

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	<p>a. Type 2/3/4 way SS 316/Forged Brass (depending on the application subject to Employer's approval during detailed Engg.)</p> <p>b. Power supply : 24 V DC \pm 10%.</p> <p>c. Plug and socket electrical connection.</p> <p>d. Insulation : Class 'H'</p> <p>e. IP Class : IP65</p>			
18.00.00	<p>REVERSE ROTATION INDICATOR (RRI)</p> <p>Reverse rotation indicator comprising of proximity sensors, processing electronics with output of 4-20mA (corresponding to speed) interconnecting cables, speed display in rpm, normal, reverse indication and required channel alarm contact shall be provided. The contact rating shall be 60VDC, 6VA (or more if required by Control system). The exact details of the RRI shall be strictly as approved by Employer during detailed engineering. The power supply of RRI is to be arranged by the Bidder.</p>			
19.00.00	<p>WATER SYSTEM RELATED SPECIAL INSTRUMENTS (DM PLANT, CPU PLANT, PT PLANT, ETC)</p>			
19.01.00	<p>ANALYSER INSTRUMENTS:</p> <p>For Technical specification of Cation/Specific Conductivity, pH, Sodium, Silica, Turbidity, Total Dissolved Solids (TDS) and Concentration analysers, please refer Specification of Analysers, Part-B, Sub-section IIIC-12 of this specification. Specification of concentration analyser shall be similar to Conductivity analyser except range which shall be as per process requirements.</p>			
19.02.00	<p>Residual Chlorine Analyser</p> <p>a. An automatic chlorine residual analyser of amperometric type shall be provided alongwith the chlorinating plant for monitoring the residual chlorine content of cooling water. The analyser shall be suitable for accurate residual measurement in open/closed systems. The measurement accuracy shall not be affected by presence of treatment chemicals as chromates, phosphates, de-former highly polluted water, change in temperature etc.</p> <p>b. Circulating water as sample to residual chlorine analyser shall be taken from hot circulating water pipe work before entry to cooling towers. Exact location and layout of sampling arrangement shall be finalised during detailed engg. stage. Bidder shall provide necessary pumping system (with 100% standby) for meeting the analyser requirements, if needed. All the drains shall be terminated up to the nearest plant drainage system.</p>			
19.03.00	<p>All the outdoor field instruments such as analysers/transmitters/meters etc. shall be provided with suitable Free standing cabinet(s)/panel/rack so that the equipments are protected against rain/ sunlight etc.</p>			
19.04.00	<p>Parshall Flume</p> <p>The Bidder shall provide all the control and Instrument devices including primary sensors, transmitters, flow indicator cum integrator / totaliser and shall include all required accessories for the flow measurement of raw water through the clarifier. The system shall be of reputed make and acceptable to the owner.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2</p>	<p>SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)</p>	<p>PAGE 26 OF 34</p>	

CLAUSE NO.	TECHNICAL REQUIREMENTS																								
19.05.00	<p>Level measurement shall be based on ultrasonic/radon technology. The flow compensation is to be implemented in the transmitter itself. The transmitter shall provide 4-20 mA DC in direct proportion to flow and shall be able to drive a load impedance of 500 ohms minimum</p> <p>Accuracy shall be +/- 1 % or better.</p> <p>All the mounting hardware and accessories required for erection and commissioning of the same are to be provided by the contractor. Mounting fittings material shall be SS316. All weather canopy is to be provided for electronics/sensor to protect the same from rain/sunlight etc.</p> <p>The Type makes and models no. shall be subject to Owner's approval.</p> <p>Electronic Flow-Meter</p> <p>The electronic flow meter shall include flow sensor and flow indicator cum integrator / totaliser and shall include all required accessories for satisfactory operation. The flow meter shall be based on full bore electromagnetic principle and shall be electronic type of proven design, make and model acceptable to the owner.</p> <p>The Bidder shall submit all necessary technical literature and details of selection criteria of the instrument offered to substantiate the model selected. The Bidder shall also furnish list of similar installation along with feed back on satisfactory performance of the instruments.</p> <p>The flow meter shall meet or exceed the following requirement :</p> <table border="0"> <tr> <td>(a) Output</td> <td>:</td> <td>4-20 mA DC Isolated output</td> </tr> <tr> <td>(b) Accuracy</td> <td>:</td> <td>± 0.5% of calibrated span or better *</td> </tr> <tr> <td>(c) Repeatability</td> <td>:</td> <td>± 0.2% of calibrated span or better</td> </tr> <tr> <td>(d) Power Supply</td> <td>:</td> <td>240V AC ± 10%, 50 HZ ± 5%/ 24 V DC, to be arranged by the contractor.</td> </tr> <tr> <td>(f) Protection class</td> <td>:</td> <td>IP-55</td> </tr> <tr> <td>(e) Flow tube</td> <td>:</td> <td>SS304</td> </tr> <tr> <td>(f) liner</td> <td>:</td> <td>Hard Rubber</td> </tr> </table> <p>The flow meter shall provide local indication for instantaneous flow. It should also be possible to get local display for daily and monthly discharge. The flow meter shall indicate totaliser/ integrator to get the daily and monthly discharge as stated above.</p>			(a) Output	:	4-20 mA DC Isolated output	(b) Accuracy	:	± 0.5% of calibrated span or better *	(c) Repeatability	:	± 0.2% of calibrated span or better	(d) Power Supply	:	240V AC ± 10%, 50 HZ ± 5%/ 24 V DC, to be arranged by the contractor.	(f) Protection class	:	IP-55	(e) Flow tube	:	SS304	(f) liner	:	Hard Rubber	
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<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2</p>	<p>SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)</p>	<p>PAGE 27 OF 34</p>																						

CLAUSE NO.	TECHNICAL REQUIREMENTS																										
21.00.00	<div style="text-align: right; border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"> एनटीपीसी NTPC </div> <p>Limit switches</p> <p>For offsite plant (except PT, DM, Chlorination, chemical treatment, Liquid effluent treatment) application Limit switches shall be silver plated with high conductivity and non corrosive type. Contact rating shall be sufficient to meet the requirement of DDCMIS subject to a minimum of 60 V, 6 VA rating. Protection class shall be IP 55.</p> <p>For main plant application limit switches are to be provided as per contractor standard and proven practice.</p> <p>For PT, DM, Chlorination system , chemical treatment, Liquid effluent treatment plant , limit switches of manual valves and solenoid operated on-off valves shall be of inductive proximity type and shall be mounted inside the enclosure: pl. refer the minimum specification requirement below .</p> <table border="1"> <tr> <td>Operating voltage Range</td> <td>10-40 V DC</td> </tr> <tr> <td>Sensing system</td> <td>Inductive Proximity type , 2 Wire</td> </tr> <tr> <td>Sensor Contact Type</td> <td>NO</td> </tr> <tr> <td>Reverse polarity and short circuit protection</td> <td>Yes</td> </tr> <tr> <td>IP Class-Sensor</td> <td>IP67</td> </tr> <tr> <td>IP Class-Enclosure(Switch box)</td> <td>IP67</td> </tr> <tr> <td>Cable entry-Enclosure(Switch box)</td> <td>2no-1/2" NPT</td> </tr> <tr> <td>Casing material-Sensor</td> <td>Brass /SS</td> </tr> <tr> <td>Enclosure(Switch box) Housing material</td> <td>FRP or SS</td> </tr> <tr> <td>Operating Ambient temp(sensors)</td> <td>-5 to 70 deg C</td> </tr> <tr> <td>Max allowed Voltage Drop across sensor</td> <td>5 V</td> </tr> <tr> <td>Standard applicable</td> <td>EN 60947-5-2 or equivalent.</td> </tr> </table>			Operating voltage Range	10-40 V DC	Sensing system	Inductive Proximity type , 2 Wire	Sensor Contact Type	NO	Reverse polarity and short circuit protection	Yes	IP Class-Sensor	IP67	IP Class-Enclosure(Switch box)	IP67	Cable entry-Enclosure(Switch box)	2no-1/2" NPT	Casing material-Sensor	Brass /SS	Enclosure(Switch box) Housing material	FRP or SS	Operating Ambient temp(sensors)	-5 to 70 deg C	Max allowed Voltage Drop across sensor	5 V	Standard applicable	EN 60947-5-2 or equivalent.
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TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 28 OF 34																								

CLAUSE NO.	TECHNICAL REQUIREMENTS			
22.07.00	<p>ENCLOSURE/CABINETS / PANELS FOR EQMS AND ANALYSERS OF PT, LET, CHLORINATION, DM/RO, CWT AND CPU PLANT</p> <p>The enclosure shall accommodate all EQMS Analyzers. The enclosure of all analyzers shall provide protection from dust, humidity, precipitations, sunlight and environmental pollution. The material for the enclosure shall be of steel plate (SS304) with minimum 2 mm thick frame and minimum 2 mm thick steel (SS-304) sheet of protection IP 65 or better with safety lock of good quality. The lighting provision in the cabinet is to be provided. The cabinets shall be designed such that the wet section and dry section are separate, the exact details shall be finalized during detailed engineering. The panel shall be free standing type constructed of suitable 3 mm thick channel frame of SS and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel, and extended beyond the ends of the rack.</p> <p>In order to ensure the healthy operation of the installed electronic modules, cards, analyzers, etc inside the enclosure during continuous operation, the EQMS enclosure shall be provided with Air conditioner unit .</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2</p>	<p>SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)</p>	<p>PAGE 31 OF 34</p>	

CLAUSE NO.	TECHNICAL REQUIREMENTS			
24.00.00	DEPOSIT MONITOR			
	S. No.	Feature	Details	
	1	Standard	AS per NACE standard RP0189-2002	
	2	Type	Online, Annular flow , scale deposition	
	3	Measurement	Deposit weight and average weight per unit surface area	
	4	Observation	1. Online-Visual Offline- Quantitative by weighing heat transfer surface	
	5	Accessories:-		Qty
		(i) Flow Switch		1 Nos
		(ii) Flow meter (Rota meter)		1 Nos
		(iii) Manual Flow Control valve		1 Nos
		(iv) Skin temperature Sensor		2 Nos
		(v) Temperature Controller		1 Nos
		(vi) Digital Temperature Indicator		2 channel
		(vii) Electric heater(Electrical resistance heating element)		2 Nos
	6	Power Supply	230VAc	
	7	Electric heater protection	(a). No water Flow (b).Outlet temperature more than set point.	
25.00.00	BIO-FOULING MONITOR			
	S. No.	Feature	Details	
	1	Standard	AS per NACE standard RP0189-2002	
	2	Type	Online, Loss In static pressure due to friction in the direction of flow	
	3	Cooling water Sample Bypass tube/pipe for DP measurement	Stainless Steel	
		Measurement	Differential pressure	
	4	Accessories:-		Qty
		(i) Flow Meter		1 Nos
		(ii) Manual Flow Control valve		2 Nos
		(iii) Differential pressure transmitter (Across the tube)		1 Nos
		(iv) Pressure gauge (At Inlet)		1 Nos
		(v) Strainer (To Eliminate suspended solids) Eliminate suspended solids		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 32 OF 34	



26.00.00

CORROSION METER

S.no.	Feature	Details
1.	Type of electronics	Microprocessor based
2.	Zero & span Adjustment	To be provided
3.	Ambient temp.	50°C
4.	Display	LCD
5.	Range Corrosion rate Imbalance (Pitting Index)	: 0.01 to 150MPY : 0.01 to 100 pitting units
6.	Accuracy	: < ± 2% of reading
7.	Enclosure Type / Material	Weather and Dust proof (IP 65)
8.	Mounting	All weather Local Panel fitted with integral Air Conditioner are to be provided by the Contractor.

Sensor Probe Specification Requirement

S.no .	Feature	Details
a)	Type	: Linear Polarization Resistance Probe (LPR)
b)	Electrodes	: 2 electrode/3 electrode
c)	Spares	Three sets of spare electrodes for LPR probes

27.00.00

ONLINE ORP MONITOR / ANALYSER

ORP Sensor

S.no .	Feature	Details
a)	Type	: Cell - flow through
b)	Accuracy	: < ± 1mv
c)	Range	: -1400mv to +1400mv
d)	Electrode	: Platinum

Monitor / Analyzer Specification:-

S.no.	Feature	Details
1.	Type of electronics	Microprocessor based
2.	Zero & span Adjustment	To be provided
3.	Ambient temp.	50°C
4.	Display	LCD
5.	Enclosure Type / Material	Weather and Dust proof (IP 65).
6.	Output signals Analog	4-20 mA DC
7.	Error / fault Diagnostic	To be provided.
8.	Power supply	For power supply and distribution, refer scope / and terminal point part of the specification. Conversion / distribution from the terminal point shall be done by contractor.
9.	Load	500 Ohms minimum

CLAUSE NO.

TECHNICAL REQUIREMENTS



10.

Mounting

All weather Local Panel fitted with integral Air Conditioner are to be provided by the Contractor.

28.00.00

ORP/PH PORTABLE METER

Sensor Probe Specification Requirement

S.no	Feature	pH	ORP
b)	Electrode	: Glass	: Platinum
c)	Accuracy	: $\pm 1\%$ of reading	: $\pm 1\text{mv}$
d)	Range	: 0-14 pH	: -1400mv to +1400mv
e)	Temperature Compensation	Automatic	

Portable meter

S.no.	Feature	Details
1.	Type of electronics	Microprocessor based
2.	Measurement	Ph & ORP
3.	Ambient temp.	50°C
4.	Display	LCD
5.	Enclosure Type / Material	IP 67
6.	Power source	Batteries
7.	Battery life	>=200 hrs

TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE

TECHNICAL SPECIFICATIONS
SECTION – VI, PART-B
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SUB-SECTION-IIIC-04
MEASURING INSTRUMENTS
(PRIMARY & SECONDARY)

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CLAUSE NO.	TECHNICAL REQUIREMENTS						
SUB SECTION IIIC-12							
3.00.00	SPECIFICATION OF ANALYSERS						
3.01.00	Field proven reputed international make microprocessor based monitors/analyzers with LCD display and with necessary fault diagnostic features shall be employed. The power supply to all the analysers/ monitors shall be supplied by Contractor from his UPS system with all necessary switches, fuses, wiring/cabling and other required accessories etc. for distribution to individual requirements.						
3.02.00	.						
Minimum specifications of analysers							
Requirements	Conductivity	PH	Phosphate	Chloride	Turbidity	Degassed Cation Conductivity	
Type	For Hotwell, Two removable Type of Cells, For Others, Continuous Flow Through Type	Cell Flow Through sample	Colorimetric	Continuous Flow Through Type with Chloride & Sulphate Responsive Electrodes	Light reflection principle	Continuous Flow Through Type for continuous measurement of Specific conductivity, cation conductivity and degassed conductivity values	
Accuracy	≤ ± 1%	≤ ± 1%	≤ ± 5% of reading	≤ ± 5%	≤ 2% for range 0-50 NTU, ≤ 5% for range 50 – 200 NTU	≤ ± 1% of Reading	
Response Time (90 % of Full Scale)	≤ 5 sec.		≤ 16 min.		≤ 5 min.	≤ 5 sec.	
Range*	0-1, 0-10, 0-100 micro-mho/cm (freely programmable) for Specific Conductivity . 0-1 micro-mho/cm log scale for Cation conductivity	6-11 pH freely programmable	0-10 ppm freely programmable	0-1000 ppb freely programmable	0 – 100, 0- 200 MTU, programmable	0-1, 0-10, 0-100 μS/cm,(freely programmable) Separate 4-20mA outputs for transmitting Specific conductivity, Cation conductivity and Degassed Cation Conductivity values to DDCMIS.	
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Minimum specifications of analyserscontinued

Requirements	Hydrazine	Silica	Sodium	Dissolved O2	Total Iron (Fe)
Type	Automatic Continuous Electrochemical Type	Continuous Colorimetric Type	Continuous Flow Through sample	Continuous Flow Through sample DO analyser with optical DO sensor	Continuous Flow Through sample
Accuracy	≤ ± 5%	≤ ± 5% of reading	≤ ± 10% of reading	≤ ± 5% of reading	<±5 % of reading or ±0.005 ppm
Response Time (90 % of Full Scale)	≤ 3 min.	≤ 15 min. (including sample switching)	≤ 4 min.	≤ 30 sec.	≤ 15 min. (including sample switching)
Stability	Calibration Once in a Month		Calibration Once in a Month		
Range*	0-50, 0-100 ppb freely programmable	0-50, 0-100, 0-500 ppb freely programmable	0-1,0-10, 0-100 ppb freely programmable	0-20,0-200 ppb freely programmable	0-50ppb, 0-150ppb, 0-300ppb, 0-1ppm, 0-5ppm freely programmable or as per the process requirement.
No. of Streams	Single	Multi stream with sequencer/ stream selector (min. 4 streams)	Multi stream with sequencer/ stream selector (min. 4 streams)	Single	Multi stream with sequencer/ stream selector (min. 4streams)

- NOTES:
- All the analysers/cells shall have open Corrosion resistant drain to waste header.
 - The material of flow cell for all analysers shall be SS316.
 - Analysers/ monitors/ cells shall be suitable for operating under the conditions specified. Cell life of the sensor shall be mentioned in the datasheet.
 - Dual cation exchange column shall be provided for cation conductivity.
 - For Hot well conductivity measurement, the Contractor shall provide direct insertion / withdrawal type conductivity cell whereas for all other samples it shall be flow-through type. Monitors for hot well conductivity shall be suitable for field mounting.
 - Samples where pH, DO & conductivity is being measured, Rotameter shall installed after analyser to avoid ingress of Oxygen.

3.02.00

Contractor to furnish the open chemistry for all the analyser reagents being supplied under this package. Constitution of chemicals along with percentage of chemicals so that preparation / formulation can be done and checked at site LAB. Contractor to also provide the procedure for testing of reagents and shelf life of the chemicals. All the reagents and pH electrode sensors shall be supplied as separate BBU items.

CLAUSE NO.	TECHNICAL REQUIREMENTS																											
3.03.00	Contractor to provide piping arrangement in Wet Panel with remote operated (From Unit-DDCMIS) three way isolating valve (solenoid operated) for manual rinsing of all the Cation columns with DM water during non-availability of main sample and during shut down condition. Tapping for DM water shall be taken from discharge of Make-up water pump. Necessary piping, valves, instruments for monitoring of DM water flow shall be in the scope of contractor.																											
4.00.00	SAMPLE PIPING SYSTEM																											
4.01.00	All sample piping shall be 3/4" NB seamless type, conforming to ANSI B36.19. The schedule number shall be suitable for the particular application.																											
4.02.00	All fittings shall be socket welding type and of material ASTM182 F316H conforming to ANSI B 16.11.																											
4.03.00	Suitable identification tags shall be provided for easy check up and for proper connections.																											
4.04.00	The valves to be used in sample piping shall be of stainless steel conforming to ASTM A182. The pressure temperature ratings shall be as per ANSI B16.34. The valve design shall be such that the seats can be reconditioned and stem and disc can be replaced without removing valve body from the line. The specification of End size, Pressure class, Type, End preparation, Body, etc. for different type of valves are specified in SWAS table in Clause No. 4.06.00 of Subsection IIIC-09, Section-VI, Part-B.																											
4.05.00	Material Specifications for Sample Pipe Lines THE PIPING TO BE FURNISHED AND INSTALLED FOR WATER AND STEAM ANALYSIS SYSTEM SHALL BE AS INDICATED BELOW: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;"></th> <th style="width: 65%;">Piping System</th> <th style="width: 30%;">Material</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Piping from the sample inlet bulk head fittings to the shut off valves</td> <td>Stainless steel, ASTM A 213, Type 316H, 16 BWG tubing</td> </tr> <tr> <td>2.</td> <td>Piping for the high pressure samples and sample blow down piping</td> <td>Stainless steel, ASTM A 213, Type 316 H. 14 BWG tubing</td> </tr> <tr> <td>3.</td> <td>Blow down header</td> <td>Stainless steel, ASTM A 312, Type 304 Schedule 160</td> </tr> <tr> <td>4.</td> <td>Miscellaneous drains receiver holder</td> <td>Stainless steel, ASTM A 312, Type 304 Schedule 40</td> </tr> <tr> <td>5.</td> <td>Piping from the shut-off valves to the terminal points including branch piping and the closed cooling water grab sample piping</td> <td>Stainless steel, ASTM A 213, Type 316 H, 16 BWG tubing</td> </tr> <tr> <td>6.</td> <td>Closed cooling water piping except grab sample and water purge line</td> <td>Carbon steel, ASTM A 53 Gr. A, Schedule 40.</td> </tr> <tr> <td>7.</td> <td>Sample through drain piping and waste header piping</td> <td>Carbon steel, ASTM A 53 Gr. A, Schedule 40.</td> </tr> </tbody> </table>				Piping System	Material	1.	Piping from the sample inlet bulk head fittings to the shut off valves	Stainless steel, ASTM A 213, Type 316H, 16 BWG tubing	2.	Piping for the high pressure samples and sample blow down piping	Stainless steel, ASTM A 213, Type 316 H. 14 BWG tubing	3.	Blow down header	Stainless steel, ASTM A 312, Type 304 Schedule 160	4.	Miscellaneous drains receiver holder	Stainless steel, ASTM A 312, Type 304 Schedule 40	5.	Piping from the shut-off valves to the terminal points including branch piping and the closed cooling water grab sample piping	Stainless steel, ASTM A 213, Type 316 H, 16 BWG tubing	6.	Closed cooling water piping except grab sample and water purge line	Carbon steel, ASTM A 53 Gr. A, Schedule 40.	7.	Sample through drain piping and waste header piping	Carbon steel, ASTM A 53 Gr. A, Schedule 40.	
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TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION - IIIC-12 SWAS	PAGE 5 OF 6																									

CLAUSE NO.

