work
First aid	Safe excavation	Transformer charging
Food safety at canteen	Safe filling of hydrogen in cylinder	Electrical maintenance
Illumination	Vehicle maintenance	Safe handling of battery system
Handling and erection of heavy metals	Safe radiography	Computer operation
Safe acid cleaning	Waste disposal	Storage in open yard
Safe alkali boil out	Working at night	For sanitary maintenance
Safe oil flushing	Blasting	Batching
Steam blowing	DG set	Piling rig operation
Safe working in confined area	Handling & storage of mineral wool	Gas distribution test
Safe operation of passenger lift, material hoists & cages	Drilling, reaming and grinding(machining)	Cleaning of hotwell / deaerator
Electro-resistance heating	Compressor operation	O&M of control of AC plant & system
Air compressor	Passivation	Safe Loading of Unit
Safe EDTA Cleaning	Safe Chemical cleaning of Pre boiler system	Safe Boiler Light up
Safe Rolling and Synchronisation		

11.1 HSE ACTIVITIES

HSE activities shall be conducted at site based on the HSEMSM developed by Power Sector and issued to site by Regions.

While planning for any activity the following documents shall be referred for infrastructural requirements to establish control measures:

- 1) HSE Procedure for Register of OHS Hazards and Risks
- 2) HSE Procedure for Register of Environmental Aspects and Impacts
- 3) HSE Procedure for Register of Regulations

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 20 of 43

- 4) Operational Control Procedures
- 5) HSE Procedure for Emergency Preparedness and Response Plan
- 6) Contract documents

11.2 WORK PERMIT SYSTEM

- The following activities shall come under Work Permit System
 - a. Height working above 2 metres
 - b. Hot working at height
 - c. Confined space
 - d. Radiography
 - e. Excavation more than 4 meter depth
 - f. Heavy lifting above 50 ton
 Refer Annexure 05 for Work permit formats.
- "HSE Procedure for Work Permit System" shall be followed while implementing permit system. Where customer is having separate Work Permit System the same shall be followed.
- Permit applicant shall apply for work permit of particular work activity at particular location before starting of the work with Job Hazard Analysis.
- Permit signatory shall check that all the control measures necessary for the activity are in place and issue the permit to the permit holder.
- Permit holder shall implement and maintain all control measures during the period of permit .He will close the permit after completion of the work. The closed permit shall be archived in HSE Department of site.

11.3 SAFETY DURING WORK EXECUTION

Respective OCPS are to be followed and adherence to the same would be contractually binding

11.3.1 WELDING SAFETY

All safety precautions shall be taken for welding and cutting operations as per IS-818. All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.


11.3.2 RIGGING

Rigging equipment shall not be loaded in excess of its recommended safe working load. Rigging equipment, when not in use, shall be removed from the original work area so as not to present a hazard to employees.

11.3.3 CYLINDERS STORAGE AND MOVEMENT

All gas cylinders shall be stored in upright position. Suitable trolley shall be used. There shall be flash-back arrestors conforming to IS-11006 at both cylinder and burner ends. Damaged tube and regulators must be immediately replaced. No of cylinders shall not exceed the specified quantity as per OCP

Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dragged, struck or permitted to strike each other violently.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 21 of 43

When cylinders are transported by powered vehicle they shall be secured in a vertical position.

11.3.4 DEMOLITION WORK

Before any demolition work is commenced and also during the process of the work the following shall be ensured:

- All roads and open areas adjacent to the work site shall either be closed or suitably protected.
- No electric cable or apparatus which is liable to be a source of danger nor a cable or an apparatus used by the operator shall remain electrically charged.
- All practical steps shall be taken to prevent danger to persons employed from the risks of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render them unsafe.

11.3.5 T&Ps


All T&Ps/ MMEs should be of reputed brand/appropriate quality & must have valid test/calibration certificates bearing endorsement from competent authority of BHEL..Subcontractor to also submit monthly reports of T&Ps deployed and validity test certificates to BHEL safety Officer as per the format/procedure of BHEL.

11.3.6 CHEMICAL HANDLING

Displaying safe handling procedures for all chemicals such as lube oil, acid, alkali, sealing compounds etc , at work place. Where it is necessary to provide and/or store petroleum products or petroleum mixture & explosives, the subcontractor shall be responsible for carrying out such provision / storage in accordance with the rules & regulations laid down in the relevant petroleum act, explosive act and petroleum and carbide of calcium manual, published by the chief inspector of explosives of India. All such storage shall have prior approval if necessary from the chief inspector of explosives or any other statutory authority. The subcontractor shall be responsible for obtaining the same.

11.3.7 ELECTRICAL SAFETY

- Providing adequate no. of 24 V sources and ensure that no hand lamps are operating at voltage level above 24 Volts.
- Fulfilling safety requirements at all power tapping points.
- High/ Low pressure welders to be identified with separate colour clothings. No welders will be deployed without passing appropriate tests and holding valid welding certificates. Approved welding procedure should be displayed at work place.
- The subcontractor shall not use any hand lamp energized by Electric power with supply voltage of more than 24 volts in confined spaces like inside water boxes, turbine casings, condensers etc.
- All portable electric tools used by the subcontractor shall have safe plugging system to source of power and be appropriately earthed. Only electricians licensed by appropriate statutory authority shall be employed by the subcontractor to carry out all types of electrical works. Details of earth resource and their test date to be given to BHEL safety officer as per the prescribed formats of BHEL
- The subcontractor shall use only properly insulated and armored cables which conform to the requirement of Indian Electricity Act and Rules for all wiring, electrical applications at site.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 22 of 43

- BHEL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the cost of the subcontractor.
- All electrical appliances used in the work shall be in good working condition and shall be properly earthed.
- No maintenance work shall be carried out on live equipment.
- The subcontractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations.
- Area wise Electrical safety inspection is to be carried out on monthly basis as per "Electrical Safety Inspection checklist" and the report is to be submitted to BHEL safety officer
- Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public
- The subcontractor shall carefully follow the safety requirement of BHEL/ the purchaser with the regard to voltages used in critical areas.

11.3.8 FIRE SAFETY


- Providing appropriate fire fighting equipment at designated work place and nominate a fire officer/warden adequately trained for his job.
- Subcontractor shall provide enough fire protecting equipment of the types and numbers at his office, stores, temporary structure in labor colony etc. Such fire protection equipment shall be easy and kept open at all times.
- The fire extinguishers shall be properly refilled and kept ready which should be certified at periodic intervals. The date of changing should be marked on the Cylinders.
- All other fire safety measures as laid down in the "codes for fire safety at construction site" issued by safety coordinator of BHEL shall be followed.
- Non-compliance of the above requirement under fire protection shall in no way relieve the subcontractor of any of his responsibility and liabilities to fire incident occurring either to his materials or equipment or those of others.
- Emergency contacts nos must be displayed at prominent locations
- Tarpaulin being inflammable should not be used (instead, only non infusible covering materials shall be used) as protective cover while preheating, welding, stress relieving etc. at site.

11.3.9 SCAFFOLDING

- Suitable scaffolds shall be provided for workman for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration of work which can be done safely from ladders.
- When a ladder is used, it shall be of rigid construction made of steel. The steps shall have a minimum width of 45 cm and a maximum rise of 30 cm. Suitable handholds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper than ¼ horizontal and 1 vertical.
- Scaffolding or staging more than 3.6 m above the ground floor, swung or suspended from an overhead support or erected with stationery support shall have a guard rail properly bolted, braced or otherwise secured, at least 90 cm above the floor or platform of such scaffolding or staging and extending along the entire length of the out side and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from savor, from swaying, from the building or structure.

11.3.10 WORK AT HEIGHT:

- Guardrails and toe-board/barricades and sound platform conforming to IS:4912-1978 should be provided.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 23 of 43

- Wherever necessary, life-line(pp or metallic) and fall arrestor along with Polyamide rope or Retractable lifeline should be provided.
- Safety Net as per IS:11057:1984 should be used extensively for prevention/ arrest of men and materials falling from height. The safety nets shall be fire resistant, duly tested and shall be of ISI marked and the nets shall be located as per site requirements to arrest or to reduce the consequences of a possible fall of persons working at different heights.
- Reaching beyond barricaded area without lifeline support, moving with support of bracings, walking on beams without support, jumping from one level to another, throwing objects and taking shortcut must be discouraged.
- Use of Rebar steel for making Jhoola and monkey-ladder (Rods welded to vertical or inclined structural members), temporary platform etc. must be avoided.
- Monkey Ladder should be properly made and fitted with cages.
- Jhoola should be made with angles and flats and tested like any lifting tools before use.
- Lanyard must be anchored always and in case of double lanyard, each should be anchored separately.
- In case of pipe-rack, persons should not walk on pipes and walk on platforms only.
- In case of roof work, walking ladder/ platform should be provided along with lifeline and/ or fall arrestor.
- Empty drums must not be used.
- For chimney or structure painting, both hanging platform and men should be anchored separately to a firm structure alongwith separate fall arrestor. Rope ladder should be discouraged.

11.3.11 WORKING PLATFORM

Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or floor level, they shall be closely boarded and shall have adequate width which shall not be less than 750 mm and be suitably fenced as described above. Every opening in the floor or a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm.

11.3.12 EXCAVATION

Wherever there are open excavation in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.


11.3.13 LADDER SAFETY

Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m in the length while the width between side rails in rung ladder shall in no case be less than app. 29.2 cm for ladder upto and including 3 m in length. For longer ladders this width shall be increased at least 1/4" for each additional foot of length.

A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to Construction.

11.3.14 LIFTING SAFETY

- It will be the responsibility of the subcontractor to ensure safe lifting of the equipment, taking due precaution to avoid any incident and damage to other equipment and personnel.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 24 of 43

- All requisite tests and inspection of handling equipment, tools & tackle shall be periodically done by the subcontractor by engaging only the Competent Persons as per law.
- Defective equipment or uncertified shall be removed from service.
- Any equipment shall not be loaded in excess of its recommended safe working load.

11.3.15 HOISTING APPLIANCE

- Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safe guards.
- Hoisting appliance should be provided with such means as will reduce to the minimum the risk of any part of a suspended load becoming incidentally displaced.
- When workers employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided.
- The worker should not wear any rings, watches and carry keys or other materials which are good conductor of electricity.

11.4 ENVIRONMENTAL CONTROL

Environment protection has always been given prime importance by BHEL. Environmental damage is a major concern of the principal subcontractor and every effort shall be made, to have effective control measures in place to avoid pollution of Air, Water and Land and associated life. Chlorofluorocarbons such as carbon tetrachloride and trichloroethylene shall not be used. Waste disposal shall be done in accordance with the guidelines laid down in the project specification.

Any chemical including solvents and paints, required for construction shall be stored in designated bonded areas around the site as per Material Safety Data Sheet (MSDS).

In the event of any spillage, the principle is to recover as much material as possible before it enters drainage system and to take all possible action to prevent spilled materials from running off the site. The subcontractor shall use appropriate MSDS for clean-up technique

All subcontractors shall be responsible for the cleanliness of their own areas.


The subcontractors shall ensure that noise levels generated by plant or machinery are as low as reasonably practicable. Where the subcontractor anticipates the generation of excessive noise levels from his operations the subcontractor shall inform to Construction Manager of BHEL accordingly so that reasonable & practicable precautions can be taken to protect other persons who may be affected.

It is imperative on the part of the subcontractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social upliftment, conversion of packing woods to school furniture, keeping good relation with local populace etc.

The subcontractor shall carry out periodic air and water quality check and illumination level checking in his area of work place and take suitable control measure.

11.5 HOUSEKEEPING

- Keeping the work area clean/ free from debris, removed scaffoldings, scraps, insulation/sheeting wastage /cut pieces, temporary structures, packing woods etc. will be in the scope of the subcontractor. Such cleanings has to be done by

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 25 of 43

subcontractor within quoted rate, on daily basis by an identified group. If such activity is not carried out by subcontractor / BHEL is not satisfied, then BHEL may get it done by other agency and actual cost along with BHEL overheads will be deducted from contractor's bill. Such decisions of BHEL shall be binding on the subcontractor

- Proper housekeeping to be maintained at work place and the following are to be taken care of on daily basis.
- All surplus earth and debris are removed/disposed off from the working areas to identified locations.
- Unused/Surplus cables, steel items and steel scrap lying scattered at different places/elevation within the working areas are removed to identified locations.
- All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from workplace to identified locations. Sufficient waste bins shall be provided at
- Different work places for easy collection of scrap/waste. Scrap chute shall be installed to remove scrap from high location.
- Access and egress (stair case, gangways, ladders etc.) path should be free from all scrap and other hindrances.
- Workmen shall be educated through tool box talk about the importance of housekeeping and encourage not to litter.
- Labour camp area shall be kept clear and materials like pipes, steel, sand, concrete, chips and bricks, etc. shall not be allowed in the camp to obstruct free movement of men and machineries.
- Fabricated steel structures, pipes & piping materials shall be stacked properly.
- No parking of trucks/trolleys, cranes and trailers etc. shall be allowed in the camp, which may obstruct the traffic movement as well as below LT/HT power line.
- Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas

11.6 WASTE MANAGEMENT


Take suitable measures for waste management and environment related laws/legislation as a part of normal construction activities. Compliance with the legal requirements on storage/ disposal of paint drums (including the empty ones), Lubricant containers, Chemical Containers, and transportation and storage of hazardous chemicals will be strictly maintained.

11.6.1 BINS AT WORK PLACE

- Sufficient rubbish bins shall be provided close to workplaces.
- Bins should be painted yellow and numbered.
- Sufficient nos. of drip trays shall be provided to collect oil and grease.
- Sufficient qty. of broomsticks with handle shall be provided.
- Adequate strength of employees should be deployed to ensure daily monitoring and service for waste management.

11.6.2 STORAGE AND COLLECTION

- Different types of rubbish/waste should be collected and stored separately.
- Paper, oily rags, smoking material, flammable, metal pieces should be collected in separate bins with close fitting lids.
- Rubbish should not be left or allowed to accumulate on construction and other work places.
- Do not burn construction rubbish near working site.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00
		Date: 12.08.2014
		Page: 26 of 43

11.6.3 SEGREGATION

- Earmark the scrap area for different types of waste.
- Store wastes away from building.
- Oil spill absorbed by non-combustible absorbent should be kept in separate bin.
- Clinical and first aid waste stored and incinerated separately.

11.6.4 DISPOSAL

- Sufficient containers and scrap disposal area should be allocated.
- All scrap bin and containers should be conveniently located.
- Provide self-closing containers for flammable/spontaneously combustible material.
- Keep drainage channels free from choking.
- Make schedule for collection and disposal of waste.


11.6.5 WARNING AND SIGNS

- Appropriate sign to be displayed at scrap storage area
- No toxic, corrosive or flammable substance to be discarded into public sewage system.
- Waste disposal shall be in accordance with best practice.
- Comply with all the requirements of Pollution Control Board (PCB) for storage and disposal of hazardous waste.

11.7 TRAFFIC MANAGEMENT SYSTEM

11.7.1 SAFE WORKPLACE TRANSPORT SYSTEM

- Traffic routes in a work place shall be suitable for the persons or vehicles using them. This shall be sufficient in number and of sufficient size. This shall reflect the suitability of traffic routes for vehicles and pedestrians.
- Where vehicles and pedestrians use the same traffic routes there shall be sufficient space between them. Where necessary all traffic routes must be suitably indicated. Pedestrians or vehicles must be able to use traffic routes without endangering those at work. There must be sufficient separation of traffic routes from doors, gates and pedestrian traffic routes.
- For internal traffic, lines marked on roads / access routes and between buildings shall clearly indicate where vehicles are to pass.
- Temporary obstacles shall be brought to the attention of drivers by warning signs or hazard cones.
- Speed limits shall be clearly displayed. Speed ramps preceded by a warning signs or marker are necessary.
- The traffic route should be wide enough to allow vehicles to pass and re-pass oncoming or parked traffic and it may be advisable to introduce on-way system or parking restrictions.
- Safest route shall be provided between places where vehicles have to call or deliver.
- Avoid vulnerable areas/items such as fuel or chemicals tanks or pipes, open or unprotected edges and structures likely to collapse

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 27 of 43

- Safe areas shall be provided for loading and unloading.
- Avoid sharp or blind bends. If this is not possible hazards should be indicated e.g. blind corner.
- Ensure road crossings are minimum and clearly signed.
- Entrance and gateways shall be wide enough to accommodate a second vehicle without causing obstruction.
- Set sensible speed limits which are clearly sign posted.
- Where necessary ramps should be used to retard speed. This shall be preceded by a warning sign or mark on the road.
- Forklift trucks shall not pass over road hump unless of a type capable of doing so.
- Overhead electric cable, pipes containing flammable hazardous chemical shall be shielded by using goal posts height gauge posts or barriers.
- Road traffic signs shall be provided on prominent locations for prevention of incidents and hazards and for quick guidance and warning to employees and public. Safety signs shall be displayed as per the project working requirement and guideline of the state in which project is done. Vehicles hired or used shall not be parked within the 15m radius of any working area. Any vehicle, that is required to be at the immediate/near the vicinity, shall be approved by the person in-charge of the site.


11.7.2 TRAFFIC ROUTE FOR PEDESTRIANS

- Where traffic routes are used by both pedestrians and vehicles road shall be wide enough to allow vehicles and pedestrians safely.
- Separate routes shall be provided for pedestrians to keep them away from vehicles. Provide suitable barriers/guard at entrances/exit and the corners or buildings.
- Where pedestrian and vehicle routes cross, appropriate crossing shall be provided.
- Where crowd is likely to use roadway e.g. at the end of shift, stop vehicles from using them at such times.
- Provide high visibility clothing for people permitted in delivery area.

11.7.3 WORK VEHICLE

Work vehicle shall be as safe stable efficient and roadworthy as private vehicles on public roads. Site management shall ensure that drivers are suitably trained. All vehicle e.g. heavy motor vehicle forklift trucks dump trucks mobile cranes shall ensure that the work equipment conforms to the following:

- A high level of stability.
- A safe means of access/egress.
- Suitable and effective service and parking brakes.
- Windscreens with wipers and external mirrors giving optimum all round visibility.
- Provision of horn, vehicle lights, reflectors, reversing lights, reversing alarms.
- Provision of seat belts.
- Guards on dangerous parts.
- Driver protection - to prevent injury from overturning and from falling objects/materials.
- Driver protection from adverse weather.
- No vehicle shall be parked below HT/LT power lines.
- Valid Pollution Under Control certification for all vehicles

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 28 of 43

11.7.4 DAILY CHECK BY DRIVER

- There should also be daily safety checks containing below mentioned points by the driver before the vehicle is used.
 - Brakes.
 - Tires.
 - Steering.
 - Mirrors.
 - Windscreen waters.
 - Wipers.
 - Warning signals.
 - Specific safety system i.e. control interlocks
- Management should ensure that drivers carry out these checks.

11.7.5 TRANSPORTATION OF PERSONNEL AND MATERIALS BY VEHICLES


- All drivers shall hold a valid driving License for the class of vehicle to be driven and be registered as an authorized BHEL driver with the Administration Department.
- Securing of the load shall be by established and approved methods, i.e. chains with patented tightening equipment for steel/heavy loads. Sharp corners on loads shall be avoided when employing ropes for securing.
- All overhangs shall be made clearly visible and restricted to acceptable limits
- Load shall be checked before moving off and after traveling a suitable distance.
- On no account is construction site to be blocked by parked vehicles Drivers of vehicles shall only stop or park in the areas designate by the stringing foreman.
- Warning signs shall be displayed during transportation of material.
All vehicles used by BHEL shall be in worthy condition and in conformance to the Land Transport requirement.

11.7.6 MAINTENANCE

All Vehicles used for transportation of man and material shall undergo scheduled inspections on frequent intervals to secure safe operation. Such inspections shall be conducted in particular for steering, brakes, lights, horn, doors etc. Site management shall ensure that work equipment is maintained in an efficient, working order and in good repair. Inspections and services carried out at regular intervals of time and or mileage. No maintenance shall be carried below HT/LT power lines.

11.8 EMERGENCY PREPAREDNESS AND RESPONSE

- Emergency preparedness and response capability of site shall be developed as per Emergency Preparedness and Response plan issued by Regional HQ
- Availability of adequate number of first aiders and fire warden shall be ensured with BHEL and its subcontractors
- All the subcontractor's supervisory personnel and sufficient number of workers shall be trained for fire protection systems. Enough number of such trained personnel must be available during the tenure of contract. Subcontractor should nominate his supervisor to coordinate and implement the safety measures.
- Assembly point shall be earmarked and access to the same from different location shall be shown
- Fire exit shall be identified and pathway shall be clear for emergency escape.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14 REV: 00
	POWER SECTOR	Date: 12.08.2014 Page: 29 of 43

- Appropriate type and number of fire extinguisher shall be deployed as per Fire extinguisher deployment plan and validity shall be ensured periodically through inspection
- Adequate number of first aid boxes shall be strategically placed at different work places to cater emergency need. Holder of the first aid box shall be identified on the box itself who will have the responsibility to maintain the same.
- First aid center shall be developed at site with trained medical personnel and ambulance
- Emergency contact numbers (format given in EPRP) of the site shall be displayed at prominent locations.
- Tie up with fire brigade shall be done in case customer is not having fire station.
- Tie up with hospital shall be done in case customer is not having hospital.
- Disaster Management group shall be formed at site
- Mock drill shall be arranged at regular intervals. Monthly report of the above to be given to BHEL safety Officer as per prescribed BHEL formats
- Mock drill shall be conducted on different emergencies periodically to find out gaps in emergency preparedness and taking necessary corrective action

12.0 HSE INSPECTION

Inspection on HSE for different activities being carried out at site shall be done to ensure compliance to HSEMS requirements. The subcontractor shall maintain and ensure necessary safety measures as required for inspection and tests HV test, Pneumatic test, Hydraulic test, Spring test, Bend test etc as applicable, to enable inspection agency for performing Inspection. If any test equipment is found not complying with proper safety requirements then the Inspection Agency may withhold inspection, till such time the desired safety requirements are met.

12.1 DAILY HSE CHECKS


Both the Site Supervisors and safety officer of Subcontractor are to conduct daily site Safety inspection around work activities and premises to ensure that work methods and the sites are maintained to an acceptable standard. The following are to form the common subjects of a daily safety inspection:

- Personal Safety wears & gear compliance.
- Complying with site safety rules and permit-to-work (PTW).
- Positions and postures of workers.
- Use of tools and equipment etc. by the workers.

The inspection should be carried out just when work starts in beginning of the day, during peak activities period of the day and just before the day's work ends.

12.2 INSPECTION OF PPE

- PPEs shall be inspected by HSE officer at random once in a week as per format no. HSEP:13-F06 for its compliance to standard and compliance to use and any adverse observation shall be recorded in the PPE register.
- The applicable PPEs for carrying out particular activities are listed below.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 30 of 43

12.3 INSPECTION OF T&Ps

- A master list of T&Ps shall be maintained by each subcontractor.
- All T&Ps being used at site shall be inspected by HSE officer once in a month as per format no. HSEP:13-F07 for its healthiness and maintenance.
- The T&Ps which require third party inspection shall be checked for its validity during inspection. The third party test certificate should be accompanied with a copy of the concerned competent person's valid qualification record.
- The validity of T&P shall be monitored as per "Status of T&Ps" format no. HSEP:13-F08

12.4 INSPECTION OF CRANES AND WINCHES


- Cranes and winches shall be inspected by the operator through a daily checklist for its safe condition (as provided by the equipment manufacturer) before first use of the day.
- Cranes and Winches shall be inspected by HSE officer once in a month as per format no. HSEP:13-F09 for healthiness, maintenance and validity of third party inspection.
- The date of third party inspection and next due date shall be painted on cranes and winches.
- The operators/drivers shall be authorized by sub-contractor based on their competency and experience and shall carry the I-card.
- The operator should be above 18 years of age and should be in possession of driving license of HMV man & goods), vision test certificate and should have minimum qualification so that he can read the instructions and check list.

12.5 INSPECTION ON HEIGHT WORKING

- Inspection on height working shall be conducted daily by supervisors before start of work to ensure safe working condition including provision of
 - Fall arrestor
 - Lifelines
 - Safety nets
 - Fencing and barricading
 - Warning signage
 - Covering of opening
 - Proper scaffolding with access and egress.
 - Illumination
- Inspection on height working shall be conducted once in a week by HSE officer as per format no. HSEP:14-F10.
- Medical fitness of height worker shall be ensured.
- Height working shall not be allowed during adverse weather.

12.6 INSPECTION ON WELDING AND GAS CUTTING OPERATION

- Supervisor shall ensure that no flammable items are available in near vicinity during welding and gas cutting activity.
- Gas cylinders shall be kept upright.
- Use of Flash back arrestor shall be ensured at both ends.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00
		Date: 12.08.2014
		Page: 31 of 43

- Inspection during welding and gas cutting operations shall be carried out by HSE officer once a month as per format no. HSEP:14-F11.
- Use of fire blanket to be ensured to avoid falling of splatters during welding or gas cutting operation at height.
- Availability of fire extinguisher at vicinity shall be ensured.

12.7 INSPECTION ON ELECTRICAL INSTALLATION / APPLIANCES

- Ensure proper earthing in electrical installation
- Use ELCB at electrical booth
- Electrical installation shall be properly covered at top where required
- Use appropriate PPEs while working
- Use portable electrical light < 24 V in confined space and potentially wet area.
- Monthly inspection shall be carried out as per format no. HSEP:14-F12.

12.8 INSPECTION OF ELEVATOR


- Elevators shall be inspected by concerned supervisors once in a week as per format no. HSEP:14-F13.
- All elevators shall be inspected by competent person and validity shall be ensured.
- The date of third party inspection and next due date shall be painted on elevator.

13.0 HSE PERFORMANCE

HSE performance of the subcontractor shall be monitored as per the following parameters:

Sl. No.	Parameters of measurement
1	Timely deployment of qualified safety officer and cumulative number of days in a month the required no. of qualified safety officer is available
2	Shortfall in number of meetings in the month conducted or attended by the safety officer
3	Level of compliance wrt decisions taken in previous meetings/audit/inspection/as reported.
4	Delay in submission of monthly report on safety in the prescribed format
5	Delay in reporting any incident including near-miss to BHEL /Customer/statutory authority(if required)
6	Degree of PPE non-compliance
7	Non- conducting of health check-up as per BOCW equirements
8	Non availability of proper first-aid facility , ambulance, adequate labour welfare initiatives
9	Non conductance of induction training and tool box meeting
10	Total number of instances in the month, House keeping NOT attended inspite of instructions by BHEL i.e. removal/disposal of surplus earth/ debris/scrap/unused/surplus cable drums/other electrical items/surplus steel items/packing material

- Suitable HSE reward system shall be developed at site level to promote HSE compliance amongst workmen.
- To decide HSE reward performance towards HSE shall be evaluated for workmen and it shall be awarded regularly in public gathering.
- If safety record of the subcontractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognize the safety performance of the subcontractor may be considered by BHEL after completion of the job.


	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00
		Date: 12.08.2014
		Page: 32 of 43

14.0 HSE PENALTIES

- As per contractual provision HSE penalties shall be imposed on subcontractors for non-compliance on HSE requirement as per format no. HSEP:14-F14. The list in the format is only indicative. For any other violation, not listed in the format, the minimum penalty amount is to be decided as per BOCW act.
- If principal customer/statutory and regulatory bodies impose some penalty on HSE due to the non-compliance of the subcontractor the same shall be passed on to them.
- The penalty amount shall be recovered by Site Finance department from subcontractors from the RA/Final bill.

15.0 OTHER REQUIREMENTS

- In case of any delay in completion of a job due to mishaps attributable to lapses by the subcontractor, BHEL shall have the right to recover cost of such delay from the payments due to the subcontractor, after notifying the subcontractor suitably.
- If the subcontractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the subcontractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instruction regarding safety issued by BHEL, BHEL shall have the right to take corrective steps at the risk and cost of the subcontractor after giving a notice of not less than 7 days indicating the steps that would be taken by BHEL.
- If the subcontractor succeeds in carrying out its job in time without any fatal or disabling injury incident and without any damage to property BHEL may, at its sole discretion, favorably consider to reward the subcontractor suitably for the performance.
- In case of any damage to property due to lapses by the subcontractor, BHEL shall have the right to recover the cost of such damages from the subcontractor after holding an appropriate enquiry.
- The subcontractor shall take all measures at the sites of the work to protect all persons from incidents and shall be bound to bear the expenses of defense of every suit, action or other proceeding of law that may be brought by any persons for injury sustained or death owing to neglect of the above precautions and to pay any such persons such compensation or which may with the consent of the subcontractor be paid to compromise any claim by any such person, should such claim proceeding be filed against BHEL, the subcontractor hereby agrees to indemnify BHEL against the same.
- The subcontractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.
- The subcontractor shall notify BHEL of his intention to bring to site any equipment or material which may create hazard.
- BHEL shall have the right to prescribe the conditions under which such equipment or materials may be handled and the subcontractor shall adhere to such instructions.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 33 of 43

- BHEL may prohibit the use of any construction machinery, which according to the organization is unsafe. No claim for compensation due to such prohibition will be entertained by BHEL.

16. NON COMPLIANCE

NONCONFORMITY OF SAFETY RULES AND SAFETY APPLIANCES WILL BE VIEWED SERIOUSLY AND BHEL HAS RIGHT TO IMPOSE FINES ON THE SUBCONTRACTOR AS UNDER FOR EVERY INSTANCE OF VIOLATION NOTICED:


SN	Violation of Safety Norms	Fine (in Rs)
01	Not Wearing Safety Helmet	200/- *
02.	Not wearing Safety Belt or not anchoring life line	500/-*
03	Not wearing safety shoe	200/-*
04	Not keeping gas cylinders vertically	200/-
05	Not using flash back arrestors	100/-
06	Not wearing gloves	50/- *
07.	Grinding Without Goggles	50/- *
08.	Not using 24 V Supply For Internal Work	500/-
09.	Electrical Plugs Not used for hand Machine	100/-
10.	Not Slings properly	200/-
11.	Using Damaged Sling	200/-
12.	Lifting Cylinders Without Cage	500/-
13.	Not Using Proper Welding Cable With Lot of Joints And Not Insulated Property.	200/-
14.	Not Removing Small Scrap From Platforms	500/-
15.	Gas Cutting Without Taking Proper Precaution or Not Using Sheet Below Gas Cutting	500/-
16.	Not Maintaining Electric Winches Which are Operated Dangerously	500/-
17.	Improper Earthing Of Electrical T&P	500/-
18	No or improper barricading	500/-
19.	Activity carried out without Safety work permit (Height work, Lifting activity, Hot work-each person/case)	1000/-
20.	Incident Resulting in Partial Loss in Earning Capacity	25,000/- per victim
21.	Fatal Incident Resulting in total loss in Earning Capacity	1,00,000/- per victim for first instance #

- Legend:-

*: per head. For repeated violation by the same person, the penalty would be double of the previous penalty. Date of "Repeated violation" will be counted from subsequent days.

#: or as deducted by customer, whichever is higher. For repeated fatal incident in the same Unit incremental penalty to be imposed. The subcontractor will pay 2 times the penalty compared to previously paid in case there are repeated cases of fatal incidents under the same subcontractor for the same package in the same unit.

Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the subcontractor. The amount collected above will be utilized for giving award to the employees who could avoid incident by following safety rules. Also the amount will be spent for purchasing the safety appliances and supporting the safety activity at site.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 34 of 43

17.0 HSE AUDIT/INSPECTION


- Regular HSE Audit/inspection shall be carried out by Subcontractor as per Site HSE audit calendar.
- HSE checklist(**Annexure 02**) shall be used for carrying out audit/inspection and report shall be submitted to BHEL sitemangement
- All non-conformities and observations on HSE identified during internal or external HSE audit shall be disposed off by site in a time bound manner and reported back the implementation status
- Corrective action and Preventive action on HSE issues raised by certification body issued by Regional HQs shall be implemented by site and reported to Site management.

18.0 MONTHLY HSE REVIEW MEETING


- Site shall hold HSE review meeting every month to discuss and resolve HSE issues of site and improve HSE performance. It will also discuss the incidents occurred since previous meeting, its root cause and Corrective action and Preventive action. The agenda is given below:
 - Implementation of earlier MOM
 - HSE performance
 - HSE inspection
 - HSE audit and CAPA
 - HSE training
 - Health check-up camp
 - HSE planning for the erection and commissioning and installation activities in the coming month
 - HSE reward and promotional activities
- The meeting shall be chaired by Construction Manager, convened by HSE coordinator and attended by all HOS, Site Incharge of Subcontractors and HSE officer of Subcontractors.
- MOM on the discussion will be circulated to the concerned for implementation.