TECHNICAL REQUIREMENTS



4.06.00

SWAS Valve Table:

S. No.	Service / Location	End Size	Pr. Class	Type	End Preparation	Body
1	Sample Shut off valve	0.38	6000	Globe	SW	316SS
2	Sample blow down valve	0.38	6000	Ball valve	SW	316SS
3	Solenoid valve	--	--	2 way	--	316SS
4	Pr. reducing Valve	0.38	--	Needle	Tube	316SS
5	Safety relief Valve	0.25	3000	Relief	Tube	316SS
6	PI and FI isolation valve	0.25	3000	Needle	Tube	316SS
7	Back pr. regulating valve	0.25	300	C.W.	SCR	316SS
8	Grab	0.25	300	3-way	Tube	316SS
9	Quick	--	--	ball	--	316SS
10	Individual P.C. and S.C. inlet & outlet valve					316SS
11	P.C. I/L & O/L header & chilled water I/L & O/L isolation valve	--	--	Gate	--	316SS
12	Safety relief valve at each PC & SC and cooling water header	--	--	Relief	--	316SS
13	High Pressure reducing valve	--	--	--	--	316SS
14	Isolation valve before primary cooler	--	--	Needle	Tube	316SS

ANALYSER INSTRUMENTS OF PT PLANT :

Comprehensive Annual Maintenance Service (AMS) for three (03) years after warranty period shall be provided by the contractor for analyser instruments of PT plant.

SERVICES FOR ANALYSER INSTRUMENTS OF PT PLANT DURING DEFECT LIABILITY PERIOD

1.1 The Contractor shall provide an unlimited warranty on all equipments during the Defect liability period. This warranty shall include repair, replacement, replenishment of consumables (for e.g. reagents, calibration gases etc. as applicable) and correction of identified discrepancies including Analysers, Sample Handling System, Transmitters, (as applicable) etc. at no cost to Employer.

1.2 The Contractor shall provide warranty spares including components for each system based on (and keeping adequate over margin) normally experienced failure rate. Exhaustive list of all such items shall be submitted along with Datasheet for Employer's review and approval during details Engg stage regarding adequacy of the same. The warranty spares as per the list mentioned above will be dispatched by the Contractor along with the main equipment consignment. However, for items which have a limited shelf life shall be dispatched in a phased manner during the warranty period. Unused spares/consumables shall be Contractor's property after expiry of warranty period and shall be taken back.

1.3 SERVICES FOR ANALYSER INSTRUMENTS OF PT PLANT DURING ANNUAL MAINTENANCE SERVICE (AMS) PERIOD

1.3.1 The Contractor shall provide complete maintenance services for each System under comprehensive Annual Maintenance Service (AMS) for period of three years after the Warranty period.

1.3.2 The AMS shall cover total maintenance of all Analysers, Sample Handling System, Transmitters etc. coming under the scope of each system and shall include free repair/replacement of each items, replenishment of consumables, correction of problems (if any) and supply of expendable items.

1.3.3 Further, Contractor may note that during the AMS he will be allowed to use Employer's mandatory spares, but has to replenish the same within three months' time or before completion of AMS period whichever is earlier.

1.3.4 The Contractor shall prepare detailed list of faults corrected and parts, expendables utilized during AMS period and shall furnish the same to Employer, properly documented at the end of AMS period. Further, during AMS period the details as required by Employer/ Project Manager shall be made available by Contractor's personnel.

1.3.5 Contractor shall also provide a list of all required AMS spares which shall be finalized along with datasheet during detail Engineering stage. These spares will be dispatched by the Contractor at the beginning of AMS on yearly requirement basis. However, for items which have a limited shelf life shall be dispatched in a phased manner during the AMS period. Unused spare/consumable shall be Contractor's property after expiry of AMS period and shall be taken back.

1.4. DEPUTATION OF ENGINEER/ TECHNICAL EXPERT FOR ANALYSER INSTRUMENTS OF PT PLANT .

38.1 Contractor shall depute Technical Experts of the OAM /OEM/OES/ (Original Analyser Manufacturer/Original Equipment Manufacturer/Original Equipment supplier) for each of the above system at Site, who will be fully qualified to perform the required duties, supervision of maintenance, repair etc. for a period of six month. Employer will intimate the contractor two weeks advance notice for start of deputation period.

38.2 After expiry of above six month period, Technical expert for each system shall visit site on monthly basis for monitoring the performance and rectify the problem (if any) for each system for the remaining warranty period and during entire AMS period. In the event of any malfunction/fault/failure in the system or any component thereof contractor shall depute Technical expert of respective system to reach site within 48hrs of call raised by site during the remaining warranty period and entire AMS period.

CLAUSE NO.	TECHNICAL REQUIREMENTS			
9.00.00	<p style="color: red;">AMS for Profibus Instruments</p>			
10.00.00	<p>ANNUAL MAINTENANCE SERVICES</p>			
10.01.00	<p>The requirements specified below are applicable for warranty (defect liability period) and 3 years AMS period.</p>			
10.01.01	<p>The Contractor's scope shall also include providing Post Warranty Maintenance for 3 years after completion of warranty period of the offered profibus systems and all associated components as per specification. The AMS shall include tools and tackle as required; travel, boarding & lodging of service engineer. In the event of any malfunction of the system hardware/system software, experienced service engineer shall be made available at site within 48 hours on the receipt of such information from Employer.</p> <p>Employer personnel will work on system day-to-day basis and wherever possible, Employer shall inform the type of failure of hardware/ software to Contractor based on diagnostic available with the system. However Contractor shall be fully responsible to attend and rectify the root cause and the failure within 48 hrs. Contractor may utilize the spares available with Employer, if necessary and available with Employer at site, which are part of mandatory spares supplied with system as per this specification. However, the consumed spares shall be replenished to Employer within 2 months' time.</p>			
10.02.00	<p>The services under Post Warranty Maintenance Agreement, shall broadly comprise of the following:</p>			
10.02.01	<p>Periodic Maintenance Site visits, minimum four (4) times in a year (total days expected 16 in a year), schedule of visits to be discussed and finalized jointly between Contractor and client after placement of order/ delivery. It shall include inspection of general healthiness of the system, study and advice on daily maintenance, inspection of Hardware & Software, if any problem is reported, running of test programs, on-line servicing and solving reported problems. System shall be checked online.</p>			
10.02.02	<p>Software Maintenance/ Support Contractor shall maintain the existing operating & application software for any debugging requirements to have consistent performance of the system.</p>			
10.02.03	<p>Emergency Service In the event of any malfunction of the profibus system hardware/system software during this period, Service Engineer must report at site within 48 hrs. of report of failure. The system must be brought back within 48 hours after reporting at site.</p>			
10.03.00	<p>Contractor shall note that while carrying out the Annual Maintenance Contract activities, Employer's engineers shall associate with the Contractor. On-job training of these associated engineers shall be covered under this scope. This shall include all items being supplied by Contractor, including any bought out items but not limited to the following: Labour, at no additional cost, to repair any system devices , to provide tests, and adjustment to system devices.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-4540-001A-2</p>	<p>SUB-SECTION-III-C-16</p>	<p>PAGE 4 OF 4</p>	

SPECIFICATIONS FOR PR. GAUGE, D.P. GAUGE, TEMP. GAUGE AND LEVEL GAUGE.

SI. No	FEATURES	ESSENTIAL/MINIMUM REQUIREMENTS			
		Pr. Gauge/ Gauge/ gauges	DP Draught Gauge	Temperature Gauge	Level Gauge
1	Sensing Element and material	Bourdon for high pressure, Diaphragm/Bellow for low pr. Of 316 SS		Mercury in steel for below 450°C and inert gas actuated for above 450°C of SS bulb and capillary.	Tempered * toughened Borosilicate gauge glass steel armoured reflex or transparent type.
2	Body material	SS 316		SS 316	Forged carbon steel/304 SS
3	Dial size	150mm		150 mm	Tubular covering entire range
4	End connection	1/2 inch NPT (M)		3/4" NPT (M)	Process connection as per ASME PTC and drain/vent 15 NB
5	Accuracy	±1% of span		± 1% of span	± 2%
6	Scale	Linear, 270° arc graduated in metric units		Linear, 270° arc graduated in °C	Linear vertical
7	Range selection	Cover 125% of max. of scale		Cover 125% of max. of scale	Cover 125% of max. of scale
8	Over range test	Test pr. for the assembly shall be 1.5 to the max. Design pr. at 38°C.			
9	Housing	Weather and dust proof as per IP-55		Weather and dust proof as per IP-55	CS/304 SS leak proof
10	Zero/span adjustment	Provided		Provided	--
11	Identification	Engraved with service legend or laminated phenolic name plate			

12	Accessories	Blow out disc, siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	SS Thermowell	Gasket for all KEL-F shield for transparent type vent and drain valves of Steel/SS as per CS/Alloy process Requirement.
13	Material of Bourdon/ movement	316 SS / 304 SS	316 SS / 304 SS	

Notes:-

*Bicolour type level gauges will be provided for applications involving steam and water except for condensate and feed water services.

Length of gauge glass shall not be more than 1400 mm. If the vessel is higher, multiple gauge glasses with 50 mm overlapping shall be provided.

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.

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	CONTROL VALVES, ACTUATORS & ACCESSORIES		
1.00.00	CONTROL VALVES, ACTUATORS & ACCESSORIES		
1.01.00	General Requirements		
1.01.01	<p>The control valves and accessories equipment furnished by the Bidder shall be designed, constructed and tested in accordance with the latest applicable requirements of code for pressure piping ANSI B 31.1, the ASME Boiler & pressure vessel code, Indian Boiler Regulation (IBR), ISA, and other standards specified elsewhere as well as in accordance with all applicable requirements of the “Federal Occupational Safety and Health Standards, USA” or acceptable equal standards. All the Control Valves, their actuators and accessories to be furnished under this Sub-section will be fully suitable and compatible with the modulating loops covered under the Specification.</p>		
1.01.02	<p>All the control valves and accessories offered by the Bidder shall be from reputed, experienced manufacturers of specified type and range of valves. Ceramic lined control valves shall be provided as per standard and proven practice of QFGDM.</p>		
1.01.03	<p>For special type of control valves such as combined pressure and temperature control valves for Aux PRDS application, separator drain control valves, refer to the corresponding mechanical sections.</p>		
1.01.04	<p>Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.</p>		
1.02.00	CONTROL VALVE SIZING & CONSTRUCTION		
1.02.01	<p>The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.</p>		
1.02.02	<p>The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall ensure that valves outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec. for steam services and 50% of sonic velocity for flashing services. Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which will be subject to Employer’s approval during detailed engineering.</p>		
1.02.03	<p>Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and down stream piping. Thus for cavitation service, only valve with anti cavitation trim shall be provided. Detailed calculations to establish whether cavitation will occur or not for any given application shall be furnished. For flashing services, valve with hardened trim shall be provided.</p>		
1.02.04	<p>Control valves for application such as SH Spray Control, RH spray Control, Heavy Oil Heating, pressurizing and Control system, HP/LP heater Emergency level control, Emergency Make-up to condenser hotwell, GSC minimum flow, Deaerator Drain to Condenser Hotwell, Condensate spill to condensate reserve tank, condenser normal make-up and valve gland sealing supplying pressure control, CEPS minimum flow control, BFP circulation control valve shall have permissible leakage rate as per leakage Class V. All other</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 1 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS											
1.02.05	control valves shall have leakage rate as per leakage Class-IV as per ANSI / FCI /70.2,2006 or equivalent.											
1.02.05	The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers except for few cases as per contractor's standard and proven practice subject to employer's approval.											
1.02.06	Control valves for steam and water application shall be provided with rangability of 30:1 for all services except for applications wherein control valves are envisaged to be operated in lower range like Reheater spray and superheater spray system wherein control valve with rangability of 50:1 shall be provided											
2.00.00	VALVE CONSTRUCTION											
2.01.00	All valves shall be of globe body design & straightaway pattern with single or double port, unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure and pressure drops permit.											
2.02.00	Valves with high lift cage guided plugs & quick-change trims shall be supplied.											
2.03.00	Cast Iron valves are not acceptable.											
2.04.00	Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Employer. Bonnet joints of the internal threaded or union type will not be acceptable.											
2.05.00	Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.											
2.06.00	All valves connected to vacuum on down stream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing or with extra deep gland packing, which shall be equipped with lantern rings to admit pressurized water for gland sealing.)											
2.07.00	Valve characteristic shall match with the process characteristics.											
2.08.00	Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.											
2.09.00	Flanged valves shall be in accordance to ANSI B 16.5.											
3.00.00	VALVE MATERIALS											
	<table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Service</th> <th>Body material</th> <th>Trim Material</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Non-corrosive, non-flashing and non-cavitation service except DM water</td> <td>Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C</td> <td>316SS stelled with stelled faced guide posts and bushings.</td> </tr> </tbody> </table>	Sr. No.	Service	Body material	Trim Material	1	Non-corrosive, non-flashing and non-cavitation service except DM water	Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C	316SS stelled with stelled faced guide posts and bushings.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
<p>4.00.00</p> <p>5.00.00</p> <p>6.00.00</p> <p>6.01.00</p>	<p>2. Severe flashing/cavitation on services Alloy steel ASTM-A217 Gr. WC9 440 C</p> <p>3. Low flashing/cavitation on service Alloy steel ASTM-A217 Gr. WC6 17-4 PH SS</p> <p>4. DM water service 316 SS 316 SS</p> <p>NOTE: (a) Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34.</p> <p>(b) Severe flashing / cavitation services includes as a minimum all control valves whose downstream piping is connected to condenser or flash tank.</p> <p>However, Bidder may offer valves with body and trim materials better than specified materials and in such cases Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified material for Employer's consideration and approval.</p> <p>END PREPARATION</p> <p>Valve body ends shall be either butt welded/socket welded, flanged (Rubber lined for condensate service) or screwed as finalized during detailed engineering and as per Employer's approval. The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per ANSI B 16.11. Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of the control valve body.</p> <p>VALVE ACTUATORS</p> <p>All control valves shall be furnished with pneumatic actuators except for pressure and temperature control valve for auxiliary PRDS application (electro-hydraulic / pneumatically operated) and separator drain control valve (electro-hydraulic type).The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg.C continuously.</p> <p>Valve actuators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An adequate allowance for stem force, at least 0.15 Kg/sq.cm. per linear millimeter of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified.</p> <p>The travel time of the pneumatic actuators shall not exceed 10 seconds.</p> <p>CONTROL VALVE ACCESSORY DEVICES</p> <p>All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-4540-001A-2</p>	<p>SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES</p>	<p>PAGE 3 OF 5</p>	

CLAUSE NO.	TECHNICAL REQUIREMENTS			
7.00.00	Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements.			
7.01.00	SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER			
	1	Environment	a) Protection class.	IP-65 Minimum
	2	EMC & CE Compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN50082 or equivalent.
	3	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).
			Hand Held Calibrator	(i) Universal HART Calibrator to be provided for conventional positioners. (for quantity, refer Part-A. Contract quantities of the specification). (ii) Fieldbus compatible calibrator to be provided for fieldbus based positioners. (for quantity, refer Part-A)
	POSITIONER WITH INTRINSIC PARTIAL STROKE TEST (PST) FACILITY			
	<p>FGD Bypass Damper is very critical for the safe evacuation of flue gas when FGD is not in operation. Normally it shall be in CLOSED condition most of the times when FGD is in operation. But during emergency need, if it fails to OPEN, it can lead to high furnace pressure and subsequent MFT. Therefore, a PARTIAL STROKE TEST for the Bypass damper to be carried out in AUTO at regular intervals.</p> <p>A timer is set to conduct partial stroke test weekly (programmable). When timer is due, an alarm message is sent to both Main Unit Control Room and FGD Control Room: "FGD PARTIAL STROKE TEST SCHEDULED". A soft Push Button is to be provided in the Main Control Room only. Once the Operator presses the PB, the timer is reset and "FGD PARTIAL STROKE TEST INITIATED" message should flash in both Main Unit CR and FGD CR.</p> <p>An analog output command shall be sent to the FGD Bypass Damper for programmable opening. Once the Damper OPENS to the predetermined Set Point, a close command is issued to close the damper (approx. 10% opening PFT SP is to be given and for CLOSE Limit switch is to be used). After getting, the close feedback "FGD PARTIAL STROKE TEST SUCCESSFUL" message is flashed. This test should complete successfully within a scheduled time. If it does not, "FGD PARTIAL STROKE TEST FAIL" alarm shall be flashed in both Unit CR and FGD CR. Scheme shall be finalised during detailed engineering.</p> <p>Contractor shall provide <i>positioner</i> with intrinsic Partial Stroke Test (PST) facility to achieve the above functionalities for the FGD Bypass Damper with all suitable pneumatic and electrical connections.</p>			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 4 OF 5	

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
8.00.00	<p>All other or better specifications of Positioners shall be applicable to PST positioners as mentioned in Section – VI, Part-B, Control Valves, Actuators & Accessories, Sub-Section- IIIC-08, Clause 7.00.00.</p> <p>TEST AND EXAMINATION</p> <p>All valves shall be tested in accordance with the quality assurance programme agreed between the Employer and Contractor, which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following:</p> <p>8.01.00 Non Destructive Test as per ANSI B-16.34.</p> <p>8.02.00 Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test.</p> <p>8.03.00 Valve closure test and seat leakage test in accordance with ANSI-B 16.34/ FCI 70.2 standard and as per the leakage class indicated above</p> <p>8.04.00 Functional Test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position.</p> <p>8.05.00 CV Test: Please refer CI No. 1.00.00 & 3.00.00 OF Sub-section- IIIC-10 (Type test requirements), Control Valves.</p> <p>Bidder shall furnish all the control valves under this main plant package as finalized during detailed engineering stage without any price repercussions whatsoever depending on the process requirements. All the control valves provided by the Bidder for this project shall meet the specifications requirements specified herein. Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 5 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS											
<p>1.00.00</p> <p>PROCESS CONNECTION PIPING</p> <p>Process connection & piping including all impulse piping, sample piping, pneumatic piping/tubing, valves, valve manifolds, fittings and all other accessories required for proper installation & completeness of impulse piping system, sampling piping system and air supply system shall be provided by the Contractor on as required basis.</p> <p>The rating of material of impulse pipes, tubes, fittings, valves and their installation thereof shall conform to the latest edition of standards as per following table:</p> <table border="1"> <tr> <td>Impulse Pipes, Tubes (Material, Rating)</td> <td>ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70</td> </tr> <tr> <td>Valves (Material, Pr. Class, Size)</td> <td>ASTM A182/ASTM A105 as per ASME 16.34</td> </tr> <tr> <td>Fittings (Size, Rating, Material)</td> <td>ANSI B31.1, ANSI B31.1a, ASME B16.11-2009</td> </tr> <tr> <td>Installation Schemes</td> <td>BS 6739-2009, ANSI/ISA 77.70</td> </tr> </table> <p>Instrument air filters cum regulator set with mounting accessories shall be provided for pneumatic device requiring air supply.</p> <p>1.01.00</p> <p>All transmitters and switches (except for fuel oil applications) shall be suitably grouped together and mounted inside</p> <p>(i) Local Instruments Enclosures (LIE) in case of Open Areas of the Plant like Boiler Area, Coal Handling, Chimney Area, FGD area, CW Pump House, DM Plant, PT Plant, Ash Handling Plant etc.</p> <p>(ii) Local Instrument Racks (LIR) in case of covered areas like Turbine Area, Generator Area etc.</p> <p>(iii) Local Indicators/Gauges shall also be suitably grouped in Local Instrument Racks</p> <p>In case grouping is not possible and these are to be installed individually, canopy with suitable mounting arrangement shall be provided.</p> <p>All electric actuators, pneumatic control valves, Junction Boxes, Solenoid boxes and Local control panels which are not installed inside building, suitable canopy shall be provided and design of canopy shall be approved by Employer during detailed engineering.</p> <p>1.02.00</p> <p>Local Instrument Enclosures (LIEs) and Local Instrument Racks (LIRs) complete with all fittings, mountings & accessories, drains and Utility Lighting, Cable & Grounding cable etc. shall be provided by the Contractor on as required basis. The Degree of Protection of LIE and JB of LIE/LIR shall be IP-55. The instrument racks shall be constructed from 1.6 mm sheet plate and shall be free standing type constructed of suitable 3 mm thick channel frame of steel and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel and extended beyond the ends of the rack.</p> <p>1.03.00</p> <p>All temperature transmitters shall be suitably grouped together and mounted inside</p> <p>(i) Enclosures in case of open areas of the plant like Boiler Area, Coal Handling,</p>	Impulse Pipes, Tubes (Material, Rating)	ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70	Valves (Material, Pr. Class, Size)	ASTM A182/ASTM A105 as per ASME 16.34	Fittings (Size, Rating, Material)	ANSI B31.1, ANSI B31.1a, ASME B16.11-2009	Installation Schemes	BS 6739-2009, ANSI/ISA 77.70	<p align="center">PROCESS CONNECTION AND PIPING</p>			
	Impulse Pipes, Tubes (Material, Rating)	ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70										
	Valves (Material, Pr. Class, Size)	ASTM A182/ASTM A105 as per ASME 16.34										
	Fittings (Size, Rating, Material)	ANSI B31.1, ANSI B31.1a, ASME B16.11-2009										
	Installation Schemes	BS 6739-2009, ANSI/ISA 77.70										
<p align="center">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p align="center">TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2</p>	<p align="center">SUB-SECTION-IIIC-06 PROCESS CONNECTION AND PIPING</p>	<p align="center">PAGE 1 OF 2</p>									

CLAUSE NO.	TECHNICAL REQUIREMENTS	
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1.04.00 Chimney Area, FGD area, CW Pump House, DM Plant, PT Plant, Ash Handling Plant etc. and (ii) Racks in case of covered areas like Turbine Area, Generator Area etc. on as required basis. In case grouping is not possible and temperature transmitter is to be installed individually, canopy with suitable mounting arrangement shall be provided.