19.0 FORMATS USED(Details available in Annexure-04)

SL. No.	Format Name	Format No.	Rev No.
01	Inspection of First Aid Box	HSEP:13-F01	00
02	Health Check Up	HSEP:13-F02	00
03	HSE Induction Training	HSEP:13-F03	00
04	Tool Box Talk	HSEP:13-F04	00
05	Monthly Site HSE Report	HSEP:13-F05	00
06	Inspection of PPE	HSEP:13-F06	00

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 35 of 43

07	Inspection of T&Ps	HSEP:13-F07	00
08	Status of T&Ps	HSEP:13-F08	00
09	Inspection of Cranes and Winches	HSEP:13-F09	00
10	Inspection on Height Working	HSEP:13-F10	00
11	Inspection on Welding & Gas Cutting	HSEP:13-F11	00
12	Inspection on Electrical Installation	HSEP:13-F12	00
13	Inspection on Elevator	HSEP:13-F13	00
14	HSE Penalty	HSEP:13-F14	00
15	Accident /incident / property damage /fire incident report	HSEP:13-F15	00

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 36 of 43

20.0 ANNEXURES

ANNEXURE 01

As per Contract Labour (Regulation & Abolition Act), Central Rules, 1971,


- (1) The first-aid box shall be distinctively marked with a Red Cross on a white background and shall contain the following items, namely:

(a) For establishments in which the number of contract labour employed does not exceed fifty, each first aid box shall contain the following equipment:

(i)	6 small sterilized dressings
(ii)	3 medium size sterilized dressings
(iii)	3 large size sterilized dressings
(iv)	6 pieces of sterilized eye pads in separate sealed packets.
(v)	6 roller bandages 10 cm wide.
(vi)	6 roller bandages 5 cm wide.
(vii)	One tourniquet
(viii)	A supply of suitable splints
(ix)	Three packets of safety pins.
(x)	Kidney tray.
(xi)	3 large sterilized burn dressings.
(xii)	1 (30ml) bottle containing a two percent alcoholic solution of iodine
(xiii)	1 (30 ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label
(xiv)	1 snake bite lancet
(xv)	1 (30gms) bottle of potassium permanganate crystals.
(xvi)	1 pair scissors
(xvii)	1 copy of the First-Aid leaflet issued by the Director General, Factory Advice Service and Labour Institutes, Government of India.
(xviii)	A bottle containing 100 tablets (each of 5 grains) of aspirin
(xix)	Ointment for burns
(xx)	A bottle of suitable surgical anti-septic solution


(b) For establishment in which the number of contract labour exceeds fifty each first-aid box shall contain the following equipment:

(i)	12 small sterilized dressings
(ii)	6 medium size sterilized dressings
(iii)	6 large size sterilized dressings.
(iv)	6 large size sterilized burn dressings
(v)	6 (15 grams) packets sterilized cotton wool
(vi)	12 pieces of sterilized eye pads in separate sealed packets.

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 37 of 43

(vii)	12 roller bandages 10 cm wide.
(viii)	12 roller bandages 5 cm wide.
(ix)	One tourniquet.
(x)	A supply of suitable splints.
(xi)	Three packets of safety pins.
(xii)	Kidney tray.
(xiii)	Sufficient number of eye washes bottles filled with distilled water or suitable liquid clearly indicated by a distinctive sign which shall be visible at all times.
(xiv)	4 per cent Xylocaine eye drops, and boric acid eye drops and soda by carbonate eye drops.
(xv)	1 (60ml) bottle containing a two percent alcoholic solution of iodine
(xvi)	One (two hundred ml) bottle of mercurochrome (2 per cent) solution in water.
(xvii)	1 (120ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label.
(xviii)	1 roll of adhesive plaster (6 cmX1 meter)
(xix)	2 rolls of adhesive plaster (2 cmX1 meter)
(xx)	A snake bite lancet.
(xxi)	1 (30 grams) bottle of potassium permanganate crystals.
(xxii)	1 pair scissors
(xxiii)	1 copy of the First-Aid leaflet issued by the Director-General, Factory Advice service and labour Institutes, Government of India.
(xxiv)	a bottle containing 100 tablets (each of 5 grains) of aspirin
(xxv)	Ointment for burns
(xxvi)	A bottle of a suitable surgical anti septic solution.

(2) Adequate arrangement shall be made for immediate recoument of the equipment when necessary.


	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 38 of 43

ANNEXURE 02**HSE AUDIT/INSPECTION CHECKLIST CUM COMPLIANCE REPORT**

PROJECT: _____ SUBCONTRACTOR: _____
DATE : _____ OWNER : _____
INSPECTION BY: _____

Note : write 'NA' wherever the items is not applicable


Item	Y e s	N o	Remarks	Action
HOUSEKEEPING				
Waste containers provided and used				
Passageways and walkways clear				
General neatness of working area				
Other				
PERSONNEL PROTECTIVE EQUIPMENTS				
Goggles; shields				
Face protection				
Hearing protection				
Respiratory masks etc.				
Safety belts				
Other				
EXCAVATIONS / OPENINGS				
Openings properly covered or barricaded				
Excavations shored				
Excavations barricaded				
Overnight lighting provided				
Other				
WELDING, CUTTING				
Gas cylinders chained upright				
Cable and hoses not obstructing				
Fire extinguisher (s) accessible				
Others				
SCAFFOLDING				
Fully decked platforms				
Guard and intermediate rails in place				
Toe boards in place				
Adequate shoring				
Adequate access				
Others				
LADDER				
Extension side rails 1 m above				
Top of landing				
Properly secured				

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 39 of 43

Angle $\pm 70^{\circ}$ from horizontal				
Other				
HOISTS, CRANES AND DERRICKS				
Condition of cables and sheaf OK				
Condition of slings, chains, hooks OK				
Inspection & maintenance log maintained				
Outriggers used				
Signals observed and understood				
Qualified operators				
Others				
MACHINERY, TOOLS & EQUIPMENT				
Proper instruction				
Safety devices				
Proper cords				
Inspection and maintenance				
Other				
VEHICLE AND TRAFFIC				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				
Other				
TEMPORARY FACILITIES				
Emergency instructions posted				
Fire extinguishers provided				
Fire-aid equipment available				
General neatness				
Others				
FIRE PREVENTION				
Personnel instructed				
Fire extinguishers checked				
No smoking in prohibited areas.				
Hydrants				
Clearance				
Others				
ELECTRICAL				
Proper wiring				
ELCB's provided				
Ground fault circuit interrupters				
Protection against damage				
Prevention of tripping hazards				
Other				
HANDLING & STORAGE OF MATERIALS				
Properly stored or stacked				
Passageways clear				
Other				
FLAMMABLE GASES AND LIQUIDS				
Containers clearly identified				
Proper storage				
Fire extinguisher nearby				

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 40 of 43


Other				
WORKING AT HEIGHT				
Safety nets				
Safety belts				
Safety helmets				
Anchoring of safety belt to the life line rope				
ENVIRONMENT				
Lubricant waste/engine oils properly dispose.				
Waste from Canteen, offices, sanitation etc. disposed properly.				
Disposal of surplus earth, stripping materials, expired batteries, oily rags and combustible materials done properly.				
HEALTH CHECKS				
Hygienic conditions at labor camps O.K.				
Availability of first-aid facilities				
Proper sanitation at site, office & labor camps.				
Arrangement of medical facilities.				
Measures for dealing with illness.				
Availability of potable drinking water for workmen & staff.				
Provision of crèches for children.				

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00
		Date: 12.08.2014
		Page: 41 of 43


ANNEXURE 03**REFERENCES**

- Contract documents
- Relevant legislations
- HSEMSM
- Relevant Indian standards as listed below (illustrative only):


SL NO	CODE NAME	TITLE
(1)	IS : 818-1888 (Reaffirmed 2003)	Code of Practice for safety and health requirements in Electric and Gas Welding and Cutting operations.
(2)	IS: 1179-1967 (Reaffirmed 2003)	Specification for Equipment for Eye & Face protection during welding.
(3)	IS : 1989 (Part 2):1986 (Reaffirmed 1997)	Specification for Leather Safety Boots & Shoes
(4)	IS:2925 – 1984 (Reaffirmed 2010)	Specification for Industrial Safety Helmets
(5)	IS:3521 : 1999 (Reaffirmed 2002)	Industrial Safety Belts & Harnesses-Specification
(6)	IS:3646(Part II) – 1966 (Reaffirmed 2003)	Code of Practice for Interior Illumination
(7)	IS:3696 (Part I) – 1987 (Reaffirmed 2002)	Safety Code for Scaffolds and Ladders
(8)	IS: 3696(Part 2) : 1991 (Reaffirmed 2002)	Scaffolds and Ladders-Code of Safety
(9)	IS:3786 – 1983 (Reaffirmed 2002)	Method for Computation of Frequency and Severity Rates for Industrial Injuries and Classification of Industrial Incidents
(10)	IS:4770 : 1991 (Reaffirmed 2006)	Rubber Gloves – Electricals purposes-Specification
(11)	IS:4912 : 1978 (Reaffirmed 2002)	Safety Requirements for Floor and Wall Openings, Railings and Toe Boards
(12)	IS: 5983 – 1980 (Reaffirmed 2002)	Specification for Eye-Protectors
(13)	IS:6519 – 1971 (Reaffirmed 1997)	Code of Practice for Selection, Care and Repair of Safety Footwear
(14)	IS:9167:1979	Specification for Ear-Protectors
(15)	IS:6994(Part I)-1973 (Re affirmed 1996)	Specification for Industrial Safety Gloves Leather and Cotton Gloves
(16)	IS:8519 – 1977 (Reaffirmed 1983)	Guide for Selection of Industrial Safety Equipment for Body Protection.
(17)	IS 11006 : 2011	Flash Back(Flame Arrestor) Specification

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00 Date: 12.08.2014 Page: 42 of 43

(18)	IS:8520 – 1977 (Reaffirmed 2002)	Guide for Selection of Industrial Safety Equipment for Eye, Face and Ear Protection.
(19)	IS:9473:2002	Respiratory Protective Devices-Filtering Half Masks to protect against Particles-Specification.
(20)	IS:9944:1992 (Reaffirmed 2003)	Natural and Man-made Fiber Rope Slings-Recommendations on Safe working loads.
(21)	IS:11057 – 1884 (Reaffirmed 2001)	Specification for Industrial Safety Nets
(22)	IS:12254:1993 (Reaffirmed 2002)	Polyvinyl Chloride (PVC) Industrial Boots-Specification
(23)	IS:13367(Part 1):1992 (Reaffirmed 20030)	Safe Use of Cranes-Code of Practice
(24)	IS:14166:1994 (Reaffirmed 2002)	Respiratory Protective Devices-Full Face Masks Specification
(25)	IS:14746 : 1999 (Reaffirmed 2003)	Respiratory Protective Devices-Half Masks and Quarter Masks - Specification
(26)	IS : 15397 :2003 (Reaffirmed 2008)	Portable Extinguisher Mechanical Foam Type(Stored Pressure)-Specification
(27)	IS: 19011:2002	Guidelines for Quality and/or Environmental Management Systems Auditing

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS	Doc no.: HSEP: 14
	POWER SECTOR	REV: 00
		Date: 12.08.2014
		Page: 43 of 43


**ANNEXURE 04 : SAFETY FORMATS
&
ANNEXURE 05 : WORK PERMIT FORMATS**

	POWER SECTOR	FORMAT NO: HSEP:13-F01 REV NO.: 00 PAGE NO. 01 OF 02
	INSPECTION OF FIRST AID BOX	

Name of Site :	
Name of Sub-Contractor :	
Inspected by :	
Date of Inspection :	


Number of employees on the site:- _____

Sl.No.	Item	No. Available	Remarks
1	No. of small sterilized dressings		
2	No of medium sized sterilized dressings		
3	No of large sized sterilized dressings.		
4	No of large sized sterilized burn dressings		
5	No of (15 grams) packets sterilized cotton wool		
6	No of pieces of sterilized eye pads in separate sealed packets.		
7	No of roller bandages 10 cm wide.		
8	No of roller bandages 5 cm wide.		
9	Whether tourniquet available		
10	Whether supply of suitable splints available.		
11	No of packets of safety pins.		
12	Whether kidney tray available		
13	Whether sufficient number of eye wash bottles, filled with distilled water or suitable liquid, clearly indicated by a distinctive sign which shall be visible at all times, available.		
14	Whether 4%-xylocaine eye drops, and boric acid eye drops and soda by carbonate eye drops available.		
15	Whether (60ml) bottle containing a two percent alcoholic solution of iodine available		
16	Whether (two hundred ml) bottle of mercurochrome (2 per cent) solution in water available.		

	POWER SECTOR	FORMAT NO: HSEP:13-F01 REV NO.: 00 PAGE NO. 02 OF 02
	INSPECTION OF FIRST AID BOX	

Sl.No.	Item	No. Available	Remarks
17	Whether 120ml bottle containing Sal volatile having the dose and mode of administration indicated on the label, available.		
18	Whether roll of adhesive plaster (6 cmX1 meter) available		
19	No of rolls of adhesive plaster (2 cmX1 meter)		
20	Whether snake bite lancet available.		
21	Whether (30 grams) bottle of potassium permanganate crystals available.		
22	Whether a pair scissors available		
23	Whether copy of the First-Aid leaflet issued by the Director-General, Factory Advice service and labour Institutes, Government of India available.		
24	Whether bottle containing 100 tablets (each of 5 grains) of aspirin available		
25	Whether Ointment for burns available		
26	Whether bottle of a suitable surgical anti septic solution available		


Signature of Subcontractor's Site I/C::

	POWER SECTOR	FORMAT NO: HSEP:13-F02 REV NO.: 00 PAGE NO. 01 OF 02
	HEALTH CHECK UP	

Name of Site :	
Name of Sub-Contractor :	
Name of Employee :	


NAME:

History Of Past Illness	H/O Epilepsy
	H/O Drug Allergy
	H/O Diabetics/ Hypertension
	H/O Unconsciousness
Personal History	
EXAMINATION	
OBSERVATION	
<u>General Physical Examination</u>	
Height	:
Weight	:
BMI	:
Built And nourishment	:
Pallor	:
Temperature	:
Chest Expansion	: Inspiration Expansion
Lymph Node Enlargement	:
<u>Ear, Nose, Throat</u>	:
Ear	:
Nose	:
Throat	:

	POWER SECTOR	FORMAT NO: HSEP:13-F02 REV NO.: 00 PAGE NO. 02 OF 02
	HEALTH CHECK UP	

EXAMINATION	OBSERVATION
<u>Cardiovascular System Examination :</u>	
Inspection :	
Palpation :	Pulse BP
Auscultation (Heart Sounds) :	
<u>Respiratory System :</u>	
Inspection :	Respiratory Rate
Palpation:	
Percussion :	
Auscultation (Breath Sounds) :	
<u>Examination of Abdomen :</u>	
Inspection :	
Palpation :	
Auscultation (Bowel Sounds) :	
Any Other :	
Clinical Impression	


Signature of the examining doctor

	POWER SECTOR	FORMAT NO: HSEP:13-F06 REV NO.: 00 PAGE NO. 01 OF 01
	PERSONAL PROTECTIVE EQUIPMENTS	

Name of Site :	
Name of Sub-Contractor :	
Inspected by :	
Date of Inspection :	

Item	Issued this Month	Nos. Issued up to the Month	Percentage of usage at site
Safety Helmet			
Safety Shoes			
Full Body Harness			
Fall Arrestor			
Safety Nets			
Other PPEs.			

Signature of Site I/C of Subcontractor :


	POWER SECTOR	FORMAT NO: HSEP:13-F07 REV NO.: 00 PAGE NO. 01 OF 01
	INSPECTION OF T&Ps	

Name of Site :	
Name of Sub-Contractor :	
Date of Inspection :	

Sl.No.	Description	Remarks
1.0	Name of equipment	
2.0	Basic Information of equipment	
2.1	Specification	
2.2	Sr. No. of equipment	
2.3	Make	
2.4	Year of manufacture	
3.0	Major repairs / overhauls(Furnish details of work carried out)	Date(s) of major repair/overhaul
3.1		
3.2		
3.3	Repairs carried out at site	
4.0	Any performance test conducted	Yes/No
5.0	Document Submitted	Yes/No
6.0	Manufacturer's test / guarantee certificate	Available/ Not available
7.0	Performance test	Done/ Not Done
8.0	Acceptance Norms	
9.0	Committee Observations	
10.0	Date of next review (if accepted)	

Signature-Site Safety Officer (BHEL)


Signature-Subcontractor/ Subcontractor's
Safety Officer

	POWER SECTOR	FORMAT NO: HSEP:13-F08 REV NO.: 00 PAGE NO. 01 OF 01
	STATUS OF T&Ps	

Name of Site	
Name of Sub-Contractor	
Date of Inspection	

Item	Nos. Deployed	Identification No.	Nos. Tested by competent person	Validity of Test Certificate
Winches				
Chain Blocks				
Wire Rope Slings				
Man Cages				
D-Shackles				
Air Compressors				
Crawler Cranes				
Mobile Cranes				
Hydra Cranes				
Others				


Signature of Site I/C of subcontractor :

	POWER SECTOR	FORMAT NO: HSEP:13-F09 REV NO.: 00 PAGE NO. 01 OF 03
	INSPECTION OF CRANES AND WINCHES	
Name of Site :		
Name of Sub-Contractor :		
Inspected by :		
Date of Inspection:		

Crane Reg. No (Make/Model) _____

Name of Driver/Operator _____


Sl.no.	Description	Observation	Measures
1	Valid Driving license		
2	Hook & Hook Latch		
3	Over Hoist limit switch		
4	Boom limit switch		
5	Boom Angle Indicator		
6	Boom limit cutoff switch		
7	Condition of Boom		
8	Condition of ropes		
9	Number of load lines		
10	Size and condition of the slings		
11	Stability of the cranes		
12	Soil Condition		
13	Swing Break And Lock		
14	Proper Break And Lock		
15	Hoist Break And Lock		
16	Boom Break And Lock		
17	Main Clutch		
18	Leakage in Hydraulic Cylinders		
19	Out riggers fully extendable		
20	Tyre pressure		
21	Condition of Battery And Lamps		

	POWER SECTOR	FORMAT NO: HSEP:13-F09 REV NO.: 00 PAGE NO. 02 OF 03
	INSPECTION OF CRANES AND WINCHES	

Sl.no.	Description	Observation	Measures
22	Guards of moving and rotating parts		
23	Load chart provided		
24	Number and position of pedant ropes		
25	Reverse Horn		
26	Load Test Details		
27	Operator's fitness		
28	Pollution under control certificate		
29	Fire extinguisher of appropriate type.		
30	Training of the operator		


WINCH

Sl. No.	Description	YES	NO	NA	Remarks
1	Has the copy of Third Party Inspection certificate been provided in winch machine shed?				
2	Is winch machine operator experienced enough to operate the winch machine?				
3	Is the winch machine operated by someone other than the winch machine operator?				
4	Is there guard provided in all moving parts like wheel and motor's shaft?				
5	Will it protect against unforeseen operational contingencies?				
6	Are brakes, clutch and locking arrangement working properly?				
7	Has it been ensured that the guard does not constitute a hazard by itself?				
8	Are the cranks and the connecting rods protected by guardrails?				
9	Is there provision for fully covered shed with wooden plank roof?				

	POWER SECTOR	FORMAT NO: HSEP:13-F09 REV NO.: 00 PAGE NO. 03 OF 03
	INSPECTION OF CRANES AND WINCHES	


Sl. No.	Description	YES	NO	NA	Remarks
10	Is wire rope free from any kind of damage or wear and tear?				
11	Is split pin provided for the protection of clutch and brake locking arrangement?				
12	Is pulley inspected by competent person and certified before use?				
13	Is pulley free from any wear and tear visually?				
14	Is winch rope barricaded with clipsheet for the protection of rope and person?				
15	Is the wire rope lubricated by cardium oil?				
16	Is there any friction in wire rope which may damage the wire rope rather than the rolling parts?				
17	Is there any oil leakage in the hydraulic system of the winch machine?				
18	Has it been ensured that the guard will not cause discomfort or inconvenience to operator?				
	Total Number of NO:				
	Total Number of NA:				
	% Compliance :				

Signature of Site I/C of subcontractor :

	POWER SECTOR	FORMAT NO: HSEP:13-F10 REV NO.: 00 PAGE NO. 01 OF 02
	INSPECTION OF HEIGHT WORKING	


Name of Site :	
Name of Sub-Contractor :	
Inspected by :	
Date of Inspection:	

Sl. No.	Descriptions	Observation (Yes/No)	Remarks
1	All the workers have been explained safe work method?		
2	An established communication system has been established and explained to the workers.		
3	Adequate illumination has been ensured.		
4	Work area inspected prior to the start of the work.		
5	Area below the work place barricaded, particularly below hot work.		
6	Workers provided with bags /box to carry bolts, nuts and hand tools		
7	Arrangement for fastening hand tools made.		
8	All work platforms ensured to be of adequate strength and ergonomically suitable.		
9	Fabricated makeshift arrangements are checked for quality and type of material welding, anchoring etc.		
10.	Work at more than one elevation at the same segment is restricted.		
	ACCESS/EGRESS		
1	Walkways provided with handrail, mid-rail and toe guard?		
2	All checkered plates, gratings properly welded/ bolted?		
3	Are ladders inspected and they are in good condition?		
4	Are ladders spliced?		
5	Are ladders properly secured to prevent slipping, sliding or falling?		
6	Do side rails extend 36" above top landing?		
7	Are built up ladders constructed of sound materials?		

	POWER SECTOR	FORMAT NO: HSEP:13-F10 REV NO.: 00 PAGE NO. 02 OF 02
	INSPECTION OF HEIGHT WORKING	


Sl. No.	Descriptions	Observation (Yes/No)	Remarks
8	Are rugs and cleats not over 12" on center?		
9	Metal ladders not used around electrical hazards.		
10	Proper maintenance and storage.		
11	Ladders placed at right slope.		
12	Ladders / staircases welded/ bolted properly.		
13	Any obstruction in the stairs.		
14	Are landing provided with handrails, knee rails, toe boards etc.?		
15	Whether ramp is provided with proper slope.		
16	Proper hand rails / guards provided in ramps.		
	Housekeeping		
1	Walkways, aisles & all overhead workplaces cleared of loose material.		
2	Flammable materials, if any, are cleared.		
3	All the de shuttering materials are removed after de shuttering is done.		
4	Platforms and walkways free from oil/grease or other slippery material.		
5	Collected scrap are brought down or lowered down and not dropped from height.		
	PPE And Safety Devices		
1	Use of safety helmet, safety belts ensured for all workers		
2	Anchoring points provided at all places of work.		
3	Common lifeline provided wherever linear movement at height is required.		
4	Safety nets are use wherever required.		
5	Proper fall arrest system is deployed at critical workplaces.		
6	Crawler boards/Safety system or works on fragile roof are used.		

Signature of Site I/C of subcontractor :

	POWER SECTOR	FORMAT NO: HSEP:13-F11 REV NO.: 00 PAGE NO. 01 OF 02
	INSPECTION OF WELDING AND GAS CUTTING	


Name of Site	
Name of Sub-Contractor	
Inspected by	
Date of Inspection	

Welding				Remarks
Sl.no.	Description	Y e s	N o	
1	Is electric connection given through 30 mA ELCB/RCCB to welding m/c?			
2	Is electric cable fitted properly in junction box on m/c?			
3	Is electrical cable free from joints?			
4	Are the joints attached firmly & insulated with tape?			
5	Is double earthing given to body of m/c?			
6	Is the physical condition of the m/c good?			
7	Is ON/OFF switch connected to the m/c is working and in good condition?			
8	Are indication lamps on m/c working?			
9	Is the electrode holder in good condition?			
10	Are the cables of the welding m/c lugged & tight properly?			
11	Are return lead connected properly (Rod, Angle, Channels shall not be used)			
	Total No of NO			
	Total No of YES			

	POWER SECTOR	FORMAT NO: HSEP:13-F11 REV NO.: 00 PAGE NO. 02 OF 02
	INSPECTION OF WELDING AND GAS CUTTING	


Gas Cutting				
Sl. no	Description	Yes	No	Remarks
1	Are Cylinders kept on trolleys?			
2	Physical condition of Gas cylinders Good?			
3	Is there Oil/Grease on valve of the cylinder?			
4	Are pressure regulators in good condition?			
5	Condition of hose pipe OK?			
6	Are hose pipe clamped with hose clip?			
7	Is flash back arrestor & NRV fitted on torch both for O2 and LPG cylinder?			
8	Is nozzle of the torch cleaned?			
	Total Number of NO			
	Total No of YES			
	% Compliance			

Signature of Site I/C of subcontractor :

	POWER SECTOR	FORMAT NO: HSEP:13-F12 REV NO.: 00 PAGE NO. 01 OF 02
	INSPECTION OF ELECTRICAL INSTALLATION	


Name of Site	
Name of Sub-Contractor	
Inspected by	
Date of Inspection:	

Sr. No.	Contents	Yes/No	Remarks
A	Cable		
1.	Whether the condition of cable is checked?		
2.	Are cables received from other sites checked for insulation resistance before putting them into use?		
3.	Are all main cables taken either underground / overhead?		
4.	Are welding cables routed properly above the ground?		
5.	Are welding and electrical cables overlapping?		
6.	Is any improper joining of cables/wires prevailing at site?		
B	DBs/SDBs		
1.	Is earth conductor continued upto DB / SDB?		
2.	Whether DBs and extension boards are protected from rain / water?		
3.	Is there any overloading of DBs / SDBs?		
4.	Are correct / proper fuses & CBs provided at main boards and sub-boards?		
5.	Is energized wiring in junction boxes, CB panels & similar places covered all times?		
C	ELCB		
1.	Whether the connections are routed through ELCB?		
2.	Is ELCB sensitivity maintained at 30 mA?		

	POWER SECTOR	FORMAT NO: HSEP:13-F12 REV NO.: 00 PAGE NO. 02 OF 02
	INSPECTION OF ELECTRICAL INSTALLATION	

Sr. No.	Contents	Yes/No	Remarks
3.	Are the ELCB numbered and tested periodically & test results recorded in a logbook countersigned by a competent person?		
D	Grounding		
1.	Is natural earthing ensured at the source of power (main DB at Generator or Transformer)?		
2.	Whether the continuity and tightness of the earth conductor are checked?		
3.	Mention the gauge of the earth conductor used at the site.		
4.	Mention the value of Earth Resistance.		
E	Electrically operated Machines or Accessories.		
1.	Whether the plug top is provided everywhere.		
2.	Are all metal parts of electrical equipment and light fittings / accessories grounded?		
3.	Is there any shed or cover for welding machines?		
4.	Are halogen lamps fixed at proper places?		
5.	Are portable power tools maintained as per norms?		
6.	Any other information:		

Signature of Site I/C of subcontractor :

	POWER SECTOR	FORMAT NO: HSEP:13-F13 REV NO.: 00 PAGE NO. 01 OF 01
	INSPECTION OF ELEVATOR	

Name of Site	
Name of Sub-Contractor	
Inspected by	
Date of Inspection	

Sr. No.	Description	Remarks
1.0	Name of equipment	
2.0	Basic Information of equipment	
2.1	Specification	
2.2	Sr. No. of equipment	
2.3	Make	
2.4	Year of manufacture	
3.0	Major repairs/overhauls(Furnish details of work carried out)	Date(s) of major repair/overhaul
3.1		
3.2		
3.3	Repairs carried out at site	
4.0	Any performance test conducted	Yes/No
5.0	Document Submitted	Yes/No
6.0	Manufacturer's test / guarantee certificate	Available/ Not available
7.0	Performance test	Done/ Not Done
8.0	Acceptance Norms	
9.0	Committee Observations	
10.0	Date of next review (if accepted)	

Signature-Subcontractor/ Subcontractor's Safety Officer	Signature-Site Safety Officer (BHEL)
--	--



POWER SECTOR

HSE PENALTY

FORMAT NO: HSEP:13-F14

REV NO.: 00

PAGE NO. 01 OF 02

Sub: MEMO for Penalty for non compliances in Safety

Following lapse (tick marked) was observed and penalty is imposed as stated at the bottom of this memo. It is requested that such occurrences be please avoided in future.


Safety Area

SN	Violation of Safety Norms	Fine (in Rs)
01	Not Wearing Safety Helmet	200/- *
02.	Not wearing Safety Belt or not anchoring life line	500/-*
03	Not wearing safety shoe	200/-*
04	Not keeping gas cylinders vertically	200/-
05	Not using flash back arrestors	100/-
06	Not wearing gloves	50/- *
07.	Grinding Without Goggles	50/- *
08.	Not using 24 V Supply For Internal Work	500/-
09.	Electrical Plugs Not used for hand Machine	100/-
10.	Not Slings properly	200/-
11.	Using Damaged Sling	200/-
12.	Lifting Cylinders Without Cage	500/-
13.	Not Using Proper Welding Cable With Lot of Joints And Not Insulated Property.	200/-
14.	Not Removing Small Scrap From Platforms	500/-
15.	Gas Cutting Without Taking Proper Precaution or Not Using Sheet Below Gas Cutting	500/-
16.	Not Maintaining Electric Winches Which are Operated Dangerously	500/-
17.	Improper Earthing Of Electrical T&P	500/-
18	No or improper barricading	500/-
19.	Activity carried out without Safety work permit (Height work, Lifting activity, Hot work-each person/case)	1000/-
20.	Incident Resulting in Partial Loss in Earning Capacity	25,000/- per victim
21.	Fatal Incident Resulting in total loss in Earning Capacity	1,00,000/- per victim for first instance #

Legend:-

*: per head. For repeated violation by the same person, the penalty would be double of the previous penalty. Date of "Repeated violation" will be counted from subsequent days.

#: or as deducted by customer, whichever is higher. For repeated fatal incident in the same Unit incremental penalty to be imposed. The subcontractor will pay 2 times the penalty compared to previously paid in case there are repeated cases of fatal incidents under the same subcontractor for the same package in the same unit.

	POWER SECTOR	FORMAT NO: HSEP:13-F14 REV NO.: 00 PAGE NO. 02 OF 02
	HSE PENALTY	

Details (if any) related to non- compliance (Name of persons, Nature of deficiency, etc.)

Penalty imposed:

1, Rate as per above chart _____

2. No. of Persons/ machine/ event/ labour _____

3. Total Penalty= 1. X 2. = _____


Signature :

Witnessed by: (Sub- Contractor representative) (BHEL Personnel)

Name _____

Name _____

Distribution: 1 Copy: to Sub- contractor,
1 Copy to Site Construction Manager(BHEL)

	POWER SECTOR- HQ	FORMAT NO: HSEP:13-F15
	Incident Report	REV NO.: 00
(To be submitted within 24 hours of time of incident)		PAGE NO. 01 OF 01

Type of incident: Fatal/Major/ Minor/Fire/Property Damage/Near-miss

1	NAME OF SITE		3	ACTIVITY AREA	
2	SCOPE OF WORK		4	NAME OF CONTRACTOR	
			5	NAME & DESIGNATION OF BHEL ACTIVITY I/C	
6	DATE & TIME OF ACCIDENT		7	DATE RESUMED	
8	NO. OF WORK-DAYS LOST BY VICTIM (If duty not resumed, give estimated figure)				
9	NO. OF MANHOURS LOST BY OTHERS				
10	PERSONAL DETAILS OF INJURED AND / OR DETAILS OF MATERIALS / EQUIPMENT / PROPERTY DAMAGED				
	NAME		NAME OF MATERIAL / EQUIPMENT / PROPERTY		
	PERIOD OF EMPLOYMENT				
	AGE	YRS	SEX	MALE/ FEMALE	ESTIMATED COST
	MARITAL STATUS		SINGLE / MARRIED		ACTUAL COST
	OCCUPATION		NATURE OF DAMAGE		
	PART OF BODY INJURED				
	NATURE OF INJURY				
	AGENCY (OBJECT / EQUIPMENT / SUBSTANCE) MOST RESPONSIBLE FOR CAUSING ACCIDENT / INJURY / DAMAGE				
12	PERSON (NAME & DESIGNATION) WITH MOST CONTROL OVER AGENCY (OBJECT / EQUIPMENT / SUBSTANCE) CAUSING ACCIDENT INJURY / DAMAGE				
13	DESCRIBE CLEARLY HOW THE ACCIDENT OCCURRED (USE ADDITIONAL SHEET, IF REQUIRED)				
ANALYSIS					
14	WHAT ACTS AND / OR CONDITIONS CONTRIBUTED MOST DIRECTLY TO THIS ACCIDENT				
15	WHAT ARE THE BASIC REASON FOR THE EXISTENCE OF THESE ACTS AND / OR CONDITION ?				
16	WHAT CORRECTIVE ACTIONS HAVE BEEN TAKEN TO PREVENT ACCIDENT RECURRENCE ?				
	DATE :		SIGNATURE OF SITE HSE COORDINATOR		
17	COMMENTS OF HEAD / SOX				
	DATE:		SIGNATURE OF HEAD/SOX		

469360/2021/BAP/WS(SAF)

**SAFETY WORK CLEARANCE**

Permit no. _____

Project: _____

Emergency Contact Nos: _____

Subcontractor: _____

BURNING/WELDING /HOT WORK PERMIT

Area : _____ Date: _____ Time: _____

Name of Site Engineer (Permit Requesting Authority): _____ Sign: _____

Name of Work Performing Contractor: _____

Name of Package In charge: _____ Sign: _____ Date: _____

Description of Work: _____

Work Execution Date: _____ Time Valid from: _____ to _____

The above signing person(s) will be responsible to ensure that the above described work will be done under all the safety precautions mentioned on the permit to work.

The following precautions are to be taken:

No.	Item	Yes	Not required
1.	Proper Access/Exit available		
2.	Proper ventilation and /or lighting provided.		
3.	Proper and safe scaffolding, platform, ladder provided.		
4.	Welding machine located in a clean and dry area.		
5.	Welding machine grounded at the equipment and proper leakage current protection device (ELCB) provided for welding machine.		
6.	Emergency STOP buttons are in working condition. Welder /Helper knows how to operate it.		
7.	Welding machine input/output cables, welding holder and weld return clamp (Holder) are insulated and in good condition.		
8.	Welder & Fitter trained to connect ground/work return clamps (Holder) to work place prior to energization of welding machine.		
9.	Gas cylinders are stacked vertically and not below the welding / cutting area. Regulator key is available with cylinder.		
10.	Pressure gauges/Flash back arrestor provided and in working condition.		
11.	Personal Protective equipment Minimum applicable: safety helmet, safety goggles, welding helmet, safety shoes, leather gloves, long sleeve and nose mask -provided		
12.	In case of pits, water removed from the pit and wood/rubber insulation provided.		
13.	Safety signboards are in place.		
14.	Adequate and Suitable nos. of fire fighting extinguisher provided.		
15.	Nearby combustible material removed. Housekeeping done.		
16.	Other		

Name of Contractor Safety Officer: _____ Sign: _____ Date: _____ Time: _____

Reviewed and approved by BHEL Site Engineer (Permit Issuing Authority):

Name: _____ Sign: _____ Date: _____ Time: _____

Name of BHEL Safety Representative: _____ Sign: _____

I understand the precaution to be taken as described above and as per project requirement and hereby confirm that work will be executed under my supervision by following all precaution and Safety Rules.

Name of Work Performing Authority: _____ Sign: _____ Date: _____ Time: _____

Permit Cancellation:

I hereby declare that the work is complete, all workers under my control have been withdrawn and the site restored to safe tidy condition.

Name of Work performing Authority: _____ Sign: _____ Date: _____ Time: _____

Name of Site Engr. (Permit Requesting Authority): _____ Sign: _____ Date: _____ Time: _____

Name of BHEL Site Engr. (Permit Issuing Authority): _____ Sign: _____ Date: _____ Time: _____

(This permit is valid only for the date it is issued)

Original at BHEL site

Second Copy – BHEL SAFETY

Third Copy : Contractor

469360/2021/BAP/WS(SAP)

**SAFETY WORK CLEARANCE**

Permit no. _____

Project: _____

Emergency Contact Nos: _____

Subcontractor: _____

LIFTING ACTIVITY PERMIT

Area : _____ Date: _____ Time: _____

Name of Site Engineer (Permit Requesting Authority): _____ Sign: _____

Name of Work Performing Contractor: _____

Name of Package In charge: _____ Sign: _____ Date: _____

Description of Work: _____

Work Execution Date: _____ Time Valid from: _____ to _____

The above signing person(s) will be responsible to ensure that the above described work will be done under all the safety precautions mentioned on the permit to work.

The following precautions are to be taken:

No.	Item	Yes	Not required
1.	Crane used for lifting activity tested, certified and approved for rated lifting		
2.	All lifting tackles, gears/appliances are tested and certified for lifting works.		
3.	Crane operator is trained and competent for lifting operation.		
4.	Lifting sling/ belt is protected against sharp edge of the jobs to be lifted.		
5.	Access and exit marked and without obstruction.		
6.	Lifting arrangement adequate.		
7.	Uwanted rubbish material removed from work platform.		
8.	Minimum 2 guidelines have been provided for balancing and guiding jobs to be lifted.		
9.	Periphery area of crane booms as well as lifting job is barricaded and unauthorised/no-entry sign board posted.		
10.	Rigger and signal man is trained and competent for lifting work.		
11.	No lifting activity to be carried out during lightening, heavy wind/rain.		
12.	If scaffolding to be used during lift, scaffolding with valid tag available for use.		
13.	Double lanyards safety harness/belt checked an in working condition.		
14.	Safety shoes (non-slip), helmet with chin strap available with employees.		
15.	Others.		

Name of Contractor Safety Officer: _____ Sign: _____ Date: _____ Time: _____

Reviewed and approved by BHEL Site Engineer (Permit Issuing Authority):

Name: _____ Sign: _____ Date: _____ Time: _____

Name of BHEL Safety Representative: _____ Sign: _____

I understand the precaution to be taken as described above and as per project requirement and hereby confirm that work will be executed under my supervision by following all precaution and Safety Rules.

Name of Work Performing Authority: _____ Sign: _____ Date: _____ Time: _____

Permit Cancellation:

I hereby declare that the work is complete, all workers under my control have been withdrawn and the site restored to safe tidy condition.

Name of Work performing Authority: _____ Sign: _____ Date: _____ Time: _____

Name of Site Engr. (Permit Requesting Authority): _____ Sign: _____ Date: _____ Time: _____

Name of BHEL Site Engr. (Permit Issuing Authority): _____ Sign: _____ Date: _____ Time: _____

(This permit is valid only for the date it is issued)

Original at BHEL site**Second Copy – BHEL SAFETY****Third Copy : Contractor**

469360/2021/BAP/WS(SAF)

**SAFETY WORK CLEARANCE**

Permit no. _____

Project: _____

Emergency Contact Nos: _____

Subcontractor: _____

WORKING AT HEIGHT PERMIT

Area : _____ Date: _____ Time: _____

Name of Site Engineer (Permit Requesting Authority): _____ Sign: _____

Name of Work Performing Contractor: _____

Name of Package In charge: _____ Sign: _____ Date: _____

Description of Work: _____

Work Execution Date: _____ Time Valid from: _____ to _____

The above signing person(s) will be responsible to ensure that the above described work will be done under all the safety precautions mentioned on the permit to work.

The following precautions are to be taken:

No.	Item	Yes	Not required
1.	All workers on job are medically fit for working at height (Person should not have vertigo)		
2.	Scaffolding with valid tag available for use		
3.	Safety harness with life line support/ fall arrester are checked and in working condition		
4.	Safety shoes (non-slip), Helmet with chin strip available with employees		
5.	Safety nets are provided as per design and provided 25 ft. below working area & extending 8 ft beyond.		
6.	Horizontal life lines are provided to cater to design specification of 2300kg per person.		
7.	Ladders have been inspected and provided as per BHEL standard/contract.		
8.	All lifting / tightening tools, hand tools/equipment checked and in good condition		
9.	Access and exit marked and without obstruction.		
10.	Lighting arrangement adequate.		
11.	Unwanted and rubbish material removed from working platform.		
12.	Electrical cable, welding Hose/Compressed air hose properly secured and lay down without obstruction.		
13.	Signboards provided on working platforms		
14.	Hazards in the vicinity are identified and communicated to the worker.		
15.	Other		

Name of Contractor Safety Officer: _____ Sign: _____ Date: _____ Time: _____

Reviewed and approved by BHEL Site Engineer (Permit Issuing Authority):

Name: _____ Sign: _____ Date: _____ Time: _____

Name of BHEL Safety Representative: _____ Sign: _____

I understand the precaution to be taken as described above and as per project requirement and hereby confirm that work will be executed under my supervision by following all precaution and Safety Rules.

Name of Work Performing Authority: _____ Sign: _____ Date: _____ Time: _____

Permit Cancellation:

I hereby declare that the work is complete, all workers under my control have been withdrawn and the site restored to safe tidy condition.

Name of Work performing Authority: _____ Sign: _____ Date: _____ Time: _____

Name of Site Engr. (Permit Requesting Authority): _____ Sign: _____ Date: _____ Time: _____

Name of BHEL Site Engr. (Permit Issuing Authority): _____ Sign: _____ Date: _____ Time: _____

(This permit is valid only for the date it is issued)

Original at BHEL site**Second Copy – BHEL SAFETY****Third Copy : Contractor**

Additional General Technical Requirements

Equipment and Accessories

This Specification is intended to cover the design, engineering, manufacture, assembly/reassembly, testing at manufacturer's works, packing, forwarding, supply and delivery duly packed for, transportation for site including shop painting, final painting, unloading, handling, storage, and in-plant transportation at site, complete services of erection, testing at site, successful commissioning, operation & training of Owners personnel and handing over in a flawless operating condition to Owner, the CW Chlorination System, as defined subsequently, complete with all auxiliaries and accessories, as specified hereinafter and elsewhere of this Specification and as required for safe and trouble free smooth operation.

This specification also includes carrying out of performance guarantee tests at site for each and individual unit as well as the plant as a whole after successful commissioning only. All necessary equipment, instruments, services, labour as required for this purpose shall be under the scope of this Specification. All instruments required for performance testing will be arranged by the Bidder.

This specification also includes design, detail engineering and supervision of all civil and architectural works.

Any additional plant, material, services which are not specifically mentioned here, but are required to make the plants/ systems, complete in every respect in accordance with the technical specification and for safe operation and guaranteed performance, shall be covered under the scope of this specification.

Bidders are requested to carefully examine and understand the specifications and seek clarifications if required, to ensure that they have understood the specification. The Bidders' Bids should not carry any sections like clarifications, interpretations and/or assumptions. However, if the bidder feels that, in his opinion, certain features brought out in their Bid are superior to what has been specified, the same may be highlighted separately.

The equipment and accessories to be furnished and put into operation and all other required services are detailed herein under. The items, though not specifically mentioned but needed to make the system complete in all respects and reliable for safe and smooth operation and guaranteed performance, shall also be treated as though included and the same shall be furnished, unless otherwise specifically excluded elsewhere.

C.W Chlorination System

Forty (40) numbers Chlorine Ton Containers, each provided with isolation valves, eductor tubes, two (2) numbers Roller Supports, safety accessories and Automatic Switch Over facility.

Three (3) nos. Chlorine Manifolds each with all accessories.

Three (3) nos. electrically heated water bath type Chlorine Evaporators, each with all accessories.

469360/2021/BAP-WS(CON)

Six (6) nos. Strainers in chlorine gas line, two (2) nos. for each of the three (3) nos. chlorination streams.

Pressure regulation and automatic shut-off valves for each of the chlorine gas line from the outlet of each Chlorine Evaporator.

Three (3) Chlorinators each vacuum operated aqueous solution feed type complete with all accessories.

Each Chlorinator should have the items as follows:

- Remote Vacuum Regulator.
- The monitoring and control as below will be done through Operating Station:
 - a) Chlorine Gas Flow meter.
 - b) Differential Pressure Regulator.
 - c) Manual Flow Control Valve.
- Fixed throat type Remote Ejector.

Three (3) nos. Water Supply Booster Pumps each complete with electrical drive motor and all other accessories to supply water to the Evaporators and Chlorinators.

Adequate nos. of Chlorinated Water Diffusers.

Adequate safety and supervisory instruments complete with gas mask and chlorine leak detector as detailed out in Annexure-I to this section. Two (2) nos. Free Residual Chlorine analyzer shall be provided and the 4-20 mA output from FRC analyser shall be used to control the chlorine dosing rate through Remote operated Manual control valve. CW chlorination system shall be manually operated from DCS.

One (1) no. electrically operated monorail hoist of 3.0 Ton capacity complete with lifting bar, load indicator and all accessories.

Suitable weighing and lifting devices as detailed out in Annexure-I to this section.

Complete ventilation system of Chlorination System Building. The Supplier shall include in his offer, all necessary fans complete with electrical drive motors and all other accessories, as required for proper ventilation.

One (1) no. Emergency Chlorine Leak Absorption System complete with:

- a) Forty (40) nos. FRP hoods each for enclosing a ton container (connected to manifolds) along with arrangement for connecting the same to the FRP duct.
- b) Two (2) nos. Blowers each complete with all accessories.
- c) Adequate number of exhaust/Ventilation fan with one (1) no. additional fan as standby along with motorized damper and ducting work to evacuate chlorinated air to absorption tower during chlorine leakage condition.
- d) One (1) no. Absorption Tower complete with all accessories.
- e) One (1) no. Caustic Solution Preparation Cum Recirculation Tank complete with agitator and its drive motor as well as all other accessories
- f) Two (2) nos. (2x 100%) Caustic Solution Preparation Cum Recirculation Pumps each complete with drive motor and all accessories.

- g) All other necessary accessories as required.
Chlorine leakage absorption system shall be fully automatic.

Design quality of treated water from Chlorination Systems is envisaged as Follows:

Residual Chlorine content: Not more than 0.1 ppm as Cl₂

Each chlorinator and evaporator for C.W Chlorination System will have a normal capacity not less than 120 Kg/hr.

All nuts, bolts etc. in submerged and corrosive application shall be of SS-316.

Rubbers used for rubber lining of equipment and piping shall be of natural rubber with shore hardness 65 ± 5^0 in Scale-A.

Design and Construction

For design and construction of all equipment Bidder shall refer to Annexure-I of this section. Some guidelines have been listed as under:

Chlorinator

The Chlorinator shall include the following items for accurate control and safety of operation:

- a) Inlet chlorine pressure reducing valve to reduce the pressure to a constant sub-atmospheric pressure (automatic).
- b) Automatic pressure vacuum relief valve.
- c) Indicating meter (rotameter).



- d) Chlorine feed rate adjuster (manual).
- e) Chlorine metering orifice.
- f) Vacuum differential regulating valve (automatic).
- g) Automatic Drain Relief Valve/Spring Loaded Check Valve.
- h) Injector vacuum gauge.
- i) Injector power water supply system.

Chlorine Pipe Manifold and Accessories

Pipe Manifold with Accessories:

Flexible connector with valved ends : Required for joining chlorine ton-container to the pipe manifold

i) Type : Tubing

ii) Features and accessories : Tubing shall be provided with suitable expansion loop. Nipples shall be provided on each end.

Yokes and adaptors are recommended for connections to the container valve outlet. If union connections are used, the threads on the connectors must match the valve outlet thread.

iii) Material of Construction

a) Tubing : Annealed copper, cadmium plated.

b) Nipples : Silver soldered copper nipples.

Alternatively, flexible metal hose, constructed of corrugated metal with moneltire braid and monel nipples.

Suggested copper and copper alloy tubing and fittings for dry chlorine service upto the manifold should be as follows (for nominal sizes 1/4" to 1.1/2 ") :

Copper tube : Copper water tube type K, soft as per ASTM-B-88. The OD of type K water tube is 1/8" larger than the nominal size.

Fittings : Wrought copper solder joint fittings (joints should be made with a brazing alloy containing no tin)

Hydraulic Testing Pressure for Tubing : 40 Kg/Sq.Cm (g)

Piping Handling Chlorine :

i) Features : As simple as possible, with minimum number of screwed and flanged joints. Piping shall be well supported and adequately sloped to allow drainage. Low spots shall be avoided. Suitable allowances shall be provided for pipe expansion





due to change in temperature

- ii) Material of Construction

Dry liquid chlorine	Dry chlorine gas under pressure	Chlorinated water service
Carbon steel Gr.B seamless	ASTM A 106 Schedule 80	CPVC
Carbon steel 2000 Rating	ASTM A 105 Gr. 1	CPVC
Carbon steel class 300	ASTM A 181 Gr.1	

Note :

1. PVC or similar materials shall not be used in liquid chlorine and pressurised chlorine gas lines.
2. PVC can be used in chlorine gas line operating under vacuum
3. Piping and fittings for conveying chlorine gas under vacuum including vent lines and fittings from all points of chlorine gas, vent, leak off and pressure relief to outside discharge which could be exposed to wet-chlorine shall be schedule 80 PVC as per IS : 4985.

Pipes handling clarified water shall be of MS construction (IS: 1239, Part-I, Heavy Duty).

Pipes handling air shall be Sch. 40 or standard galvanized steel A53 Gr. A screwed or flanged.

Valves

Valves for liquid and gas service on the chlorine supply side of the installation shall preferably be approved by the Chlorine Institute, U.S.A.

The specification should be as follows :

Type	: Ball/ Rising stem globe
Body	: Steel/ Bronze (silver plated)
Seat	: Monel
Ball	: Monel
Stem	: Monel
Disc	: Haste-alloy/ Monel
Gasket	: Bonded asbestos fibre
Packing	: Oil free graphitized asbestos.





Globe valves up to 40 mm NB size shall be 300 ASA (minimum) outside screw & yoke, with forged body and renewable seat. Valves 50 mm and larger shall be cast body.

- i) Valves handling chlorine under vacuum or chlorinated water shall be made of PVC or PVC lined body. Type may be ball or diaphragm.
- ii) All sampling valves and analysing instrument isolation valves shall be needle type of stainless steel (AISI-316) construction. All other instrument isolation valves shall be full bore ball valves of SS-316 construction as per BS 5351.

Chlorine shut-off valves shall be electrically/pneumatically operated, arranged to shut-off on operating power/air failure.

Expansion chambers shall be provided in all pipelines carrying liquid chlorine which may become stagnant due to closure of isolating valves. The expansion chamber shall be sized for a minimum 20% of the piping volume in which it will be installed. Connection to the chamber shall be through a rupture disc (set at 28 Kg/Sq.cm approx.). Expansion chamber shall be mounted between two shut-off valves. Expansion chamber shall be provided at the highest level of the piping. Suitable pressure switch shall be provided to initiate a high pressure alarm.

Socket welded joints shall be used in PVC service. Teflon tape/Litharge/Glycerine cement shall be used in all screwed joints.

If chlorine line is run in a pipe rack, where it saves space, with other pipelines carrying flammable materials, the chlorine lines should be protected from fire, resulting from leak or break in one of the other lines as given in Chlorine Institute, USA.

All piping above the ground shall be suitably protected from the atmospheric corrosion by adequate painting system or adequate insulation system.

All buried pipelines shall be coal tar coated and wrapped. Buried pipes shall be cathodically protected.

For PVC line, in case of chlorine solution piping, if any, all joints shall be socket type with solvent welding. For these pipes, laid on the sand level, insulation shall be provided to prevent solar effect and mechanical damages on the pipe. For piping system carrying chlorinated water solution or chlorine gas under vacuum, neoprene lining shall not be used.

Data regarding pipe material etc. has been presented in Annexure-I of this section.



INSTALLATION

Chlorine pipeline joints shall be flanged or welded. If threaded joints are required, extreme care shall be taken to obtain clean, sharp thread two or three cuts may be necessary to produce the desired perfect thread. Cut pipe shall be reamed after threading and the threads shall be washed with trichloro ethylene to remove cutting oils. Linseed oil and white lead paste is recommended as a pipe dope. For permanent joints, freshly prepared litharge and glycerin also can be used.

During erection, cutting oil, grease and other foreign materials inside pipe lengths and fittings shall be removed. New valves or other equipment received in an oily condition shall be dismantled, and cleaned before use.

Chlorine pipeline and valves, after installation shall be hydraulically tested at 40 Kg/Sq.cm (g) for leak tightness.

Drying of pipeline shall be done by passing steam through lines from the high end allowing condensate and foreign matter to drain out. Steaming shall be continued until the pipeline is thoroughly heated and no further debris is blown out. Steam supply shall then be disconnected and the pipeline is dried by passing dry air (dew point - 40⁰ .C) through the hot pipeline.

After drying, the system shall be filled with dry air at 10 kg/cm² (g) and tested for leaks by application of soapy water on the outside of joints. Small quantities of chlorine gas shall then be introduced in the pipeline, test pressure built up with air and tested for chlorine leakage.

The complete installation including chlorine ton containers should meet the requirements of Chief Inspector of Explosives, Nagpur, India and any other statutory regulation prevalent in India.

All valves, equipment, piping etc. shall be as per recommendations of chlorine manual of Chlorine Institute, USA.

INSPECTION AND TESTING

The guaranteed performance figures of the equipment shall be proved by the Contractor during these tests. Should the results of these tests show any deficiency from the guaranteed values, the Contractor shall modify the equipment as required to enable it to meet the guarantees. In such a case, performance and guarantee tests shall be repeated within one month from the date, the equipment is ready for retest and all costs for modifications including labour, materials and the cost of additional testing to prove that the equipment meets the guarantees, shall be borne by the Contractor.

Performance

Necessary pumps shall be started and flow shall be established through all the streams. Valves shall be adjusted so as to have equal and rated distribution of flow through all the streams.

Random samples will have to be collected from the down- stream of chlorinator and it has to be observed whether the chlorine content of each sample shall be within $\pm 25\%$ of the average value of the samples.

Capacity of the chlorinator as indicated by the flow indicator shall be compared with the value determined from the flow rate of chlorinated water. The difference shall not exceed 5%.

Capacity of the chlorinator shall be tested both at the highest and lowest gas disposal rates.

Guarantee

The Circulating Water Chlorination System shall be guaranteed so that cleaning of condenser tubes is not required earlier than two years. The entire Chlorination System (i.e dosing and storage) shall be guaranteed for compliance with the regulations of Chlorine Institute.

All pumps shall be guaranteed for capacity, total dynamic head and power consumption.

All fans and blowers shall be guaranteed for head and power consumption.

C.W. Chlorination System

- a) Each evaporator shall be guaranteed for the rated capacity.
- b) Each chlorinator shall be guaranteed for the rated capacity.

ENGINEERING SERICES

CONTENTS

CLAUSE NO.	DESCRIPTION
1.00.00	GENERAL
2.00.00	DESIGN COORDINATION MEETING
3.00.00	CO-OPERATION WITH OTHER SUCCESSFUL BIDDERS AND CONSULTANTS
4.00.00	GUIDELINES FOR OWNER'S ENGINEERING SERVICES
5.00.00	INSTRUCTION MANUALS
6.00.00	PLANT HANDBOOK
7.00.00	TENDER STAGE DOCUMENT SUBMISSION
8.00.00	CONTRACT STAGE DOCUMENT SUBMISSION AND APPROVAL PROCEDURE

OWNER'S ENGINEERING SERVICES

1.00.00 GENERAL

- 1.01.0 As part of the overall project management activity, the Successful Bidder Shall be responsible for proper Owner's Engineering and co-ordination of activities during various phases of execution of the contract. The Successful Bidder shall identify a person, designated as Project Manager, with whom the Owner, the Consulting Owner's Engineer or the Review Consultant shall interact on matters related to Owner's Engineering as well as execution of the contract. The Project Manager shall be the single-point contact person on behalf of the Successful Bidder and shall be responsible for all Owner's Engineering co-ordination. The Owner /Consultant /Review Consultant shall interact with the Project Manager only on all matters of co-ordination between the Owner and the Successful Bidder or on matters involving the Successful Bidder, his manufacturing units and sub-vendors. For expediting, the Owner or his representative may sometimes interact with the manufacturing units or sub-vendors of the Successful Bidders. However such interaction will not, under any circumstance, dilute the responsibility of the Successful Bidder to provide a fully Owner's Engineered and coordinated package under this contract.
- 1.02.0 On finalization of the contract, a procedure for exchange of Owner's Engineering information will be mutually agreed and finalized between the Owner and the Successful Bidder.

2.00.0 DESIGN COORDINATION MEETING

The Successful Bidder and his sub-vendors will be called upon to attend design co-ordination meetings with the Owner's Engineer, other Successful Bidders and the Consultants of the Owner during the period of execution of contract. The Successful Bidder including his sub-vendors shall attend such meetings at their own cost at Owner's or Consultant's office in Kolkata/ or at mutually agreed venue as and when required and fully cooperate with such persons and agencies involved during those discussions.

3.00.00 CO-OPERATION WITH OTHER CONTRACTORS AND CONSULTING OWNER'S ENGINEERS

The Successful Bidder shall agree to cooperate with the Owner's other Contractors and Consulting Owner's Engineers and freely exchange with them such technical information as is necessary to obtain the most efficient and economical design and to avoid unnecessary duplication of efforts. The Owner's Engineer shall be provided with copies of all

correspondences addressed by the Successful Bidder to other Sub-Vendors and Consulting Owner's Engineers in respect of such exchange of technical information.

4.00.00 GUIDELINES FOR OWNER'S ENGINEERING SERVICES

- 4.01.00 Prior to commencement of the Owner's Engineering work as part of design submissions, all aspects of design viz., criteria for selection and sizing of all equipment and systems, design margins etc. including that for structural steel and civil work shall be outlined and these shall form the basis for the detailed Owner's Engineering work.
- 4.02.00 Owner's Engineering work shall be performed on modern and proven concepts and internationally accepted good Owner's Engineering practices but fully compatible with the Indian environments. Owner shall have the right to review and approve the Owner's Engineering work by themselves and/or through consultant and ask for any clarifications and changes/modifications to the work performed by Successful Bidder.
- 4.03.00 At any stage during the performance of assignment, the Successful Bidder may be required to make certain changes/modification/improvements in design/drawing/other documents, which in the opinion of the Owner could result in better improved design, layout, operability, plant availability, maintainability, reliability or economy of the plant and its systems/sub-systems in view of revised and more accurate information/data available at a later date(s) or feedback(s) received during execution/operation of similar units. Such changes/modifications/improvements required could be identified by Owner and/or Consultant and mutually discussed. Owner requires the Bidder to incorporate such action in the subject assignment appropriately without any additional cost liability and time implication to the Owner and same shall be within the responsibilities and Scope of the Successful Bidder.
- 4.04.00 During the course of review of detailed Owner's Engineering stages, it may be essential in the opinion of Owner to obtain certain classified data for review purposes only. In case Owner so desires, the Bidder shall submit such data to Owner.
- 4.05.00 During the course of review of detailed Owner's Engineering, it may be essential in Owner's opinion to obtain data and the Bidder engineers information on similar equipment and plants Owner. In case, Owner so desires the Bidder shall submit such data and information to the Owner.
- 4.06.00 It is not the intent to give details of every single task covered in the total Owner's Engineering work to be carried out by Successful Bidder, however, all Owner's Engineering work required for the satisfactory completion of the plant/systems as specified shall be carried out by the

Successful Bidder. Broadly, the following are the minimum requirements in respect of scope of major items of work.

- 4.06.01 Preparation, updating and finalisation of scheme drawings, control and interlock diagrams, detailed and fully dimensioned layout drawings (plant layout and equipment layout detailed plan, elevation and cross-sectional drawings at different elevations/ floor levels) covering all mechanical, electrical, C&I, civil and structural items, equipment, systems and facilities. Drawings and Schedules prepared by the Successful Bidder from time to time, as detailed designs are developed, shall be submitted for Owner's/ Consultant's approval before the work is taken up. Revisions, corrections, additions to drawings and schedules shall not be considered to change the scope of work.
- 4.06.02 Preparation of detailed technical specifications including data sheets, tender drawings and bill of material for all bought out items, as also finalisation of corresponding sub-Vendors.
- 4.06.03 Review of sub-Vendor's data, drawings, design calculations, schedules, bill of materials, instruction manuals etc. for all equipment, before forwarding them to Owner/Consultant for approval.
- 4.06.04 Preparation of civil construction drawings for all equipment showing foundation details and full details regarding equipment loads, floor openings, details of embedment, etc. required for preparation of civil construction drawings and also as referred at relevant sections of Scope & Exclusions. These documents shall be preceded by appropriate design calculations, static and dynamic analysis as necessary.
- 4.06.05 Preparation and finalisation of process piping and instrumentation diagrams and schematics, complete in all respects for all systems/packages of the power plant.
- 4.06.06 Preparation of consolidated schedules and bills of materials, including line numbers, tag numbers, source of supply, service conditions, specifications, materials, types and connections details, quantities for items of the plant including dampers, steam traps, strainers, instrumentations, ducting.
- 4.06.07 Sizing of all piping and equipment as per the stipulated design criteria; carrying out of flexibility analysis/dynamic analysis as necessary; hangers & support Owner's engineering.
- 4.06.08 Final revision of all documents including preparation and compilation of Instruction Manuals for installation, commissioning, operation and maintenance for all equipment and systems. Refer clause 5.00.00 for the specific requirement in this regard.

4.06.09 Certification and submission of final as-built drawings for all areas.

4.06.10 Preparation and compilation of all drawings, schedules and instructions, which may be required at site, whether separately, mentioned or not.

4.06.11 All erection and assembly drawings, which may be required at site.

5.00.00 INSTRUCTION MANUALS

5.01.00 The Bidder shall provide all necessary instruction manuals for the Owner's review, comment, and final acceptance as required in the contract. The instruction manual shall contain full details required for erection, commissioning, operation and maintenance of each equipment. The instruction manual shall be submitted in the form of one (1) soft copy in CD and 15 hard copies.

5.02.00 Erection Manuals

The erection manuals shall be submitted at least three (3) months prior to commencement of erection activities of particular equipment/system. The manuals shall contain the following as a minimum:

- a) Erection strategy.
- b) Sequence of erection.
- c) List of tools, tackles, heavy equipment like cranes, dozers etc. Required for erection.
- d) Bill of Materials.
- e) Safety precautions to be followed during erection.
- f) Erection instructions.
- g) Critical checks and permissible deviation/tolerances.
- h) Check-list for pre-commissioning activities
- i) Checklist for commissioning of the system.
- j) Procedure for initial checking, testing and acceptance norms.

5.03.00 Operation & Maintenance Manuals

5.03.01 The operating and maintenance instructions together with drawings of the equipment, as completed, shall be in sufficient detail to enable the Owner to operate, maintain, dismantle, reassemble, and adjust all parts of the equipment. They shall outline a systematic procedure for all operations likely to be carried out during the life of the plant/ equipment. Each manual shall include a complete set of drawings together with performance/ rating curves of the equipment and test certificates wherever applicable.

5.03.02 If after commissioning and initial operation of the plant, the manuals require any modification/ additions in the view of the Owner or Bidder, the same shall be incorporated and the updated final manuals shall be submitted to the Owner.

5.03.03 The manuals shall include the following:

- a) List of spare parts along with their drawing, catalogue, and Performa for ordering spares.
- b) Location and identification guide for bearings of various equipment and lubrication schedule including charts showing lubrication checking, testing and replacement procedure.
- c) Wherever applicable, fault location charts shall be included to facilitate fault detection.
- d) Detailed specification for all consumables (including lubricating oils, greases, chemicals etc.) required for each equipment.

6.00.00 PLANT HANDBOOK

The Bidder shall provide the plant handbook to the Owner as per provision of the contract.

The Plant Handbook shall contain the following as a minimum:

- a) Design and performance data
- b) Process & instrumentation diagrams
- c) Single line diagrams
- d) Sequence & Protection interlock schemes
- e) Alarm and trip values
- f) Performance curves
- g) General layout plan and layout of Balance of Plant building and auxiliary buildings
- h) Important Do's and Don'ts.

7.00.00 TENDER STAGE DOCUMENT SUBMISSION

7.01.00 The Bidder shall submit along with his bid all documents/drawings as specified in RFP and respective sections of the Technical Specifications in Vol-II and Vol-III. The documents shall include but not be limited to the following:

- a) All Bid proposal sheets duly filled up.
- b) Detailed experience list and financial resources of the Prime Bidder his collaborators/associates in this bid as well as the sub-vendors proposed.
- c) Scheme drawings indicating scope of supply and service as offered by the Bidder indicating clearly exclusions, if any.
- d) List of terminal points of the package offered together with quality and quantity of various input (i.e. water, air, electricity etc.) as required from the Owner at such interfaces.

- e) Equipment GA, Layout, Design Calculations, interlock and other write-up, catalogues/literature etc. as required for clear understanding of the bid submitted.
- f) High level project schedule network indicating target dates for intermediate milestones and final commissioning of plant systems; This network shall be supplemented by a detailed write-up on proposed sequence and method of execution for project implementation, deployment schedule for Key personnel with their bio-data, schedule of construction machinery etc.

8.00.00 CONTRACT STAGE DOCUMENT SUBMISSION AND APPROVAL PROCEDURE

- 8.01.00 Owner's Engineering schedule shall be submitted by the Bidder as indicated in the RFP. Owner's Engineering schedule shall be developed in format as desired by the Owner/consultant.

The documents shall be divided into two categories: a) for approval and b) for information/further Owner's Engineering and co-ordination by the Consultant.

In preparing this schedule, the Bidder shall allow one (1) week from date of receipt for review and comments by the Consultant for each submission of a document.

This document submission schedule shall require acceptance by the Owner/Consultant.

Bidder shall also develop and submit a Master drawing list to the Owner/consultant.

- 8.02.00 All contract documents shall be marked with the name of the Owner, the Project, the specification title and number and the unit designation.

All dimensions shall be in metric units.

All notes, markings etc. shall be in English.

- 8.03.00 Documents/Drawings, submitted during tender stage, shall be revalidated or revised as required and submitted as certified contract document for approval/information of the Owner/Consultant.

- 8.04.00 Unless specified otherwise, the following categories of documents/drawings would require approval of the Owner/Consultant:

- a) System scheme and Process & instrumentation Diagrams (P & IDs).

- b) Design basis documents / memoranda / calculations justifying sizing and selection of equipment, vessels, tanks, piping, valves & specialties as well as the process parameters.
- c) Equipment data sheets and general arrangement drawings.
- d) Materials of construction.
- e) General Arrangement and Layout drawings.
- f) Typical control schemes, circuit diagrams, drive/ feeder-wise control scheme showing all external interfaces.
- g) Control System Configuration
- h) Shop Inspection and Testing Procedures, Test Set-up & Instrumentation, Acceptance Criteria and Codes / Standards followed, correction curves / charts, etc.
- i) Performance Test Procedures, Instrumentation, Acceptance Criteria and Codes / Standards followed, correction curves / charts, etc.
- j) Schedules covering equipment delivery schedules, erection, testing and commissioning schedules at L1 and L2 levels.

8.05.00 Unless specified otherwise, the following categories of documents / drawings would be treated for information/further Owner's Engineering by the Owner/Consultant. The Bidder shall, however, incorporate all additional information and clarifications in these documents/ drawings as and when desired by the Owner/ Consultant.

- a) Equipment foundation drawings.
- a) Equipment cross-section drawings, product literature etc. which are of proprietary nature.
- b) Predicted performance curves of equipment.
- c) Various bills of quantity, schedules etc.
- d) Piping fabrication drawings, isometrics etc.
- e) Panel wiring diagrams.
- f) Instruction/Operation manuals.

- g) Service manuals and trouble shooting guide for C & I system including field instruments.
- h) Operation logic diagrams.
- i) Cable schedule and interconnection chart.

In essence, the Bidder is solely responsible for corrections and adequacy of design & Owner's Engineering for documents under this category.

8.06.00 Upon review, the Consultant shall put his remarks and one of the following action stamps on the drawing / document:

- a) Approved.
- b) Approved except as noted, forward final drawing
- c) Approved except as noted, resubmission required.
- d) Disapproved.
- e) For information/reference only.

For action stamps in category (c) & (d), documents must be resubmitted for review by the Owner/Consultant. For action stamp in category (b), further review by Owner/Consultant would not be necessary provided the Bidder agrees & incorporates the minor comments made on the document.

Except for action stamp under category (c) & (d), the Bidder can proceed with manufacturing and other sequential activities for those areas of a drawing/document which do not have any review comment by the Owner/Consultant.

The Consultant may accord approval in category (c) or (d) in more than one submission of a document till he is satisfied that the intent of the specification has been fully complied with. The Bidder shall be responsible for delay in such cases and no extension of time shall ordinarily be allowed on such grounds.

The Bidder's work shall be in strict accordance with the finally approved drawings and no deviation shall be permitted without written approval of the Consultant.