1.05.00 For skid mounted instruments and instruments integral to equipments, process connection and piping can be in line with bidder's standard and proven practice.

1.06.00 Contractor shall furnish "Certificate of Compliance" of erection of PCP as per NTPC approved documents.

PAINTING COLOR SCHEME FOR IMPULSE PIPING

S. No.	Area / Equipment	Impulse Pipe Ground Color		Identification Tag/Band		
		Color	RAL	Color	ISC No.	RAL
1)	Air	Grey	9002	Sky Blue	101	
2)	Water	Grey	9002	Sea Green	217	
3)	Steam	Aluminum		Signal Red	537	3001
4)	Air Steam Mixture	Aluminum		Sky Blue	101	
5)	Gas	Grey	9002	Canary Yellow	309	
6)	Oils	Grey	9002	Light Brown	410	
7)	Pulverized Fuel	Grey	9002	Silver Grey	628	
8)	Fire Installations	Fire Red	536 (ISC) 3001 (RAL)	White		9010
9)	HP Dosing	Grey	9002	Dark Admiralty Grey	632	
10)	LP Dosing / acid / alkali Piping	Grey	9002	Signal Red	537	
11)	Ash Piping	Grey	9002	French Blue	166	

Note: Ground color indicated against each piping shall be followed in case piping is not insulated /cladded.

CLAUSE NO.	TECHNICAL REQUIREMENTS			
6.00.00	<p>FIELD MOUNTED LOCAL JUNCTION BOXES (AS PER STANDARD AND PROVEN Practice of vendor</p> <p>(i) No. of ways 12/24/36/48/64/72/96/128 with 20% spares terminals.</p> <p>(ii) Material and Thickness 4mm thick Fiberglass Reinforced Polyester (FRP).</p> <p>(iii) Type of terminal blocks Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm². A M6 earthing stud shall be provided.</p> <p>(iv) Protection Class IP: 55 min. for indoor & IP-65 min for outdoor applications.</p> <p>(v) Grounding To be provided.</p> <p>(vi) Color RAL 7035</p>			
11.00.00	<p>CONDUITS AND CABLE TRAYS TO BE PROVIDED AS PER STANDARD AND PROVEN PRACTISE OF CONTRACTOR.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-4540-001A-2</p>	<p>SUB-SECTION-IIIIC-07 INSTRUMENTATION CABLES</p>	<p>PAGE 6 OF 6</p>	

PROVENESS CRITERIA

5.00.00 INSTRUMENTS (PRIMARY & SECONDARY)

(i) Type of Instrument

(ii) Make / Model

(iii) Name of Power Station
(Location & Address)

(iv) Unit Size (MW)

(v) Commissioning date

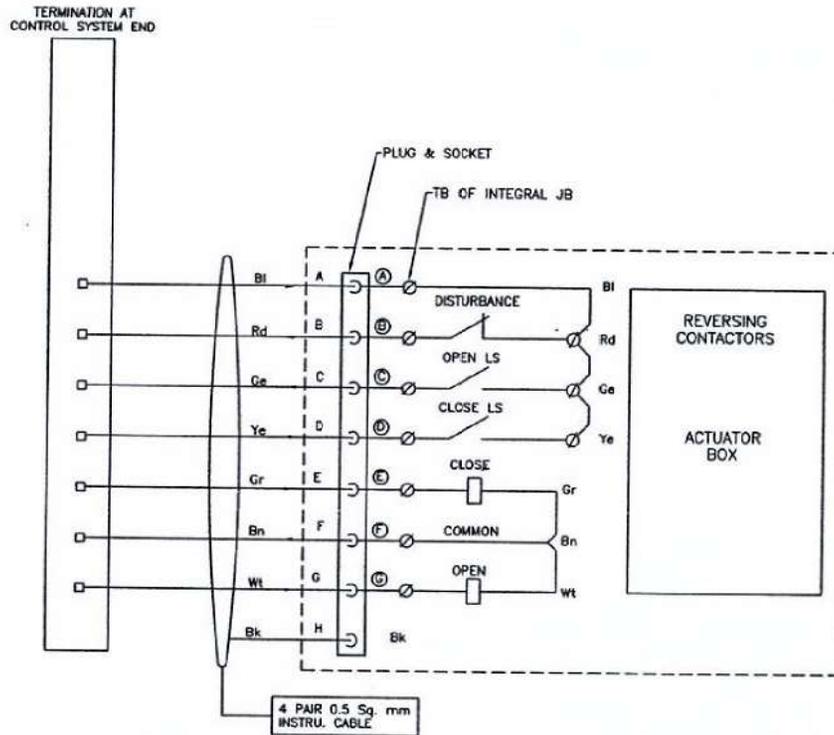
Whether above instruments have
atleast one (1) year satisfactory
operation
in one (1) power station having
unit rating of 200 MW or above.

Yes/No

(vi) Client's certificate attached

Yes/No

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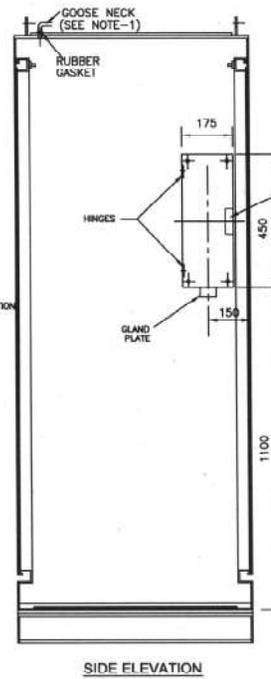
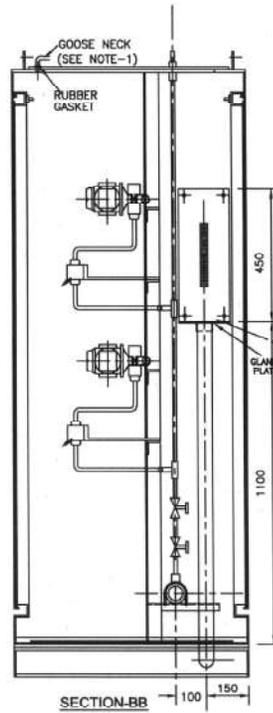
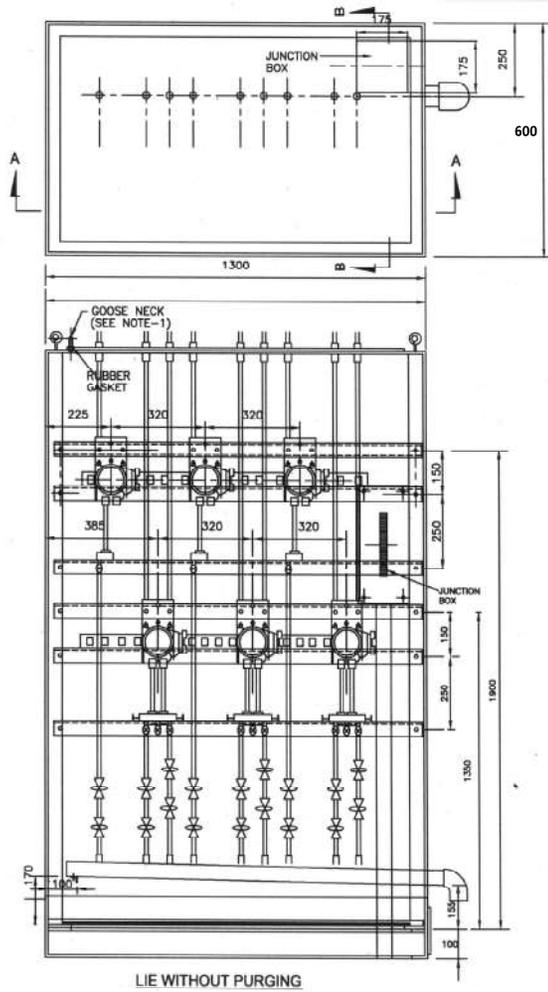


4 PAIR 0.5 Sq. mm INSTRU. CABLE

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		एन टी पी सी लिमिटेड NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION	
PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF ACTUATORS	
REV. NO.	DESCRIPTION	DATE	DRG. NO.
A	FIRST ISSUE	28.04.06	0000-999-POI-A-063
DRAWN		SIZE	SCALE
DESIGN		A3	N.T.S.
CHKD.		REV. NO.	
M		A	
E			
C			
C&I			
ARCH.			
APPD			
CLEARED BY			

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NOTES:-

1. TO BE PROVIDED FOR LIEs USED IN STEAM & WATER APPLICATION.
2. MATERIAL OF JBs FOR LIEs SHALL BE SAME AS THAT OF LIE.

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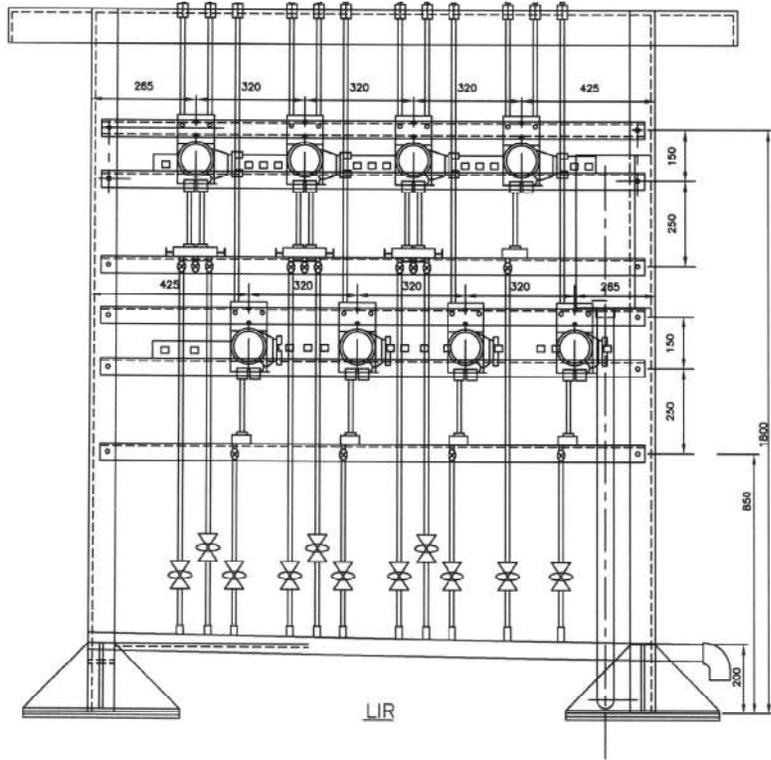
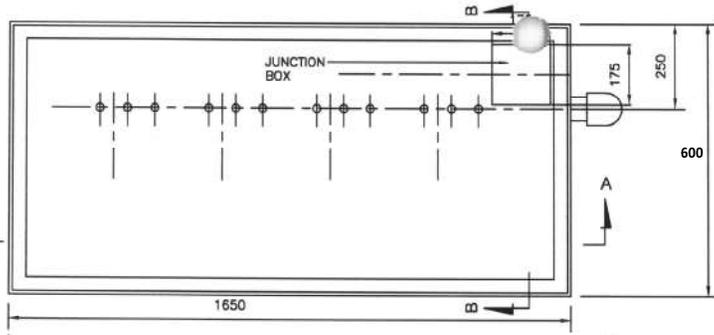


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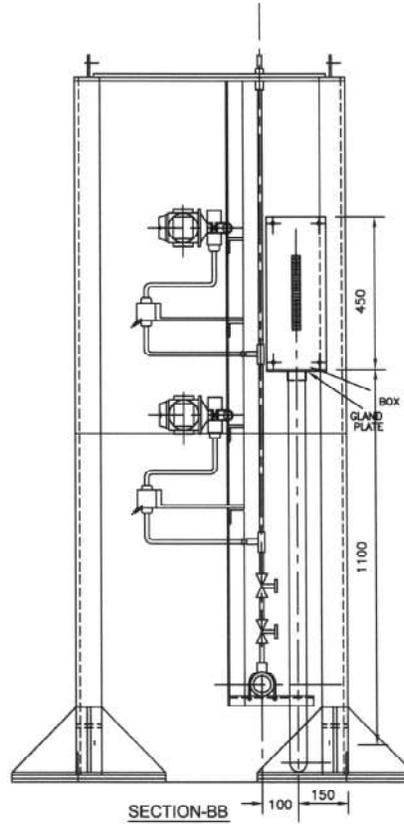
PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK	
REV. NO.	DESCRIPTION	DATE	DRG. NO.
A	FIRST ISSUE	21.08.12	0000-999-POI-A-064
REV. NO.	DESCRIPTION	DATE	DRG. NO.
			B

REV. NO.	DESCRIPTION	DATE	DRG. NO.
A	FIRST ISSUE	21.08.12	0000-999-POI-A-064
REV. NO.	DESCRIPTION	DATE	DRG. NO.
			B

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SECTION-AA
LIR WITHOUT PURGING



SECTION-BB

NOTE:-
1. MATERIAL OF JBs FOR LIRs SHALL BE SAME AS THAT OF LIR.

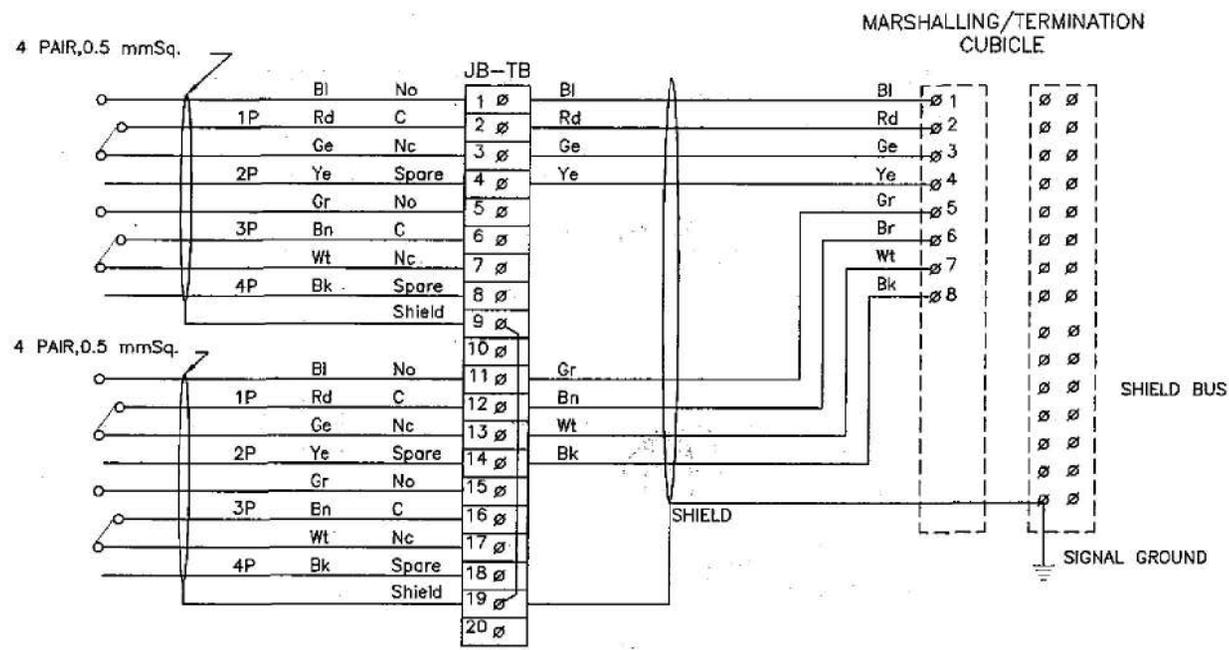
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PROJECT	TYPICAL THERMAL POWER PROJECT				
TITLE	TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK				
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	DATE
A	FIRST ISSUE				21.08.12
SIZE	SCALE	DRG. NO.	REV. NO.		
A3	N.T.S.	0000-999-POI-A-064	A		

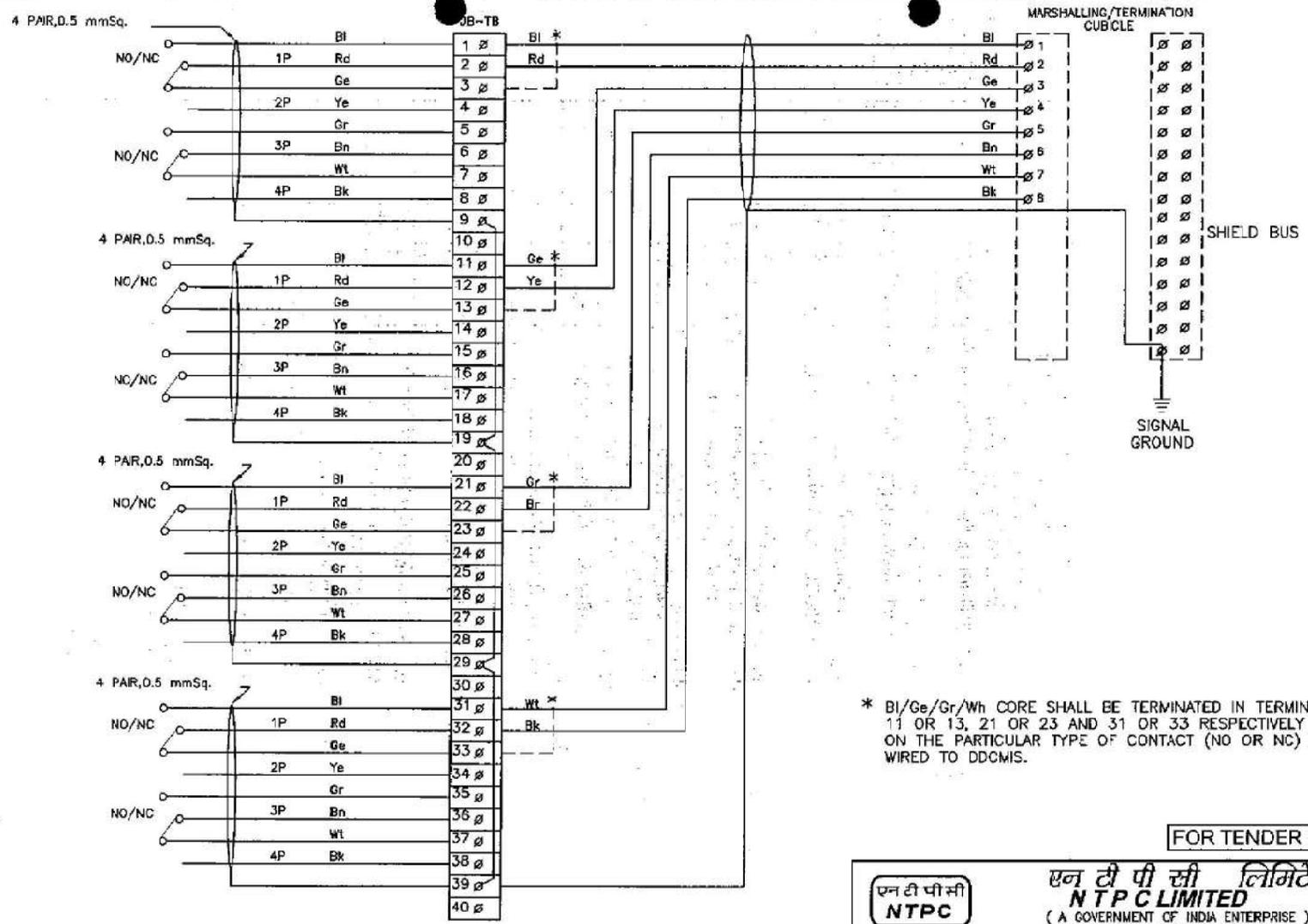
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PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF FIELD INSTRUMENTS/ SWGR SWITCH (COC) TERMINATION DETAILS	
REV. NO.	DESCRIPTION	SIZE	SCALE
A	FIRST ISSUE	A3	NTS
DRWN	DESIGN	CHKD.	DATE
			29.04.06
CLEARED BY		DRG. NO.	REV. NO.
		0000-999-POI-A-065	A
SH 01 OF 14			

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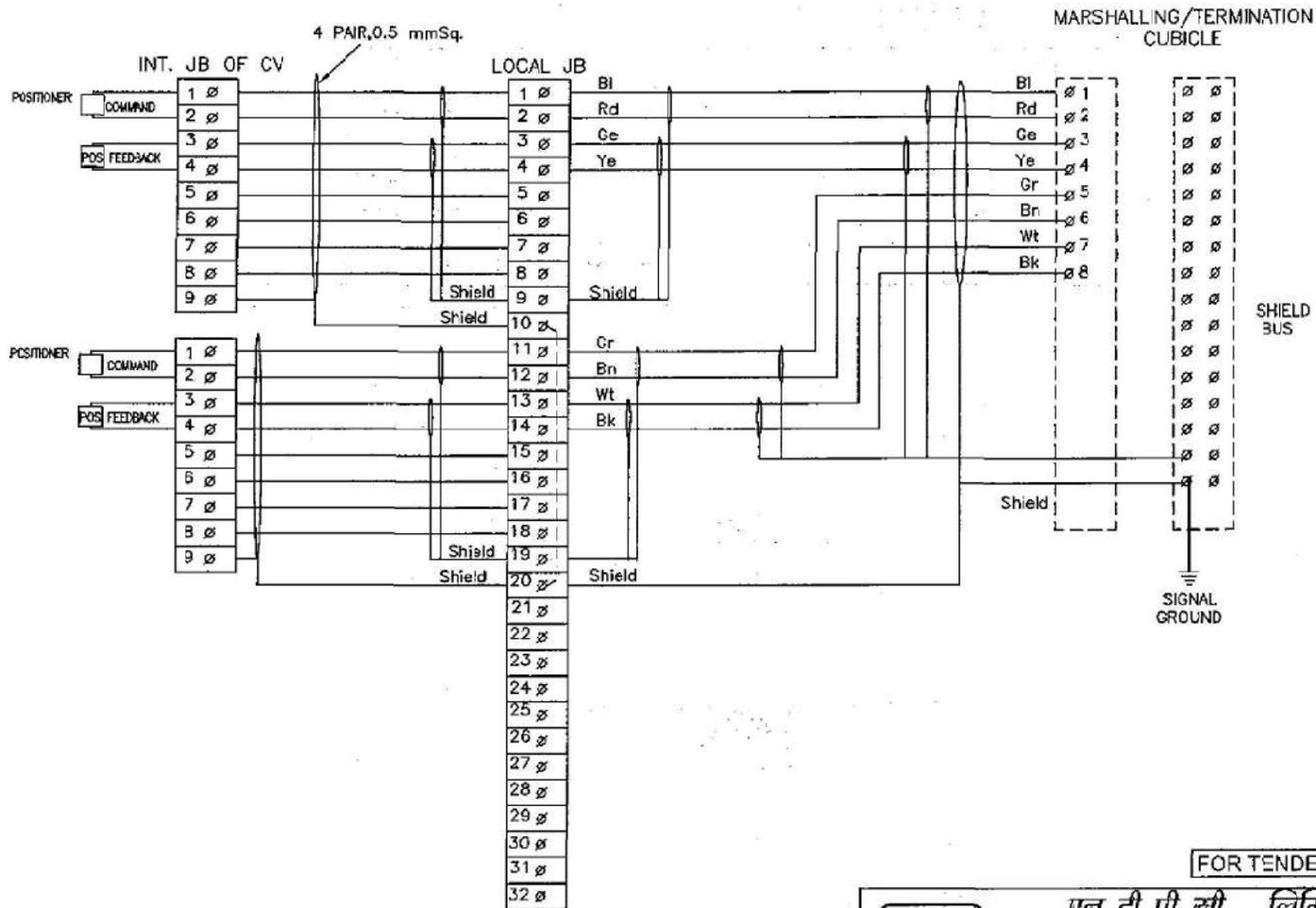
* Bl/Ge/Gr/Wt CORE SHALL BE TERMINATED IN TERMINAL 1 OR 3, 11 OR 13, 21 OR 23 AND 31 OR 33 RESPECTIVELY DEPENDING ON THE PARTICULAR TYPE OF CONTACT (NO OR NC) IS TO BE WIRED TO DDCMIS.

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PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF FIELD INSTRUMENTS SWITCH TERMINATION DETAILS NO/NC	
REV. NO.	DESCRIPTION	SIZE	SCALE
A	FIRST ISSUE	A3	NTS
DRAWN	DESIGN	CHKD.	DATE
			29.04.06
M		E	C
C&I		ARCH.	APPD
CLEARED BY:		DRG. NO.	REV. NO.
		0000-999-POI-A-065	A
SH 02 OF 14			

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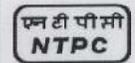
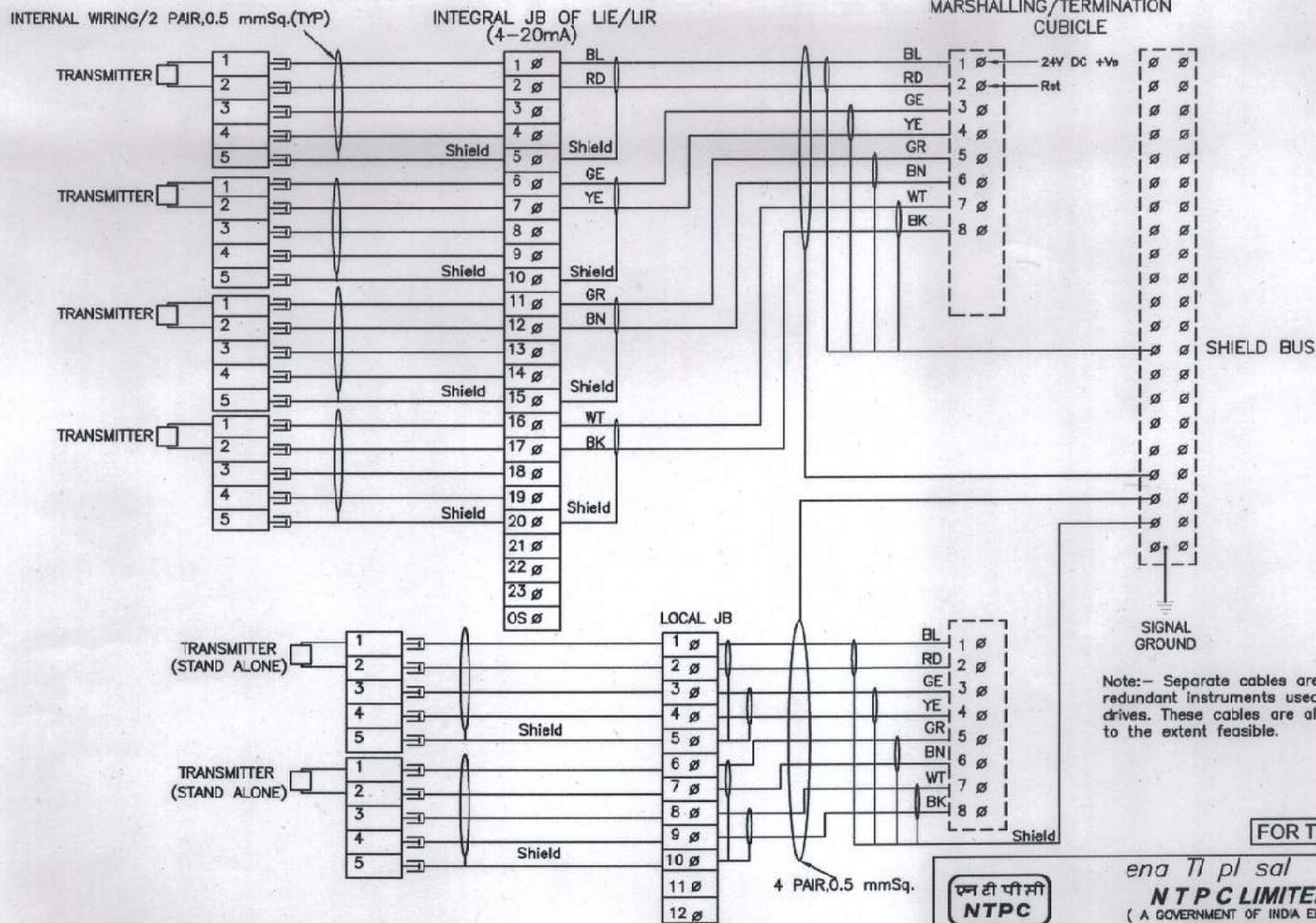


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		<p style="text-align: center;">एन टी पी सी लिमिटेड NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION</p>	
PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF FIELD INSTRUMENTS CONTROL VALVE	
REV. NO.	DESCRIPTION	SIZE	SCALE
A	FIRST ISSUE	A3	NTS
DRG. NO.	0000-999-PCI-A-065	REV. NO.	A
SH 03 OF 14			

DATE	29.04.06
APPD	
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DESIGN	
DRAWN	
REV. NO.	A

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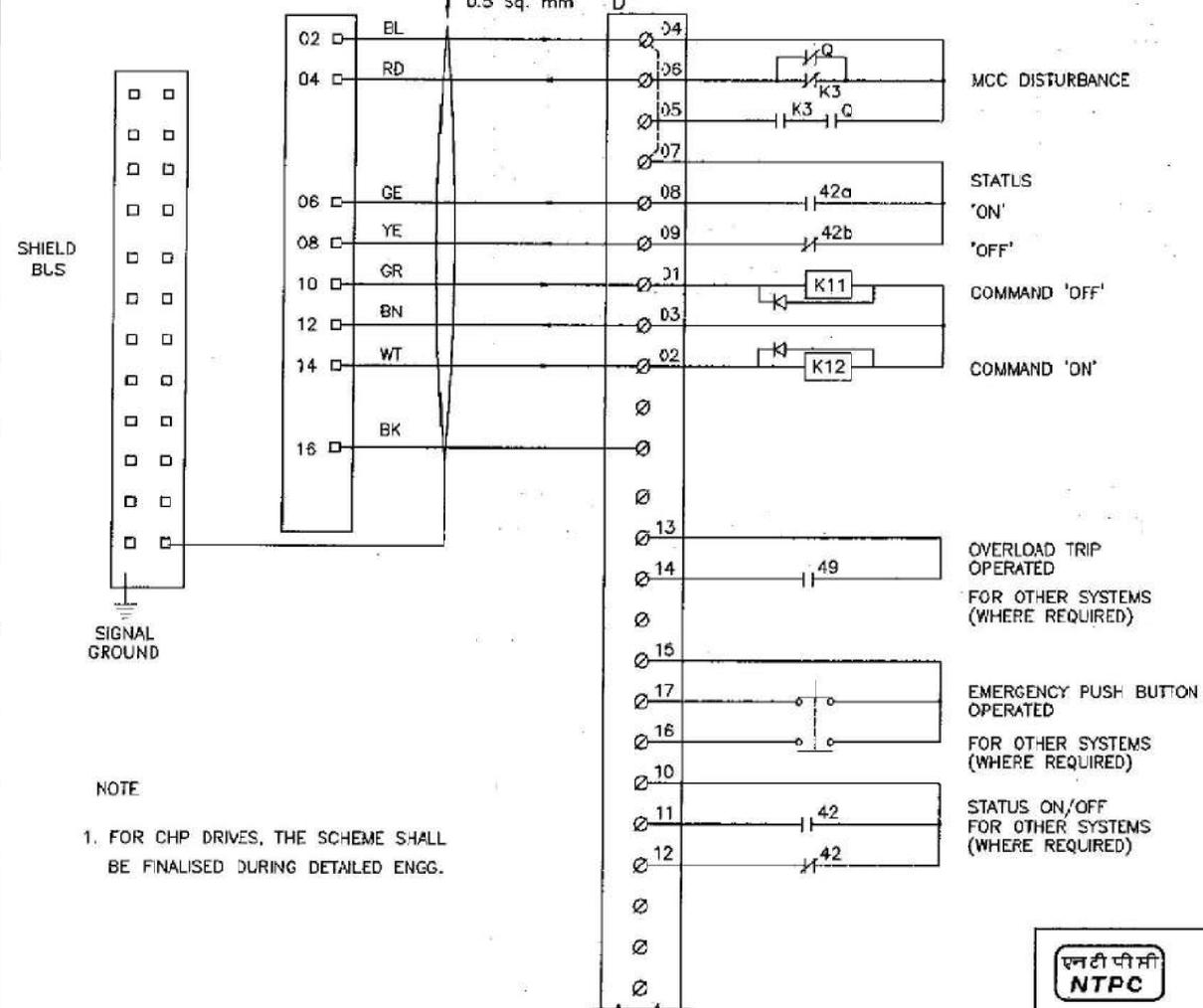


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C	NOTE REGARDING CABLE IS ADDED.									10.12.13	PROJECT	TYPICAL THERMAL POWER PROJECT			REV. NO.
B	INTERNAL WIRING FOR LIE/LIR MOUNTED SHOWN WIRING OF STAND ALONE TXTR SHOWN									10.12.06	TITLE	INTERFACING OF FIELD INSTRUMENTS 4-20mA			c
A	FIRST ISSUE									12.1.05	SIZE	SCALE	DRG. NO.		
REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE	A3	NTS	0000-999-POI-A-065	REV. NO.
					CLEARED BY									SH 04 OF 14	

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MARSHALLING/ TERMINATION CUBICLES



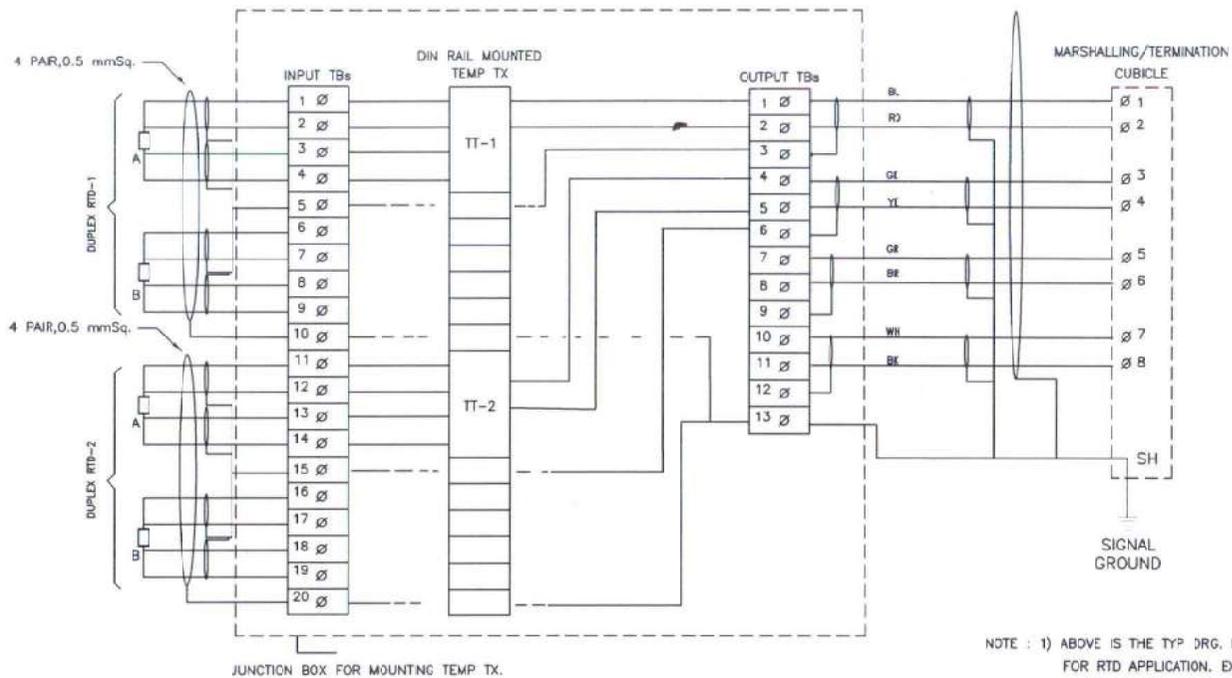
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PROJECT	TYPICAL THERMAL POWER PROJECT
TITLE	INTERFACING OF FIELD INSTRUMENTS INTERFACE OF DDCMIS WITH MCC/SWGR/ACTUATOR (LT MOTORS)

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&W	ARCH.	APPD	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
A	FIRST ISSUE										29.04.06	A3	NTS	0000-999-POI-A-065	A
CLEARED BY											SH 05 CF 14				

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NOTE : 1) ABOVE IS THE TYP DRG. FOR DIN RAIL MOUNTED TEMP TRANSMITTERS FOR RTD APPLICATION. EXACT TYPE OF TEMP TRANSMITTER SHALL BE AS PER PART-A OF SPECIFICATION.
 2) THE EXACT GROUPING OF TEMP TXs SHALL BE FINALISED DURING DETAILED ENGG. STAGE.

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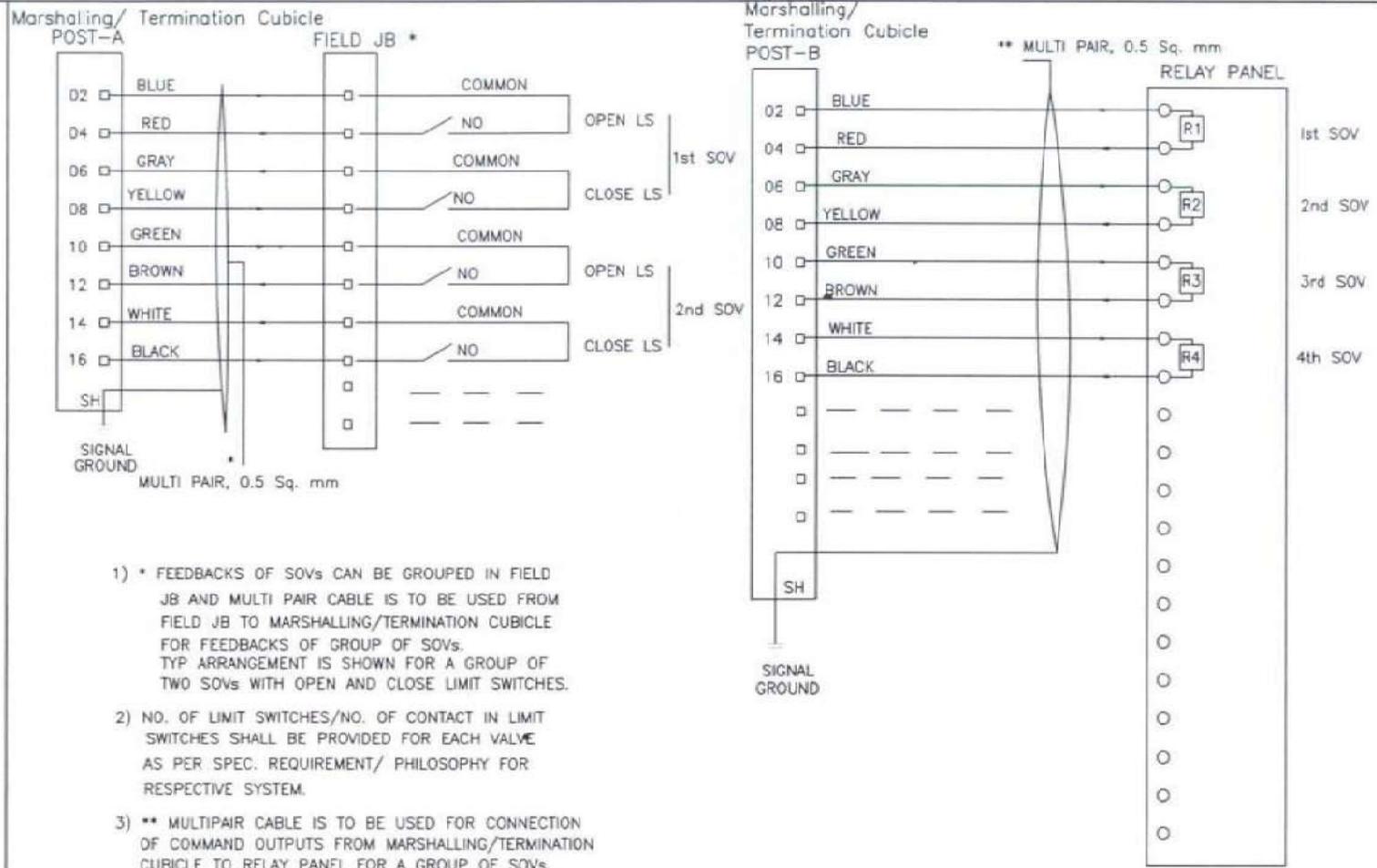
PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INTERFACING OF FIELD INSTRUMENTS
 TYPICAL RTD CONNECTION WITH TEMP TRANSMITTERS INJBS

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APFD	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
A	FIRST ISSUE										29.04.08	A3	NTS	0000-999-POI-A-065	C
CLEARED BY															

SH 06 OF 14

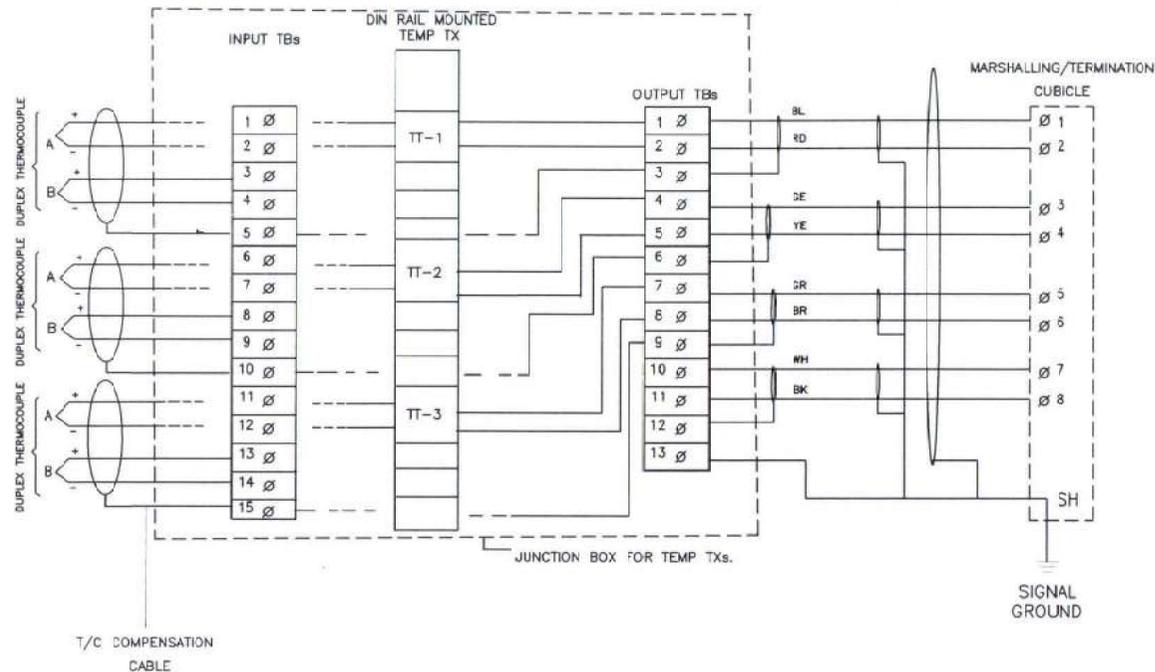
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- 1) * FEEDBACKS OF SOVs CAN BE GROUPED IN FIELD JB AND MULTI PAIR CABLE IS TO BE USED FROM FIELD JB TO MARSHALLING/TERMINATION CUBICLE FOR FEEDBACKS OF GROUP OF SOVs. TYP ARRANGEMENT IS SHOWN FOR A GROUP OF TWO SOVs WITH OPEN AND CLOSE LIMIT SWITCHES.
- 2) NO. OF LIMIT SWITCHES/NO. OF CONTACT IN LIMIT SWITCHES SHALL BE PROVIDED FOR EACH VALVE AS PER SPEC. REQUIREMENT/ PHILOSOPHY FOR RESPECTIVE SYSTEM.
- 3) ** MULTIPAIR CABLE IS TO BE USED FOR CONNECTION OF COMMAND OUTPUTS FROM MARSHALLING/TERMINATION CUBICLE TO RELAY PANEL FOR A GROUP OF SOVs.