8.07.00 Except key plan/general yard plan, any layout drawing requiring scrutiny shall not be drawn to a scale less than 1:50.

8.08.00 For review by the Consultant, the Bidder shall furnish three (3) prints of each drawing (only for first submission). There upon all transaction of drawings including reviewed comments and stamping shall be done

in soft. All transaction of drawings shall be accompanied by a reference letter mentioning the date, revision no. and document status. Only on receiving the Approval Stamping, bidder shall distribute 6 sets of drawings (2 at WBPDCCL corporate office and 4 sets at WBPDCCL site office).. The Bidder shall furnish three (3) CDs of all as built/final drawings for Owner/Consultant site.

- 8.09.00 In case of contradiction between the stipulations above and those stated elsewhere in the specification, the stipulations herein shall prevail.

**WBPDC****EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III**

SECTION-VI

PROJECT MANAGEMENT AND SITE SERVICES

**Development Consultants Pvt. Ltd.****Volume : II-A
Section : VI
Project Management and Site Services**



CONTENT

CLAUSE NO.	DESCRIPTION
1.00.00	PROJECT MANAGEMENT SERVICES
2.00.00	SITE SERVICES
3.00.00	PROTECTION & CARE
ANNEXURE-I	LIST OF SUB-VENDORS





PROJECT MANAGEMENT AND SITE SERVICES

1.00.00 PROJECT MANAGEMENT SERVICES

1.01.00 Responsibility

The Bidder shall identify a separate and independent project management team headed by a Project Manager for the execution of this project. Responsibilities of this project Management team shall cover the areas listed below :

- a) Planning and Monitoring
- b) Owner's Engineering Management
- c) Contracts Management
- d) Quality Assurance, Inspection & Expediting
- e) Construction Management
- f) Spares Management
- g) Commissioning Management

Detailed responsibilities in the above areas are discussed below :

1.02.00 Organisation

1.02.01 Headquarters

The project management team shall be stationed at the organizational headquarter and headed by a senior level executive designated as the Project Manager who shall be responsible to Owner for the execution of the project. . He should have adequate financial power and authority to give decision.

Separately, designated leaders shall be identified for each of the areas mentioned under 1.01.00, who, in turn, will report to the Project Manager for all matters related to this contract.

1.02.02 Central Co-ordination Cell

The central coordination/ cell shall be based in Kolkata and shall have sufficient technical personnel to coordinate technical matters and to quickly resolve day to day queries or references made by Owner and his Consultants without having the need to refer to his headquarters each time.





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

1.02.03 Site Organisation

The site should have a competent construction manager for all site operations with adequate financial power and sufficient level of authority to take site decisions. The organisation chart for site should indicate the various levels of experts to be posted for supervision in the various fields in civil construction, erection, commissioning etc.

1.02.04 Organisation Chart

The Bidder shall furnish a detailed organisation chart for the project management team, clearly identifying the key personnel in each of the areas mentioned at 1.01.00 above. The expected number of executives at different levels shall also be indicated, separately for headquarters, central coordination cell and site organisation.

1.03.00 Implementation Schedule

The following milestones shall be followed by the Contractor against each activity as detailed below:

1.	Letter of Award (LOA)	Zero Date
2.	Supply Completion	
3.	Synchronization	
4.	Completion of Trial Operation	
5.	System & Completion of all facilities as per contract and handing over	
6.	P. G. Test	To be completed within three (3) months after Completion of all facilities and handing over.
7.	Guarantee/Warranty Period	For a period of 18 months from the date of completion of the facilities or twelve (12) months from the date of operation acceptance (or any part thereof), whichever occurs first and any suitable extension of time for completion of rectified job granted by Employer
8.	Final Acceptance	After the expiry of defect liability period





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

1.03.01 Owner's Engineering Schedules

These schedules shall cover various design submissions indicating different Owner's Engineering activities to be performed. Such schedules shall be furnished by the Bidder for each and every plant/systems/ equipment/ item covered in the scope of this specification.

1.03.02 Manufacturing Schedule

The Contractor shall submit to the Owner's Engineer his manufacturing and delivery schedules for all equipment within thirty (30) days from the date of issue of the Letter of Award (LOA). Such schedules shall be in line with the detailed network for all phases of the work of the Contractor. Such schedules shall be reviewed, updated and submitted to the Owner's Engineer, once in every two months thereafter, by the Contractor. Schedules shall also include the materials and equipment purchased from outside suppliers.

1.03.03 Erection Schedules

In order to achieve the overall completion schedule, the Contractor shall provide the Owner all the information covering erection sequence, testing and commissioning activities. These schedules may be based on the recommended erection procedures and will be subject to discussions/agreements with the Owner subsequent to the award of contract.

1.03.04 The successful Bidder shall have to provide all the above schedules (i.e. 1.03.01, 1.03.02 & 1.03.03) in a tabular form in addition to that in the form of L2 & L3 networks and these shall necessarily include information not limited to the earliest and latest dates for various activities/submissions and also any related constraints. However, the Bidder shall include in his proposal a Level-1 (L-1) network showing the major activities and various milestones to achieve the above mentioned completion schedule.

1.03.05 The Contractor shall provide the Owner the original disc/software for all such schedules along with requisite no. of copies (as required by the Owner) within an agreed time schedule. This time schedule will be agreed between Owner/Bidder at the time of award of Contract. The Contractor's project management software shall be compatible with that of the Owner and the input data shall be furnished to the Owner in a manner compatible with Owner's project management software, Primavera.

1.04.00 Detailed Responsibilities

1.04.01 Planning & Monitoring

a) Planning

The Bidder shall prepare a Master Network Schedule in the form of PERT network consisting of at least 500 activities.





The network shall be prepared on a Work Breakdown Structure for the project which sub-divides the project into a set of manageable systems/sub-systems. The master network will identify milestones of key events for each system/package in the areas of Owner's Engineering, procurement, manufacture and despatch and erection and commissioning. The master network shall represent the Level-I plan and will form the basis for development of detailed second and third tier execution plans. The master network shall conform to the overall schedule prescribed by Owner.

The master network should be submitted along with the bid, which would be mutually discussed and finalised before the Award of Contract. This master network would clearly indicate the responsibility of the Bidder and project management team. This master network would form a part of the contract. The master network shall also identify a complete list of inputs to be furnished by the Owner which may be required for proper interfacing and tie-up. Scheduled dates for providing such inputs shall also be indicated, which will be mutually discussed and finalised.

b) Monitoring & Progress Reporting

The progress reports would be emanated every month, one from the head office of the Contractor and another from the site office. The progress report emanating from the head office should necessarily include the following sections:

- i) Report on key milestones.
- ii) Management summary indicating critical areas with details of actions initiated and effect of any on the project.
- iii) Action needing attention of the Owner/Consultant.
- iv) Detailed package wise status of Owner's Engineering submissions, quality plan submissions and approval, procurement manufacture and despatch.

The monthly report generated from the site office should necessarily include:

- i) Report on key milestones.
- ii) Management summary indicating critical areas with details of actions initiated and effect if any on the project.
- iii) Action needing attention of the Owner/Consultant.



WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

- iv) This report would also cover the areas pertaining to the receipt of the equipment at the port, port clearance, transport, receipt at site, erection and commissioning.

In addition to the above, as the project execution progresses, the Contractor shall also be responsible for generating more frequent reports in the form of fax/e-mail information on progress in critical areas so that actions can be expedited. The exact format of the progress report shall be finalised after award of Contract.

1.04.02 Owner's Engineering Management

Based on the master network for the project (L-1) the Contractor will prepare an exhaustive list of Owner's Engineering activities for the equipment/systems covered in his scope and a detailed programme of accomplishing the same within the time frame specified in the master network. This schedule will form the Level-2 (L-2) network for Owner's Engineering activities.

Based on (L-2) network, the Bidder shall further develop the Level-3 (L-3) network for Owner's Engineering activities which will indicate schedule for data availability, drawing release date and document submission dates.

Detailed (L-2) and (L-3) networks would be submitted sequentially by the Contractor within two months from the date of issue of Letter of Award and finalised within one (1) month thereafter.

All such networks shall be provided in MS PROJECT software.

The Owner's Engineering management team should also co-ordinate all interface Owner's Engineering activity between the Contractor and the equipment sub-vendors so as to ensure the correctness and completeness of related Owner's Engineering documentation before the same is submitted to the Owner.

1.04.03 Contracts Management

Based on the master network, the Contractor shall submit L-2 programmes of manufacture and despatch. In addition, the master network shall also include periods considered for site activities viz. erection, commissioning etc. These L-2 programmes would be submitted in 2 months time from the date of award of contract and finalised within one (1) month thereafter. The Contractor will also submit site mobilisation plan. This programme would be submitted at the time of finalisation of award of contract and agreed immediately thereafter so that immediate development of the various activities at site could take place.

The Contractor should also submit L-3 programmes for the manufacturing, despatch of the various items. These networks shall also show the customer hold points (CHP) which have to be cleared by Owner or their authorised representative(s) before further manufacturing can take place. These L-3 programmes for the manufacture and despatch would clearly identify responsibilities of the Contractor, sub-Contractor and Owner. These networks





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

shall be submitted within one (1) month of the date of finalisation of the various sub-contracts by the Contractor.

In case all the manufacture is being done by the Contractor then the L-2 programmes would be themselves amplified to cover details of the manufacture, inspection, clearance by Owner and despatch.

The Contractor shall also submit the programme for procurement of bought out items, detailed shipping schedule and cash flow statement for Owner's approval.

1.04.04

Quality Assurance, Inspection and Expediting

The Contractor shall submit the list of manufacturers/sub-vendors from whom the equipment are expected to be procured and the quality assurance plans thereof for the manufacture shall be approved by the QA group of Owner before the manufacturing is commenced. The list of major suppliers would be submitted along with the bid and this shall be mutually discussed and approval will be given by the Owner during contract negotiation meeting prior to placement of Letter of Award. This approved list will be binding to the bidder. In the said list, Owner reserves the right to include reputed/reliable vendors of his own choice. Regarding the various other sub-vendors, the list would be submitted within six (6) months of the award of the contract that shall be scrutinized by the Owner to accord approval. In such list Owner reserves the right to include vendors of his own choice. No further vendor approval will be given after six (6) months. On the quality plans, the customer hold points will also be identified based on which Owner would give clearance for the manufacture to proceed further.

Quality assurance/Inspection group of Owner or its representative would issue a material despatch clearance certificate (MDCC) after the inspection clearance which will enable the Contractor to despatch the equipment and claim the payment. In the despatch programme, the Contractor shall indicate a schedule of estimated programme, tonnages specifically identifying various oversize dimensioned consignments (ODC). Further the Contractor will also be required to ensure at all stages of shipment that packing of all shipments despatched are suitable for ocean freight to India, handling at the port of entry, inland transportation and preservation at site up to erection. All despatch details & item lists shall be made available to both Owner & site immediately after shipping.

The Contractor shall also expedite all despatches from their own works/works of their sub-vendors, so as to match with the various activities mentioned at 1.04.03 above.

1.04.05

Construction Management

Based on the L-1 Master Network Programme, within two (2) months of the issue of Letter of Award, the Contractor shall submit a programme of construction/erection/commissioning, either in continuation with the manufacture and despatch or separately for the implementation. These





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

programmes would be amplified showing when the civil drawings shall be released by him and construction of civil works shall be completed by him to facilitate start of erection and subsequent activities and shall form the basis for site execution and detailed monitoring. The three monthly rolling programme with the first month's programme being tentative based on the site conditions would be prepared based on these L-3 programmes. The Contractor shall also be involved along with the Owner to tie up detailed resource mobilisation plan over the period of time of the contract matching with the performance targets.

The L-3 programme would be jointly finalised by the site in-charge of the Contractor with the Owner's project coordinator as well as the site planning representative. The erection programme will also identify the sequential erectable tonnages that are required for various equipment which should be taken care of in the despatch programmes.

Erection and commissioning of the equipment shall also be done under the supervision of experts from the respective equipment/ system supplier.

1.04.06 **Spares Management**

Along with the proposal for the plant and equipment, the Contractor shall also submit proposals/schedule for the following:

- a) Mandatory spares
- b) Recommended spares

While the award for mandatory spares will be finalised at the time of the award of contract, recommended spares will be finalised within twelve (12) months thereafter.

1.05.00 **Project Progress Review Meetings**

Keeping in mind the overall responsibility of the Contractor it is intended that periodic progress reviews on the entire activities of execution in respect of Sagardighi Thermal Power Plant unit #5 will be held initially at least once in two (2) months at Kolkata/site. During peak period it may be held once in a month. These meetings will be attended by reasonably higher officials of the Contractor and their leading sub- contractors and will be used as a forum for discussing all areas where progress needs to be speeded up. Actions will be placed on the concerned agencies and decisions will be taken to expedite/speed up the progress. Minutes of such meetings will be issued reflecting the major discussions and decisions taken and circulated to all concerned for reference and action. The Contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.

In addition to the above, and to streamline the construction and erection at site, a suitable frequency and forum of periodic meetings between the Contractor and the Owner will be decided upon as part of erection coordination procedure. Site co-ordination meeting may be held on weekly basis.





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

1.06.00 **Owner's Consultant**

The Owner would appoint a consultant to assist him in some of the areas mentioned at 1.01.00 above. The details of interaction and procedures for coordination between Owner/Owner's Consultant and Contractor/Contractor's project management team shall be finalised during contract negotiations.

1.07.00 **Commissioning Management**

1.07.01 For commissioning of the various equipment/system covered under the scope of contract, Owner will form an organisation structure which may consist of the following committees. The Contractor shall nominate his representative on one or more of the committee as decided by the Owner:

- a) Commissioning Teams.
- b) Testing Teams.

1.07.02 Commissioning documents shall be prepared by the Contractor in the following manner and submitted for Owner's approval :

- a) Paper of Principle

This document shall be prepared for the various equipment/ systems under commissioning and shall have the following objectives to fulfill and shall be submitted for Owner's approval at least six (6) months before their actual commissioning :

- i) Establish design data against which Plant Performance will be compared.
- ii) Set-out the testing objectives and proposals.
- iii) Define the documentation required.

- b) **Testing/Commissioning Schedule**

These shall be prepared for the various equipment/systems under consideration and shall contain sections like detailed testing method, programme, safety, individual responsibility and results.

- c) **Standard Check Lists**

Standard checklists are intended for use at the completion of erection to ensure correct erection, testing and to a limited extent operation for repetitive items.





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

1.07.03 Test Reports

After the completion of commissioning activity of equipment/ systems, the Contractor shall prepare the test reports which shall include all the relevant information related to various commissioning checks, tests carried out, any deviations/commissions noticed with respect to the intended design requirements, sequence of various commissioning activities as actually adopted vis-à-vis as recommended in the procedures, programme schedules achieved and any other such information as required. These test reports shall be submitted in requisite number of copies to the Owner and this should be duly signed jointly by the Owner/Consultant and the Contractor/Equipment supplier, who are involved during the commissioning activities.

2.00.00 SITE SERVICES

These services shall be rendered by the Bidder as part of the overall project management service. The services shall broadly include but not be limited to the following :

- 2.01.00 Arranging material despatch from the shop by rail/road and/or sea as applicable.
- 2.02.00 Monitoring movement of materials & follow-up as necessary with Railways, road transport, port clearance etc. from the time of despatch F.O.R. works/F.O.B. port of shipment by Contractor till receipt of the same at site.
- 2.03.00 Unloading of materials at Railway Station/Railway Siding inside project area, transportation to site store, assessment of lost/damaged items in transit and arranging insurance claims and replacement of lost/damaged items. The Contractor shall submit to the Owner's Engineer a report detailing all the receipts during the week.
- 2.04.00 Issuing materials from site store/open yard from time to time for erection as per the construction programme. The Contractor shall be the custodian of all the materials issued till the plant is officially taken over by the Owner after complete erection and successful trial run & commissioning.
- 2.05.00 Transportation of materials to their respective places of erection and erection of the complete plant & equipment as supplied under this specification.
- 2.06.00 Trial run and commissioning of individual equipment/sub-systems and the plant as a whole to the satisfaction of the Owner, including supply of temporary equipment & services for chemical cleaning, steam blowing as well as performance guarantee tests.

For Coal Handling Plant, satisfactory operation of the system, amongst others, shall consist of operation without spillage or choking anywhere even during monsoon.





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

Provision for preservation of individual equipment after trial run and commissioning e.g. Nitrogen blanketing etc. as necessary shall also be in the scope of the Bidder.

- 2.07.00 Supply and application of the final paints lubricating oils and all consumable till completion of facilities and hand over..
- 2.08.00 For the purpose of erection and commissioning the Contractor's scope of work shall include but not be limited to the following :
- 2.08.01 Deployment of all skilled and unskilled manpower required for erection, supervision of erection, watch & ward, commissioning and other services to be rendered under this specification.
- 2.08.02 Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for the erection work to be handled under the scope of this specification.
- Supply of commissioning spares.
- 2.08.03 Supply of all chemicals and consumables, e.g. Regeneration chemicals, alum, lime, polyelectrolyte, resin, welding electrodes, cleaning agents, diesel oil, grease, lubricant etc. as well as materials required for temporary supports, scaffolding etc. as necessary for such erection commissioning work till completion of facilities and hand over, except those listed under exclusion elsewhere in this specification.
- 2.08.04 Construction of all civil/structural/architectural works, including construction of foundation for all equipment supplied as required, grouting of equipment on foundation after alignment, and all other incidental civil activities as detailed elsewhere.
- 2.08.05 All structural steel fabrication and erection work as detailed elsewhere in the specification.
- 2.08.06 Providing support services for the Contractor's erection staff e.g. construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, insurance cover, watch & ward for security and safety of the materials under the Contractor's custody etc. as required.
- 2.08.07 Maintaining proper documentation of all the site activities undertaken by the Contractor as per the proforma mutually agreed with the Owner; submitting monthly progress reports as also any such document as and when desired by the Owner; taking approval of all statutory authorities e.g. Boiler Inspector, Factory Inspector, Inspector of Explosives etc. for respective portions of work under the jurisdiction of such statutes or laws.
- 2.08.08 The Contractor shall provide 'Industrial Relations' unit and 'Medical' unit to take care of his erection staff and the Owner shall have no obligation in this regard.





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

2.09.00 Site Organisation

The Contractor shall maintain a site organisation of adequate strength in respect of manpower, construction machinery and other implements at all times for smooth execution of the contract. This organisation shall be reinforced from time to time, as required, to make up for slippages from the schedule without any commercial implication to the Owner. The site organisation shall be headed by a competent construction manager having sufficient authority to take decisions at site.

On award of contract, the Contractor shall submit to the Owner a site organisation chart indicating the various levels of experts to be deployed on the job. The Owner reserves the right to reject or approve the list of personnel proposed by the Contractor. The persons, whose bio-data have been approved by the Owner, will have to be posted at site and deviations in this regard will not generally be permitted.

The Contractor shall also submit to the Owner for approval a list of construction equipment, erection tools, tackle etc. prior to commencement of site activities. These tools & tackle shall not be removed from site without written permission of the Owner.

2.10.00 General Guidelines for Field Activities

2.10.01 The Contractor shall execute the works in a professional manner so as to achieve the target schedule without any sacrifice on quality and maintaining highest standards of safety and cleanliness.

2.10.02 The Contractor shall co-operate with the Owner and other Contractors working in site and arrange to perform his work in a manner so as to minimise interference with other Contractors' works. The Owner's Owner's Engineer shall be notified promptly of any defect in other Contractor's works that could affect the Contractor's work. If rescheduling of Contractor's work is requested by the Owner's Owner's Engineer in the interest of overall site activities, the same shall be complied with by the Contractor. In all cases of controversy, the decision of the Owner shall be final and binding on the Contractor without any commercial implication to owner.

2.10.03 The Owner's Engineer shall hold weekly meetings of all the Contractors working at Site at a time and a place to be designated by the Owner's Engineer. The Contractor shall attend such meetings and take notes of discussions during the meeting and the decisions of the Owner's Engineer and shall strictly adhere to those decisions in performing his Work. In addition to the above weekly meeting, Owner's Engineer may call for other meetings either with individual contractors or with selected number of contractors and in such a case the Contractor, if called will also attend such meetings.

2.10.04 Time is the essence of the Contract and the Contractor shall be responsible for performance of his Work in accordance with the specified construction schedule. If at any time the Contractor is falling behind the schedule, he shall





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

take necessary action to make good of such delays by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such action in writing to the Owner's Engineer, satisfying that his action will compensate for the delay. The Contractor shall not be allowed any extra compensation for such action.

- 2.10.05 The Owner's Engineer shall however not be responsible for provision of additional labour and or materials or supply or any other services to the Contractor except for the co-ordination work between various Contractors as set out earlier.
- 2.10.06 The works under execution shall be open to inspection & supervision by the Owner's Owner's Engineer at all times. The Contractor shall give reasonable notice to the Owner before covering up or otherwise placing beyond the reach of inspection any work in order that same may be verified, if so desired by the Owner.
- 2.10.07 Every effort shall be made to maintain the highest quality of workmanship by stringent supervision and inspection at every stage of execution. Manufacturer's instruction manual and guidelines on sequence of erection and precautions shall be strictly followed. Should any error or ambiguity be discovered in such documents, the same shall be brought to the notice of the Owner's Owner's Engineer. Manufacturer's interpretation in such cases shall be binding on the Contractor.
- 2.10.08 The Contractor shall comply with all the rules and regulations of the local authorities, all statutory laws including Minimum Wages, Workmen Compensation etc. The contractor shall engage maximum number of local unskilled and semi skilled labours for construction works. All registration and statutory inspection fees, if any, in respect of the work executed by the Contractor shall be to his account.
- 2.10.09 All the works such as cleaning, checking, leveling, blue matching, aligning, assembling, temporary erection for alignment, opening, dismantling of certain equipments for checking and cleaning, surface preparation, edge preparation, fabrication of tubes and pipes as per general Owner's Engineering practice at site, cutting grinding, straightening, chamfering, filling, chipping, drilling, reaming, scrapping, shaping, fitting-up bolting/welding, etc., as may be applicable in such erection and are necessary to complete the work satisfactorily, are to be treated as incidental and the same shall be carried out by the Contractor as part of the work.
- 2.10.10 In case of any class of work for which there is no such specification as laid down in the contract such as, blue matching, welding of stainless steel parts, etc., the work shall be carried out in accordance with the instructions and requirements of the Owner's Engineer.
- 2.10.11 It may sometimes be necessary to remove some of the erected structural members to facilitate erection of bigger/pre-assembled equipment. In such cases, the removal and re-erection of such members, which are essential, and if so agreed by the Owner's Engineer, will have to be done by the Contractor.





- 2.10.12 Attachment welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow nozzles and control valves etc., both for regular measurement and performance testing to be provided on equipment, its auxiliaries or pipelines covered within the scope of this tender, will also be the responsibility of the Contractor and the same will be done as per the instructions of Owner's Engineer. The erection and welding of all above items will be the Contractor's responsibility, even if :
- a) Product groups under which these items are re-leased are not covered in the scope of this tender.
 - b) Items are supplied by an agency other than the Contractor.
- 2.10.13 Preservation of all materials/equipment under custody of the Contractor during storage, pre-assembly & erection, commissioning etc., shall be the responsibility of the Contractor. All necessary preservatives and consumables like paints, etc., shall be arranged by the Contractor. Necessary touch up painting, periodic application of preservatives/paints on pressure parts/other equipment even after erection until completion of work shall be carried out by the Contractor. The Contractor shall fabricate piping, install lub oil systems and carry out the acid cleaning of fabricated piping. The Contractor shall also service the lub oil system, carryout the hydraulic test of oil coolers, etc.
- 2.10.14 It is responsibility of the Contractor to do the alignment etc. if necessary, repeatedly to satisfy Owner's Engineer, with all the necessary tools & tackles, manpower, etc. The alignment will be complete only when jointly certified so, by the Contractor's Owner's Engineer & Owner. Also the Contractor should ensure that the alignment is not disturbed afterwards.
- 2.10.15 Additional platforms for approaching different equipment as per site requirement, which may not be indicated in drawings, shall be fabricated and erected by the Contractor. The materials required for these works shall be supplied by the Contractor and he will have to fabricate them to suit the requirement.
- 2.10.16 Equipment and material, which are wrongly installed, shall be removed and reinstalled to comply with the design requirement at the Contractor's expense, to the satisfaction of the Owner/ Consultant.
- 2.10.17 Before erection of any equipment on a foundation, the Contractor shall check and undertake if necessary rectification of foundation bolts, reaming of holes, drilling of dowels, matching of bolts and nuts, making new dowel pin, etc.
- 2.10.18 Assistance for calibrating/testing the power cylinders, valves, gauges, instruments, etc., and setting of actuators coming under various groups shall be provided by Contractor.
- 2.10.19 It shall be the responsibility of the Contractor to provide ladders on columns for initial works till such time stairways are completed. For this, the ladder should not be welded on the column and should be prefabricated clamping type. No





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

temporary welding on any structural member is permitted except under special circumstances with the approval of Owner.

- 2.10.20 Structural materials required for the supporting/operating platforms required for the valves at various levels for the safe operation of valves will be arranged by the Contractor.
- 2.10.21 For civil, structural and architectural works, volume IIG/1 & IIG/2 may be referred. For Instrumentation and Electrical works Vol. IIE and Vol. IIF1 & F2 may be referred.
- 2.11.00 Safety
- 2.11.01 Safety and overall cleanliness of work site shall be given top priority. The Contractor shall ensure the safety of all workmen, materials and equipment either belonging to him or to others working at site. He shall observe safety rules & codes applied by the Owner at site without exception.
- 2.11.02 The Contractor shall notify the Owner of his intention to bring to site any equipment or material which may create hazard. The Owner shall have the right to prescribe the conditions under which such equipment or material may be handled and the Contractor shall adhere to such instructions. The Owner may prohibit the use of any construction machinery, which according to him is unsafe. No claim for compensation due to such prohibition will be entertained by the Owner.
- 2.11.03 Storage of petroleum products & explosives for construction work shall be as per rules and regulation laid down in Petroleum Act, Explosive Act and Petroleum and Carbide of Calcium Manual. Approvals as necessary from Chief Inspector of Explosives or other statutory authorities shall be the responsibility of the Contractor.
- 2.11.04 The Contractor shall be responsible for safe storage of his and his sub-contractor's radioactive sources.
- 2.11.05 All requisite tests & inspection of handling equipment, lifting tools & tackle shall be periodically done by the Contractor. Defective equipment shall be removed from service. Any equipment shall not be loaded in excess of its recommended safe working load.
- 2.11.06 All combustible waste and rubbish shall be collected and removed from the worksite at least once each day. Use of undercoated canvas paper, corrugated paper, fabricated carton, plastic or other flammable materials shall be restricted to the minimum and promptly removed.
- 2.11.07 The Contractor shall provide adequate number of fire protection equipment of the required types for his stores, office, temporary structures, labour colony etc. Personnel trained for fire-fighting shall be made available by the Contractor at site during the entire period of the Contract.





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

- 2.11.08 All electrical appliances used in the work shall be in good working condition and shall be properly earthed. No maintenance work shall be carried out on live equipment. The Contractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installation.
- 2.11.09 All workmen of the Contractor working in construction site shall wear safety helmets, safety boots and safety belts. The Contractor shall take appropriate insurance cover against accidents for his workmen as well as third party.
- 2.11.10 All the worksites shall be provided with adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. by the Contractor for proper working environment during night times.
- 2.11.11 Adequate number of temporary toilets/urinals (men & women separate) shall be provided at work places with soak pits. Adequate drinking water facilities and rest rooms shall be provided for workers to take food and rest.
- 2.11.12 All safety precautions shall be taken for welding and cutting operations as per IS-818.
- 2.11.13 All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.
- 2.12.00 Taking Delivery & Storage
- 2.12.01 The Contractor shall arrange issue of all equipment and materials to be erected under the contract from the stores/open yard at site by signing on standard indent forms. After completion of work, detailed auditing of the materials so issued shall be submitted to the Owner.
- 2.12.02 The Contractor shall arrange for proper and safe storage of materials till the same are taken over by the Owner as per terms of the contract. Manufacturer's instructions for preservation shall be strictly followed.
- 2.12.03 All empty containers, packing materials, gunny bags, transport frames and also surplus and unused materials reconciliation prior to completion of contract shall be the property of the Owner and returned to the Owner by the Contractor.
- 2.13.00 Site Welding & Heat Treatment
- 2.13.01 Welding shall be done in accordance with IS-813, IS-816, IS-9595 & other relevant IS/International standards and as per instructions of Contractor. Only those welders, who are qualified as per IS-817 for ordinary welds and as per IBR/ASME Section-IX for high pressure welds, shall be employed in the job.
- 2.13.02 All welders shall be tested and approved by Owner's Engineer before they are actually engaged on the work even though they may possess the requisite certificates. The Owner reserves the right to reject any welder without assigning any reason. The welder identification code as approved by the Owner's Engineer shall be stamped by the welder on each joint done by them. The





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

Contractor will be responsible for the periodic renewal, re-testing of the welders as demanded by Owner.

- 2.13.03 The Owner's Engineer is entitled to stop Contractor's any welder from his work if his work is unsatisfactory for any technical reason or there is a high percentage of the rejection of joints welded by him, which in the opinion of Owner's Engineer will adversely affect the quality of welding even though the welder has earlier passed the tests. The welders having passed the tests do not relieve the Contractor from his contractual obligations, to check the performance of the welders.
- 2.13.04 All charges for testing of welders including destructive and non- destructive tests if conducted by Owner or by the inspection authority at site shall have to be borne by the Contractor. The necessary test materials and consumables will have to be arranged by the Contractor and all testing facility made available, as required.
- 2.13.05 All welded joints shall be subject to acceptance by Owner's Engineer. Inspection of welds shall be in accordance with IS-822 or equivalent code.
- 2.13.06 Preheating/post-heating and stress relieving after welding are part of fabrication and erection work and shall be performed by the Contractor in accordance with the instruction of Owner's Engineer. Contractor shall arrange to supply heating equipment with automatic recording devices. Also the Contractor shall have to arrange for the labour, heating elements, thermocouples, compensating cables, insulation materials like mineral wools, asbestos cloth, ceramic beads, asbestos rope, etc. required for the heat-treatment and stress relieving works. During pre- heat/stress relieving operations, the temperature shall be measured at one or more points as required by attaching thermocouples and recorded on a continuous printing type recorder. All the record graphs for the heat treatment works carried out shall be got signed by the Owner's Engineer prior to the commencement of each cycle and handed over to Owner's Engineer on completion. The graphs will be the property of Owner. The Contractor has to provide thermo-chalks temperature recorders, thermocouple attachments, units, graph sheets, etc. required for the job and maintain them in good condition.
- 2.13.07 All electrodes shall be baked and dried in the electric/electrode drying oven to the required temperature and for the period specified by the Owner's Engineer before they are used in erection work. The electrodes used shall be as per IS-814, IS-815, IS-1442, IS-7280 and other codes as applicable, and shall be of approved reputed manufacture. The electrodes shall meet the requirement of the pipe material. No electrode manufactured more than 12 months ago and the type covered under certificate issued after conducting tests more than 6 months ago shall be used. All electrodes shall be preserved at works and at site as per manufacturer's recommendations.
- 2.13.08 Oxy-acetylene flame or Exothermic chemical heating for stress relieving is not permitted. Heating shall be by means, of electric induction coil or electric resistance coil.





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

- 2.13.09 It may become necessary to adopt inter layer radiography/MPT/UT depending upon the site/technical requirement necessitating interruptions in continuation of the work and making necessary arrangement for carrying out the above work.
- 2.13.10 Gas tungsten arc welding process (TIG) shall be adopted for all root pass welds except for structural works until 4.75 mm thickness is deposited. Subsequent welding after root pass can be carried out by manual metal arc welding with coated electrodes. For pipes of thickness less than 6 mm the entire welding has to be carried out by TIG welding.
- Fillet weld shall be made by shielded metal arc process as per applicable codes.
- However, the Owner's Engineer will have the option of changing the method of welding as per site requirement. The method adopted for manual arc welding shall be weaving technique and the width of weaving shall not exceed 1.5 times of the dia. of the electrode.
- In case of deviation from welding process and electrodes, the Contractor shall take approval of the Owner prior to adoption of same.
- 2.13.11 The root pass for butt joints shall be such as to achieve full penetration with complete fusion of root edges.
- 2.13.12 Each pass shall be cleared and freed of slag before the next pass is deposited.
- 2.13.13 On completion of each run, craters, weld irregularities, slag etc. shall be removed by grinding or chipping.
- 2.13.14 Each layer of welding shall have an even and smooth appearance.
- 2.13.15 Welding sequence shall be adjusted in such a way that distortion due to welding shrinkage is minimised. Further any movement, shock or vibration during welding shall be avoided to prevent weld cracks.
- 2.13.16 Proper protection of welders and the work shall be taken during periods of rain. No welding shall be carried out when surfaced to be welded are wet from any cause.
- 2.13.17 Following will be stages of inspection during welding:
- a) Two pieces to be joined shall be individually checked for the weld edge preparation and profile dimensionally and to the template. Dye penetrant check shall be carried out on edge prepared surfaces at random. The percentage will depend upon on criticality as specified by Owner's Engineer.
 - b) Joint fit up will be a stage of inspection. Misalignment after fit up may vary from 0.3 mm to 1.6 mm depending on outside diameter and thickness.





WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

- c) All joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.
- 2.13.18 All welded joints shall be painted with anti-corrosive paint immediately on completion of radiography and stress-relieving.
- 2.14.00 For further details on procedures of work at site on civil, architectural, electrical and instrumentation & control services, refer Volume: II-E, II-F1 & F2 and II-G/1 G/2 & G/3 of this specification.
- 3.00.00 **PROTECTION AND CARE**
- 3.01.00 All construction and erection activities for this project are to be carried out in the plant premises.
- 3.02.00 Generator Stator Lifting may be considered by either of the two options as mentioned below:
- a) With the help of two (2) nos. turbine room cranes.
- b) With the help of separate lifting arrangement to be provided by the Bidder from outside the TG building A-row column before the construction of A-row building wall.