	नेशनल थर्मल पावर कॉर्पोरेशन लिमिटेड National Thermal Power Corporation Ltd. (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION														
PROJECT	TYPICAL THERMAL POWER PROJECT														
TITLE	INTERFACING OF FIELD INSTRUMENTS INTERFACE OF DDCMIS WITH MCC/SWGR/ACTUATOR (SINGLE COIL SOLENOID)														
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
B	FIRST ISSUE										30.10.02	A3	NTS	0000-999-POI-A-065	C
CLEARED BY													SH 08 OF 14		

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- NOTE: 1) ABOVE IS THE TYP DRG. FOR DIN RAIL MOUNTED TEMP TRANSMITTER FOR T/C APPLICATION. EXACT TYPE OF TEMP TRANSMITTERS SHALL BE AS PER PART-A OF SPECIFICATION.
- 2) THE EXACT GROUPING OF TEMP TXs SHALL BE FINALISED DURING DETAILED ENGG. STAGE.
- 3) AFTER GLANDING OF T/C CABLES ON JB, THE CABLE PAIR OF FIRST ELEMENT WILL BE DIRECTLY CONNECTED TO TT AND FOR CABLE PAIR OF SECOND ELEMENT LOOP SHALL BE KEPT, BEFORE TERMINATION AT INPUT TBs FOR FUTURE USE.

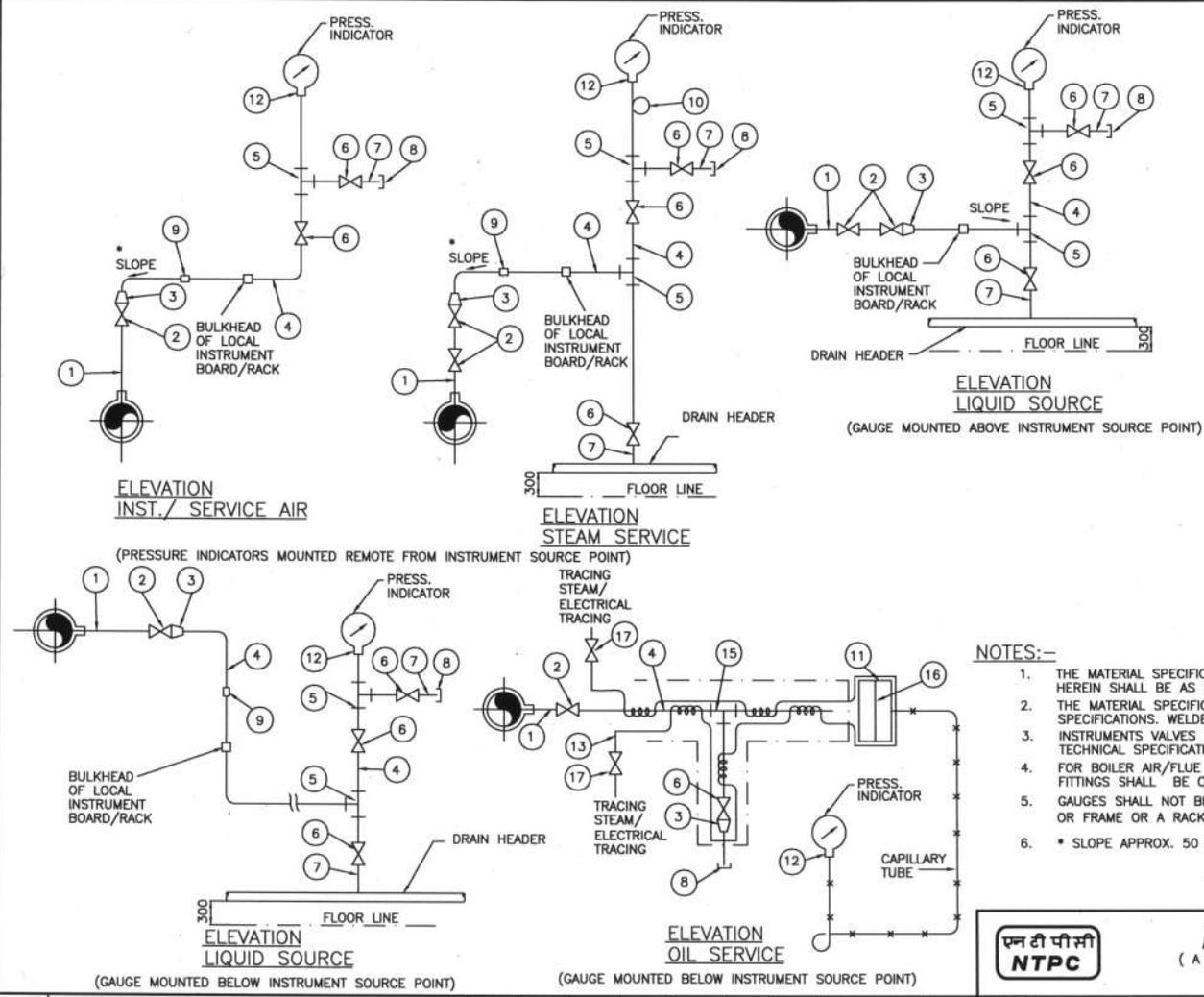
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ENGINEERING DIVISION

PROJECT	TYPICAL THERMAL POWER PROJECT		
TITLE	INTERFACING OF FIELD INSTRUMENTS TYPICAL T/C CONNECTION WITH TEMP TXs IN JBs		
REV. NO.	DESCRIPTION	DATE	REV. NO.
A	FIRST ISSUE	29.04.06	C
SIZE	SCALE	DRG. NO.	REV. NO.
A3	NTS	0000-999-POI-A-065	C
Cleared By			SH 11 OF 14

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LIST OF MATERIALS	
ITEM NO.	DESCRIPTION
1.	1/2" x 3/4" x 1" NPS SCH 40/80/160/XXS/P91 (AS PER PROCESS REQUIREMENT) NIPPLE OF MATERIAL SAME AS THAT OF MAIN PIPE.
2.	1/2"/3/4"/1" SW GLOBE VALVE/GATE VALVE
3.	3/4" / 1" x 1/2" SW REDUCING INSERT
4.	1/2" / 3/4" PIPE
5.	1/2" / 3/4" SW EQUAL TEE
6.	1/2" / 3/4" SW GLOBE VALVE.
7.	1/2" / 3/4" NPS SW x 1/2" / 3/4" NPT(M) CARBON/ALLOY STEEL NIPPLE.
8.	1/2" / 3/4" NPT(F) CAP.
9.	1/2" / 3/4" PIPE UNION.
10.	6" SS SYPHON
11.	1/2" BLIND 300lbs RF ANSI FLANGE DRILLED AND TAPED FOR 1" NPT PIPE.
12.	SUITABLE ADAPTER.
13.	1/4" CHROME MOLY STEEL TUBE.
14.	
15.	1 3/4" SW EQUAL TEE.
16.	DIAPHRAGM(WAFER ELEMENT)
17.	ISOLATION VALVE 316 SS,1/4"SW

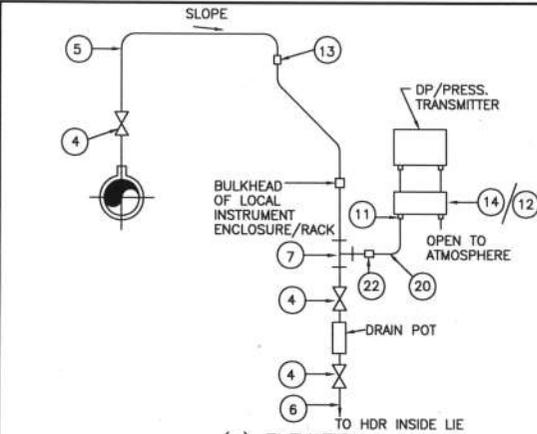
- NOTES:-**
1. THE MATERIAL SPECIFICATION AND SCHEDULE NO. OF IMPULSE PIPE & NIPPLE AS LISTED HEREIN SHALL BE AS PER TECHNICAL SPECIFICATIONS.
 2. THE MATERIAL SPECIFICATION AND RATING OF FITTINGS AS LISTED SHALL BE AS PER SPECIFICATIONS. WELDED/THREADED FITTINGS SHALL CONFIRM TO ANSI-B.16-11.
 3. INSTRUMENTS VALVES BODY STEM MATERIAL AND PRESSURE CLASS SHALL BE AS PER TECHNICAL SPECIFICATIONS.
 4. FOR BOILER AIR/FLUE GAS SERVICES SOURCE CONNECTIONS IMPULSE PIPING AND ALL FITTINGS SHALL BE OF 3/4" NB SIZE.
 5. GAUGES SHALL NOT BE MOUNTED ON THE PIPE. IT WILL BE MOUNTED ON A CHANNEL OR FRAME OR A RACK..
 6. * SLOPE APPROX. 50 MM / METRE.

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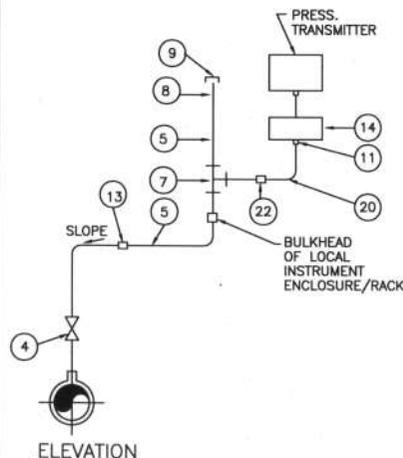
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ENGINEERING DIVISION

PROJECT										TYPICAL THERMAL POWER PROJECT					
TITLE										INSTRUMENT INSTALLATION DIAGRAM (FOR PRESSURE GAUGE)					
A	FIRST ISSUE									T.G.	21.08.12	SIZE	SCALE	DRG. NO.	REV. NO.
REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE	A3	N.T.S.	0000-999-POI-A-022	A
CLEARED BY															

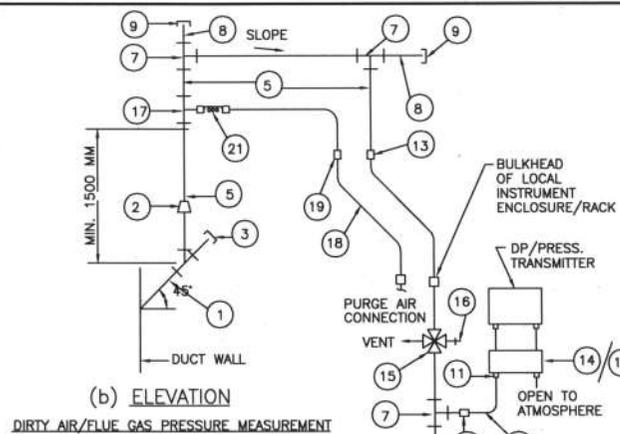
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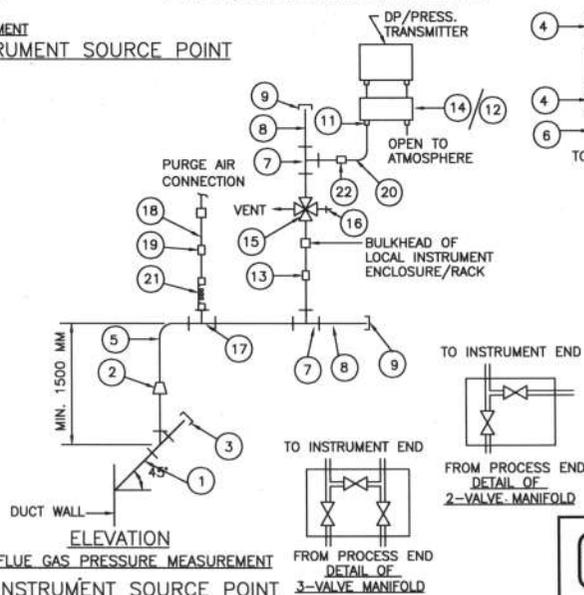
(a) ELEVATION
INST./SERVICE AIR PRESSURE MEASUREMENT
TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT



ELEVATION
INST./SERVICE AIR PRESSURE MEASUREMENT
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT



(b) ELEVATION
DIRTY AIR/FLUE GAS PRESSURE MEASUREMENT



ELEVATION
DIRTY AIR/FLUE GAS PRESSURE MEASUREMENT
FROM PROCESS END
DETAIL OF
3-VALVE MANIFOLD

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	42 X 405 MM M.S. BLACK PIPE
2.	M42x2 TO 3/4" REDUCING INSERT
3.	M42x2(F) M.S.CAP
4.	3/4" SW GLOBE VALVE/GATE VALVE
5.	3/4" NPS PIPE
6.	3/4" NPS SW 3/4" NPT(M) CS/AS NIPPLE
7.	3/4" SW EQUAL TEE
8.	3/4" NPS SCH 80 CARBON/ALLOY STEEL NIPPLE
9.	3/4" NPT(F) CS/AS CAP
10.	3/4" SW CS/AS EQUAL CROSS
11.	1/2" TUBE ADAPTER
12.	3 VALVE MANIFOLD
13.	3/4" PIPE UNION
14.	2 VALVE MANIFOLD
15.	3/4" SW 4 WAY VALVE
16.	QUICK DISCONNECT FITTING
17.	3/4"SWx1/2"SW BRANCH TEE
18.	1/2" NB SEAMLESS GI PIPE
19.	1/2" NPT (F) GI FITTING
20.	SS TUBE
21.	FLEXIBLE HOSE WITH ONE END SOCKET WELDED (PIPE SIDE) & OTHER END WITH SUITABLE FITTINGS.
22.	3/4" x 1/2" S.S. TUBE UNION

NOTES:-

- SEE NOTES UNDER DRG. NO.0000-999-POI-A-022.
- IMPULSE LINE DRAIN CONNECTIONS SHALL BE DONE AS PER TECHNICAL SPECIFICATIONS
- THE SLOPE IN THE HORIZONTAL OF THE IMPULSE PIPE SHALL BE APPROX. 50 mm/mtr.
- THE EXACT ORIENTATION OF THE TRANSMITTERS WITH RESPECT TO VALVE MANIFOLDS ETC. WILL BE FINALISED DURING DETAILED ENGINEERING KEEPING IN VIEW THE MANUFACTURER'S RECOMMENDATIONS.
- COMMON INSTRUMENT AIR HEADER (1"NB) USING REDUNDANT AIR FILTER REGULATORS WILL BE MADE IN EACH TRANSMITTER ENCLOSURE REQUIRING PURGE AIR. PURGE AIR FOR EACH INSTRUMENT LINE SHALL BE TAPPED FROM THIS HEADER USING INDIVIDUAL PURGE ROTAMETERS AS SHOWN IN DRG. NO. 0000-999-POI-A-034 TYPICALLY.

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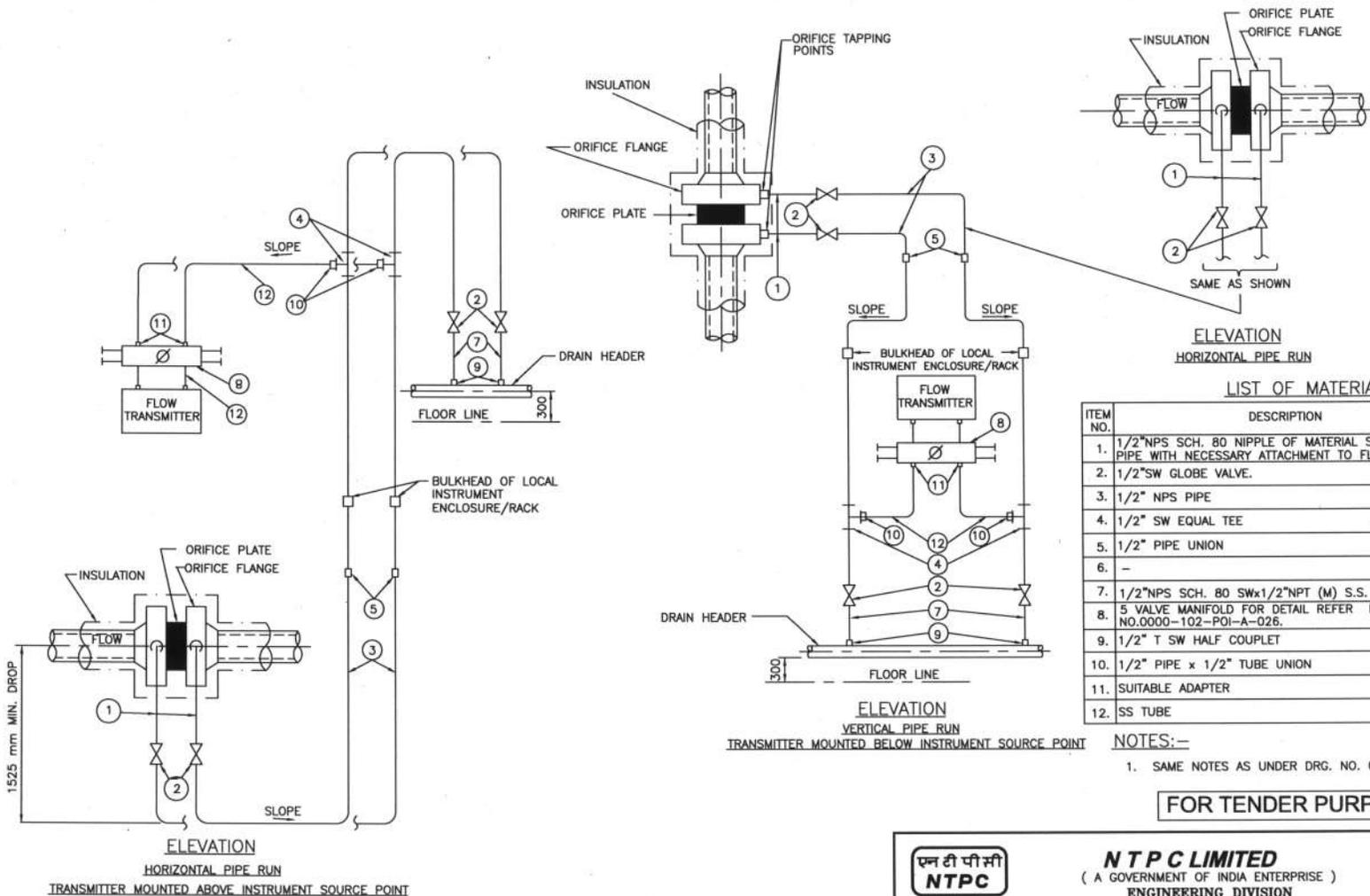
PROJECT TYPICAL THERMAL POWER PROJECT

TITLE INSTRUMENT INSTALLATION DIAGRAM
(PRESSURE MEASUREMENT USING PRESS / DP TRANSMITTERS
(INST./SERVICE, DIRTY AIR/FLUE GAS)

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE									T.G.	21.08.12
CLEARED BY											

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-023	A

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ELEVATION
HORIZONTAL PIPE RUN

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1/2"NPS SCH. 80 NIPPLE OF MATERIAL SAME AS THAT OF MAIN PIPE WITH NECESSARY ATTACHMENT TO FLANGE OF ORIFICE
2.	1/2"SW GLOBE VALVE.
3.	1/2" NPS PIPE
4.	1/2" SW EQUAL TEE
5.	1/2" PIPE UNION
6.	-
7.	1/2"NPS SCH. 80 SWx1/2"NPT (M) S.S. NIPPLE
8.	5 VALVE MANIFOLD FOR DETAIL REFER DRAWING NO.0000-102-POI-A-026.
9.	1/2" T SW HALF COUPLER
10.	1/2" PIPE x 1/2" TUBE UNION
11.	SUITABLE ADAPTER
12.	SS TUBE

NOTES:-

1. SAME NOTES AS UNDER DRG. NO. 0000-999-POI-A-023.

FOR TENDER PURPOSE ONLY

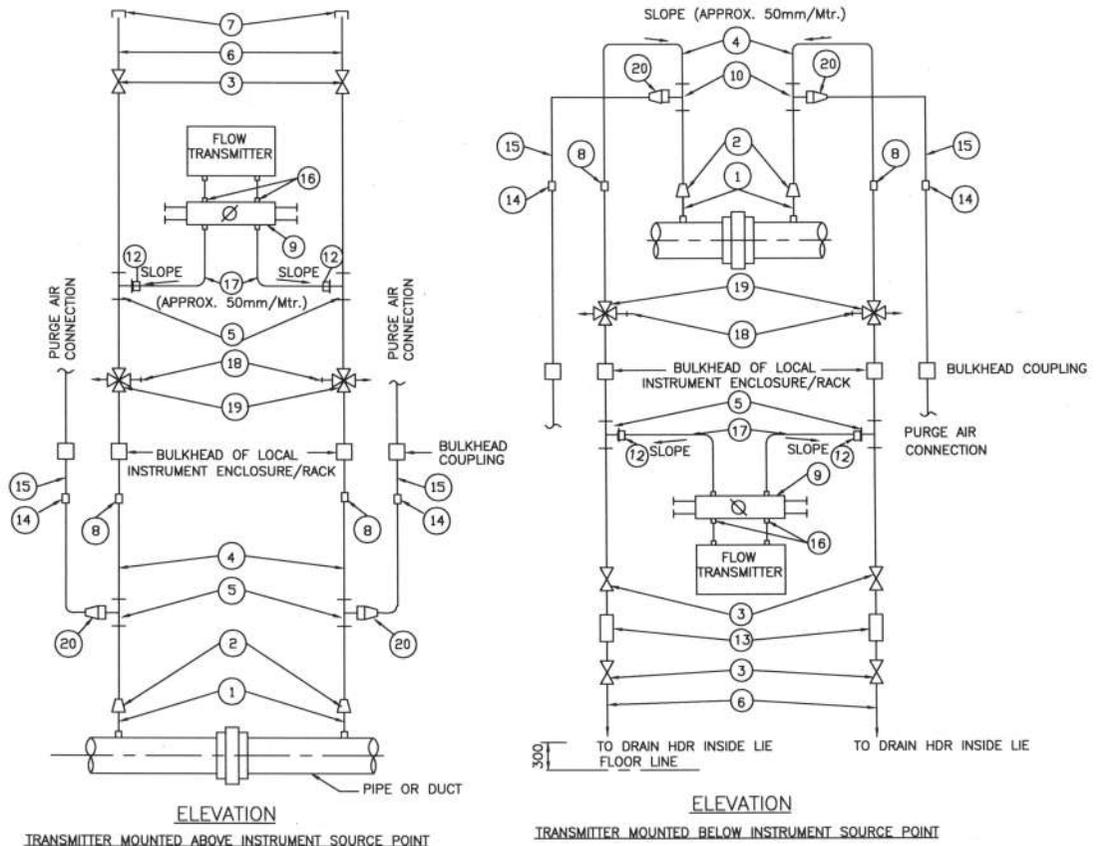


NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INSTRUMENT INSTALLATION DIAGRAM FLOW MEASUREMENT (USING ORIFICE PLATES) CONDENSATE & SERVICE WATER	
SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-027	A

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE									T.G.	21.08.12
CLEARED BY											

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AIR/GAS FLOW MEASUREMENT USING HEAD TYPE PRIMARY ELEMENT

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	42x4.05mm M.S. BLACK PIPE.
2.	M 42x2 TO 3/4"SW REDUCING INSERT.
3.	3/4" SW GLOBE VALVE.
4.	3/4" PIPE.
5.	3/4" SW EQUAL TEE.
6.	3/4" SCH. 80 SWx3/4" NPT (M) CS/AS NIPPLE
7.	3/4" NPT (F) CAP.
8.	3/4" PIPE UNION.
9.	5 VALVE MANIFOLD FOR DETAIL REFER DRAWING NO.0000-102-POI-A-026.
10.	3/4" SW EQUAL TEE.
11.	3/4" SW GATE VALVE.
12.	3/4" PIPE x 1/2" TUBE UNION
13.	DRAIN POT.
14.	1/2" GI FITTING
15.	1/2" NB GI PIPE
16.	SUITABLE ADAPTER
17.	SS TUBE
18.	QUICK DISCONNECT FITTINGS.
19.	3/4" SW 4 WAY VALVE.
20.	3/4" x1/2" REDUCER.

NOTES:-

1. SAME NOTES AS UNDER DRG. NO. 0000-999-POI-A-023.

FOR TENDER PURPOSE ONLY

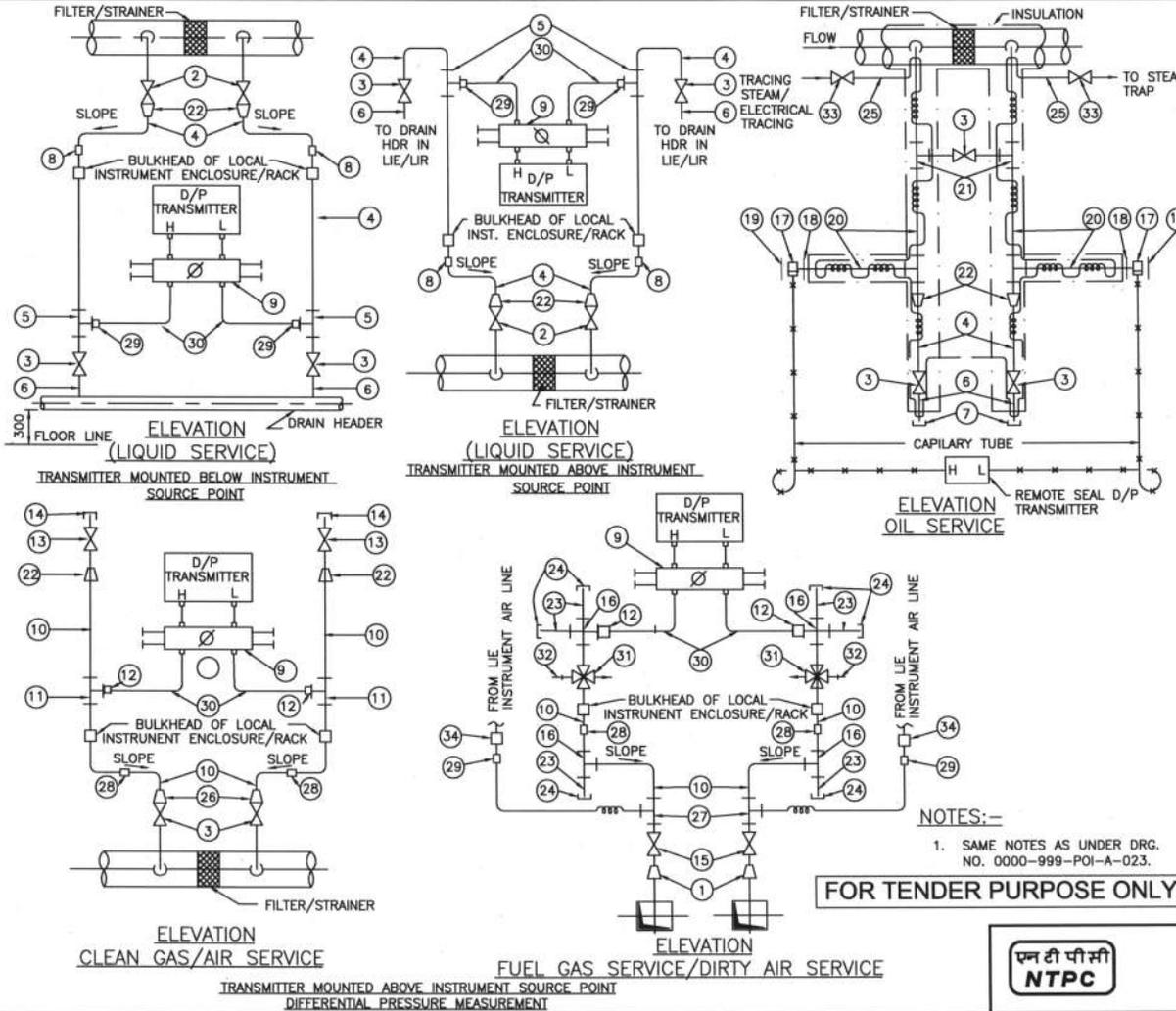


NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INSTRUMENT INSTALLATION DIAGRAM (FLOW MEASUREMENT AIR/GAS)	
REV. NO.	DESCRIPTION	DATE	REV. NO.
A	FIRST ISSUE	21.08.12	B
SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-028	B

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
CLEARED BY											

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NOTES:-
1. SAME NOTES AS UNDER DRG. NO. 0000-999-POI-A-023.

FOR TENDER PURPOSE ONLY

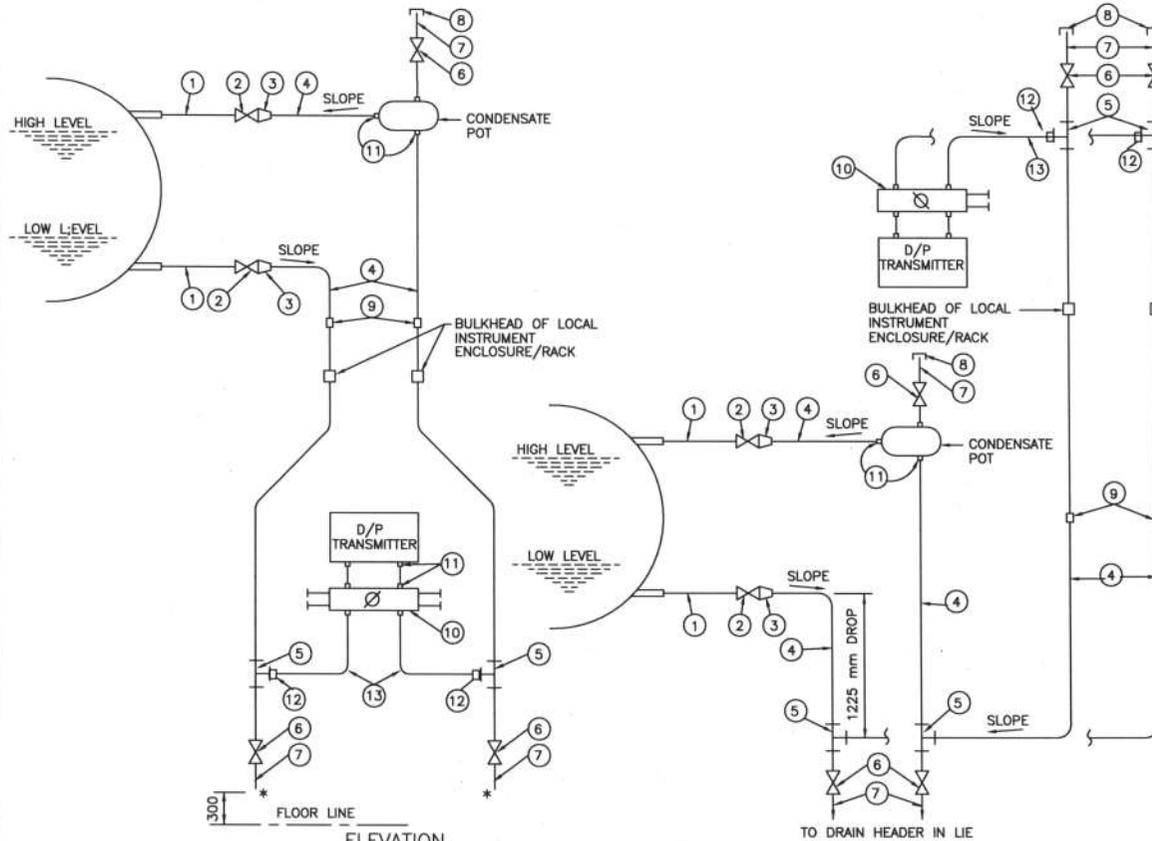
LIST OF MATERIALS	
ITEM NO.	DESCRIPTION
1.	42x2 TO 3/4" SW REDUCING INSERT.
2.	3/4" SW GLOBE VALVE.
3.	1/2" SW GLOBE VALVE FOR LIQUID APPLICATION & 3/4"/1" IN GAS/AIR APPLICATION
4.	1/2" NPS 40/80/160 (AS PER PROCESS REQUIREMENT) CARBON/ALLOY STEEL PIPE.
5.	1/2" SW EQUAL TEE.
6.	1/2" NPS SW x 1/2" NPT (M) NIPPLE.
7.	1/2" NPT (F) CAP.
8.	1/2" PIPE x 1/2" PIPE UNION.
9.	5 VALVE MANIFOLD (FOR DETAIL REFER DRAWING NO.0000-999-POI-A-026.
10.	3/4" SCH 80 CARBON/ALLOY STEEL PIPE.
11.	3/4"/1/2" SW EQUAL TEE.
12.	3/4"x1/2" TUBE UNION.
13.	1/2" SCREWED GLOBE VALVE.
14.	1/2" NPT (M) PLUG.
15.	3/4" SW GATE VALVE.
16.	3/4" SW EQUAL CROSS.
17.	WAFER ELEMENT FOR USE WITH 3"ANSI R.F. VALVE.
18.	3"BLIND 300lbs R.F. WELD NECK FLANGE DRILLED FOR 1" SCH. 40/80 PIPE.
19.	3" BLIND FLANGE.
20.	1"NPS SCH. 40/80 (AS PER PROCESS REQUIREMENT) CS PIPE.
21.	1" SW EQUAL TEE.
22.	3/4" x 1/2"SW REDUCING INSERT.
23.	3/4" SW x 3/4" NPT (M) CS/AS NIPPLE
24.	3/4" NPT (F) CS/AS CAP.
25.	1/4" NPS ALLOY STEEL PIPE.
26.	1" x 3/4" SW REDUCING INSERT.
27.	3/4" SW x 1/2" PSW BRANCH TEE.
28.	3/4" PIPE UNION
29.	1/2" CLAMP UNION (THREADED) SUITABLE FOR FLEXIBLE CONNECTION OF NYLON REINFORCED PVC TUBE.
30.	SS TUBE
31.	3/4" SW 4 WAY VALVE.
32.	QUICK DISCONNECT FITTINGS.
33.	1/4" SW ISOLATION VALVE 316SS
34.	1/2" x 1/2" SS PIPE UNION.



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PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INSTRUMENT INSTALLATION DIAGRAM	
		DIFF. PRESS.MEASUREMENT (LIQUID, OIL, AIR/GAS SERVICE)	
REV. NO.	DESCRIPTION	DATE	REV. NO.
A	FIRST ISSUE	21.08.12	A
SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-030	A

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ELEVATION
TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT

ELEVATION
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

LEVEL MEASUREMENT OF CLEAR NON-VISCOUS OR NON-CORROSIVE LIQUID IN CLOSED VESSEL WITH CONDENSABLE ATMOSPHERE USING D/P TRANSMITTER

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1" NPS SCH.40/80/160/XXS/P91 (AS PER PROCESS REQUIREMENT) CARBON /ALLOY STEEL PIPE.
2.	1" SW GLOBE VALVE.
3.	3/4"/1" TO 1/2" REDUCING INSERT.
4.	1/2" NPS SCH.80/160/XXS(AS PER PROCESS REQ.)CS/AS PIPE.
5.	1/2" SW EQUAL TEE.
6.	1/2" SW GLOBE VALVE.
7.	1/2" NPS SWx1/2" NPT(M) CS/AS NIPPLE.
8.	1/2 NPT (F) CAP.
9.	1/2" PIPE UNION.
10.	5-VALVE MANIFOLD (FOR DETAILS REF. DRG. NO.0000-999-POI-A-026.
11.	SUITABLE ADAPTER.
12.	1/2" PIPE x 1/2" TUBE UNION.
13.	S.S. TUBE.

NOTES:-

- SAME NOTES AS UNDER DRG. NO.0000-999-POI-A-023. (WHICHEVER ARE RELEVANT).
- * TO DRAIN HEADER IN LIE/LIR.

FOR TENDER PURPOSE ONLY



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ENGINEERING DIVISION

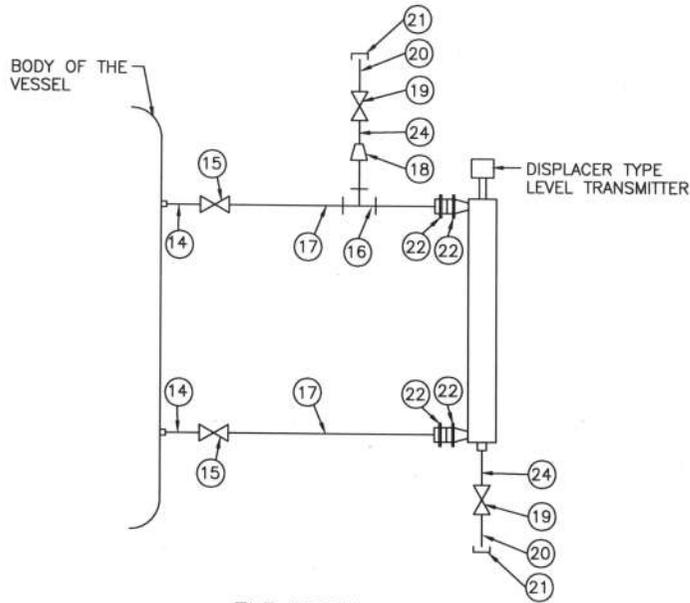
PROJECT **TYPICAL THERMAL POWER PROJECT**

TITLE **INSTRUMENT INSTALLATION DIAGRAM
(LEVEL MEASUREMENT USING D/P TRANSMITTERS)**

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE										21.08.12
CLEARED BY											

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-032	A

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ELEVATION

DISPLACER TYPE LEVEL TRANSMITTER WITH SIDE CONNECTION

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	2" NPS SCH. 40/80 (AS PER PROCESS REQUIREMENT) VESSEL NOZZLE.
15.	2" SW GLOBE VALVE.
16.	2" SW EQUAL TEE.
17.	2" NPS SCH. 40/80 CS/AS PIPE
18.	2" x 3/4" SW REDUCING INSERT.
19.	3/4" SW GLOBE VALVE
20.	3/4" NPS SW x 3/4" NPT (M) CS/AS NIPPLE.
21.	3/4" NPT (F) CAP.
22.	2" ANSI 300 lbs RAISED PHASE WELD NECK FLANGE.
23.	2" ANSI FLANGE OF LEVEL TRANSMITTER.
24.	3/4" NPS SCH. 40/80 PIPE.

NOTES:-

1. SAME NOTES AS UNDER DRG. NO.0000-999-POI-A-023 (WHICHEVER ARE RELEVANT).

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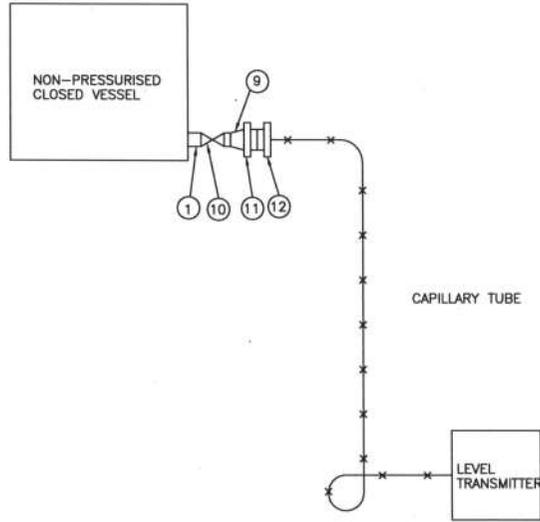
PROJECT TYPICAL THERMAL POWER PROJECT

TITLE INSTRUMENT INSTALLATION DIAGRAM
(LEVEL MEASUREMENT USING DISPLACER TYPE TRANSMITTERS)

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE									T.G.	21.08.12
					CLEARED BY						

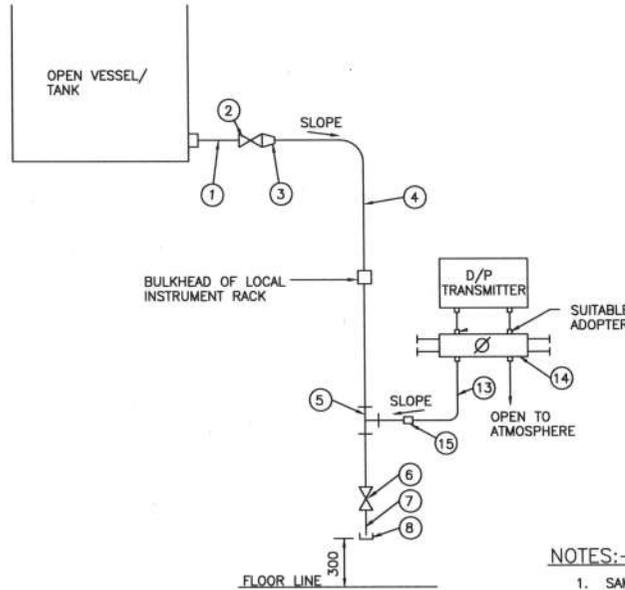
SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-032	A

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ELEVATION

LEVEL MEASUREMENT OF VISCOUS OR CORROSIVE LIQUID IN CLOSED VESSEL USING FLUSH DIAPHRAGM/WAFER TYPE LEVEL TRANSMITTER WITH REMOTE SEAL



ELEVATION

LEVEL MEASUREMENT OF CLEAN LIQUID IN AN OPEN VESSEL USING D/P TRANSMITTER

NOTES:-

1. SAME NOTES UNDER DRG. NO. 0000-999-POI-A-023.
2. FOR VACUUM APPLICATION OTHER PORT OF TRANSMITTER SHALL BE KEPT OPEN TO ATMOSPHERE.