**REQUIREMENTS OF SPARES, TOOLS & TACKLE,
LUBRICANTS/OIL/CONSUMABLES**

1.00.00 TOOLS & TACKLE

The Contractor shall supply with the equipment one complete set of special tools and tackle as required for the erection, assembly, dismantling & maintenance of the equipment. These special tools will also include special material handling equipment, jigs & fixtures for maintenance and calibration/readjustment, checking & measurement aids etc. A list of such tools & tackle shall be submitted by the Bidder along with the offer. Detailed description of each tools/tackle, its function along with the equipment/part for which it is meant for and the price of each tools/tackle shall also be indicated in the offer. These tools & tackle shall be separately packed and sent to site before the first unit commissioning. The Bidder shall also ensure that these tools are not used for erection purpose.

2.00.00 SPARES

2.01.00 General

The Bidder shall indicate and include in his scope of supply all the necessary start-up, commissioning and recommended spares in addition to mandatory spares as specified elsewhere in the specification. The Owner reserves the right to buy any or all mandatory and recommended spares. The Contractor shall also state for each item of spares both mandatory and recommended, the normal expected service life.

2.01.01 All spares supplied under this contract shall be strictly interchangeable with the parts for which they are intended to replace. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site, e.g. small items shall be packed in sealed transparent plastic bags with dessicator packs as necessary.

2.01.02 Each spare part shall be clearly marked or labelled on the outside of the packing with the description. When more than one spare part is packed in a single case, a general description of the contents shall be shown on the outside and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purposes of identification.

2.01.03 All cases, containers or other packages are liable to be opened for examination as may be considered necessary by the Engineer.

2.01.04 All mandatory spares shall be delivered to site within one to three months prior to the scheduled date of the trial operation of the plant. However, they shall not be despatched before the despatch of the associated main equipment.

- 2.01.05 The Bidder shall also guarantee supply of spare parts, which will be made, based on manufacturer's drawings on special order from the Purchaser for 30 years after commissioning of the plant.
- 2.01.06 Warranty period for all kinds of spares shall be six thousand (6000) hours of operation, except normal wear or eighteen (18) months from the date of receipt at site, whichever is earlier. In case of failure or non-conformance to specifications, the Contractor shall replace them free of cost.
- 2.02.00 **Recommended Spares**
- 2.02.01 The Contractor shall provide a list of recommended spares giving unit prices and total prices for 2 years of normal operation of the plant for spares of indigenous origin, and for 5 years of normal operation for spares of non-indigenous origin. This list shall take into consideration the mandatory spares specified elsewhere in the specification and should be a separate list.
- 2.02.02 The price of recommended spares will not be used for the evaluation of bids. The price of these spares shall remain valid for a period as specified elsewhere in the specification from the date of Award of the Contract. Where the recommended spares are the same as mandatory spares, the prices shall be the same. The prices of any recommended spares, which are not common with mandatory spares, shall be subject to review by the Owner, and shall be finalised after mutual discussion.
- 2.03.00 **Start-up Commissioning Spares**
- 2.03.01 Start-up commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system. All spares used until the plant is handed over to the Owner shall come under this category. Said spares, properly marked, shall be supplied together with the main equipment and shall be used by the Contractor, if needed, during erection & commissioning stage. All such spares which remain unused till issuance of Taking Over Certificate by the Owner, along with an equipment-wise quantitative consumption report shall be returned to the Owner during time of handover. The list of commissioning spares to be brought by the Contractor to ensure smooth commissioning of the plant shall be subject to the Engineer's approval.
- 2.03.02 The Contractor shall submit a complete BBU list inclusive of recommended, mandatory, initial start-up and commissioning spares. Costs of the above spares, which are consumed before the handing-over of the plant, shall be deemed to have been included in the lump sum proposal price of the package, and the Contractor shall have no claim on this account to the Owner.

	GENERAL SPECIFICATION FOR ERECTION, COMMISSIONING, PG TEST & HANDING OVER	SPEC. No: ROS:6322
		REV: 00

**BHARAT HEAVY ELECTRICALS LIMITED,
RANIPET- 632 406.**

GENERAL SPECIFICATION

FOR

**ERECTION, COMMISSIONING, PG TEST & HANDING OVER
OF GAS CHLORINATION PACKAGE FOR
SAGARDIGHI UNIT #5(1X660 MW)**

00	11.09.2021	AK	DBN	MSM	Fresh issue
Rev.No	Date	Prepared	Checked	Approved	Remarks

	GENERAL SPECIFICATION FOR ERECTION, COMMISSIONING, PG TEST & HANDING OVER	SPEC. No: ROS:6322
		REV: 00

GENERAL SPECIFICATION FOR ERECTION, COMMISSIONING, PG TEST & HANDING OVER

1.0 SCOPE OF WORK ON SERVICES

The scope of Erection and Commissioning services covers erection, commissioning of Water treatment system which comprises of receipt of materials & equipment at site, unloading, storage, transportation to erection spot, erection of complete system including site fabrication, stage clearance, testing, commissioning, Performance Guarantee Test, handing over of the system.

NOTE

- I. Successful commissioning means, erection of entire system, trial run / trial operation till achieving the performance, both in terms of Quality (including electrical power consumption) and Quantity to prove the agreed performance of the system and the system is ready for PG Test. Once this stage is reached, Bidder will inform to BHEL that they are ready for PG Test. If BHEL's & Customer's Engineer is satisfied in commissioning, PG test can be conducted within 30 days from the date of such notification by Bidder to BHEL and till such time the running of the system to be taken care of by the Bidder. Conduct of PG Test shall be the responsibility of the Bidder. Necessary consumables and chemicals required for the trial run / trial operation till PG Test shall be followed as specified elsewhere in the Tender specification. In case of chemical supply by BHEL, Bidder to intimate the same to BHEL well in advance (min. 4 months) before commissioning. In case, supply of Chemicals is in Bidder's scope, Bidder to ensure the readiness of consumables and chemicals before commissioning. Further any testing chemicals for testing / calibration of instruments, consumables required for PG test shall also be ensured 4 months' in advance before commissioning, failing which the Bidder has to take the responsibility of providing the same without any commercial implication.
- II. The equipment after inspection at manufacturer's works shall be transported to BHEL site and shall be received, unloaded and stored by Bidder as detailed in the supply specification and commercial terms of the tender. Bidder shall store all high value items & critical items (such as instruments, UPS, battery, etc.,) under lock & key, using containers only. The applicable materials shall be drawn from Bidder stores as per the relevant procedure. The equipment shall be erected sequentially and shall be interconnected with the applicable piping and valve system. Necessary hydraulic testing of piping, valves etc. shall also be carried out as per supply specification. Necessary pump, blind-flanges, fasteners etc. required for the hydraulic testing are in Bidder's scope.

The scope of major equipment covered for the erection & commissioning of the Water treatment system at site is covered in Technical Specification.

	GENERAL SPECIFICATION FOR ERECTION, COMMISSIONING, PG TEST & HANDING OVER	SPEC. No: ROS:6322
		REV: 00

Apart from the scope mentioned in Technical specification, the foundation grouting materials including foundation fasteners, packing shims and final grouting shall be in the scope of bidder.

The quantity and the details given are only indicative. However, the bidder shall supply required quantity to fully cater to the system requirement and carry out the erection of all the items to meet the system requirement as complete without any commercial implication to BHEL.

- 2.0 The Intent of this specification is to provide erection, commissioning & trial operation services for execution of projects according to most modern and proven techniques and codes. It is not the intent to specify completely herein, all aspects of the entire system. Nevertheless, the entire system shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation. The contract services towards installation of the Plant shall not relieve the contractor of the responsibility of providing such services, facilities to complete the project of portion of project awarded to him. The quoted rate shall deem to be inclusive of all such contingencies.
- 3.0 The Contractor shall carry out the work in accordance with instructions/ drawings/ specification/ standard practices provided / approved by BHEL from time to time.
- 4.0 Modification / Rectification / repair / replacement of defective components if any shall be under bidder's scope within specified time.
- 5.0 Bidder to submit the erection schedule along with stage check data sheets. Each and every stage the bidder to get clearance from the BHEL Engineer / Consultant Engineer / Customer Engineer.
- 6.0 Establish the site co-ordination for identification of materials, storing and issue of materials, stage clearance for erection & commissioning.
- 7.0 Identification of consignment at Bidders stores, verification of the same in the presence BHEL official, taking delivery, co-ordination for the movement from store to erection work, safe custody, erection, commissioning and trial operation.
- 8.0 All the equipment and materials shall be stored at Bidder's store. Field storage quality plan shall be submitted for BHEL approval. It shall be the responsibility of the Bidder to take delivery from their stores and transport the same to the site. Bidder shall take fully responsibility for the custody of the supplied material till the handing over of the complete system to the end Customer. Bidder to arrange the necessary Insurance for the materials during storage, erection & commissioning, and up to handing over.

	GENERAL SPECIFICATION FOR ERECTION, COMMISSIONING, PG TEST & HANDING OVER	SPEC. No: ROS:6322
		REV: 00

- 9.0 Necessary clearance for stage check, hydraulic test, leak check obtained from the customer engineer & pre – commissioning tests shall be carried out by the bidder.
- 10.0 Commissioning and putting into satisfactory operation of all the equipment at site including successful completion of trial operation and handing over of the system to the end user.
- 11.0 Finish coat (final coat) for all the equipment before hand over of the system to BHEL/Customer as per painting specification.
- 12.0 The responsibility of making the system complete in all respects, including the shortage of materials shall be with the Bidder (as Bidder is the Custodian for the material at site till handing over of the plant)

13.0 EXCLUSIONS

The following are excluded from the scope of supplier and will be arranged by BHEL

- 13.1 All civil works pertaining to Water treatment system.
- 13.2 Service water/ construction water at one point near Water treatment system
- 13.3 Construction power supply at one point near Water Treatment System
- 13.4 Supply of service / instrument air at one point as applicable
- 13.5 Bidder shall provide the shipping list with details of dispatchable units. The requirement shall be specified by the bidder in their technical offer and the supply shall be limited to the specified quantities.

14.0 Specification, Standards & Codes:

All equipment shall be designed, tested and supplied as per the specification, relevant national / international standards & statutory codes.

15.0 Name plates, labels and directional marks:

Each equipment shall be provided with nameplate details designating the tag no., service of the item etc. Necessary directional arrow marks shall be provided.

16.0 Tools and Tackles:

All the Tools & tackles required for the complete erection of components shall be arranged by the contractor at his cost. The bidder shall have & own a complete set of special tools and tackles required for erection, assembly, disassembly and maintenance. The bidder shall also supply any special tools and tackles that may be required additionally during commissioning. All tools & tackles shall be of reputed make acceptable to the Purchaser and shall be handed over to BHEL after the completion of erection & commissioning.

	GENERAL SPECIFICATION FOR ERECTION, COMMISSIONING, PG TEST & HANDING OVER	SPEC. No: ROS:6322
		REV: 00

17.0 Commissioning Consumables / Spares:

The bidder shall supply all consumables like lubricating oil, Teflon tape, m-seal, cotton waste, tissue paper roll, sampling bottles, mugs, buckets etc required for commissioning the equipment.

The bidder shall consider sufficient quantity of the commissioning spares so that the commissioning of the system will not be delayed. The bidder shall also supply any spare components that may be required additionally during commissioning. These commissioning spares shall be included in the basic scope of supply.

18.0 Inspection & Testing:

All the stage checks & materials shall be offered to BHEL / Customer/ BHEL'S authorized representative for inspection. No material shall be dispatched without obtaining written clearance from BHEL. During inspection, the internal inspection reports shall be submitted to BHEL / customer for information.

19.0 Packing & Dispatch:

19.1 All equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site, till the time of erection. Each packing shall have necessary handling marks

19.2 Each packing shall contain a packing slip indicating the details of item like item description, quantity, weight etc.

19.3 Details of handling & Storage instruction shall also be provided in each packing.

19.4 All items shall be properly packed with adequate cushioning material to prevent damages due to rough handling and inland transport. The packing shall be in such a way so as to avoid seepage of water into the packing.

19.5 Special care shall be given to prevent damage to the fragile components.

20.0 Additional requirements

20.1 After completion of all erection and commissioning works, the left out items shall be handed over to BHEL site stores.

20.2 During commissioning at site some smaller equipment may get added or Logics may have to be changed. The bidder shall carryout these changes at site without any commercial implications to BHEL.

21.0 GENERAL INSTRUCTIONS TO THE BIDDER

	GENERAL SPECIFICATION FOR ERECTION, COMMISSIONING, PG TEST & HANDING OVER	SPEC. No: ROS:6322
		REV: 00

- 21.1 Bidder shall quote for complete work specified in the document. Incomplete quotations for the part of the work will not be considered even if the quoted rates/price is lower.
- 21.2 Bidder shall contact BHEL and obtain additional details/data if any required to submit proper quotation.
- 21.3 The BHEL reserves the right to omit any one or more items of work at any time of the contact without assigning any reason what so ever.
- 21.4 The Bidder shall include all necessary commissioning spares in his basic scope of supply and the left out spares shall be handed over to BHEL after the completion of E & C.
- 21.5 Adequate lighting facilities such as low volt hand lamps shall be arranged by the contractor at the site of construction etc. at his cost.
- 21.6 All the lifting tackles including wire ropes, slings, shackles and electrically operated equipment shall be produced for inspection by BHEL Engineer before they are actually put on use. Test certificate obtained from the statutory authority should be submitted before their usage.
- 21.7 All equipment so used by contractor shall be of proven quality and safe for operation as approved by BHEL Site Engineers from time to time.
- 21.8 At periodic / intervals of work, complete and detailed account of the equipment so erected shall be submitted to the BHEL Engineer. The required format shall be submitted to BHEL Officials for approval.
- 21.9 All equipment shall be handled very carefully to prevent any damage and loss. No bare wire ropes, slings etc., shall be used for unloading and / or handling of equipment without the specific written permission of the BHEL engineer. The equipment from Bidder's storage yard shall be moved to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage for such equipment at site.
- 21.10 The nature of work covered under the specification is highly sophisticated, requiring best quality / precision workmanship, engineering and construction management. Contractor should also ensure successful and timely commercial operation of equipment installed. The contractor must have adequate quantity of precision tools, construction aids in possession. Contractor must also have adequate trained qualified and experienced supervisory staff and skilled personnel.
- 21.11 All the necessary certificates, licenses, and statutory clearances required to carry out this scope of work are to be arranged by the contractor then and there, at no extra cost.

	GENERAL SPECIFICATION FOR ERECTION, COMMISSIONING, PG TEST & HANDING OVER	SPEC. No: ROS:6322
		REV: 00

21.12 When the work is temporarily suspended contractor shall protect all construction materials equipment and facilities from causing damage to existing property interfering with the operations of the station when it goes into services. The contractor shall comply with all applicable provisions of the safety regulations clean – up programme and other precautionary measures which the BHEL has in effect at the site.

21.13 It will be the responsibility of the contractor to ensure the safe lifting of the equipment taking due precautions to avoid any accidents and damage to other equipments and personnel.
All piping shall be adequately supported and protected to prevent damage during handling and erection.

21.14 Sometimes it may become necessary for the contractor to handle certain un-required components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.

21.15 It shall be contractor's responsibility to arrange for required labour, brush, paint and other consumable like thinner, cotton waste, cloth etc., for carrying out preservative painting. The quoted rates shall be inclusive of above work.

21.16 Due to atmospheric conditions erected materials are likely to get rusted more frequently. It is the responsibility of the contractor to preserve the erection materials drawn from their stores for erection till these are commissioned and handed over to customer. The required paint, thinner all other consumables like painting brush, emery paper, cotton waste, cloth etc., have to be arranged by the contractor at his cost. The contractor should ensure that the materials are not rusted on any account till they are handed over to customer. The decision of the BHEL Engineer is final with regard to adequacy of application of paint.

22.0 SITE CLEANLINESS AND SAFETY REQUIRMENTS:

22.1 Contractor shall strictly follow all safety regulations / conditions as per general conditions of contract booklet enclosed with this tender.

22.2 Non – conformity of safety rules and safety appliances will be viewed seriously and the BHEL has right to impose fines on the contractor as under.

22.3 Contractors shall ensure that the quality is maintained in all the works connected with this contract at all stages of the requirement of BHEL.

22.4 Contractor shall ensure that all Inspection, Measuring and Testing equipment that are used, whether owned by the contractor or used on loan, are calibrated by the authorized agencies and the valid calibration certificate will be available with them for verification by BHEL. A list of such instruments

	GENERAL SPECIFICATION FOR ERECTION, COMMISSIONING, PG TEST & HANDING OVER	SPEC. No: ROS:6322
		REV: 00

possessed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.

22.5 Contractors shall arrange for the inspection of the works at various stages as required by BHEL. Immediate corrective action shall be taken by the contractor for the non-conformances if any, observed and pointed out by BHEL.

23.0 PAYMENT TO CONTRACTORS

23.1 All payment due to the contractors shall be paid by “E-payment” only.

23.2 All recoveries due from the contractor shall be effected in full from his bills unless specific approval from the competent authorities is obtained otherwise.

23.3 The bill shall be prepared in the proforma prescribed for the purpose based on the certificate issued by BHEL Engineer that entire work as stipulated in the tender specification has been completed in all respects to the entire satisfaction of BHEL. Contractor shall give unqualified “No Due” and “No Demand” certificates. Quantities / Weight erected shall be prepared and paid as per agreed payment terms. The quantities and financial value shall be entered in Measurement Book and signed by both the parties to the contract.

24.0 OTHER STATUTORY REQUIREMENTS:

24.1 Contractor shall follow & adhere to all the statutory & safety laws, rules & regulations for labour deployed in executing erection works as amended time to time.

24.2 Principle employer’s security rules & regulations are to be followed by the contractor scrupulously in executing the contract works.

24.3 Contractor shall also adhere to the requirements of the principle employer in respect of minimum wages, provident fund, insurance, etc. as applicable to the contract labour.

24.4 Contractor should get the clearance from the principle employer (TSGENCO) & BHEL for wages etc. paid to the labour submitting the necessary proof for the same. Suitable records to be maintained by the contractor for a minimum of 3 years.

24.5 The contractor shall submit a copy of labour license obtained from the licensing Officer.

24.6 The contractor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) as per contract labour rules, copies of monthly return of PF contribution with remittance challans and copy of renewed

	<p align="center">GENERAL SPECIFICATION FOR ERECTION, COMMISSIONING, PG TEST & HANDING OVER</p>	SPEC. No: ROS:6322
		REV: 00

WC insurance policy or copies of monthly return of ESI contribution with challans (if applicable) in respect of the workmen engaged by them.

24.7 It is advisable that Contractor shall visit the site to have adequate knowledge of all the above rules & regulations before bidding for the tender. No claim shall be entertained for any ignorance of the above rules & regulations during execution of work.

24.8 BHEL shall have the right to with-hold suitable amounts from contractor bills for not making payments to labour engaged by them and not adhering to the statutory, safety rules & regulations till the contractor complies with them.

25.0 TIME OF COMPLETION

25.1 The time schedule as prescribed in the contract is the essence of the contract. The time for completion shall always be reckoned from the date of commencement of work as certified by the BHEL Engineers.

25.2 The entire work shall be completed by the contractor with in the time schedule or within the such extended time as may be allowed under relevant clause.

26.0 ENGAGEMENT OF LABOUR

26.1 The contractor will be directly responsible for provision of health and sanitary arrangements more particularly described in contract labour (regulations & Abolition) Act, safety precautions etc., as may be required for safe and satisfactory execution of the contract.

26.2 The contractor shall be responsible for proper accommodation including adequate medical facilities & transportation to the work spot and back for the personnel employed by him.

Annexure A

TECHNICAL DEVIATIONS

<i>Sl. No</i>	<i>Section no.</i>	<i>Clause No.</i>	<i>Page / No.</i>	<i>Specification</i>	<i>Statement of Deviations/variatioins</i>	<i>Reason for Deviation</i>	<i>cost of withdrawal</i>

COMPLIANCE CUM CONFIRMATION SCHEDULE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnishing same with the offer:

- 1) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions/ deviations with regard to same.
- 2) QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ Customer approval in the event of order & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. The charges for 3rd party inspection (Lloyds, TUV or equivalent) for imported components shall be included in the base price of the equipment by the bidder.
- 3) All drawings/ data – sheets etc. to be submitted during contract shall be subject to BHEL/Customer review/ approval. GA drawings, as submitted with offer at tender stage are for reference purpose only and shall be subject to approval during contract stage.
- 4) There are no other deviations with respect to specification other than those furnished in the 'Schedule of Deviations'.
- 5) The offered materials shall be either equivalent or superior to those specified. Also for components where material is not specified it shall be suitable for intended duty, materials shall be subject to approval in the event of order.
- 6) The commissioning spares (if any) are supplied on 'As Required Basis' & prices for same included in the base price (If bidders reply to this is "No commissioning spares are required" and if some spares are actually required during commissioning same shall be supplied by bidder without any cost to BHEL).
- 7) All sub vendors shall be subject to BHEL/ CUSTOMER approval.
- 8) Any special tools & tackles, if required, shall be in bidder's scope.
- 9) Demonstration parameters shall stand valid till the satisfactory completion of demonstration test and its acceptance by BHEL/Customer.

DECLARATIONS

Icertify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our format proposal number Dated and there is no deviation to the specification.

I hereby certify that I am duly authorized representative of the Bidder's company whose name appears above my signature.

Bidders Company Name

Authorized representative's Signature

Name

Bidder's Name The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated

Bharat Heavy Electricals Limited
Ranipet -632406, India.
Quality Assurance(Mech)

Ref. WT: SAGA: GAS CHLN SYT: 283

Dt. 28-09-2021

Project: Sagardighi (1X660 MW)

Item Name: Gas Chlorination System & accessories

Technical Specification: ROS: 6322, REV: 00.

Following are Quality Recommendation.

1. All the items shall be inspected at Manufacturer works as per BHEL approved QP and Drawing/approved datasheet.
2. Vendor shall submit detailed Quality Plan as per attached format for all the items (Mechanical and C&I) involved in this system.
3. Physical Inspection shall be done by BHEL/BHEL AIA at Manufacturer works.
4. Annexure 'Q' shall be dully filled by the bidders.
5. Painting shall be as per Customer approved painting scheme.
6. Packing of items shall be as per BHEL Engg Approved Packing Drawing/Packing Specifications.
7. BHEL Authorized representatives shall have the right to witness the necessary inspection and testing of goods mentioned in the PO. The supplier shall inform BHEL in advance about the readiness of the goods for inspection and testing. Inspection / Inspection wavier / approval by BHEL does not absolve Supplier's responsibility for conformity of the specification as per the terms of PO. Material Test Certificates shall be submitted to BHEL.
8. **Following Inspection Notes applicable during inspection:**
 - a) Latest version of standards & Specification shall be applied.
 - b) Materials shall be procured in compliance to Functional Technical specification.
 - c) Gauges and measuring instruments with valid calibration only shall be used.
 - d) Inspection / Inspection wavier / approval by BHEL does not absolve Supplier's responsibility for conformity of the specification as per the terms of PO.
 - e) BHEL /BHEL Authorized representatives shall have the right to witness the necessary Inspection and testing of goods mentioned in the PO.
 - f) In case of Vendor Drawing & Datasheet, it needs approval by BHEL Engineering.
 - g) This QP shall be read along with relevant PO, BHEL Specification / Approved Drawing/Datasheet.

Annexure Q

		Indent No:	Enquiry no:	
Sl.No	BHEL / Customer Requirements	## Specific confirmations by the manufacturer (Acceptable/Not acceptable)		
	Quality Plan Requirement: (If SQP is not given & Vendor QP applicable)			
	(i) MQP (Manufacturing Quality Plan) shall be submitted in attached format for BHEL/Customer review & approval. Our SQP/Typical MQP/ MQP Format is attached for guidance & use.			
	(ii) MQP shall invariably cover w.r.t Inward inspection including on Raw material Procurement, In process and Final inspection in elaborated way/details.			
	(iii) Bidder shall also to give specific confirmation that on need basis, their competent officials shall visit to BHEL / customer for finalization of Quality plan including test procedure/methodology during preaward / post award approval / detailed engineering in the event of an order.			
	(iv) No deviation on BHEL/Customer approved MQP/ SQP (In case BHEL SQP is provided) is acceptable.			
1	(v) Bidder shall agree to submit all cross referred documents other than codes/standards to BHEL/Customer/Consultant.			
	Important Notes shall be included in MQP : (a) Latest revision of Standard s & Specification shall apply. Only International Standards are applicable. (b) Materials shall be procured in compliance to Functional Technical Specification. (c) Inspection shall be in compliance with Approved Quality Control Procedure for the Product. (d) NDT shall be carried out by Qualified Personnel with compliance to Approved NDT Procedures and Acceptance Norms, as per ASME standard. (e) Gauges and measuring Instruments, with valid calibration only shall be used. (f) Cleaning and Painting of products shall be carried out as per Approved Painting Schedule. (g) Finished Products shall be packed to comply with Approved Packing Schedule. (h) Welding shall be carried out by Qualified Personnel with compliance to Approved NDT Procedures and Acceptance Norms, as per ASME standard.			
2	Domestic / Inland Inspection will be carried out by BHEL/BHEL appointed Third Party Inspection Agency (TPIA) / Customer/Customer Appointed Inspection Agency/Consultant. This is applicable for all Stage inspection and Final Inspection identified as "W" - Witness or "CHP" - Customer Hold Point as per customer approved Quality Plan/ Technical specification / Approved Drawing/ Approved Data sheet / Scheme / PID / PFD / SLD (Process Instrumentation Diagram / Process Flow Diagram / Single Line Diagram) etc. (as applicable).			
3	Inspection Agency for Foreign Bidders and also for Indian Bidder but importing from Foreign Sources: (1) Any one of the following Third Party Inspection Agency (TPIA) shall be appointed by the bidder and same shall be furnished by the bidder in techno commercial bid itself. (2) The details of TPIA with contact details like Name of the official, Phone no, Email id shall also to be submitted during pre/post award. However cost for such inspection agency shall be borne by the bidder only. Inspection charges for such inspection agency shall be indicated separately so that if BHEL/Customer is undertaking the inspection by on their own , then these charges are non claimable by the bidder. For NTPC Project ensure TPI Approved by NTPC. Refer our QC Procurement email in this regard. List of TPIA 1.M/s Bureau Veritas 2.M/s TUV-Nord 3.M/s TUV-SUD 4.M/s TUV Rheinland 5.M/s Lloyds Register 6.M/s SGS 7.M/s Germanischer Lloyds 8.M/s QUEST 9.M/s Certification Engineers International 10.M/s Intertek 11.M/s IR Class Systems and Solutions 12.M/s DNV 13. M/s Fichtner 14. M/s ABS Inspection Services			

478777/2021/BAP-QA_MECH Sl.No	BHEL / Customer Requirements	## Specific confirmations by the manufacturer (Acceptable/Not acceptable)
4	Stage Inspection during manufacturing Process : Stage Inspection during manufacturing shall be carried out as per approved quality plan and all necessary documents shall be provided for review, verification and clearance for further processing. This inspection call shall be given well in advance (at least 2 weeks before) to TPI/Bidder's own inspection agency to avoid delay in the manufacturing processes.	
5	Inspection before despatch for domestic supplier : Inspection before despatch at supplier's works shall be carried out by BHEL appointed Inspection agency (as in Sl no. 2). Inspection shall be done as per approved Quality plan/ Technical specification/ Approved Drawing/ Approved Data sheet .	
6	Inspection at Foreign Source/Supplier: (a) As in sl no: 3. shall be ensured without fail (b) No material / items shall be despatched without getting the written communication from BHEL / Customer inspection carried out by Bidder appointed Third Party Inspection Agency (As per Sl no.3) / Customer/Customer Appointed Inspection Agency/Consultant. This is applicable for all Stage inspection and Final Inspection identified as "W" - Witness or "CHP" - Customer Hold Point as per customer approved Quality Plan/ Technical specification / Approved Drawing/ Approved Data sheet / Scheme / PID / PFD / SLD (Process Instrumentation Diagram / Process Flow Diagram / Single Line Diagram) etc. (As applicable). Inspection before despatch for Foreign supplier : Inspection before despatch at supplier's works shall be carried out by bidder appointed inspection agencies having international presence at vendors and or vendor's sub vendor works. Inspection shall be done as per approved Quality plan/ Technical specification/ Approved Drawing/ Approved Data sheet by TPIA mentioned in Sl no: 03 at supplier's cost.	
7	Painting shall be done strictly as per BHEL/Customer approved painting schedule / scheme only. Paint Thickness / Paint shade shall be ensured as per BHEL / Customer approved painting schedule / specification / data sheet etc. No deviation is acceptable unless otherwise accepted by BHEL/Customer in writing. Any conflict if any among BHEL / Customer approved painting schedule / Spec / data sheet etc. shall be brought to the notice of BHEL well in advance before proceeding including the BOI being procured for assy / skid like motors etc.	
8	Specific conformation for document package in the event of an order (2 Hard copies & soft copy in PDF file) is to be given containing the following with proper linkages (i) Index Sheet (ii) MQP/RQP/Endorsement Sheet (As applicable) (iii) TCs identified by BHEL/ Customer for record for "CHP" / "W" and Verification portion ("V") as given in approved QP. (iv) Final inspection report + TC including Chemical + Mechanical + HT + NDT etc. (v) Third party Inspection report + TC (vi) Customer CHP/ MDCC (vii) Type test / Performance Test reports conducted (viii) Type test / Performance Test approval/ clearance obtained from BHEL/Customer (ix) BOM with As Build Drgs with actual make / rating used with BHEL/customer approved drawings.	
9	Packing / Seaworthy Packing shall be as per BHEL Packing schedule / approved drg / sketch. This shall be ensured to take care transit / handling / transshipment in Road / Sea / Air. Photographs are to be submitted for BHEL review before despatching the material as per contract conditions.	
10	Outsourcing of test facilities: Bidder shall ensure all the testing facilities in house. However If any of the test facilities are not available with successful bidder, then bidder shall ensure the same at NABL accredited third party lab / Govt / Govt Lab for major testing such as NDT, Electrical & Mechanical testing.	
11	Important Note: No deviation on the above requirement 01 to 10 is acceptable with respect to Quality Requirement and those offers not meeting these specific customer requirement is liable for rejection and hence the bidder shall submit all the required documentary evidences in the offer itself.	
12	## Necessarily to be filled up by the bidder at the time of offer itself otherwise the offer may not be considered w.r.t Quality Requirement being customer specific requirement.	
VENDOR SIGN AND STAMP:		Vendor Name & Address:

478777/2021/BAP-QA

MECH

SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9 D	AGENCY 10			REMARKS 11
					M	B/C				M	B	C	
MANUFACTURER'S NAME & ADDRESS Manufacturer Logo		MANUFACTURING QUALITY PLAN Item/subsystem:			QP NO: Rev: Date: Page:		PROJECT: MAIN CONTRACTOR: M/s BHEL-RANIPET PO NO:						

RAW MATERIAL INSPECTION													
1	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT		MTC	√	P	V	V	NO REPAIR WELDING IS PERMITTED ON CI AS CAST / PUNCHED HEAT NO SHALL BE PROVIDED FOR CORRELATION		
	MECHANICAL PROPERTIES	MAJOR	TENSILE TEST	1 SAMPLE / HEAT		MTC	√	P	V	V			
	SURFACE EXAMINATION	MAJOR	VISUAL INSPECTION	100%		IR	√	P	V	V			
2	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT		MTC	√	P	V	V			
	MECHANICAL PROPERTIES	MAJOR	TENSILE TEST & HARDNESS	1 SAMPLE / HEAT		MTC	√	P	V	V			
	HEAT TREATMENT (As applicable)	CRITICAL	REVIEW OF TIME- TEMP CHART	100%		HT CAHRT	√	P	V	V			
	SURFACE EXAMINATION	MAJOR	VISUAL INSPECTION	100%		IR		P	V	V			
3	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT		MTC	√	P	V	V			
	MECHANICAL PROPERTIES	MAJOR	TENSILE TEST	1 SAMPLE / HEAT		MTC	√	P	V	V			

QP FORMAT

M – Manufacturer / Subcontractor, B - MAIN CONTRACTOR/ BHEL /BHEL Authorized Inspection Agency, C- Customer / Customer Authorized Inspection Agency, P - Perform, V - Verification of reports, W - Witness, TC - Test certificate, DR – Dimensional report. * Record, identified with "tick" (√) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by

478777/2021/BAP-QA MECH

Manufacturer Logo		MANUFACTURER'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN			PROJECT: MAIN CONTRACTOR: M/s BHEL-RANIPET PO NO:						
				Item/subsystem:	QP NO: Rev: Date: Page:								
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9 D	AGENCY 10			REMARKS 11
					M	B/C				M	B	C	

		SOUNDNESS	CRITICAL	VISUAL INSPECTION	100%				UT Report	√	P	V	V	FOR BAR DIA. ≥ 50 MM ONLY
4									MTC	√	P	V	V	
									MTR	√	P	V	V	

QP FORMAT

IN PROCESS INSPECTION														
5		DIMENSIONAL	MAJOR	MEASURE					IR	√	P	V	V	
		HYDROSTATIC TEST OF CASTING	CRITICAL	PRESSURE TEST	100%				IR	√	P	W	V	SEE NOTE -1
6		DIMENSIONAL	MAJOR	MEASURE					IR	√	P	V	V	
		DYNAMIC BALANCING	CRITICAL	MEASURE	100%				IR	√	P	W	V	SEE NOTE-1
7		SOUNDNESS OF CASTING	MAJOR	NDT-DPT					DPT Report	√	P	V	V	
8		DIMENSIONAL	MAJOR	VISUAL					IR	√	P	V	V	
		SOUNDNESS	CRITICAL	ULTRASONIC TEST					UT Report	√	P	W	V	FOR SHAFT DIA ≥ 50 MM ONLY (EXCEPT THREADED PORTION) SEE NOTE-1
		DP TEST ON MACHINED AREA	MAJOR	DP TEST	100%				DPT Report	√	P	V	V	
FINAL INSPECTION														

M – Manufacturer / Subcontractor, B - MAIN CONTRACTOR/ BHEL /BHEL Authorized Inspection Agency, C- Customer / Customer Authorized Inspection Agency, P - Perform, V - Verification of reports, W - Witness, TC - Test certificate, DR – Dimensional report. * Record, identified with “tick” (√) under column ‘D’ shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by

478777/2021/BAP-QA MECH

MANUFACTURER'S NAME & ADDRESS Manufacturer Logo		MANUFACTURING QUALITY PLAN Item/subsystem:				QP NO: Rev: Date: Page:		PROJECT: MAIN CONTRACTOR: M/s BHEL-RANIPET PO NO:					
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9 D	AGENCY 10			REMARKS 11
					M	B/C				M	B	C	

9	PUMP ASSEMBLY								IR	√	P	V	V	
10	PERFORMANCE TEST WITH JOB								IR	√	P	W	W	
									IR		P	W	W	
									IR		P	W	W	
									IR		P	W	W	
11	NPSHR TEST							IR	√	P	W	W		
12	PAINTING PACKING AND PRESERVATIONS							IR	√	P	V	-		

QP FORMAT

INSPECTION NOTES:

a.	Latest version of standards & Specification shall be applied.
b.	Materials shall be procured in compliance to Functional Technical specification.
c.	Gauges and measuring instruments with valid calibration only shall be used.
d.	Inspection/Inspection waiver/approval by BHEL does not absolve Supplier's responsibility for conformity of the specification as per the terms of PO.
e.	BHEL /BHEL Authorized representatives shall have the right to witness the necessary inspection and testing of goods mentioned in the PO.
f.	In case of Vendor Drawing & Datasheet, it needs approval by BHEL Engineering.
g.	This QP shall be read along with relevant PO, BHEL Specification / Approved Drawing/ Datasheet.
h.	This QP is applicable for Mandatory supply also.
i.	All other minor items, which are not cover under this QP, shall be manufactured inspected as per OEM (Original equipment Manufacturer)/BHEL standard practice and relevant standard. Relevant TC/COC will be submitted for the same.