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	3/4" / 1" NPS 40/80 PIPE.
2.	3/4" SW GLOBE VALVE.
3.	3/4" / 1/2" SW REDUCING INSERT.
4.	1/2" NPS SCH. 40/80 PIPE.
5.	1/2" SW EQUAL TEE.
6.	1/2" SW GLOBE VALVE.
7.	1/2" NPS SWx1/2" NPT(M) NIPPLE.
8.	1/2" NPT (F) CAP.
9.	3/4" TO 4" EXPANDER.
10.	3/4" BUTT WELDED GATE VALVE.
11.	4" ANSI 300 lbs R.F. WELD NECK FLANGE.
12.	4" ANSI MATCHING FLANGE WITH FLUSH DIAPHRAGM OF LEVEL TRANSMITTER
13.	SS TUBE.
14.	3-VALVE MANIFOLD (FOR DETAIL REF. DRG. NO. 0000-999-POI-A-023).
15.	1/2" PIPE x 1/2" TUBE UNION.

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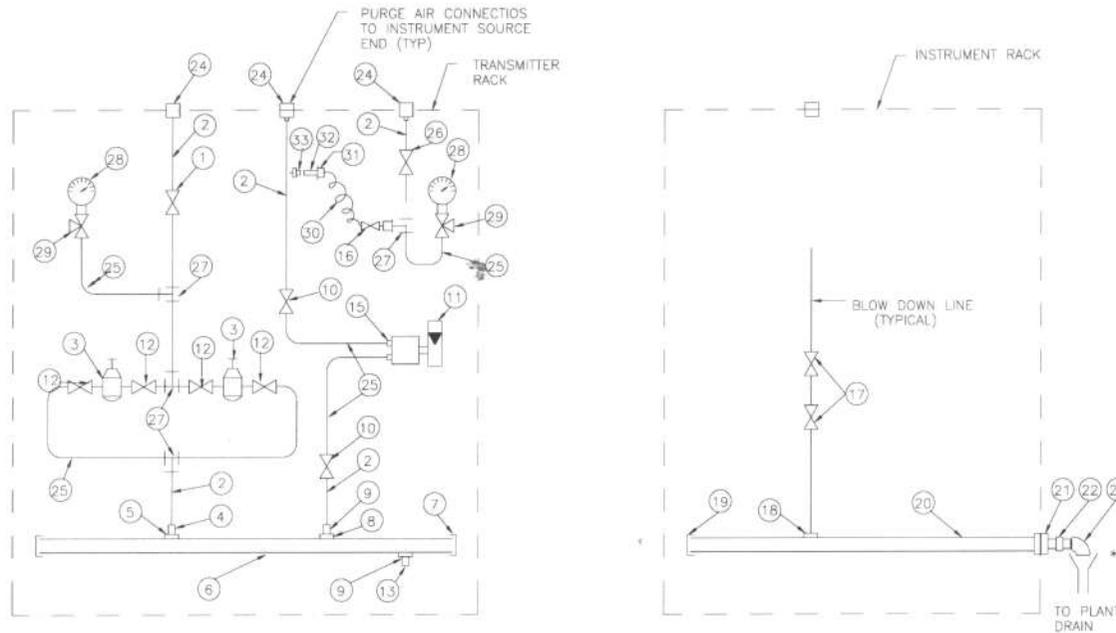


NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT	TYPICAL THERMAL POWER PROJECT		
TITLE	INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT-OPEN VESSEL)		
SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-033	A

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE								T.G.		21.08.12
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TYPICAL PURGE AIR CONNECTION INSIDE THE INST. ENCLOSURE

(APPLICABLE FOR AIR & FLUE GAS SERVICE INSTRUMENTS REQUIRING PURGE AIR)

TYPICAL BLOW DOWN HEADER CONNECTION INSIDE THE INSTRUMENT RACK/ENCLOSURE

NOTE:-

- * 1. DRAIN SHALL BE CONNECTED BY THE BIDDER TO THE NEAREST PLANT DRAIN THROUGH OPEN FUNNEL USING 2" CS PIPE FROM FUNNEL TO PLANT DRAIN.
- **2. FOR AIR/FLUE GAS LIES FOR DRAINING THE IMPULSE LINE BETWEEN ITEM 17 DRAIN POT TO BE PROVIDED ALONGWITH DRAIN HEADER, 3/4" SW HALF COUPLER, ITEM 19,20,22,23 & FUNNEL ALONGWITH 1/2" PIPING TO PLANT DRAIN HEADER SHALL BE PROVIDED FOR STM/WATER. ALL ITEMS EXCEPT DRAIN POT TO BE PROVIDED.
- 5. GI PIPES SHALL BE PROVIDED FOR PURGE AIR CONNECTION OUTSIDE LIE/LIR.

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	ISOLATION VALVE(gate/globe). SS.
2.	1/2" O.D. SEAMLESS SS PIPE.
3.	1/2" NPT (F) AIR FILTER REGULATOR.
4.	1/2" NPT x 1/2" O.D. (M) CONNECTOR SS.
5.	1/2" NPT (F) COUPLER SS.
6.	1" NB INST. AIR HEADER SS.
7.	1" PSB END CAP SS.
8.	1/2" NPT (F) COUPLER SS.
9.	1/2" NPT x 1/2" O.D. (M) CONNECTOR SS.
10.	1/2" COMP. NEEDLE VALVE SS.
11.	1/2" NPT (F) AIR PURGE SET.
12.	1/2" NPT (M) x 1/2" COMP VALVE SS.
13.	1/2" NPT PLUG SS.
14.	
15.	1/2" TUBE SS CONNECTOR.
16.	1/2" TUBE COMP. EQUAL TEE UNION.
17.	DRAIN VALVE 1/2" SW FOR WTR/STM/COND & 3/4" FOR AIR/FLUE GAS.
18.	1/2" SW HALF COUPLER
19.	2" SW CAP SS.
20.	2" NB ASTMA 105 GR. B SCH.80 BLOWDOWN HEADER
21.	2" PSW x 1" NPT (F) COUPLING.
22.	1" NPT x 1" BSP HEX NIPPLE.
23.	1" BSP ELBOW.
24.	BULKHEAD-SS 1/2" SWx1/2"NB THREADED, SUITABLE FOR GI PIPE CONNECTION
25.	1/2" O.D. SEAMLESS TUBE SS.
26.	1/2" SW PRESS. GAUGE ISOLATION VALVE SS.
27.	1/2" TUBE x 1/2" NPT (F) BRANCH TEE SS.
28.	4" DIAL x 1/2" NPT PR. GAUGE.
29.	1/2" SW x 1/2" NPT (F) PR. GAUGE VALVE SS.
30.	1/2" I.D. NYLON FLEX. HOSE BRAIDED WITH SS WIRE.
31.	1/2" NPT (M) x 1/2" HOSE BARBED CONN. SS.
32.	1/2" NPT (F) QUICK DISCONNECT SS.
33.	1/2" NPT (M) QUICKDISCONNECT SS.

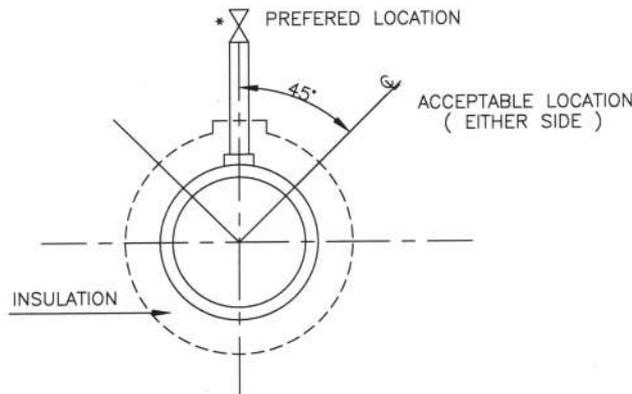
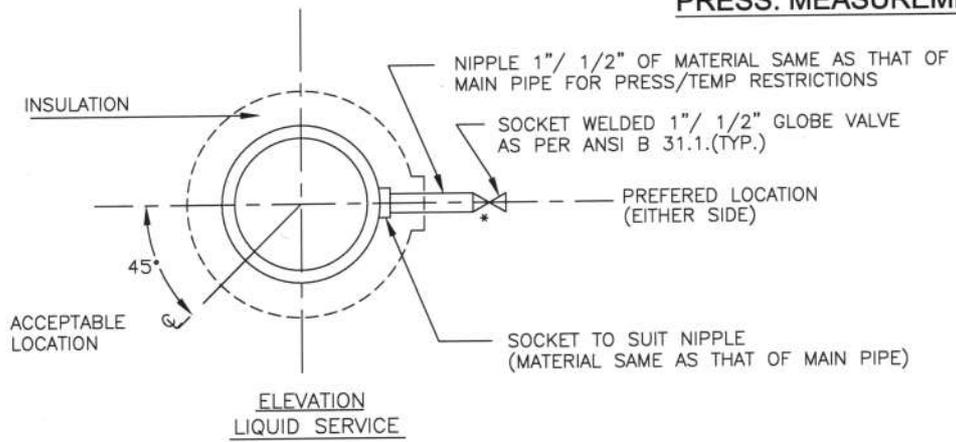
FOR TENDER PURPOSE ONLY

एन टी पी सी NTPC	NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION
PROJECT TYPICAL THERMAL POWER PROJECT	
TITLE INSTRUMENT INSTALLATION DIAGRAM TYPICAL PURGE AIR CONNECTION & BLOWDOWN HEADER CONNECTION INSIDE INSTRUMENT RACK	
REV. NO. A	REV. NO. B
DESCRIPTION	0000-999-POI-A-034

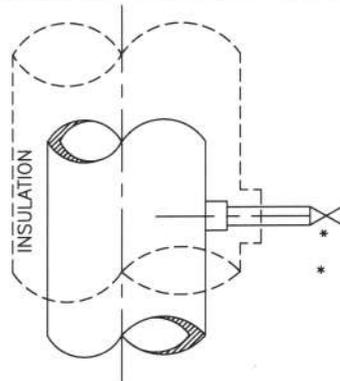
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE										02.05.14
CLEARED BY											

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PRESS. MEASUREMENT



PRESSURE CONNECTION ON HORIZONTAL PIPE



PRESSURE CONNECTIONS ON VERTICAL PIPES

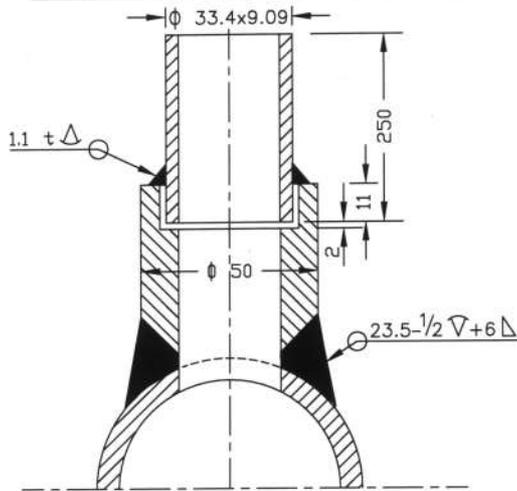
FOR TENDER PURPOSE ONLY

										NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION					
PROJECT										TYPICAL THERMAL POWER PROJECT					
TITLE										INSTRUMENT SOURCE CONNECTION DETAILS					
A	FIRST ISSUE									T.G.	31.08.18	SIZE	SCALE	DRG. NO.	REV. NO.
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD.	DATE	A4	N.T.S.	0000-999-POI-A-035	A
CLEARED BY										Sh-1 Of 14					

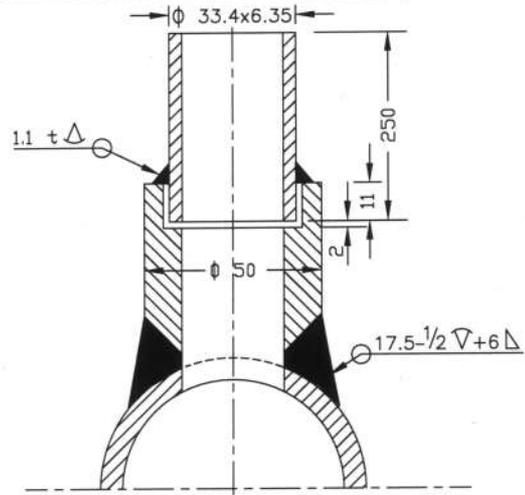
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PRESSURE MEASUREMENT

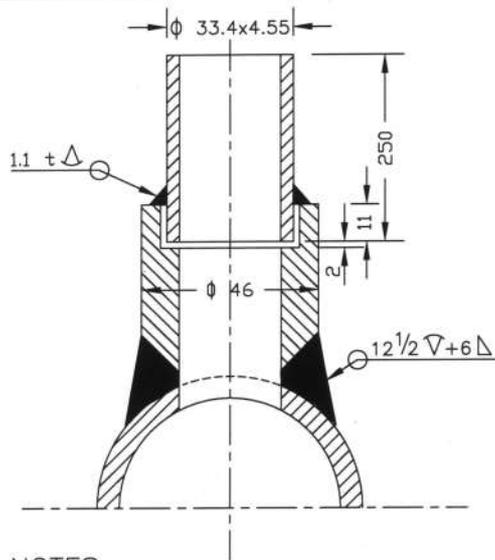
(SYSTEM PR. >40Kg/Sq Cm CL 9000)



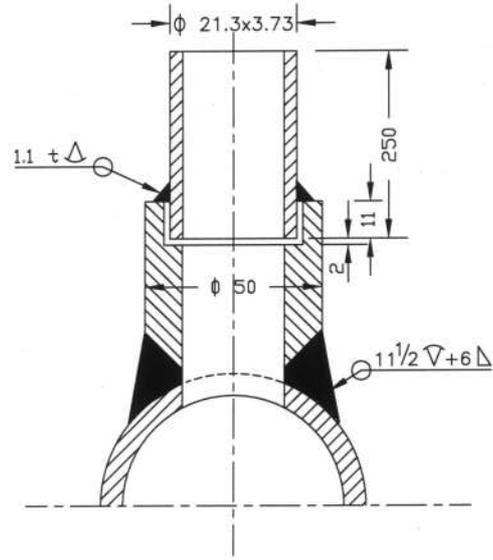
(SYSTEM PR. >40Kg/Sq Cm CL 6000)



(SYSTEM PR. <40Kg/Sq cm Nb 25 CL 3000)



(SYSTEM PR. <40Kg/Sq cm Nb 15 CL 3000)



NOTES:-

1. MATERIAL OF THE BOSS AND NIPPLE SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED AND CONFIRM TO ANSI B 16.11.
2. THE LENGTH OF THE NIPPLE SHOULD BE 250mm.
3. THE OTHER END OF THE NIPPLE SHALL BE SOCKET WELDED WITH 1" GLOBE VALVE OF MATERIAL AS PER ANSI B 16.1.
4. TWO ISOLATED VALVES ARE TO BE USED FOR PRESSURE = >40 Kg/Cm2.
5. EDGE HOLE MUST BE CLEAN AND SQUARE OR ROUNDED SLIGHTLY (1/64" RADIUS) FREE FROM BURRS, WIRE EDGES OR OTHER IRREGULARITIES.
6. ORIENTATION OF TAP WILL BE VARY WITH TYPE OF PROCESS FLUID AND NATURE OF RUN OF THE PIPE.
7. ACTIVITIES TO BE COMPLETED AT THE SHOP, WELD THE COUPLING (OR BOSS) ON THE PIPE AND DRILL PRESSURE CONNECTION HOLE (SAME AS I D OF NIPPLE) IN THE PIPE IN ALIGNMENT WITH HOLE IN THE COUPLING.
8. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.

FOR TENDER PURPOSE ONLY

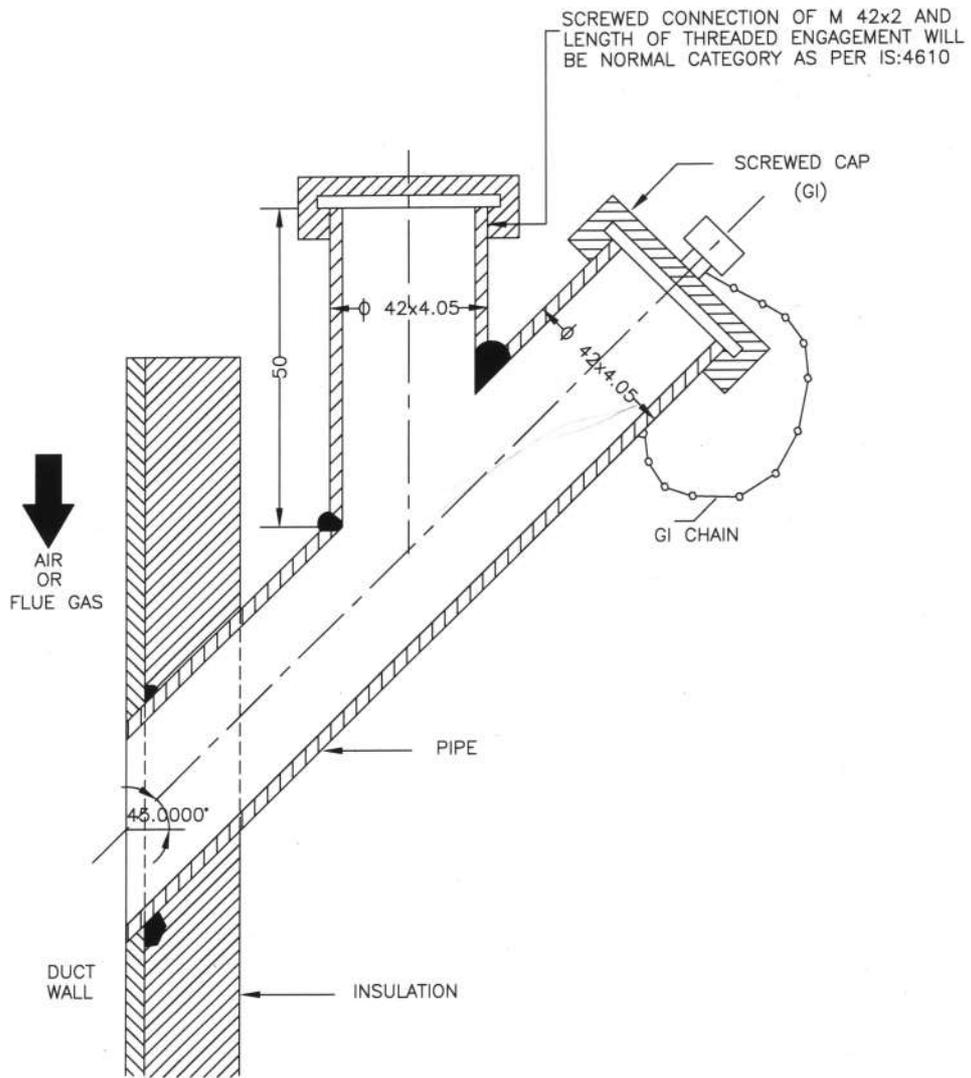


NTPC LIMITED
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ENGINEERING DIVISION

PROJECT										TYPICAL THERMAL POWER PROJECT							
TITLE										INSTRUMENT SOURCE CONNECTION DETAILS							
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CHKD	ARCH.	APPD.	DATE	SIZE	SCALE	DRG. NO.	0000-999-POI-A-035	REV. NO.	A
A	FIRST ISSUE										01.08.18	A4	N.T.S.		Sh-2 of 14		

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PRESS. MEASUREMENT



NOTES:-

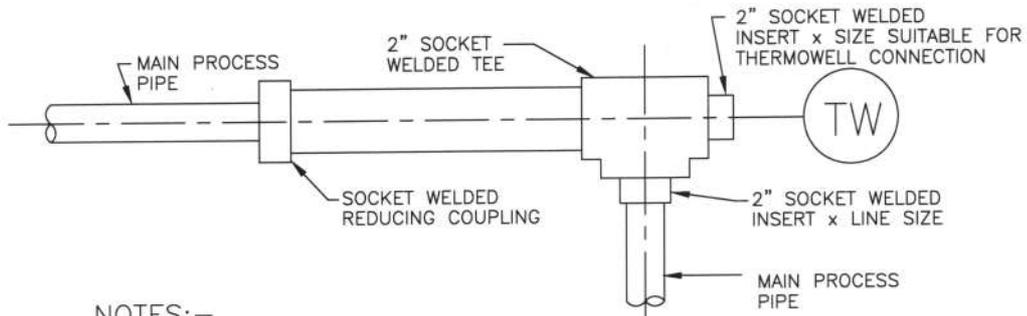
1. THIS TYPE OF PRESSURE CONNECTOR SHALL BE PROVIDED FOR PRESSURE MEASUREMENTS IN AIR AND FLUE GAS DUCT/FURNACE.
2. DIMENSIONS ARE INDICATIVE ONLY.