M – Manufacturer / Subcontractor, B - MAIN CONTRACTOR/ BHEL /BHEL Authorized Inspection Agency, C- Customer / Customer Authorized Inspection Agency, P - Perform, V - Verification of reports, W - Witness, TC - Test certificate, DR – Dimensional report. * Record, identified with "tick" (√) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by



Ref :INSP:CHK:001/ REV 00
DT:10/08/2020

Inspection document Check List

Inspection documents to be submitted after inspection of the items for getting dispatch clearance. Vendor shall provide documents to the BHEL/BHEL TPIA inspector during inspection and TPIA shall sign all the documents.

The document dossier shall contain following.

SL no.	Documents
1	Unpriced PO COPY.
2	Latest approved specification, datasheet, drawing, P&ID, test procedures, approved painting schedule, Packing etc.
3	Approved QAP.
4	CQIR Report (Disposal code should be Accepted all the offered QTY)
5	<p>As per approved QAP all the inspection documents to be submitted.</p> <p>Indexing of the reports as per QAP and each page wise numbered and correlated to QAP. If more than one test in each page, against each test the clause number of QAP to be mentioned.</p> <p>Inspection clause shall be mentioned against each test.</p> <p>1. Raw Material Test Certificates (NABL approved Lab TC/Manufacturer TC like Mechanical properties, Chemical Properties, UT etc. as per approved QAP.</p>

K. Kovarthan

கா. கோவார்ததன்
கி. கோவர்தன / K. KOVARTHANAN
பரிசுட ஹஜினியர் / Sr. Engineer
ரணபெட்டி திபிடி / Quality Department
பி.ஓ.பி.டி. | BHEL RANIPET-3

	<p>2. In process Inspection Reports like Hydro test, Dimension Report, MPI,UT ,Balancing etc. as per approved QAP.</p> <p>3. Final Inspection Reports like Shop Assembly with testing reports, Hydro test/Leak / Pressure test reports, Type test Reports, WPS/PQR/WPQ Reports, PT/RT/UT/MT Reports etc. as per approved QAP.</p> <p>4. Final Inspection like packing and surface preparation & Painting/Metal finishing reports. (Sea worthy packing / Special Packing requirement).</p>
6	Relevant pages of standard shall be attached with report.
7	Calibration reports of the instruments used to be signed by TPI after verification.
8	Above said documents are should be in single .pdf file with not more than 10MB (if more than 10MB can be split into multiple files)
9	Hard copy of the same to be submitted along with material dispatch.

Kovarthanan

K KOVARTHANAN

கா. கோவார்த்தனன்
 क. कोवर्धनन / K. KOVARTHANAN
 वरिष्ठ इंजीनियर / Sr. Engineer
 गुणवत्ता विभाग / Quality Department
 बीएचईएल राणीपेट / BHEL RANIPET

DM/QC PROC

BHEL RANIPET

OPEN TENDER ENQUIRY CHECKLIST

SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES AS PER THE TECH SPEC NO. ROS 6322 REV 00 & ROS 4291 REV 00 & RELEVANT ANNEXURE (MAIN SUPPLY, MANDATORY SPARES SUPPLY & ERECTION, COMMISSIONING, PG TEST AND HANDING OVER) FOR SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT

Enquiry No. 7710727E Dated 01-DEC-2021

Sl. No.	Document Name	Vendor Confirmation (Filled and Signed copy to be submitted along with Techno Commercial Offer)
01	Annexure A COVERING LETTER	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
02	Annexure B GENERAL TERMS & CONDITIONS (FOR GUIDANCE TO THE SUPPLIERS)	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
03	Annexure C COMMERCIAL TERMS AND CONDITIONS - INDIGENOUS	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
04	Annexure D Confirmation to CEBG & PBG format	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
05	Annexure E SPECIFICATION DEVIATION DISPOSITION REPORT	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
06	Annexure F UN PRICED /PRICE OFFER FORMAT	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
07	Annexure G Online SRF	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
08	Annexure H Make In India declaration Format	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
09	Annexure I PAYMENT MECHANISM	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
10	Annexure J INTEGRITY PACT	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
11	Annexure K PQR – FINANCIAL SOUNDNESS	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
12	Annexure L Land Sharing countries GFR 2017 Rules amendment declaration form	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
13	Technical PRE-QUALIFICATION REQUIREMENT – REF:- GCL: Sagardighi (1x660 MW) Rev 0 dt 11.09.2021	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
14	TECHNICAL SPECIFICATION NO. ROS: 6322 Rev 00 Dated 08.09.2021& ROS: 4291 Rev-00 Dated 15.09.2021 (Total No. of Pages – 453) (MAIN SUPPLY, COMMISSIONING SPARES, MANDATORY SPARES, ERECTION, COMMISSIONING, PG TEST & HANDING OVER)	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>
15	Quality evaluation requirements and QAP / QP / MQP Customer Sample Format / ANNEXURE – Q, INSPECTION CHECK LIST	Submitted <input type="checkbox"/> Not Submitted <input type="checkbox"/>



Bharat Heavy Electricals Limited

Boiler Auxiliaries Plant
RANIPET – 632 406, Tamil Nadu, India
PURCHASE – WATER SYSTEM

ANNEXURE - A

**SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM
ALONG WITH COMPLETE ACCESSORIES AS PER THE TECH SPEC NO. ROS 6322
REV 00 & ROS 4291 REV 00 & RELEVANT ANNEXURE (MAIN SUPPLY,
MANDATORY SPARES SUPPLY & ERECTION, COMMISSIONING, PG TEST AND
HANDING OVER) FOR SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT**

Enquiry No. 7710727E Dated 01-DEC-2021

To All Bidders

Dear Sir,

Please submit your MOST COMPETITIVE quotation on FIRM PRICE basis, subject to our terms & conditions in the various annexures attached herein for the below listed materials so as to uploaded on or before the due date and time.

[Requirement with Delivery date-FOR MAIN SUPPLY \(Order will be released by BHEL BAP Ranipet\):](#)

Enquiry Sl. No.	Description & material Code	Unit	Qty.	Delivery Date
001	RWT111070001 SUPPLY OF CW CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES AS PER TECHNICAL SPECIFICATION NO. ROS:6322 REV 00 DATE 08.09.2021, ROS:4291 REV 00 DATE 15.09.2021 & RELEVANT ANNEXURE.	ST	1.00	Within 10 Months from the date of CAT-I Approval of all Documents / Manufacturing clearance, whichever is Later.
In the event of order vendor should confirm the submission of BBU (Billing Breakup) for the complete system supply with break up for each line item as well as quantities with value.				

[Requirement with Delivery date-FOR SERVICES \(Order will be released by BHEL PSSR Chennai\):](#)

Enquiry Sl. No.	Description & material Code	Unit	Qty.	Delivery Date
002	RWT111080001 ERECTION, COMMISSIONING & PG TEST FOR CW CHLORINATION SYSTEM AS PER TECHNICAL SPECIFICATION NO. ROS:6322 REV 00 DATE 08.09.2021, ROS:4291 REV 00 DATE 15.09.2021 & RELEVANT ANNEXURE	ST	1.00	Complete within 6 months from Site Readiness which will be informed by BHEL.

[Requirement with Delivery date-FOR MANDATORY SPARES SUPPLY \(Order will be released by BHEL BAP Ranipet\):](#)



Bharat Heavy Electricals Limited

Boiler Auxiliaries Plant
RANIPET – 632 406, Tamil Nadu, India
PURCHASE – WATER SYSTEM

Enquiry Sl. No.	Description & material Code	Unit	Qty.	Delivery Date
003	RWT111090001 SUPPLY OF MANDATORY SPARES FOR CW CHLORINATION SYSTEM AS PER TECHNICAL SPECIFICATION NO. ROS:6322 REV 00 DATE 08.09.2021, ROS:4291 REV 00 DATE 15.09.2021 & RELEVANT ANNEXURE.	ST	1.00	Supply completion of MANDATORY SPARES within 6 Months from the date of Main Items supply completion.

In the event of order vendor should confirm the submission of BBU (Billing Breakup) for the complete system supply with break up for each line item as well as quantities with value.

All 03 Items will be compared on PACKAGE Basis & Order will be placed on a Single vendor who is the lowest (L1) on PACKAGE basis.

BIDDERS SHALL CAREFULLY READ THE FOLLOWING ANNEXURES / NOTES AND SHALL QUOTE THEIR BEST COMPETITIVE PRICE.

PLEASE REFER TO,

- 01 Annexure A COVERING LETTER**
- 02 Annexure B GENERAL TERMS & CONDITIONS (FOR GUIDANCE TO THE SUPPLIERS)**
- 03 Annexure C COMMERCIAL TERMS AND CONDITIONS - INDIGENOUS**
- 04 Annexure D Confirmation to CEBG & PBG format**
- 05 Annexure E SPECIFICATION DEVIATION DISPOSITION REPORT**
- 06 Annexure F UN PRICED /PRICE OFFER FORMAT**
- 07 Annexure G Online SRF**
- 08 Annexure H Make In India declaration Format**
- 09 Annexure I PAYMENT MECHANISM**
- 10 Annexure J INTEGRITY PACT**
- 11 Annexure K PQR – FINANCIAL SOUNDNESS**
- 12 Annexure L Land Sharing countries GFR 2017 Rules amendment declaration form**

TECHNICAL ENCLOSURES AS PER FOLLOWINGS:

13 Technical PRE-QUALIFICATION REQUIREMENT – REF:- GCL: Sagardighi (1x660 MW) Rev 0 dt 11.09.2021

14 TECHNICAL SPECIFICATION FOR CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES - SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT - ROS: 6322 Rev 00 Dated 08.09.2021 (Total No. of Pages – 453).

15 Quality evaluation requirements and QAP / QP / MQP Customer Sample Format / ANNEXURE – Q , INSP CHK 001 REV 00

Important Instruction to Bidders:

- 1. All the items will be procured from a single vendor only & all the Items will be compared on PACKAGE Basis & Order will be placed on a Single vendor who is the lowest (L1) on package basis. Hence please quote for all the items including services. Incomplete offers will be rejected.**



Bharat Heavy Electricals Limited

Boiler Auxiliaries Plant
RANIPET – 632 406, Tamil Nadu, India
PURCHASE – WATER SYSTEM

2. Vendors shall go through the “Pre-Qualification Requirement” & furnish Qualification Data sheet duly filled in along with Techno-Commercial offer. Offers received without this requirement will be summarily rejected & such offers will not be processed further.
3. Price bid opening will be considered subject to techno commercial confirmation and acceptance by BHEL, Ranipet & also approval from our customer: M/s. WBPDCS SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT
4. Price Bid opening will be done through Reverse Auction method (English method).

Name of the Project - Sagardighi Thermal Power Station (1X660 MW) Unit-5, phase-III.

Site Location - Manigram village, Sagardighi, Raghunathganj sub-division, Murshidabad District, West Bengal.



ANNEXURE –B
GENERAL TERMS & CONDITIONS
(FOR GUIDANCE TO THE SUPPLIERS)

A] Submission of Offer

a) Invitation for bid

Tenders are invited through electronic mode from eligible suppliers in case of open tenders and from suppliers to whom the enquiry is addressed in case of Limited / Single Tender.

The offers shall be posted into the system before the date and time specified in the tender.

The offer shall be sent on single part / two part / three-part basis as specified in the main tender document.

Bids shall be submitted through BHEL's e-procurement portal developed by NIC (<https://eprocurebhel.co.in/>) only.

In case of any difficulty faced while registering on ***BHEL's e-Procurement portal*** developed by NIC, queries may be addressed to 0120-4001002, 0120-4001005 and 0120-6277787; email: support-eproc@nic.in These details are also available on 'Contact Us' page of the portal.

To participate in a tender, you need to login to the portal. You must be an approved registered user. If you are not a registered user, you can register yourself by clicking upon the "Register" link. You need to have a valid login id and password to login to the portal. Enter your login id, password and click on Login button after Login, you need to select your digital signing and encryption certificates certificate.

Typical documents that would be required as part of tender submission would be

- a) ***Complete technical Offer*** with details, catalogues, as applicable.
- b) ***Un-priced bid*** (i.e. Bid without the Price) as per given format, if any.
- c) ***Filled-in BHEL's Standard Terms & Conditions*** as per Annexure enclosed with the Tender Document,
- d) ***Deviation summary*** submitted in two parts – giving the summary of technical deviations separately and the commercial deviations separately, if any and
- e) ***Supporting documents*** to substantiate equivalent material specifications / sections, where quoted for.
- f) Where asked for, ***Client list*** with their full address including detail of contact person with phone no., fax no. & e-mail ID (if any) to whom the same / similar items are supplied in the past two years. The date of supply may also be indicated, against each client.
- g) Suppliers can also upload their credentials by way of submission of Performance certificate/s issued by their customer/s detailing the quantity supplied and specification along with the un-priced PO copies and proof of supply along with the offer.

Technical acceptance of offer by BHEL shall be based on the evaluation of offer and the submitted documents.

- h) ***Bidders who are not already registered with BHEL Ranipet*** are requested to submit the Supplier Registration Form (SRF) online (<http://supplier.bhel.in/>) for evaluating and registering as an approved vendor. The Supplier Development Cell (SDC) of BHEL, Ranipet would process the SRF for evaluation /



registering the Supplier. Don't send hardcopies of SRF to BHEL-Ranipet, **only** online submission is accepted. This registration process is a separate / parallel activity, not a mandatory one and do not mix-up with submission offers.

Note

- (i) The materials offered, shall conform to the specification and scope attached in the tender.
- (ii) In case the offered materials are not conforming to the Enquiry Material Specification, such offers would not be considered for evaluation and would be rejected.

Where equivalent specifications are offered, considering such offers will be at the sole discretion of BHEL. Wherever alternative standards / specifications are offered by Bidder, the Bidder shall provide sufficient documentary evidence to ensure equivalence to the designated standards / specifications, failing which the offer would be considered as not technically acceptable and hence shall stand rejected.

- (iii) All taxes and duties payable as extra to the quoted price should be specifically stated in offers (as appearing in the online template).

Offer/s from within India shall be submitted along with the applicable HS Number and the applicable Goods & services Tax (GST) for each quoted item, failing which the purchaser will not be liable for payment of such taxes and duties. Our GST No: **33AAACB4146P2ZL**.

- (iv) The un-priced bid shall be used to indicate relevant commercial terms such as scope of freight and insurance, applicability of duties and taxes etc. All Commercial terms are to be indicated clearly in the offer.
- (v) No changes shall be entertained once the bid is opened unless otherwise specifically agreed to in writing by BHEL.
- (vi) Money values other than for those items appearing in the un-priced bid template shall not be indicated anywhere in the un-priced bid.
- (vii) Time required for inspection (at Supplier's works), should be clearly given in terms of numbers of working days.
- (viii) **Offers sent by FAX / E-mail:** would not be entertained.
- (ix) Bid should be free from correction, overwriting, using corrective fluid, etc. Any interlineation, cutting, erasure or overwriting shall be valid only if they are attested under full signature(s) of person(s) signing the bid else bid shall be liable for rejection.
- (x) Registration process for items required by BHEL is always open at <https://supplier.bhel.in>. Prospective suppliers (including MSEs & owned by SCs/STs) may visit this site and apply for registration in the respective Unit.

Price Bid in conformance with the specification and terms as given in the Un-Priced bid document.

Note

- (i) The price break-up should be in line with technical specification / scope of the tender. (Cost of material, packing charges, forwarding charges, freight and insurance charges shall be shown appropriately, as applicable).



- (ii) Unless otherwise specified as a part of the tender condition, No Price Variation Clause will be entertained and No advance payment will be made by BHEL.
- (iii) In case, there is a discrepancy in the term quoted in techno-commercial bid and price bid, the term as per the techno-commercial bid (Part I) shall hold good and the commercial term quoted in the Price Bid (Part II) shall not be considered.
- (iv) In their own interest, all Tenderers are advised to double check their prices, applicable duties and taxes.
- (v) The quotation should be valid at least for a period as mentioned in the commercial terms from the tender opening date.
- (vi) Indian bidders should submit the prices in Indian Rupees only.
- (vii) Foreign bidders may submit their bid in foreign currency. The currency for quoting shall be selected from the drop-down menu provided.
- (x) Indian Suppliers shall quote on FOR Destination basis only. Destination is BHEL, Ranipet Stores or BHEL Project Site as specified in the tender requirement. Foreign Suppliers shall quote on CFR Chennai Seaport Delivery and Insurance will be in BHEL's scope. No other delivery terms shall be acceptable. Shipment shall be arranged by the Seller on *Liner in / Liner out basis*. As per Government of India guidelines, BHEL Ranipet being a Government of India Undertaking the Bill of Lading shall be made with the Shipper as "Government of India". This shall be specifically confirmed by the Bidder.
- (xi) Where the cargo is containerized, Container washing charges, stuffing charges and / or any other such charges would be to the account of the supplier, where the containers are to be stuffed at the works of the supplier.

B] Opening of Offers

- a) **Tenders can be submitted up to time and date as mentioned in the enquiry document or subsequent corrigendum (if any). Part I will be opened on the scheduled day and time. Part II opening will be informed to techno-commercially qualified vendors.**
- b) Price Bid opening will be done through e-mode / Reverse Auction method (English method) as mentioned in the enquiry commercial terms. All tenderers would have to specifically give their acceptance for this in their bid/s.

Note

- (i) Bids including all enclosures and supporting documents like catalogues, pamphlets, etc., shall be provided in ENGLISH language only.
- (ii) In exceptional circumstances, at its option, BHEL may consider extending the due date/s for the tender openings for reasons such as (but not limited to) paucity of offers etc. However, sufficient notice would be given by BHEL for such extension.
- (iii) Deviations shall be summarized and provided in a "Deviation Statement", listing the points and the deviation against each point.



(iv) BHEL reserves the right to increase or decrease the tendered quantity and to order on more than one vendor at the lowest acceptable price to BHEL. In ordering on more than one source, the ratio of quantity split will be as specified in the tender terms.

If not explicitly specified, BHEL reserves the right to split the quantity of the enquiry as follows: 70% quantity being ordered on the original lowest bidder (L1) and balance 30% on the next higher bidder/s excluding H1, who accepts the L1 price. However, the final decision to split the order rests with BHEL only.

In the event that the other than L1 suppliers do not accept the L1 price, then the balance will be reverted to the original L1 and the original L1 shall be bound to accept the balance of the enquiry quantity kept reserved for order splitting. This decision would be given by BHEL within 60 days of the price bid opening.

Notwithstanding the quantum of split that may be indicated in the main body of the enquiry, bidders are advised to note that the splitting of the orders will be decided by BHEL after the evaluation of the techno-commercial and price bids.

(v) Offers for part quantities on item level basis are not acceptable to BHEL. While tenderers can quote for some or all the tendered items, no supplier shall quote for partial quantity of any given enquiry item. Such partial offer would not be considered in the enquiry for that item. Suppliers are to note that the evaluation unless otherwise specified will be on item level and not for the tendered items as a whole.

C] Evaluation of Offers

Note: The evaluation currency for this tender shall be INR.

a) The price bids including the impact price (if any) of the technically acceptable offers alone shall be opened.

b) Offers with pre-conditions (like conditional discounts) for price are liable to be not considered / rejected. For evaluation such conditions would be removed and only the base offer would be considered for evaluation and comparison.

d) In the event of any change in scope / quantity arising out of the discussions, offerers would be given a chance to submit their revised offer / Impact bids. The option for the revised offer / impact offer will be triggered by BHEL. The Supplier then will have the facility to feed-in the revised price / impact price as per the provision given by BHEL. The impact price can be positive or negative (or nil). The impact price option shall contain only the price addition / deletion for such change in the scope / quantities, over and above the original scope and price quoted. The original price quoted would remain unchanged. The total price would then be computed by the arithmetic addition of the original price and the impact price. Where BHEL gives the option of submitting the revised offer, the impact would be computed as the arithmetic difference of the revised price and the original price.

e) For evaluating the overseas offers, CFR Chennai Sea Port price quoted will be taken into account. The cost to BHEL will be arrived at by loading the applicable customs duty project wise, insurance charges, inland transportation charges to BHEL stores and LC charges etc.,

f) Deleted.



- g) BHEL reserves the right to reject without assigning any reasons / load any offer with factors other than already specified for such offers having deviations to BHEL Specifications, Standard Terms & Conditions at its discretion. The decision of BHEL in this regard shall be final.
- h) BHEL reserves the right to reject an offer due to unsatisfactory performance during tender finalisation / execution of a contract at any of BHEL projects / units in the past or if unsatisfactory performance report is received from the party/s referenced by the supplier at any time during tender finalisation.
- i) BHEL reserves the right to operate Purchase / Price preference to Government of India Undertakings, which shall be given as per the guidelines of Government of India given from time to time and / or relax the Terms and Conditions of the tender.
- j) For the purpose of comparing prices, tender prices shall be converted to Indian rupees and the conversion shall be made by using the TT Selling rate of State Bank of India (SBI) prevailing on the date of opening of Techno-Commercial / Unpriced bids. If the relevant day happens to be a bank holiday, then the forex rate as on the previous bank (SBI) working day shall be taken. This exchange rate will be followed till placement of order. Tenderers may please note that even if an impact price is taken as in (d) for purpose of price evaluation and arriving at the rank; the exchange rate will be taken as explained above.
- k) Unless otherwise specified, evaluation will be on individual line item basis only and ordering will be on respective L1 vendors.
- l) BHEL reserves the right to conduct negotiations on the “Price” and “Other Commercial Terms and Conditions” with the lowest ranked offered at any time after the bid opening but before the release of the Purchase Order and If so required by BHEL, Supplier may have to share their costing sheet with BHEL.
- m) Bidders are required to confirm in writing in their techno-commercial document that other than themselves (the bidder) none of its group companies, concerns or affiliates etc., are participating in the tender either directly or indirectly or through any other agency under the same proprietor / common partner(s)/ common Directors. If during the evaluation of the bids it is found that the bidder has submitted the offer in violation of this condition, then all the offers received from the group companies would stand rejected. If such relationship is found at a later date where the Purchase Order has been issued, then BHEL would cancel the Purchase Order and initiate suitable action/s under the contract/s including but not limited to invoking the Risk Purchase clause of the order and other applicable legal provisions / guidelines of BHEL including guidelines on suspension of business dealings. (Please see clause L sub-clause c).
- n) For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 15.06.2017, 28.05.2018, 29.05.2019, 04.06.2020 & 18.09.2020 and subsequent Orders issued by the respective Nodal Ministry shall be applicable even if issued after issue of this NIT but before finalization of contract/ PO/ WO against this NIT.

In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and/ or local content in respect of this procurement, same shall be applicable.

For this procurement, the local content to categorize a supplier as a Class I local supplier / Class II local supplier / Non-Local supplier and purchase preference to Class I local supplier, is as defined in Public Procurement (Preference to Make in India), Order 2017 dated 04.06.2020 issued by DPIIT and subsequent amendments. In case of subsequent orders issued by the nodal ministry, changing the definition of local



content for the items of the NIT, the same shall be applicable even if issued after issue of this NIT, but before opening of Part-II bids against this NIT.

Preference to Make in India including counter offering will be as per the Public Procurement (Preference to Make in India), Order 2017 available in the following links <https://dipp.gov.in/public-procurements>

http://dipp.nic.in/sites/default/files/publicProcurement_MakeinIndia_15June2017.pdf

http://dipp.nic.in/sites/default/files/Revised-PPP-MII-Order-2017_28052018.pdf

https://dipp.gov.in/sites/default/files/PPP-MII%20Order%20dt%2029th%20May%2019_0.pdf

<https://dipp.gov.in/sites/default/files/PPP%20MII%20Order%20dated%204th%20June%202020.pdf>

<https://dpiit.gov.in/sites/default/files/PPP%20MII%20Order%20dated%2016%2009%202020.pdf>

D] Execution of the Order

a) BHEL will have the option to pre-inspect the materials at Supplier's works by BHEL's own inspector or by third party agency appointed by BHEL or BHEL's end customer/s. The mere act of the pre-dispatch inspection (PDI) does not absolve the Supplier from giving the specifications as agreed upon in the Purchase Order. In the case of inspection being carried out by a third party inspector (TPI) as per the extant practice, the TPI would forward the Inspection Report (IR) along with Test Certificates and other related documents to the Quality Assurance (QA) Department of BHEL. The QA department after scrutinising the report/s submitted by the TPI would issue the Material Dispatch Clearance Certificate (MDCC). Suppliers are hereby informed that materials should be dispatched only after getting the MDCC, failing which the materials may be rejected on receipt at BHEL Stores.

b) In the case of overseas suppliers Inspection call for carrying out the inspection shall be given 30 days before the scheduled contract delivery date. The Inspection date/s given by the Supplier shall be on firm basis. For local Suppliers the Notice period of Inspection shall be 10 working days.

c) Deviations, if any pointed out by the visiting Inspection team of BHEL shall be corrected and the items as per specification shall be dispatched on or before the contract delivery date after getting the MDCC.

d) The final inspection for acceptance will, however be carried out at BHEL's works at Ranipet.

e) The contract delivery date is the date of receipt at BHEL Stores/Site for suppliers in India, applicable in the case of FOR Destination Contracts.

For ex-works contracts or FOR dispatching station indigenous contracts, the date of the Lorry way bill issued by the authorised transport carriers of BHEL / Railway Receipt / Courier Way bill / Airway bill or any such dispatch documents of carriage approved by BHEL would be considered as the Contract Delivery Date. In the case of CFR contracts with overseas suppliers, the B/L date shall be taken as the Contract Delivery Date

f) Travel & other local stay cost for the Inspectors sent by BHEL will be to BHEL account, but other Inspection Charges, if any shall be to the account of the Seller only.



g) The supplier shall arrange for packing suitably in all respects for normal transport by sea / rail / road and Materials shall be suitably protected against effect of tropical salt laden atmosphere in the event of shipment being delayed at ports / store yards and as per BHEL TDC.

h) Foreign suppliers shall dispatch on CFR agreed Sea-Port basis, according to the contract conditions. Indian suppliers shall dispatch on free delivery (door-delivery) at BHEL stores basis only. Unloading the materials at BHEL Stores would be to the account of BHEL only.

i) In the event of any short supply, it shall be the responsibility of the supplier to deliver such short supplied/ missing items on Free-of-Cost basis at BHEL stores, including customs clearances at Indian Ports in the case of foreign suppliers.

k) Terms of payment: Refer commercial terms of enquiry. If not specified in commercial terms, then following will be followed.

k.1) For Indigenous Suppliers: Unless otherwise agreed to by BHEL, the standard payment terms of BHEL shall be: For non-MSE suppliers 100% payment made directly through EFT within 90 days from the date of receipt and acceptance of materials at BHEL Stores, Ranipet or 90 days from the date of acknowledgement of receipt of materials at destination specified. If any supplier asks for payment terms other than the above specified, then suitable loading on cost will be considered. **Loading of any deviation in the payment terms**

w.r.t tender terms will be "Base rate of State Bank of India (SBI) (as applicable on the date of bid opening: Techno-commercial bid opening in case of two part bids) + 6%, will be considered for loading for the periods of relaxation sought by bidders.

k.2) For MSE vendors (under Micro & Small category alone) 100% payment will be made within 45 days from the date of receipt and acceptance of materials at BHEL Stores, Ranipet or 45 days from the date of acknowledgement of receipt of materials at destination specified. **Vendors to get themselves registered in Udyam registration Portal.** The existing Micro & Small vendors are to submit copy of CA certificate along with Udyog Adhar Registration Certificate.

l) NOTE:

Where the destination specified is other than BHEL Stores Ranipet, for claiming payment, Supplier has to submit proof of receipt of the materials at the destination by furnishing a copy of the acknowledged despatch document (LR/RR/Courier receipt etc.).

If the Bidder is bidding for the first time and wants to be considered as an MSE then, the Bidder shall submit document evidencing that they are an MSE along with a certificate from a Chartered Accountant certifying the status of their Unit / Works clearly specifying the address of the works which is to be considered as MSE and send the same to BHEL, Ranipet either before the tender opening date or upload it as a part of the tender document in the e-procurement portal. Where the document is submitted electronically a hard copy shall invariably be sent within a reasonable period (not exceeding 30 days) from the bid opening date for the purpose of BHEL's records. If the hard copy is not received within this specified time, then the supplier would be treated as a non-MSE. BHEL will not be responsible for any postal / courier / delivery delays.

For approved vendors the status as on the date of the bid opening as available with BHEL Ranipet's records shall be used for reckoning the status of the Bidder as an MSE or otherwise.



Offer/s received without these documents will be treated as non-MSE and order finalization will be done based on this premise. Documents submitted after Bid-opening will not be considered in this tender. This provision for MSE will apply subject to the condition that the participating MSE meets the tender requirements.

For approved suppliers, in case of any change in the MSE status, it shall be the responsibility of the Bidder to notify the change as a part of the Bid document. If at a later date it comes to the knowledge of BHEL, Ranipet that the change in the status has not been intimated by the Bidder and the order is obtained under the premise of an MSE then BHEL would cancel the pending order against this tender and take necessary steps for suspension of the business dealing with the Bidder as per the procurement policy of BHEL. Similarly, if a supplier claims MSE status after the Part I bid opening, then the same would not be considered in the tender.

In case after the bid opening it is seen that non MSE has become L1, then depending on the nature of the item, if it is not possible to split the tendered items / quantities on account of reasons like customer contract requirements of supplying one make for a given project or technical reasons like the tendered item being a system etc. then BHEL may counter offer the L1 prices for full package to eligible MSE vendor who are within the +15% band of L1.

Other concessions for MSEs / Reserved sectors (Also for women owned MSEs and MSEs owned by SC/STs)

In addition to the concessions specified above, MSE suppliers will be eligible for such other concessions as per the MSME Act 2006 and any other benefits / concessions that may be announced by the Government of India from time to time. However, such concessions as applicable at the time of tender opening alone will be applicable. Any concessions advised after tender opening will not be considered for the current tender.

Items that are reserved for MSE and for any other items for which reservations for Indian manufacturers are notified by the Govt. Of India, such concessions as prevailing on the date of tender opening shall apply as a part of this tender conditions. ii) Foreign Suppliers "100% thru' irrevocable & unconfirmed LC at sight within 3 weeks from the PO date through any one of our Bankers listed elsewhere in the tender conditions for 100% value (less Agency Commission, if any) valid up to the PO delivery period and 15 days thereafter for negotiation. All bank charges in India to BHEL's account and all other charges outside India to Supplier's account. **BHEL would load the price of foreign suppliers in order to bring them on common platform as per Indigenous Suppliers on the account of differential payment terms to Indigenous Suppliers. Loading of payment terms will be "Base rate of State Bank of India (SBI) (as applicable on the date of bid opening: Techno-commercial bid opening in case of two part bids) + 6%, will be considered for loading for the periods of relaxation compared to indigenous suppliers i.e. 90 days.**

m) Any incidence of tax like Income tax, Goods & Services Tax (GST) and Withholding any other similar tax / duties /levies imposed by the Government of India, or the State Government, where the BHEL Unit is located, deductible at Source, during the tenure of the Order shall be deducted by BHEL and necessary certification of the deduction (Tax deduction at Source) would be given. This is subject to the supplier fulfilling the necessary documentation as specified by the Government of India. (e.g. Tax Residency Certificate, PAN Number etc.)

n) The Guarantee period shall start from the "Date of receipt and acceptance of the materials at BHEL Stores."



E] Liquidated Damages Clause:

BHEL will levy penalty as Liquidated Damages (LD), for delay in delivery. The damages shall be at the rate of ½% per week or part thereof subject to a maximum of 10% PLUS applicable Goods & Services Tax (GST). The contract delivery date for purpose of L.D is the date of receipt at BHEL Stores for suppliers in India for F.O.R. Destination Contract and the date of dispatch clearance given by BHEL for overseas suppliers. For ex-works or F.O.R dispatching station contracts, the date of the dispatch document will be reckoned as the date of delivery for computing the LD. Supplier shall deduct the applicable LD from the first payment when raising the claim for the same. The applicable LD if any would be communicated by BHEL along with the dispatch clearance. It is taken by BHEL that Foreign Suppliers have confirmed their acceptance to BHEL for opening the LC for value which is the value of the order reduced by the applicable LD. The LD would apply on the undelivered portion only. In case of reasons attributable to BHEL for the delay in delivery (for e.g. delay in arranging the pre-inspection) then the delivery time would be reset to the extent of the time delay attributable to BHEL, with waiver of the LD. Delivery being the essence of BHEL's contract requirements, unless otherwise specified the LD would apply on the undelivered portion of the contracted items. **In the event that a Supplier does not accept the LD condition above, the offer would be loaded to the extent of the shortfall with respect to upper limit specified above.**

F) Miscellaneous

i) Role of Principals and Agents:

BHEL will deal directly with indigenous manufacturers only.

BHEL strongly discourages the engagement of Agents in India by foreign principals, to deal with BHEL, in BHEL's tenders.

BHEL will not enter into any correspondence with an Indian Agent.

The Indian Agent will not be extended the privilege given to the principals, such as that of attending the tender openings, attending technical discussions, commercial discussions or price negotiations and such like.

In case, in spite of the above, a foreign principal insists on engaging an Indian Agent, It is made clear by BHEL that:

It is the sole responsibility of the foreign principal to ensure the Agent does not represent any other foreign principal in a given tender.

An undertaking to this effect shall be given by the foreign principal that his / her Agent does not represent any other foreign principal in the tender. This document shall form a part of the techno-commercial offer.

A Principal shall authorise only one Agent to quote against each BHEL's tender. In the event a Principal authorises more than one agent to quote against a BHEL's tender, then all such offers will be rejected by BHEL in that tender. Principals are also advised to include BHEL's tender Number / Reference in their authorisation issued to the Agent.

If at any stage of the tender, BHEL finds that an Indian Agent has represented more than one foreign principal, all such offers of and all the foreign principals would be disqualified summarily in the tender inquiry.



BHEL will only give an intimation of notice of the disqualification. No correspondence would be entertained by BHEL, on their decision. Such decision of BHEL shall be irrevocable, firm and final and shall be binding on the tenderer.

BHEL, due to business reasons would ban, would have banned Indian agents from dealing with BHEL.

Any foreign principal who engages such a banned agent, or an employee of the banned agency, or any other person connected with the banned agency, at any time during the tender proceedings, would be disqualified from the tender proceedings. The decision of BHEL in this regard shall be final and be binding on the OEM.

Hence in their own interests, prospective tenderers may check with BHEL, the status of their proposed agent vis-à-vis BHEL.

In view of the requirement of BHEL, it is strongly suggested that in their own interest, foreign principals may desist from engaging any Indian agent and deal with BHEL directly and it is stressed that any Main producer proposing to deal with BHEL by engaging and through an Indian Agent does so at their own risk.

BHEL shall in no way be responsible for any consequences that may arise to the foreign principal on account of the antecedents / actions of their Indian Agent.

In the event of the foreign principal engaging an Indian Agent:

- a) **The Supplier shall furnish an authenticated copy of the Agency Agreement with his agent detailing the precise relationship between them and their mutual interest in the business along with techno commercial bid.**
- b) The Supplier shall furnish original authorization letter for the Indian Agent. The letter shall contain name, contact person, complete postal address including phone, fax and e-mail ID. It shall also spell out the type of services to be rendered by Indian Agent.
- c) Indian Agent & Agency commission: An Indian Agent can represent only one Foreign Manufacturer against a particular Tender. The CFR price quoted by the foreign bidder shall include the agency commission. However, the agency commission component payable to their Indian Agents shall be shown separately in the Offer, either as a lump-sum or as a percentage of the quoted price. This will be paid by BHEL in Indian Rupees, on satisfactory receipt & acceptance of the materials. For calculation of Rupee equivalent of Agency Commission, exchange rate as prevailing on the date of Purchase Order will be taken and
- d) For all discussions, technical clarification and negotiations etc. only the principal would be authorized for interaction with BHEL. The Agent shall not be a party to the discussions / negotiations and would not be normally allowed to participate.

ii) Terms & Conditions of Letter of Credit (L/C) for overseas suppliers (indicated for acceptance).

- a) Unconfirmed irrevocable Letter of Credit at Sight only will be opened by BHEL. Confirmation of L/C is not preferred by BHEL. Also L.C will be opened in Lots in line with the staggered delivery.
- b) All Bank charges out side India are to the Supplier's account and within India to BHEL's account.



c) In case of L/C extension caused by delays attributable to the Supplier, the L/C extension / commitment charges are to be borne by the Supplier.

iii) Other terms & conditions for letter of credit: - Documents for negotiation

a) Signed Commercial invoice in quadruplicate, for a value not exceeding the draft amount, quoting the import Licence No and certifying goods evidencing shipment of the merchandise are as per Applicant's Purchase Order. The amount of invoice after deducting Indian Agent's commission, if any, should not exceed the Credit amount. (The Indian agent's commission, if any, is payable in India in Indian rupees only.)

b) Certificate of Country of Origin, from the country of manufacture, issued by the Chamber of Commerce.

c) One set of Original and two sets of Non-negotiable copies of 'signed', 'unmarked', 'clean on board' Ocean Bill of Lading, showing Shipper as "Government of India" Account M/s. Bharat Heavy Electrical Ltd, Unit: BHEL, Ranipet as consignee (The opening bank should not be notified as consignee), marked freight payable / prepaid at destination.

d) Packing list in 4 copies in English, indicating Size Wise Number of bundles / pieces shipped and weight.

e) Certified copy of the fax / e-mail sent by the beneficiary to the applicant giving the following particulars of shipment, as the insurance is to be arranged by the Applicant in India: (a) Purchase Order Number & date; (b) Bill of Lading Number & date (c) Name of vessel; (d) Port of Loading; (e) Number of bundles / pieces and weight; (f) Invoice Number, date and value (g) Purchase Order item number's despatched. The cable / fax is to be sent within 2 working days of shipment.

f) Beneficiary's certificate showing the relevant airmail / courier reference no. and date that the following clauses have been complied with:

1] Beneficiary to forward by Registered Airmail / Courier one complete set of original documents and one set of non-negotiable documents within 3 working days of obtaining shipping documents to Regional Manager (ROD), Bharat Heavy Electricals Ltd, 6th Floor, EVR Periyar Bldg. No 690 (Old 474), Anna Salai, Nandanam, Chennai-600035. India. (Phone: +91-24330931, 24330253; e-mail: pbpwar@bhel.in)

2] Beneficiary to courier at his cost 3 copies of complete set of non-negotiable documents to the Officer who released the Purchase Order.

3] Declaration by the Supplier certifying that the contents in each case are not less than those entered in the invoices / packing list and that the invoicing for the supplies effected is strictly in accordance with agreed rates as stipulated in the Purchase Order.

4] Declaration to the effect that all other documents as per purchase order has been couriered to the Purchase order releasing authority

5) The carrying steamer should be seaworthy, less than 25 years of age and approved by Lloyds / Classification Societies / General Insurance Corporation of India from time to time and

6) Copy of Dispatch Clearance / Instruction issued by BHEL.

iv) Documents to be sent directly to the Purchaser prior to shipment

a) Manufacturer's Original Internal Inspection / Test certificate in triplicate.



- b) Manufacturer's Original Guarantee certificate as per Purchase Order. The material shall be guaranteed for a period of 12 months from the date of acceptance of the materials at BHEL stores or 18 months from the date of dispatch whichever is earlier. The acceptance would be evidenced by the Stores Receipt Voucher (SRV) which will be raised by BHEL.
- c) Inspection / Test Certificate issued by BHEL / Inspection agency specified in the Purchase Order. In the event that Inspection prior to dispatch is not carried out by the Engineers of BHEL, the Inspection certificate of the third party so authorized by BHEL and
- d) Any other documentation as specified in the Purchase Order.

y) Conditions for transportation:

- a) All shipping documents shall show the Purchase Order Number & Date, Import Licence Number & Date, and Letter of Credit Number & Date. b) Transshipment is to be avoided.
- c) Loading on deck is not permitted. The transport document must not contain a provision that goods may be carried on deck.
- d) A transport document which is produced or appearing to have been produced by reprographic, automated or computerized systems or as carbon copy will be accepted as an original document provided that it is marked as original and is ink-signed.
- e) The transport document must contain all the conditions of carriage on the original document.
- f) The transport document must not indicate the place of destination as being different from the port of discharge.
- g) The transport document must not contain the indication 'intended' or similar qualification in relation to the vessel or other means of transport or port of loading or port of discharge.
- h) The transport document must be issued by the carrier or his agent and not by any freight forwarder.
- i) Transport documents bearing reference by stamp or otherwise, to costs additional to the freight charges are not acceptable.
- j) The Bills of Exchange must be dated and presentation of documents for negotiation must not be later than 15 days after the date of shipment and in any case not later than the expiry date of the Credit.
- l) Indian suppliers shall dispatch the materials on freight prepaid and on door-delivery basis (FOR Destination – Destination: BHEL Stores) and
- m) In the event there is a delay by the Supplier in negotiating / submitting the document, any demurrage / wharfage arising out of the same shall be to the account of the Supplier and shall be deducted from the final payment. Also, in such cases, the Supplier shall authorize the Steamer / Shipping agent / transporter to freely release the consignment to BHEL by providing a “Surrender Bill of Lading”. Over-seas Suppliers have to give a No-Objection Certificate to BHEL, authorizing BHEL to get the Delivery Order from the Steamer Agent without producing the Original Bill of Lading. This is required to ensure avoidance of incidence of demurrage at Chennai Sea-port that may arise in case of delayed presentation of documents by the Seller.



G) Reverse auction (RA) / on-line bidding on internet:

1. Decision to go for RA would be taken before floating of the tender and will be specified in the enquiry commercial terms.

In case it is decided to go for RA, following may be referred to:-

“BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among all the techno-commercially qualified bidders. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered as initial bids of bidders in RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking.”

Bidders are advised to read the RA guidelines published in BHEL portal www.bhel.com.

<https://www.bhel.com/sites/default/files/Guidelines%20for%20Reverse%20Auction%20-%202021%20-%20Abridged.pdf>

H] Force Majeure

If at any time during the currency of this contract, the performance in whole or in part, by either party of any obligations under this contract shall be prevented or delayed by reason, of any war, hostilities, acts of the public enemy, civil commotion, sabotage, fires, explosions, epidemics, quarantine, restrictions or acts of GOD (hereinafter referred to as events), then provided notice of happening of any such events is given by either party to other within ten days from the date of occurrence thereof, neither party shall reason of such events be entitled to terminate this contract nor shall either party have any such non-performance and delay is resumed as soon as practicable after such events has come to an end or ceased to exist. If the performance in whole or part of any obligation under this contract is prevented or delayed by reason or any such event claims for extension of time shall be granted for period considered reasonable by the purchaser subject to prompt notification by the seller to the purchaser of the particulars of the events and supply to the purchaser if required of any supporting evidence. Any waiver of time in respect of partial instalment shall not be deemed to be a waiver of time in respect of remaining deliveries.

I] Cancellation of Order:

In the event of non-performance of the contract by the Supplier, BHEL reserves the right to cancel the order with issue of a written notice. BHEL would provide a curing period of 30 days, for the Supplier to rectify the situation. If the Supplier fails to rectify the reason/s that led to the issue of cancellation notice by BHEL, then the cancellation order would be issued automatically by BHEL, without further recourse to the Seller. BHEL will not pay any cancellation charges or any other charges / damages to the Supplier, arising out such cancellation. In the event of the non-performance of the supply contract, by the Supplier, the rights of BHEL include, in addition to cancelling the order, to take alternate purchase action at the cost and risk of the supplier. The additional expenditure to be incurred by BHEL in such alternate purchase would be to the account of the supplier. (Risk Purchase). This remedy would be in addition to the invoking of the CEBG on grounds of failure of the Supplier in executing the Contract and any other legal remedies." BHEL reserves the right to initiate the alternate purchase action at the cost and risk of the erring supplier by issue of a simple notice of intention for the alternate purchase action duly sent by any electronic means and / or by a letter. The cancellation of the order would not be a pre-condition for initiation of the alternate purchase action.



J] Contract Execution Bank Guarantee:

To demonstrate the fidelity of the successful bidder, in executing the Contract, on receipt of the Letter of Intent / Purchase Order, the Supplier shall arrange to provide a contract execution bank guarantee (CEBG). The format of the CEBG is a part of this enquiry. The format may be downloaded and necessary stamping may be obtained from the Banker towards submission of the CEBG. The indigenous suppliers have to provide the CEBG from any one of the Nationalized Banks, listed in the annexure to these terms. Overseas suppliers can submit the CEBG from any of the reputed International / National Bankers. However the CEBG is to be confirmed by any of the Bankers listed by us. In the event of failure by the Supplier to execute the contract either fully or partially, BHEL would encash the entire CEBG. The CEBG shall be valid for the period covering the agreed delivery date of the order with a further claim period of 3 months on the last specified delivery date. In the event of the failure of delivery BHEL would proceed with encashing the CEBG without reference to the Supplier. In the event of BHEL granting extension of the delivery dates, then the CEBG validity shall also be got extended by the Supplier to the extent of the extended delivery times together with the claim period as specified elsewhere. **The CEBG shall be submitted for a value of 2% of the Purchase order within 30 days from issue of PO. CEBG will be returned after submission of 10% PBG/BG.**

Suppliers who are already registered with BHEL and having a vendor performance rating of A or A+ grade would be exempted from submission of CEBG.

Performance Bank Guarantee

Where ever so required, the Supplier shall arrange to provide a Performance bank guarantee (PBG). The indigenous suppliers have to provide the PBG from any one of the Nationalized Banks, listed in the tender terms. Overseas suppliers can submit the PBG from any of the reputed International / National Bankers. However, the PBG shall be confirmed by any of the Bankers listed by us. The PBG shall guarantee the performance of the equipment / materials / items supplied and shall cover the guarantee period. The PBG shall have a claim period of 3 months in addition to the guarantee period. In the event of failure of the supplies made within the guarantee period, BHEL would encash the entire PBG. **The PBG shall be submitted for a value of 10% of the Purchase order along with the first invoice.**

The supplier/s have to get the PBG format (pre-printed) from BHEL and get the same stamped by the Banker. Change of PBG terms either by the supplier's Banker or by the supplier, after servicing of the order is not acceptable. Similarly, PBG prepared by the supplier (typed by them) will also not be acceptable to BHEL. The pre-printed form issued by BHEL shall be used for making the PBG.

K] Post-order submission of documents for approval

In the event of the release of Letter of Intent (LoI) / Purchase order/s (PO) against this tender, Bidders have to submit the applicable documents as called for in the tender / LoI / PO/s, such as drawings, data sheets, design calculations etc. These documents for approval have to be submitted within the agreed timelines between BHEL and Bidder. Normally the time period for submission for approval is 15 days from the date of receipt of the LoI / PO by the supplier. The actual time period within which the documents have to be submitted for approval would be specified in the LoI / PO.

Such documents would be subjected to evaluation and approval by BHEL and / or by BHEL's customer / Consultant / Customer's Consultant. Bidders have to give their specific acceptance for this.



After approval of such documents and after getting clearance from BHEL, only the items ordered can be taken up for manufacture.

Any changes required by BHEL / Customer etc. in the documents submitted for approval shall be incorporated by the Bidder and no extra cost would be payable by BHEL for such changes.

In the event that the Bidder does not carry out the required corrections, then the LoI / PO would be liable for cancellation by BHEL and BHEL would resort to alternate purchase action at the risk and cost of the Bidder under the Risk Purchase Condition of the Purchase Order.

Note: After receiving the LoI / PO, supplier shall also forward the acknowledgement / acceptance of the LoI / PO by signing and returning the second copy of the LoI / PO as the token of acceptance.

L] Others

a) In case of any contradiction in the terms and conditions given here and elsewhere in the other documents of the tender, it shall be the responsibility of the tenderer to get it clarified from BHEL. The officer authorized to provide such clarifications is the tender issuing officer.

b) Alterations to the conditions of the Tender can be done only by the authorized officer, at any time before the date and time of tender opening and would be duly communicated through a corrigendum. c)

Suspension of Business dealings with Suppliers:

(i) Before submitting offer, prospective bidders are advised to visit our web-site www.bhel.com / supplier registration to familiarize themselves with BHEL's policy and procedures of Suspension of Business Dealings with Suppliers.

Submission of offer shall be deemed to be evidence of the Bidder to have read and accepted the above said policy.

ii) Treatment of Banned / Under-performing Vendors:

Any supplier who has been put on "Hold" or "Banned" from having business dealings with BHEL, Ranipet or any other unit of BHEL shall not submit their offer against this tender. If any such offers are received they would be summarily rejected and sent back. During the processing of tender, if any unit of BHEL puts a supplier on "Ban" then further processing of the offer will not be taken up and in case an order is placed, BHEL, Ranipet may resort at their discretion to cancel the PO either fully or partially.

If any of the supplier who is supplying similar material to BHEL, Ranipet has a Vendor Performance Rating (VPR) score of 'C' or below, then offer given by such parties will not be considered for ordering in this tender.

If any of the Bidders have unexecuted order/s with BHEL and if in such orders, the deliveries have been delayed beyond a reasonable period (say 30 days of agreed delivery period), the offer of such Bidders will also be liable for rejection.

Offers of such of those bidders against whom action for suspension of business dealings has been initiated by BHEL, Ranipet or any other Units/Division of BHEL will also not be considered in this tender.

d) Fraud Prevention Policy:

The Bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website



<http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.

e) **Applicability of Integrity Pact:-**

IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner. A panel of Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl.No	IEM	Email
1.	Shri Arun Chandra Verma, IPS (Retd.)	acverma1@gmail.com
2.	Shri Virendra Bahadur Singh, IPS (Retd.)	vbsinghips@gmail.com

The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid(Part-I, in case of two/three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to the IEM(s).All correspondence with the IEMs shall be done through email only.

Note:

No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below:

For all clarifications/ issues related to the tender, please contact:

Name: (1) (2)

Dep't: Address:

.....

.....

Phone:(Landline/Mobile) (1) (2)

Email:

Fax:

Integrity Pact are applicable for all the BHEL enquiries whose estimated value is equal to or more than Rupees 02 Crores.

Format of Integrity Pact with applicable nominated IEM is attached along with the tender documents for ready reference of Suppliers.

f) If any Supplier attempts to bribe, or pay commission, gift or any advantage or bring in undue influence either by himself or on his behalf any one including a stranger to the tender, in addition to instituting legal



proceedings as per the extant laws prevailing, will disqualify the supplier from this tender and all future tenders of BHEL. Decision of the Purchaser would be final in this matter.

g) The laws governing this transaction shall be the laws in India.

h) Wherever not specified, Inco terms 2010 shall be used to interpret the Commercial terms and conditions and

i) In the event of an order, Supplier shall agree to settlement of disputes or differences, if any, by way of arbitration, in accordance with the "Rule of Arbitration" of the Indian Council of Arbitration.

The language in the tender documents downloaded by the Bidders shall at no point of time be changed, altered or modified in any manner by the Tenderer. If such changes are made by any tenderer, it shall be considered as tampering with BHEL's terms and the offer shall be summarily rejected, whenever it is noticed by BHEL. Such Bidders would be disqualified from the Bidding Process and their offers would be forfeited / Bank Guarantees invoked. They would also not be allowed to participate in future tenders of BHEL.

M. Conditions for rejection of offers:

Following is the list of situations which would lead to rejection of offer/s.

This list is not exhaustive but only indicative.

BHEL reserve the right to reject one or all offers without assigning any reason. The decision of BHEL will be final in this regard.

- 1. If the offer fails to meet the technical requirements/specifications of the tendered item/s.*
- 2. If the offer does not meet the commercial terms & conditions, such as but not limited to delivery period specified in the tender, Delivery terms, payment terms, Liquidated damages, Risk Purchase, cancellation clause etc., including the load factors specified in the tender.*
- 3. If the bidder fails to respond to clarification sought, within a reasonable period. In case of doubts / lack of clarity on the technical and commercial offer of the bidder, BHEL will seek clarifications. Bidders are required to respond completely to such BHEL's queries within 3 working days unless otherwise agreed to in writing by BHEL for period beyond 3 days. If supplier fails to respond within 3 working days or maximum 2 working days on a reminder thereon, the offer of such bidders will be automatically dis-qualified in the tender without further recourse to informing the bidder.*
- 4. If any of the conditions listed below are applicable to the bidder, the offer is liable to be rejected:*

If any

- Debt recovery / Winding up Proceedings are initiated against the Company in Courts / Debt Recovery Tribunals (DRTs),
 - Proceedings are there against the Company in National Company Law Tribunal (NCLT) with respect to Insolvency and Bankruptcy Code (IBC) or otherwise,
 - Any proceedings are there against the Company under the "Securitization and Reconstruction of Financial Assets and Enforcement of Security Interest (SARFAESI) Act,
 - Any restructuring proceedings are underway for the Company under Corporate Debt Restructuring (CDR), Strategic Debt Restructuring (SDR) or otherwise,
 - Divestment / demerger proceedings are underway for the Company under the Companies Act.
 - If action under guidelines of suspension of business dealings (Ref AA/MM/SB/01 Rev 02 dt 22.07.2016) and its latest revisions has been initiated against the company/bidder.
- 5. Failure to sign & accept the Integrity Pact (where applicable). Bidders are hereby informed that the contents of the Integrity Pact are firm and fixed and cannot be changed.*



The above list is not exhaustive but is indicative only.

N. Special Note:

BHEL is a Government of India Undertaking. Its procurement practices are governed by the (Internal) Purchase Policy issued by the management of the company and as per enquiry Annexures applicable at the time of finalising the order against this tender.

-O-

ANNEXURE - C
BHEL : BAP : RANIPET
PURCHASE – WATER SYSTEM
COMMERCIAL TERMS AND CONDITIONS
SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES AS PER THE TECH SPEC NO. ROS 6322 REV 00 & ROS 4291 REV 00 & RELEVANT ANNEXURE (MAIN SUPPLY, MANDATORY SPARES SUPPLY & ERECTION, COMMISSIONING, PG TEST AND HANDING OVER)
FOR SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT

Enquiry No. 7710727E Dated 01-DEC-2021

Sl. No.	DESCRIPTION	BHEL (PURCHASER) REQUIREMENT	VENDOR (SELLER) CONFIRMATION
I	<u>PRE-QUALIFICATION REQUIREMENT</u>		
01	PRE-QUALIFICATION REQUIREMENT (TECHNICAL)	Vendor should submit the Filled QR Datasheet & Necessary supporting documents proof for meeting the QR as per Pre-Qualification Requirement (PQR) for SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES I) REF:- GCL: Sagardighi (1x660 MW) Rev 0 dt 11.09.2021	
02	PRE-QUALIFICATION REQUIREMENT (FINANCIAL SOUNDNESS)	Vendor should submit the Filled QR Datasheet & Necessary supporting documents proof for meeting the QR as per Pre-Qualification Requirement (PQR) for FINANCIAL SOUNDNESS I) ANNEXURE - K	
03	FILLED Qualification Requirements DATA SHEET & NECESSARY SUPPORTING DOCUMENTS PROOF SUBMISSION	BHEL reserve the right to Accept/Reject the bids if any of the above details are not submitted - Please confirm	
II	<u>Technical</u>		
01	SCOPE OF SUPPLY	Please confirm the Scope of Supply of " Design, Engineering, Manufacture, Fabrication, Assembly, Inspection and Testing at Vendor's & Sub-Vendor's Works, Painting, Forwarding, Proper Packing, Shipment and Delivery at Site, Unloading, Handling & Transportation at Site of CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES " as per Specification No. 1. ROS:6322 REV 00 DATE 08.09.2021, ROS:4291 REV 00 DATE 15.09.2021 & RELEVANT ANNEXURE. submit the same after necessary Filling, signing & returning a copy of the same.	
02	SPECIFICATION	Please confirm Clause wise / Point wise "IN TOTO" for all specifications and submit along with offer.	
03	DATA SHEETS / DRAWINGS	Filled Data Sheets and Drawings are to be submitted along with offer. (if applicable)	
04	QUALITY ASSURANCE PLAN (QAP)	Please Confirm to submit the QAP / RQP / MQP as per the Customer Sample Format for review and approval by customer within 2 Weeks from the date of Letter of Award (LOA). Please Refer Annexure - Q and provide your acceptance.	
05	SPECIFICATION DEVIATION DISPOSITION REPORT (SDDR)	Attached SDDR to be filled & submit along with offer. (Even, If NO deviation is taken, NIL report to be submitted).	
06	ERECTION, COMMISSIONING, PG TEST & HANDING OVER OF GAS CHLORINATION PLANT ALONG WITH COMPLETE ACCESSORIES AT SAGARDIGHI PROJECT SITE	Please confirm the carrying out " ERECTION, COMMISSIONING, PG TEST & HANDING OVER OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES " as per Specification No. 1. ROS:6322 REV 00 DATE 08.09.2021, ROS:4291 REV 00 DATE 15.09.2021 & RELEVANT ANNEXURE.	
07	COMMISSIONING SPARES	Please confirm that the Supply of "COMMISSIONING SPARES" as per the Technical specification & bidder's offer and WILL BE SUPPLIED ALONG WITH MAIN SUPPLY Commissioning spares shall be packed separately with detailed packing list (items should not be packed along with main supply items) The commissioning spares List and the individual price should be indicated. Any other spare(s) required during commissioning but not indicated in the list, should also be supplied at BIDDER's cost & BHEL will not entertain any claim towards supply of such spares used/supplied during commissioning.	
08	MANDATORY SPARES	Please confirm that the " Supply of "MANDATORY SPARES" as per the Technical specification ROS:6322 REV 00 DATE 08.09.2021, ROS:4291 REV 00 DATE 15.09.2021 & RELEVANT ANNEXURE. - FOR CW GAS CHLORINATION SYSTEM. Mandatory Spares shall be packed separately with detailed packing list (items should not be packed along with main supply items) Mandatory Spares List and the individual price should be indicated. The Bidder should also indicate if any spare(s) other than those indicated in the spec is/are required. Packing of Mandatory Spares should have a Red colour band all around the box/ package and words "MANDATORY SPARES" written in red colour. Project, Package description, BHEL's PO No. and date should also be clearly mentioned on the box.	
09	END CUSTOMER APPROVAL	Documents submitted for Pre-Qualifications will be submitted to M/s. WBPDCS SAGARDIGHI TPP PROJECT for evaluation. Bidders will be required to submit any further documents/information/clarifications sought by M/s. WBPDCS SAGARDIGHI. ONLY END CUSTOMER APPROVED BIDDERS WILL BE QUALIFIED FOR PRICE BID OPENING.	

ANNEXURE - C
 BHEL : BAP : RANIPET
 PURCHASE – WATER SYSTEM
COMMERCIAL TERMS AND CONDITIONS
 SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES AS PER THE TECH SPEC NO.
 ROS 6322 REV 00 & ROS 4291 REV 00 & RELEVANT ANNEXURE (MAIN SUPPLY, MANDATORY SPARES SUPPLY & ERECTION, COMMISSIONING, PG TEST
 AND HANDING OVER)
 FOR SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT
 Enquiry No. 7710727E Dated 01-DEC-2021

Sl. No.	DESCRIPTION	BHEL (PURCHASER) REQUIREMENT	VENDOR (SELLER) CONFIRMATION
III	Commercial Terms & Conditions		
01	PRICE	Please confirm 'Firm Price' till completion of order	
02	UNPRICED BID (PART-1)	Please confirm submission of ' Unpriced bid ' in the price bid format attached duly signed. SCANNED COPY of FILLED & SIGNED COPY OF 'Price Bid' format attached by filling all informations by writing ' Quoted ' as the case may be in the ' Rate ' and ' Value ' columns to be submitted through E-Procurement System.	
03	PRICED BID (PART-2)	Please confirm submission of ' Priced bid ' in the price bid format (BOQ) attached duly signed. SCANNED COPY of FILLED & SIGNED COPY OF ' Price Bid ' format attached by filling all informations by writing the value as the case may be in the ' Rate ' and ' Value ' columns in a separate attachment to be submitted through E- Procurement System. Price bid opening will be considered after the Techno-Commercial evaluation & further final approval from the customer: M/s. WBPDCS SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT	
04A	DELIVERY TERMS & PRICE BASIS	Please confirm for FOR - Destination (M/s. WBPDCS SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT) basis. Unloading the Material at site is BHEL's Scope	
04B	RECEIPT OF GOODS AND STORAGE	The equipment after inspection at manufacturer's works shall be transported to BHEL site and shall be received, unloaded and stored by Vendor as detailed in the supply specification. Bidder shall store all high value items & critical items (such as instruments, UPS, battery, etc..) under lock & key, using containers only - Please Confirm	
05A	CONSIGNEE ADDRESS (SUPPLY DESTINATION) FOR ENQ. SL. NO. 001 - MAIN SUPPLY and ENQ. SL. NO. 002 - E&C	Please confirm supply to the following consignee address in the event of Order. DEPUTY GENERAL MANAGER(I/C PROJECT) THE WEST BENGAL POWER DEVELOPMENT CORPORATION LIMITED SAGARDIGHI THERMAL POWER PROJECT MANIGRAM, MURSHIDABAD WEST BENGAL - 742237 GSTN - 19AABCT3027C1ZQ Contact Person: will be informed later (On account of M/s BHEL, BAP, Ranipet - 632 406)	
05B	CONSIGNEE ADDRESS (SUPPLY DESTINATION) FOR ENQ. SL. NO. 003	Please confirm supply to the following consignee address in the event of Order. THE AGM / STORES BHARAT HEAVY ELECTRICALS LIMITED, BOILER AUXILIARIES PLANT, RANIPET – 632 406 TAMILNADU. GSTIN 33AAACB4146P2ZL PAN NO. AAACB4146P	
06	ORIGIN OF DESPATCH OF VARIOUS CONSIGNMENT	Please indicate clearly the origin of despatch of various consignments duly indicating whether interstate or intrastate based on the consignee address above. Origin of despatch should not be subjected to change during execution of contract.	
07	PACKING & FORWARDING	Please confirm inclusion of Packing & Forwarding Charges in the Basic quoted price. If it is extra payable by BHEL, Please clearly indicate the applicable Packing & Forwarding charges in % value. Packing shall be in conformity with specifications and shall be such as to ensure prevention of damages, corrosion, deterioration, shortages, pilferage and loss in transit or storage. Packing List shall be submitted as per standard format along with advance set of documents for claiming payment which shall also indicate:- a) Packing size. b) Gross weight and net weight of each package. c) Contents of the package with quantity of each item separately.	

ANNEXURE - C
BHEL : BAP : RANIPET
PURCHASE – WATER SYSTEM
COMMERCIAL TERMS AND CONDITIONS
SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES AS PER THE TECH SPEC NO. ROS 6322 REV 00 & ROS 4291 REV 00 & RELEVANT ANNEXURE (MAIN SUPPLY, MANDATORY SPARES SUPPLY & ERECTION, COMMISSIONING, PG TEST AND HANDING OVER)
FOR SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT

Enquiry No. 7710727E Dated 01-DEC-2021

Sl. No.	DESCRIPTION	BHEL (PURCHASER) REQUIREMENT	VENDOR (SELLER) CONFIRMATION
08	FREIGHT & INSURANCE	<p>Please confirm inclusion of Freight & Insurance Charges towards this in the Basic quoted price.</p> <p>A) If Freight & GST is extra payable by BHEL, Please clearly indicate the applicable portions of : 01.Freight charges in % on Basic Quoted price. 02.If GST applicable for the freight kindly indicate the same.</p> <p>B) If Insurance is extra payable by BHEL, Please clearly indicate the applicable portions of : Insurance charges in % on Basic Quoted price.</p> <p>All dispatches shall be through road carriers approved by Purchaser/ Bank, on freight pre-paid basis.</p> <p>Road Permit/E-way bill, if required, will be arranged by Supplier.</p>	
09A	GOODS AND SERVICES TAX FOR SUPPLY PORTION (CGST/SGST/UTGST/IGST) (FOR ENQ. SL. NO. 001 & 003)	<p>Seller/ Contractor is required to ensure that CGST/SGST/UTGST/IGST (whichever is applicable) is quoted as per the existing tariff on the date of the offer and all benefits as per existing laws have been considered.</p> <p>It is the responsibility of the seller/contractor to issue the Tax Invoice strictly as per the format prescribed under the relevant applicable GST law(CGST Act/SGST Act/UTGST Act/IGST Act).</p> <p>Vendor to indicate the proper GSTN Registration/ HSN code in their tax invoice.</p> <p>CGST/SGST/UTGST/IGST shall be paid at actuals against Tax Invoice but restricted to the amount and percentage in the order/contract</p>	
		Please Confirm the Applicable percentage of CGST/SGST/UTGST/IGST Payable Extra by BHEL (OR) Not?	
09B	GOODS AND SERVICES TAX (GST) FOR SERVICE PORTION (CGST/SGST/UTGST/IGST) FOR ENQ SL. NO. 002)	<p>Seller/ Contractor is required to ensure that CGST/SGST/UTGST/IGST (whichever is applicable) is quoted as per the existing tariff on the date of the offer and all benefits as per existing laws have been considered.</p> <p>It is the responsibility of the seller/contractor to issue the Tax Invoice strictly as per the format prescribed under the relevant applicable GST law(CGST Act/SGST Act/UTGST Act/IGST Act).</p> <p>Vendor to indicate the proper GSTN Registration/ HSN code in their tax invoice.</p> <p>CGST/SGST/UTGST/IGST shall be paid at actuals against Tax Invoice but restricted to the amount and percentage in the order/contract</p>	
		Please Confirm the Applicable percentage of CGST/SGST/UTGST/IGST Payable Extra by BHEL (OR) Not?	
10A	PAYMENT TERM FOR SUPPLY (ENQ. SL. NO. 001 - MAIN SUPPLY)	<p>1. Vendor has to submit the Invoice for 100% of Basic price with applicable % of GST, Freight with GST if any. BHEL will release 90% Payment of basic price of materials supplied, along with 100% freight, taxes and duties (as applicable) against submission of MRC (Material Receipt Certificate - MRC signed by respective site MM official and ultimate customer designated official) and submission of Bank Guarantee for 10% of PO value valid till guarantee period towards performance.</p> <p>BG - 10% of Order/ Contract value (excluding taxes, duties & freight) before first submission of documents for payment to cover the due performance of Order/ Contract and to fulfill the guarantee conditions stipulated in the Order/ Contract.</p> <p>Validity of the Bank Guarantee shall be for the entire Guarantee period. Initially, it should be at least 18 months plus 3 months claim period, later extended to cover the entire guarantee period, two months before its expiry.</p>	
		<p>10% will be released after</p> <p>i) submission of all final documents as per Technical Specifications and</p> <p>ii) successful completion of Performance Guarantee (PG) / Demonstration Test and handing over of the CW GAS CHLORINATION SYSTEM.</p> <p>Please confirm above payment term and Please note that the Invoices should be submitted strictly on the above Indicated % only.</p>	
10B	PAYMENT TERM FOR SUPPLY (ENQ. SL. NO. 003 - MANDATORY SPARES)	100% payment will be against Receipt of Material at Stores (DB i.e Day Book Register receipt) & submission of Bank Guarantee towards Performance (As called for in Sl. No. 22A) & receipt of complete documents as per PO.	
11	PAYMENT TERM FOR ERECTION, COMMISSIONING, PG TEST OF CW GAS CHLORINATION SYSTEM AT	<p>1) Eighty percent (80%) payment on prorata basis for the work completed, as per approved billing schedule, shall be released by Site authorities/ Region on submission of protocols, duly signed by BHEL Site/ Owner.</p> <p>2) Ten percent (10%) of the total value shall be released by Site authorities/ Region on successful commissioning of the complete the CW GAS CHLORINATION SYSTEM.</p>	

ANNEXURE - C
BHEL : BAP : RANIPET
PURCHASE – WATER SYSTEM
COMMERCIAL TERMS AND CONDITIONS
SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES AS PER THE TECH SPEC NO. ROS 6322 REV 00 & ROS 4291 REV 00 & RELEVANT ANNEXURE (MAIN SUPPLY, MANDATORY SPARES SUPPLY & ERECTION, COMMISSIONING, PG TEST AND HANDING OVER)
FOR SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT

Enquiry No. 7710727E Dated 01-DEC-2021

Sl. No.	DESCRIPTION	BHEL (PURCHASER) REQUIREMENT	VENDOR (SELLER) CONFIRMATION
11	GAS CHLORINATION SYSTEM AT SAGARDIGHI PROJECT SITE (ENQ. SL. NO. 002 - SERVICE)	Ten percent (10%) of the total value shall be released by Site authorities/ Region on successful completion of PG/ Demonstration test(s) and handing over of CW GAS CHLORINATION SYSTEM to the Owner. Please confirm above payment term and Please note that the Invoices should be submitted strictly on the above Indicated % only.	
12A	CONFIRM THE PAYMENT TERM FOR SUPPLY. (DURATION FOR MAKING PAYMENT)	Differential Payments applicable for Supply & Service - Within 45 days for MSE (Micro & Small Enterprise) vendor & Within 90 days for MEDIUM & Non MSE vendors For MSE status Registration, you have to submit the Notarized copy of MSE Udyam Certificate with Original CA certificate.	
12B	UN-ACCEPTABLE PAYMENT TERMS	Offers with payment Terms such as Cash against Delivery / advance payment / payment through Bank against dispatch documents will be summarily rejected	
13	CONDITION FOR ERECTION & COMMISSIONING, PG TEST CHARGES	Total ERECTION, COMMISSIONING & PG TEST charges including GST should be minimum 20% of the total quoted package price (including all taxes and freight), failing which the break-up of prices shall be adjusted accordingly for ordering.	
14A	DELIVERY PERIOD FOR THE SUPPLY (ENQ. SL. NO. 001 MAIN ITEMS & COMMISSIONING SPARES if any)	Please confirm the supply completion within 10 Months from the date of CAT-I Approval of all Documents / Manufacturing clearance, which ever is Later. Vendor to submit all drawings/documents within 2 weeks from the date of purchase order and resubmit the drawings/documents within 1 week incorporating all the comments. In case there are supplier's delays in submission of drawings/documents beyond 2 weeks of order or 1 week of comments, that much days of delay would be reduced from delivery period. Vendor can also quote improved delivery date if any or otherwise, please clearly indicate the delivery period in weeks / months from the date of Manufacturing clearance. NOTE: Delivery period shall be reckoned till receipt of materials at site subject to issuance of MDCC from Customer / BHEL. For LD Purpose, Date of site receipt of material will only be considered.	
14B	DELIVERY PERIOD FOR THE SUPPLY (ENQ. SL. NO. 003 - MANDATORY SPARES)	Please confirm the supply completion within 6 Months from the date of Main Items supply completion. Vendor to submit all drawings/documents within 2 weeks from the date of purchase order and resubmit the drawings/documents within 1 week incorporating all the comments. In case there are delays of submission of drawings/documents beyond 2 weeks of order or 1 week of comments, that much days of delay would be reduced from delivery period. Vendor can also quote improved delivery date if any or otherwise, please clearly indicate the delivery period in weeks / months from the date of Manufacturing clearance. NOTE: Delivery period shall be reckoned till receipt of materials at BHEL BAP RANIPET STORES subject to issuance of MDCC from Customer / BHEL. For LD Purpose, Date of site receipt of material will only be considered.	
15	ERECTION, COMMISSIONING & PG TEST PERIOD	Please confirm the completion of ERECTION , COMMISSIONING, PG TEST Period within 6 MONTHS from the Supply PO Delivery date / Date of Site Readiness whichever is Later. Site Readiness will be informed by BHEL. Vendor can also quote improved delivery date if any or otherwise, Please clearly indicate the ERECTION , COMMISSIONING, PG TEST period in weeks / months from the date of Supply PO Delivery date / Date of Site Readiness whichever is Later.	
16A	LIQUIDATED DAMAGES (LD) - Main Supply Portion	Purchaser reserves the right to recover from the Seller/ Contractor, as agreed liquidated damages and not by way of penalty, a sum equivalent to half (1/2) percent and applicable GST thereon, of the total contract price (main supply and E & C), excluding GST per week or part thereof, subject to a maximum of ten (10) percent of the total contract price (main supply and E&C) excluding GST, if E&C completion of the package is delayed beyond the contractual completion date or extension thereof as per the period stipulated in the Order/ Contract.	
16B	LIQUIDATED DAMAGES (LD) - Mandatory Spares Supply Portion	LD on mandatory spares portion where delivery for mandatory spares is defined separately in the NIT. LD shall be applicable @ 1/2 percent and applicable GST thereon, of the total mandatory spares portion contract value excluding GST per week or part thereof, limiting to 10% of total contract value of mandatory spares excluding GST.	
16C	LIQUIDATED DAMAGES (LD) - SERVICE Portion	LD on service portion ERECTION, COMMISSIONING & PG TEST, etc.) where delivery for services are defined separately in the NIT. LD shall be applicable @0.5 % percent and applicable GST thereon, of the total service portion contract value excluding GST per week or part thereof subject to a maximum of ten (10) percent of the total contract value of service portion excluding GST.	

ANNEXURE - C
BHEL : BAP : RANIPET
PURCHASE – WATER SYSTEM
COMMERCIAL TERMS AND CONDITIONS
SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES AS PER THE TECH SPEC NO. ROS 6322 REV 00 & ROS 4291 REV 00 & RELEVANT ANNEXURE (MAIN SUPPLY, MANDATORY SPARES SUPPLY & ERECTION, COMMISSIONING, PG TEST AND HANDING OVER)
FOR SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT

Enquiry No. 7710727E Dated 01-DEC-2021

Sl. No.	DESCRIPTION	BHEL (PURCHASER) REQUIREMENT	VENDOR (SELLER) CONFIRMATION
17	OFFER VALIDITY	Please confirm Offer Validity for a minimum period of 180 days from the date of PART I bid opening.	
18	INSPECTION	Please confirm for 'Inspection of all the Items by BHEL Engineers / BHEL Authorized Engineer and Customer / Consultant Engineer either jointly or individually before the dispatch of the item at vendor works as per approved QAP. Inspection charges if any to be indicated in the price bid format.	
19	TEST CERTIFICATE (TC)	Please confirm that required TC will be provided at 'No Extra Cost'.	
20A	GUARANTEE CERTIFICATE (GC) - Supply Portion.	Please confirm furnishing of Guarantee certificate in BHEL format for 12 months from the date of commissioning or 18 months from the date of last despatch whichever is earlier.	
20B	GUARANTEE CERTIFICATE (GC) - E & C Portion	Please confirm furnishing of Guarantee certificate in BHEL format for the system for "12 MONTHS FROM THE DATE OF PG TEST OR 18 MONTHS FROM THE DATE OF COMPLETION OF ERECTION & COMMISSIONING of the Plant." whichever is earlier.	
21	Contract Execution Bank Guarantee (CEBG).	To demonstrate the fidelity of the successful bidder, in executing the Contract, on receipt of the Letter of Intent / Purchase Order, the Supplier shall arrange to provide a contract execution bank guarantee (CEBG) equivalent to 2% of the PO value.	
22A	PERFORMANCE BANK GUARANTEE (PBG) TOWARDS Supply Portion (10% OF ORDER VALUE) (Main Supply & Mandatory Spares)	PBG to be submitted in the format ENCLOSED. PBG for 10% of the Total PO Value. Validity of the Performance Bank Guarantee shall be for the entire Guarantee period. Initially, it should be at least 18 months from the date of first dispatch or 12 months from the date of commissioning plus 3 months claim period, later extended to cover the entire guarantee period plus three months claim period. PBG (if required) to be extended 2 months before the expiry date.	
22B	BANK GUARANTEE (BG) TOWARDS E & C Portion. (10% OF ORDER VALUE)	BG to be submitted in the format ENCLOSED. BG for 10% of the Total PO Value valid for 12 months from the date of PG TEST OR 18 MONTHS FROM THE DATE OF COMPLETION OF ERECTION & COMMISSIONING of the Plant plus 3 months claim period. BG (if required) to be extended 2 months before the expiry date.	
23	ERECTION MANUAL (INSTALLATION INSTRUCTIONS)	Please confirm for providing of 'comprehensive Erection Manual covering the entire supply which include bought-outs' 6 sets in Hard copy & one CD form.	
24	O & M MANUAL	Please confirm for providing of 'comprehensive O&M Manual covering the entire System' 6 sets in Hard copy & one CD form.	
25	REVERSE AUCTION	BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among the techno-commercially qualified bidders. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered for RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking.	
26	RISK PURCHASE CLAUSE	Alternatively, the purchaser at his option will be entitled the contract and to purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or despatch within the time stipulated as aforesaid or If the same were not available, the best and the nearest available substitute therefor. The supplier shall be liable for any loss which the purchaser may sustain by reason of such risk purchases In addition to penalty at the rate mentioned In LD Clause above.	
27	ZERO DATE (CONTRACT EFFECTIVE DATE)	Contract Effective date starts from Manufacturing Clearance subject to Documents submission clause. Please confirm for 'Date of Manufacturing Clearance'.	
28	Loading Criteria	Please note that no Commercial deviation is acceptable to BHEL. In case any deviation is taken in any of the commercial terms such as PAYMENT TERMS, LD etc., where in we have specified the days, percentages etc., then loading will be done to the extent of the short fall with respect to the upper Limit specified for evaluation. In respect of LD offers which do not accept for LD Clause would be summarly rejected - Please Confirm.	
29	NEGOTIATION	In the event of negotiation if any, please confirm participation only by supplier's representative and not by their Agent which include indian Agent in the case of Foreign Offer.	
30	OTHER DOCUMENTS FOR APPROVAL (BBU)	In the event of order vendor should confirm the submission of BBU (Billing Breakup) for the complete system supply with break up for each line item as well as quantities with value (If Applicable)	
31	LAW GOVERNING THE CONTRACT AND COURT JURISDICTION	The contract shall be governed by the Law for the time being in force in the Republic of India. The Civil Court having original Civil Jurisdiction at Ranipet / Vellore Tamil Nadu, shall alone have exclusive jurisdiction in regard to all matters in respect of the Contract.	
32	FRAUD POLICY	The bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants/ service providers shall strictly adhere to BHEL fraud prevention policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL management about any fraud or suspected fraud as soon as it comes to their notice	

ANNEXURE - C
BHEL : BAP : RANIPET
PURCHASE – WATER SYSTEM
COMMERCIAL TERMS AND CONDITIONS
SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES AS PER THE TECH SPEC NO. ROS 6322 REV 00 & ROS 4291 REV 00 & RELEVANT ANNEXURE (MAIN SUPPLY, MANDATORY SPARES SUPPLY & ERECTION, COMMISSIONING, PG TEST AND HANDING OVER)
FOR SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT

Enquiry No. 7710727E Dated 01-DEC-2021

Sl. No.	DESCRIPTION	BHEL (PURCHASER) REQUIREMENT	VENDOR (SELLER) CONFIRMATION
33	PLEASE PROVIDE THE STATUTORY DETAILS (Submit a copy of PAN, if not submitted already)	GST Regn. Number	
		HSN NO.: HARMONIZED SYSTEM OF NOMENCLATURE UNDER GST FOR THE OFFERED ITEM	
		PAN No. :	
34	CONTACT PERSON'S ON TECHNICAL DETAILS FOR CORRESPONDENCE	Name:	
		Designation:	
		Phone No.:	
		Mobile No.:	
		Fax No.:	
		E-mail ID:	
35	CONTACT PERSON'S ON COMMERCIAL DETAILS FOR CORRESPONDENCE	Name:	
		Designation:	
		Phone No.:	
		Mobile No.:	
		Fax No.:	
		E-mail ID:	
36	IMPORTANT NOTE. BHEL/Ranipet will issue LOA (Letter of Award) for E&C and supervision Portion (Service Part) and BHEL/PSSR will issue the Purchase order and make the payment.	Acceptance Required	
37	BHEL will not take cognizance of commercial terms mentioned by the bidder any where else. Commercial terms and conditions indicated in this Annexure - A will only be applicable and binding.	Acceptance Required	

Signature, Seal & Date of offerer on all the pages.

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To
NAME
& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at _____¹ through its Unit at _____ (name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) with its registered office at _____² hereinafter referred to as the 'Vendor / Contractor / Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No _____ dated _____³ valued at Rs _____⁴ (Rupees -----)/FC _____ (in words _____) for _____⁵ (hereinafter called the 'Contract') and the Vendor / Contractor / Supplier having agreed to provide a Contract Performance Bank Guarantee, equivalent to _____ % (_____ . Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we, _____, (hereinafter referred to as the Bank), having registered/Head office at _____ and inter alia a branch at _____ being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer any sum or sums upto a maximum amount of Rs -- -----⁶ (Rupees -----) without any demur, immediately on first demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand.

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Vendor / Contractor / Supplier in any suit or proceeding pending before any Court or Tribunal, Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the Vendor / Contractor / Supplier shall have no claim against us for making such payment.

We the _____ bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract/satisfactory completion of the performance guarantee period as per the terms of the Contract and that it shall continue to be enforceable till

all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We, _____ BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Vendor / Contractor / Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Vendor / Contractor / Supplier and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Vendor / Contractor / Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Vendor / Contractor / Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Vendor / Contractor / Supplier and notwithstanding any security or other guarantee that the Employer may have in relation to the Vendor / Contractor / Supplier's liabilities.

This Guarantee shall remain in force upto and including _____⁷ and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Vendor / Contractor / Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the _____⁸ we shall be discharged from all liabilities under this guarantee thereafter.

We, _____ BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed _____⁶
- b) This Guarantee shall be valid up to _____⁷
- c) Unless the Bank is served a written claim or demand on or before _____⁸ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of
(Name of the Bank)

Dated _____ .

Place of Issue _____ .

¹ NAME AND ADDRESS OF EMPLOYER I.e Bharat Heavy Electricals Limited

² NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

³ DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

⁴ CONTRACT VALUE

⁵ PROJECT/SUPPLY DETAILS

⁶ BG AMOUNT IN FIGURES AND WORDS

⁷ VALIDITY DATE

⁸ DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. Units are advised that expiry of claim period may be kept 3-6 months after validity date. It may be ensured that the same is in line with the agreement/ contract entered with the Vendor.
2. The BG should be on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Contractor/Supplier /Bank issuing the guarantee.
3. In line with the GCC, SCC or contractual terms, Unit may carry out minor modifications in the Standard BG Formats. If required, such modifications may be carried out after taking up appropriately with the Unit/Region & Law Deptt.

4. In Case of Bank Guarantees submitted by Foreign Vendors-

- a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
- b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**
 - b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank & (BHEL & Consortium Bank) branch in India. It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
 - b.2 **In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank** (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.
 - b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). The BG Format provided to them should clearly specify the same.

**ANNEXURE - E
SPECIFICATION DEVIATION DISPOSITION REPORT**

<p>Enquiry No. 7710727E Dated 01-DEC-2021</p>	<p align="center">SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES AS PER THE TECH SPEC NO. ROS 6322 REV 00 & ROS 4291 REV 00 & RELEVANT ANNEXURE (MAIN SUPPLY, MANDATORY SPARES SUPPLY & ERECTION, COMMISSIONING, PG TEST AND HANDING OVER) FOR SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT</p>	<p>Vendor Name</p>	
<p>01. TECHNICAL SPECIFICATION FOR CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES - SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT - ROS: 6322 Rev 00 Dated 08.09.2021 (Total No. of Pages – 545).</p> <p>02. Quality evaluation requirements and QAP / QP / MQP Customer Sample Format / ANNEXURE – Q</p> <p>03. INSPECTION CHECK LIST for obtaining the MDCC from End Customer - INSP CHK 001 REV 00</p> <p>4. Financial PQR - Annexure K</p>			
<p>Page</p>	<p>Clause</p>	<p>Details Of Deviation With Reason</p>	<p>Disposition By BHEL</p>
<p align="center">Signature Of Vendor</p>			<p>Reviewed By</p>
<p align="center">“ AGREED DEVIATION “</p>			<p>APPROVED BY</p>
<p align="center">if any to be incorporated in the PO in the event of order.</p>			

Date :

VENDOR's SIGNATURE WITH SEAL

Tender Inviting Authority: AGM/PURCHASE

Name of Work: SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES and MANDATORY SPARES for SAGARDIGHI PROJECT.

ENQUIRY No: 7710727E dt 01 DEC 2021

Name of the Bidder/ Bidding Firm / Company :	
--	--

PRICE SCHEDULE

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Item Code / Make	Quantity	Units	BASIC RATE PER UNIT(Inclusive of packing & forwarding, freight and insurance) to be entered by the Bidder in INR Rs. P	GST on Basic price to be entered by the Bidder in percentage	TOTAL AMOUNT Without Taxes in Rs. P	TOTAL AMOUNT With Taxes in Rs. P	TOTAL AMOUNT In Words
1	2	3	4	5	13	14	53	54	55
0	SUPPLY, ERECTION AND COMMISSIONING OF CW GAS CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES AS PER THE TECH SPEC NO. ROS 6322 REV 00 & ROS 4291 REV 00 & RELEVANT ANNEXURE (MAIN SUPPLY, MANDATORY SPARES SUPPLY & ERECTION, COMMISSIONING, PG TEST AND HANDING OVER) FOR SAGARDIGHI TPP EXTN U#5 1X660 MW PROJECT								
1	RWT111070001 SUPPLY OF CW CHLORINATION SYSTEM ALONG WITH COMPLETE ACCESSORIES AS PER TECHNICAL SPECIFICATION NO. ROS:6322 REV 00 DATE 08.09.2021, ROS:4291 REV 00 DATE 15.09.2021 & RELEVANT ANNEXURE	item1	1	ST		18.00	0.00	0.00	INR Zero Only
2	RWT111080001 ERECTION, COMMISSIONING & PG TEST FOR CW CHLORINATION SYSTEM AS PER TECHNICAL SPECIFICATION NO. ROS:6322 REV 00 DATE 08.09.2021, ROS:4291 REV 00 DATE 15.09.2021 & RELEVANT ANNEXURE ERECTION, COMMISSIONING, PG TEST & HANDING OVER OF STP	item2	1	ST		18.00	0.00	0.00	INR Zero Only
3	RWT111090001 SUPPLY OF MANDATORY SPARES FOR CW CHLORINATION SYSTEM AS PER TECHNICAL SPECIFICATION NO. ROS:6322 REV 00 DATE 08.09.2021, ROS:4291 REV 00 DATE 15.09.2021 & RELEVANT ANNEXURE	item3	1	ST		18.00	0.00	0.00	INR Zero Only
Total in Figures							0.00	0.00	INR Zero Only
Quoted Rate in Words		INR Zero Only							

ANNEXURE G

Online SRF Submission Procedure

Following are the formalities to be completed by your company for registration purpose.

NOTE: BEFORE PROCEEDING FOR ONLINE REGISTRATION " PLS READ STEPS FOR FILLING UP ONLINE REGISTRATION FORM - HELP MENU" - DETAILS ATTACHED WITH THIS MAIL

With effect from 01.04.2015 onwards, we have migrated to online Supplier Registration Form (SRF) as per our Corporate guidelines. **Supplier Registration Form (SRF)** is to be fed in our BHEL website portal – **ie., PDF documents of SRF and its annexure as called for shall be signed by authorized signatory & uploaded in portal.**

We request to visit our Web Site : www.bhel.com and click under heading "Supplier Registration" and fill up the **"Supplier Registration Form"** which is available in the Online Supplier Registration Portal.

Or else, copy the following URL Link and paste in the web link address: http://www.bhel.com/vender_registration/vender.php and proceed with.

Or else, type directly as <http://203.129.195.108>

Click the button "search material" on the home page of supplier registration portal and search thoroughly your required material / product

*After completing the material search then proceed for User Id & Password for filling up the details of registration requirements. **Note: If you are an already registered supplier with any of our BHEL Unit - pls select "existing permanent supplier" or else select "New Registration" and then proceed accordingly.***

Please note that for a foreign suppliers' there is a separate format to be filled in, which may be taken care suitably.

After successful submission of SRF along with all annexures as called for thro' online i.e., authorized signatory signed pdf documents of SRF and its annexures are to be uploaded thro' online portal and confirm the same in **"form dispatch"** area ie., registration part-4 – wherein supplier has to confirm that all the documents were submitted "online" and click the button **"confirm"**. After clicking confirmation button, the same will be appearing against BHEL Ranipet for registration.

Looking for a long successful & sustaining business association with BHEL.

Annexure H
(On company letter head)

Self-Certification under Preference to
“MAKE IN INDIA” Policy

CERTIFICATE

In line with Government Public Procurement Order No. P-45021/2/2017-BE-II dt. 15.06.2017, as amended from time to time and as applicable on the date of submission of tender, we hereby certify that we M/s _____ (supplier name) are local supplier meeting the requirement of minimum Local content as defined in above orders for the material / package against BHEL’s Enquiry no – 7710727E dt 01.12.2021

Please select one category from below

- Class I supplier – (Local content more than 50%)
- Class II Supplier – (Local Content >20& <=50%)
- Non-Local Supplier – (Local Content less than 20%)

Details of location at which local value addition will be made is as follows:

We also understand, false declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rule for which for which a bidder or its successors can be debarred for up two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.

Seal and Signature of Authorized Signatory

*For tenders with value more than INR 10 Crore, above declaration to accompanied by a certificate from a CA. please refer GOI’s MII order P-45021/2/2017-BE-II dt. 15.06.2017 latest revision dt 16.09.2020.

ANNEXURE I

Payment Mechanism at BHEL, Ranipet

(Effective for all tenders issued by BHEL Ranipet from 01 July 2011 onwards unless otherwise notified of change/s in writing given by an authorized official of BHEL, Ranipet)

BHEL, Ranipet's payment mechanism will be as follows: (All Bidders are requested to read this carefully and take note of it before submitting their offer)

All bills of Suppliers processed for payment by BHEL, Ranipet shall pass through the following mile stones:

(1) Receipt of materials at BHEL, Ranipet Stores (evidenced by the Day-Book Number and Date generated at BHEL Stores, Ranipet) or Receipt of materials at Project Site / Destination specified in the Purchase Order (as evidenced by the acknowledgement given by the Consignee).

(2) Acceptance of the supplied materials at BHEL Stores, Ranipet. (Proof of evidence: Stores Receipt voucher - Short form "SRV", raised by BHEL Stores, Ranipet referenced by the SRV Number and Date)

(3) Receipt and Registration of the Bills / Invoices of the Supplier at BHEL, Ranipet Accounts Department. (evidenced by the ABS Number and Date)

(4) Receipt of clarifications, if any that may be required by BHEL, Ranipet Accounts or Purchase Department, from the Supplier. (As evidenced by the IOM Inward Date)

(5) Bill processing and passing.

(6) Payment release.

All these events are transparently available in the SCM web-site of BHEL, Ranipet,

{<http://bapscm.bhelrpt.co.in/purc>} which can be viewed by all registered supplier with a password.

Allowed Time frames:

A] From DB to SRV: 10 Days

B] From SRV to ABS: 15 Days

C] From ABS to Bill Pass: 07 Days (if Stage 4 above is not applicable)

OR

From IOM to Bill Pass: 07 Days (if Stage 4 above is applicable)

D] From Bill Pass to Payment Release: As per payment terms of the Purchase order.

All Suppliers payment/s would be released based on seniority of receipt of the processed bills at the payment section of BHEL, Ranipet Accounts Department.

The seniority would be based on the sequence of milestone events listed above.

In the sequence of the bill processing the preceding mile-stone seniority will be void, if the subsequent event occurs beyond the permitted time frame between two successive events.

Thus for example:

Start seniority would be with the DB date.

If the SRV date is greater than 10 days of the DB date, then the seniority of the DB date would be replaced by the SRV date.

If the ABS date is greater than 15 days of the SRV date, then the seniority would be reckoned by the ABS date.

If the Bill pass date is greater than 07 days of the ABS date then the seniority would be the date of inward receipt of the IOM.

The logics of these sequence is that SRV, ABS, IOM inward entry are dependent entirely on submission of correct documentation by Suppliers, as called for in the Purchase Order. If the documents are correctly submitted each of the milestone listed above will occur within BHEL, Ranipet within the timelines specified above.

Hence, in their own interest all Suppliers are requested to take note of this process and comply with the same.

Caution: Suppliers' payments would get delayed / affected if they fail to adhere to the submission of the documents specified in the Purchase Order / Contract, since the listed milestone events occurrence are contingent upon the availability of the requisite documents.

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for

_____ . The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

- 1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-
 - 1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
 - 1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.
 - 1.1.3 The Principal will exclude from the process all known prejudiced persons.
- 1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions:

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

- 2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.
- 2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
- 2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
- 2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
- 2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.
- 2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.
- 2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and will await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 4 - Compensation for Damages

- 4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent Earnest Money Deposit/ Bid Security.
- 4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to

demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher.

Section 5 - Previous Transgression

- 5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.
- 5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 - Equal treatment of all Bidders/ Contractors / Sub-contractors

- 6.1 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors. In case of sub-contracting, the Principal contractor shall be responsible for the adoption of IP by his sub-contractors and shall continue to remain responsible for any default by his sub-contractors.
- 6.2 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 - Independent External Monitor(s)

- 8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
- 8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.
- 8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality in line with Non- disclosure agreement.
- 8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

- 8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.
- 8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter should be examined by the full panel of IEMs jointly as far as possible, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.
- 8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the Commission, in case of suspicion of serious irregularities requiring legal/ administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.
- 8.8 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.
- 8.9 IEM should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the organization should be looked into by the CVO of the concerned organisation.
- 8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code/ Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
- 8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.
- 8.12 The word 'Monitor' would include both singular and plural.

Section 9 - Pact Duration

- 9.1 This Pact shall be operative from the date IP is signed by both the parties till the final completion of contract for successful bidder and for all other bidders 6 months after the contract has been awarded. Issues like warranty / guarantee etc. should be outside the purview of IEMs.
- 9.2 If any claim is made/ lodged during currency of IP, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

- 10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

- 10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.
- 10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.
- 10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 10.5 Only those bidders / contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal

(Office Seal)

Place-----

Date-----

Witness:_____

(Name & Address) _____

For & On behalf of the Bidder/

Contractor

(Office Seal)

Witness:_____

(Name & Address) _____



Bharat Heavy Electricals Limited

Boiler Auxiliaries Plant
RANIPET – 632 406, Tamil Nadu, India

Ref.: Enq. No. 7710727E

Date : 01.12.2021

Annexure K PRE-QUALIFICATION REQUIREMENT (QR) FINANCIAL SOUNDNESS

Sl. No.	BHEL REQUIREMENT	VENDOR (SELLER) CONFIRMATION
1	The bidder has to submit financial accounts (audited, if applicable comprising of Audit report, Balance Sheet, Profit & Loss A/c Statement and Notes/Schedules pertaining to Turnover/Sales/Revenue), for last three years (or from the date of incorporation, whichever is less) as on tender due date to review the above criteria. In case the incorporation of vendor is less than 3 years, average annual financial turnover shall be calculated based on available information as below:-	
i	If the accounts are available for ≤ 1 Financial Year, the Average Annual Turnover shall be calculated based on available information divided by 1 (One).	
ii	If the accounts are available for >1 but ≤ 2 Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 2 (Two).	
iii	If the accounts are available for >2 but ≤ 3 Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 3 (Three).	
2	Foreign bidders to submit a latest report from reputed third party business rating agency like Dun & Bradstreet, Credit reform etc. for review of above criteria.	
3	While calculating Annual Turnover / Sales, other operating income and other income shall not be considered.	
4	For evaluation of foreign bidder, exchange rate (TT selling rate of SBI) as on scheduled date of tender opening (Part-I bid in case of two part bid) shall be considered.	
5	Average annual financial turnover during the last Three Financial Years ending 31.03.2021 should not be less than Rs 1.66 Crores (Rs One Crore sixty six Lakhs)	
6	Net worth of the vendor should be positive. *	
7	The current ratio should be >1 as per latest audited balance sheet	
8	Vendor should be profit earning company / firm (Profit / Earnings before depreciation & amortization, Interest and Tax) at least once in the last 3 years.	

Note : For any Supplier the above said documents is Mandatory and without which submitted offer is liable for rejection.

*.....As per section 2 (57) of The Companies Act, 2013, net worth means the aggregate value of the paid up share capital and all reserves carried out of the profit and security premium after deducting the aggregate value of the accumulated losses, deferred expenditure and miscellaneous expenditure not written off as per the audited balance sheet, but does not includes reserves created out of revaluation of assets, write back of depreciation and amalgamation.

Signature, Seal & Date of Bidder

To be submitted in company letter head

ANNEXURE L

I/we are bidder from _____ (Address with country).
We do not belong to any of the below category mentioned.

1. Any of entity/office/workshop of our organisation/incorporation, established in a country sharing land border with India, If yes, provide the full address of all such locations.
2. Any of subsidiary of our organisation/incorporation, established in a country sharing land border with India, If yes, provide the full address of all such locations.
3. Any of entity/office/workshop of our organisation/incorporation, controlled in a country sharing land border with India, If yes, provide the full address of all such locations.
4. Any of entity whose beneficial owner is situated in a country sharing land border with India, If yes, provide the full name, address of all such locations.
5. Any Indian Agent available, If so, Provide details of address and contacts.
6. Any employee/directors who is/are citizen of country sharing land border with India, If yes, provide the full name, employee code and address of all such locations.
7. Any of consortium/joint venture of our organisation/incorporation, established in a country sharing land border with India, If yes, provide the full address of all such locations.

Meaning of beneficial owner

- 1) In case of a company or limited liability partnership, beneficial owner is the natural person, who, whether acting alone or together, or through one or more judicial person, has a controlling ownership interest or who exercises control through other means.

Explanation

- a) Controlling ownership interest means ownership of or entitlement to more than twenty-five percent of shares or capital or profits of the company.
 - b) "control" shall include the right to appoint majority of the directors or to control the management rights or shareholder's agreement or voting agreement.
- 2) In case or a partnership firm the beneficial owner is the natural person (s) who whether acting alone or together or through one or more judicial person, has ownership of the entitlement to more than fifteen percent of capital or profits of the partnership.
 - 3) In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together or through one or more judicial person, has ownership of the entitlement to more than fifteen percent of the property or capital or [profits of such association or body of individual.

To be submitted in company letter head

- 4) Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official.
- 5) In case of a trust, the identification of beneficial owner (s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust and any other natural person exercising the ultimate effective control over the trust through a chain of control of ownership.
- 6) An agent is a person employed to do any act for another, or to represent another in dealing with third person.

We have read the clause regarding restriction on procurement from a bidder of a country which shares a land border with India, we hereby declare that we do not belong to any such country and are eligible to be considered.

In case, any of information is found to be false, even after bid acceptance, immediate termination may happen and action will be taken as per law.

Format is being filled without altering any of the clause mentioned in the given format**

Dated: _____

Authorised Sign and stamp_____