FOR TENDER PURPOSE ONLY

NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION															
					PROJECT TYPICAL THERMAL POWER PROJECT										
					TITLE INSTRUMENT SOURCE CONNECTION DETAILS										
A	FIRST ISSUE	DRAWN	DESIGN	CHKD.	M	E	C	CHK	ARCH.	APPD.	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CHK	ARCH.	APPD.	DATE	A4	N.T.S.	0000-999-POI-A-035	A
Cleared by											Sh-3 of 14	A			

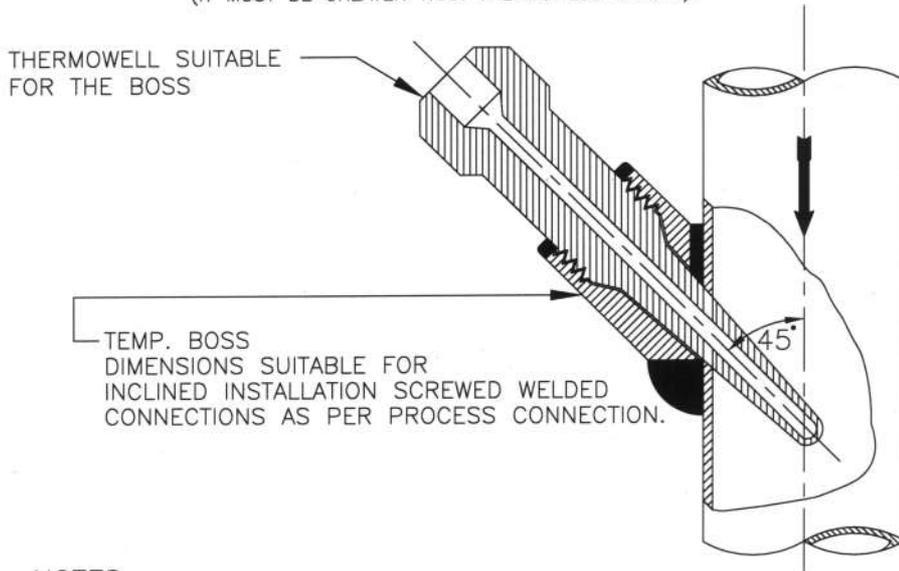
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TEMP. MEASUREMENT



NOTES:-

1. THIS TYPE OF THERMOWELL INSTALLATION IS SUITABLE FOR THE PROCESS PIPE OF 2" NPS AND SMALLER.
2. FOR STEAM SERVICE THIS TYPE OF THERMOWELL INSTALLATION 90° BEND MAY BE USED ONLY IN VERTICAL PLANE.
3. THE LENGTH OF THE LARGER PIPE SECTION SHALL BE MINIMUM 150mm (IT MUST BE GREATER THAN THERMOWELL LENGTH).



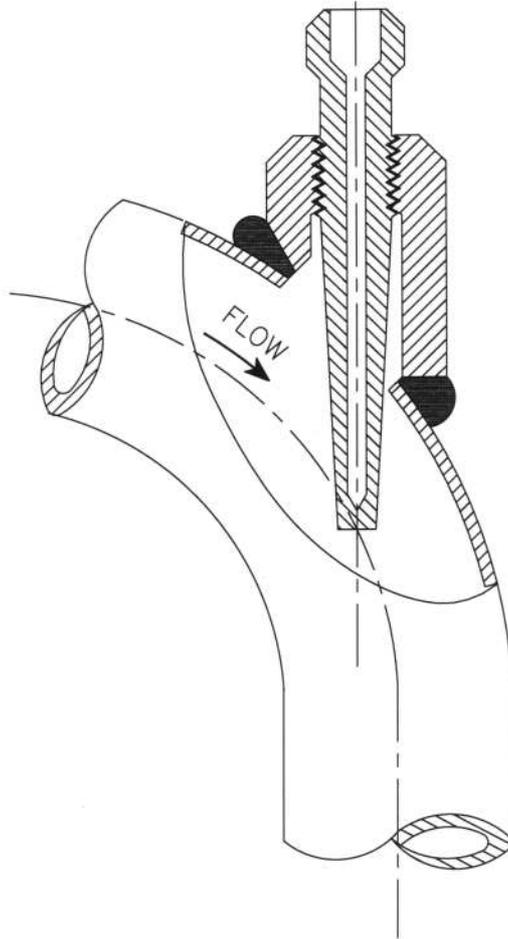
NOTES:-

1. INCLINED INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MIN. 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF MIN. 3" SIZE OF MAIN PIPING SPECIFICATION SHALL BE USED.
3. THIS TYPE OF INSTALLATION IS APPLICABLE FOR HORIZONTAL AND VERTICAL PIPE SECTION.
4. FOR STEAM SERVICES EXPANDER SECTION MAY BE USED ONLY IN VERTICAL RUN.
5. THE EXPANDER SECTION SHALL BE OF ADEQUATE LENGTH (ATLEAST 3-4 TIMES DIA OF THE MAIN PROCESS PIPE AT BOTH SIDE OF THE INSTALLED THERMOWELL).

FOR TENDER PURPOSE ONLY

NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION															
PROJECT					TYPICAL THERMAL POWER PROJECT (SG PACKAGE)										
TITLE															
INSTRUMENT SOURCE CONNECTION DETAILS															
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD.	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
A	FIRST ISSUE											A4	N.T.S.	0000-999/102-POI-A-035	A
CLEARED BY										Sh-4 Of 14					

TEMP. MEASUREMENT



NOTES:-

1. FLOW INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MINIMUM 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF ELBOW FORM (AS SHOWN) OF MINIMUM 3" SIZE SHALL BE USED.
3. ELBOW EXPANDER SECTION IN HORIZONTAL PLANE MAY BE USED FOR LIQUID SERVICES. ONLY STEAM SERVICES EXPANDER SECTION MAY BE USED IN VERTICAL PLAN.

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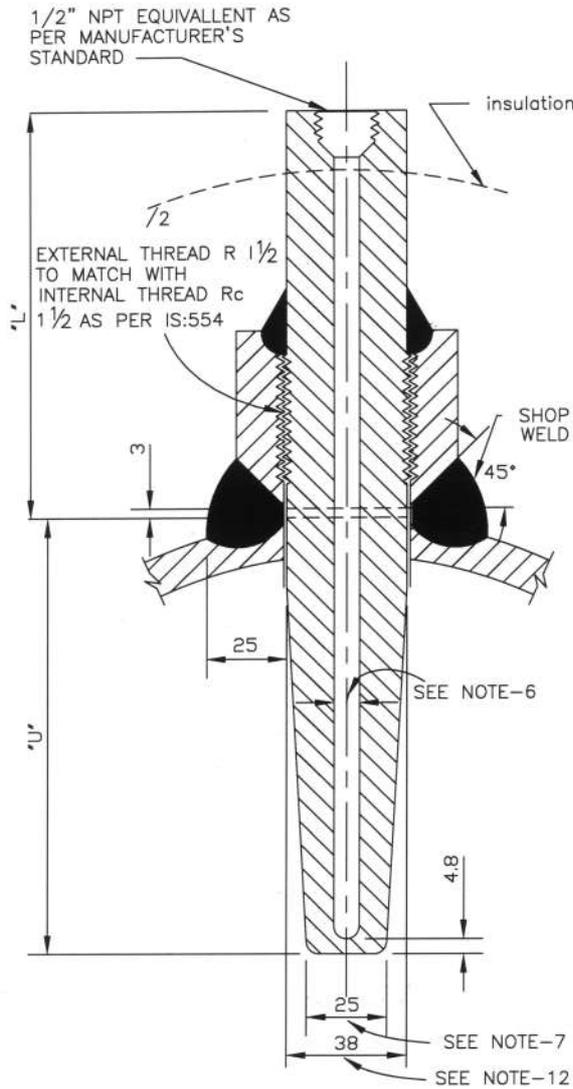
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TEMP. MEASUREMENT



NOTES:-

1. THIS TYPE OF TEMPERATURE BOSS SHALL BE USED FOR THE PROCESS PRESS EQUAL/ABOVE 40 Kg/Cm2(g).
2. THE MATERIAL OF THE BOSS SHOULD BE SIMILAR TO THAT OF PIPING MATERIAL OF SPECIFICATION.
3. ALL WELD TO BE TESTED IN ACCORDANCE WITH APPLICABLE CODES BY MANUFACTURER.
4. MATERIAL OF THE THERMOWELL SHALL BE OF 316SS.
5. THERMOWELL SHALL BE DRILLED BARSTOCK TYPE.
6. INTERNAL BORE OF THE THERMOWELL SHOULD BE SELECTED BASED ON THE NORMAL SIZE OF THE SENSING ELEMENT AS PER ASME,PTC-19.3.
7. THE BOTTOM DIAMETER OF THE THERMOWELL TYPICALLY SHOWN HERE SHALL BE SUBJECT TO VARIATION BASED ON THE INTERNAL BORE OF THERMOWELL AND THICKNESS OF THERMOWELL MATERIAL TO WITHSTAND THE PROCESS PRESS.AND TEMP.,AS PER ASME,PTC-19.3.
8. THE TYPE OF TAPERED THERMOWELL SHALL BE USED FOR LIQUID VELOCITIES UP TO 92M.P.S.(300F.T.P.S.).
9. THERMOWELL WITH THE INSULATION LAG EXTENSIONS SHALL BE USED WHEREVER APPLICABLE.
10. ACTIVITIES TO BE COMPLETED AT THE SHOP. WELD THE BOSS ON THE PIPE AND DRILL THE HOLE IN THE PIPE IN ALIGNMENT WITH HOLE IN THE BOSS. PROVIDE INTERNAL THREAD AS PER IS:554 TO MATCH WITH THE THERMOWELL EXTERNAL THREAD.
11. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.
12. WILL BE SUITABLE TO MATCH THE STUB DIMENSIONS AS PER RC 1 1/2
13. THE "U" & "L" DIMENSIONS SHALL BE BE SELECTED BASED ON PARTICULAR APPLICATION AND THE SAME SHALL BE SUBJECT TO OWNER'S APPROVAL DURING DETAILED ENGINEERING.
14. ALL DIMENSIONS ARE INDICATIVE ONLY.

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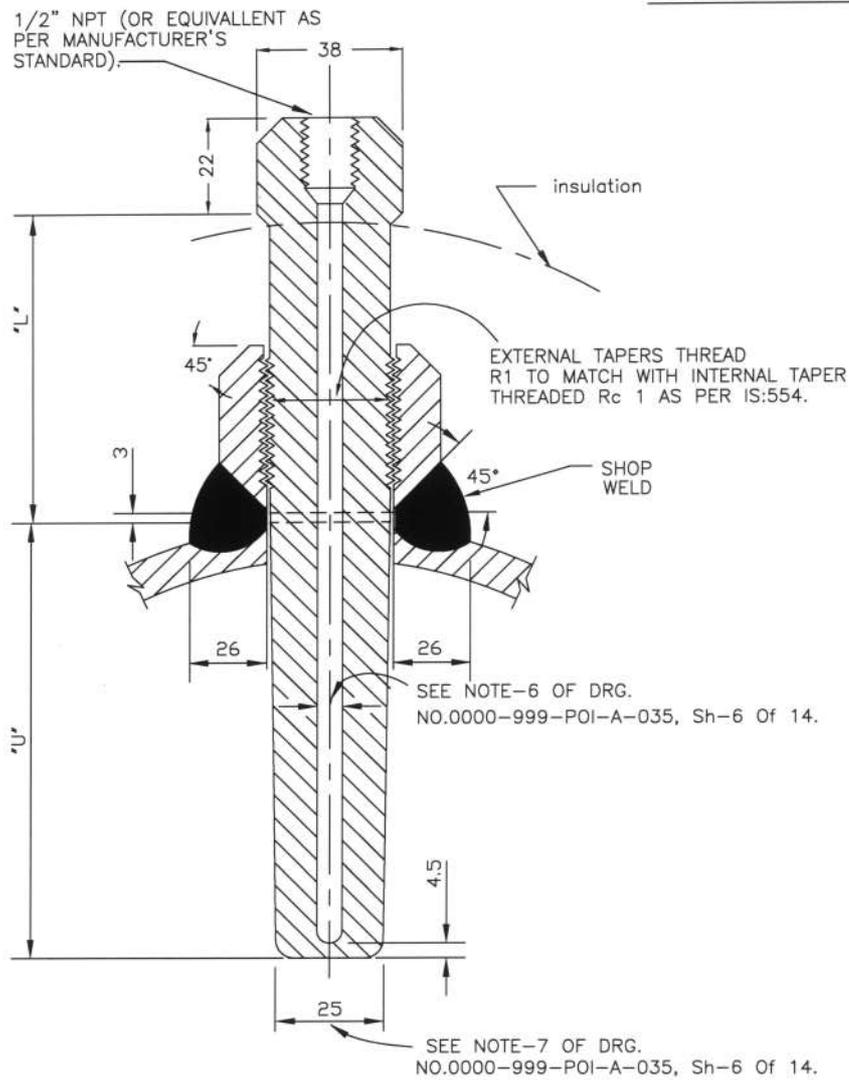
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PROJECT										TYPICAL THERMAL POWER PROJECT		
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TEMP. MEASUREMENT



NOTES:-

1. THIS TYPE OF TEMPERATURE BOSS IS APPLICABLE FOR THE PROCESS PRESSURE/TEMPERATURE BELOW 40 Kg/Cm2(g)/400°C
2. FOR PRESSURE TIGHT JOINTS THE BOSS SHOULD HAVE INTERNAL TAPERED PIPE THREAD Rc 1 AS PER IS:554. THE LENGTH OF THREAD ENGAGEMENT SHOULD BE AS PER ABOVE STANDARD.
3. PIPES HAVING PROBABILITY OF PROLONGED VIBRATION SEAL WELDING MAY BE DONE ALL AROUND AFTER TIGHTENING THERMOWELL WITHIN THE BOSS.
4. SEE NOTES-2 TO 14 OF DRG. NO. 0000-999-POI-A-035, Sh-6 Of 14.

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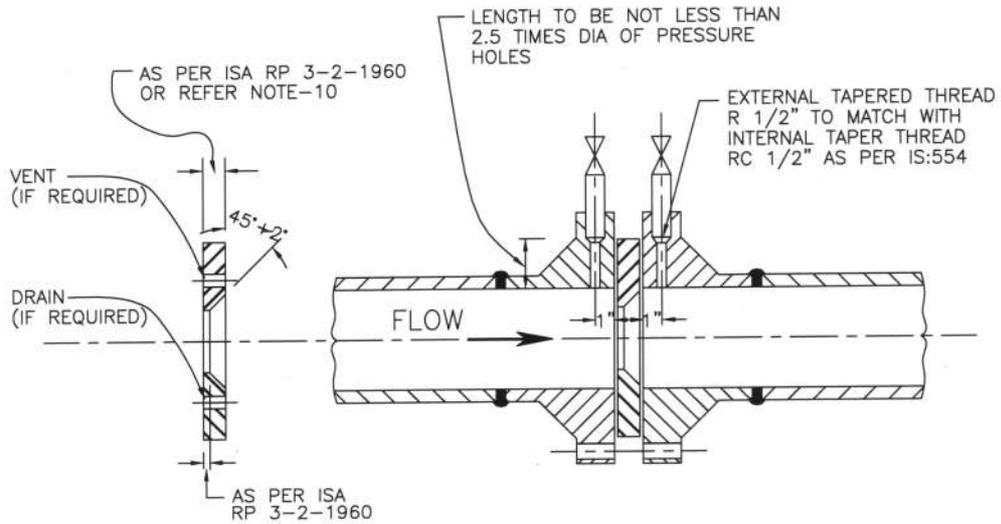


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FLOW MEASUREMENT



NOTES:—

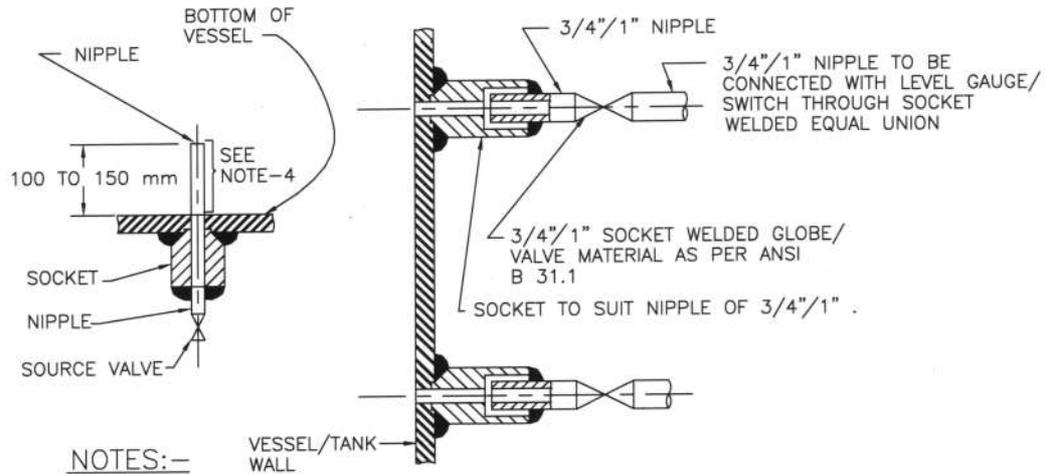
1. ORIFICE PLATE MOUNTED BETWEEN FLANGES WITH FLANGE TAPPING (AS SHOWN ABOVE) SHOULD BE LIMITED TO PIPE SIZES OF 2" OR LARGER.
2. ORIFICE PLATE SHALL BE MOUNTED BETWEEN PIPING FLANGES WITH THE SHARP EDGE FACING UPSTREAM SUCH THAT CENTRE OF THE CONCENTRIC ORIFICE SHOULD BE WITHIN 0.79 mm (1/32") OF THE AXIS OF THE PIPE.
3. TWO GASKETS SHALL BE INSERTED BETWEEN THE PLATE AND THE FLANGES AND INSIDE DIAMETER OF THE GASKETS SHOULD BE ATLEAST 1.5 mm (1/16") GREATER THAN THE INSIDE DIAMETER OF THE PIPE SO THAT THEY DO NOT PROTRUDE INTO THE PIPE.
4. PIPING FLANGES SHALL BE ANSI WELD NECK, RAISED FACE TYPE. THE FLANGE IS TO BE ALIGNED WITH THE FACE PERPENDICULAR TO THE FLOW AXIS.
5. BIDDER TO SUPPLY ORIFICE PLATE SPECIAL TYPE (HAVING PRESS. CONNECTIONS) OF FLANGES ALONG WITH GASKETS, NIPPLES AND SOURCE VALVES.
6. ON HORIZONTAL PIPE RUN PRESSURE CONNECTIONS ARE TO BE TAKEN FROM SIDES FOR LIQUID AND STEAM SERVICE AND FROM TOP FOR DRY GAS SERVICE. FOR PROCESS LIQUIDS INSTALLATION OF PRESSURE TAPS MAY BE ALLOWED WITHIN AN ANGLE OF 45° ELBOW THE HORIZONTAL IN SPECIAL CASES BUT NO BOTTOM CONNECTIONS ARE ALLOWED.
7. THE LOCATION OF PRESSURE TAPS MUST BE WITHIN 1.5 mm (1/16") OF THE DISTANCE SPECIFIED.
8. MAXIMUM DIAMETER OF PRESS. CONNECTION HOLES SHALL BE AS PER RECOMMENDATIONS OF ASME PTC 19.5. THE DIAMETER OF THE HOLE SHOULD REMAIN THE SAME FOR A DISTANCE NOT LESS THAN 2.5 TIMES OF THE DIAMETER BEFORE EXPANDING INTO THE PRESSURE PIPE.
9. THERE MUST BE NO BURRS WIRE EDGES OR OTHER IRREGULARITIES ALONG THE EDGE OF THE HOLE AND IT MUST BE SQUARE AND ROUNDED SLIGHTLY (1/64" RADIUS).
10. ORIFICE PLATE SHOULD BE FLAT WITHIN 0.02 mm (0.001") AND THE SURFACE ROUGHNESS SHOULD NOT EXCEED 20 MICRO INCH. THE THICKNESS OF THE ORIFICE PLATE SHOULD BE AS PER EN ISO 5167:2003.
11. FOR HORIZONTAL PIPE RUN DRAIN HOLES IN ORIFICE PLATES ARE AT THE BOTTOM (APPROX. TANGENT TO INSIDE DIA OF PIPE) FOR STEAM OR GAS SERVICE. VENT HOLES SHOULD BE LOCATED ON UPPER SIDE FOR INCOMPRESSIBLE FLUID.
12. ORIFICE PLATE SHOULD BE OF 316 SS (ASTM A167-54 GRADE-II).
13. RECOMMENDED MINIMUM LENGTHS OF STRAIGHT PIPE PRECEDING AND FOLLOWING ORIFICES SHALL BE AS PER EN ISO 5167:2003.
14. THREE PAIRS OF PRESSURE TAPS SHALL BE PROVIDED WITH NIPPLES OF REQUIRED LENGTH AND SOURCE VALVES AND THE UN-USED TAPS ARE PLUGGED.
15. THE INTERNAL TAPERED CONNECTION WITHIN THE FLANGE FOR PRESSURE TAPS SHOULD BE RC 1/2" AND THE NIPPLE SHOULD ALSO OF EXTERNAL THREADED R 1/2" AS PER IS:554. THE LENGTH OF THREADED ENGAGEMENT SHALL BE AS PER ABOVE STANDARD.

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<p>PROJECT TYPICAL THERMAL POWER PROJECT</p>											
<p>TITLE INSTRUMENT SOURCE CONNECTION DETAILS</p>											
A	FIRST ISSUE										
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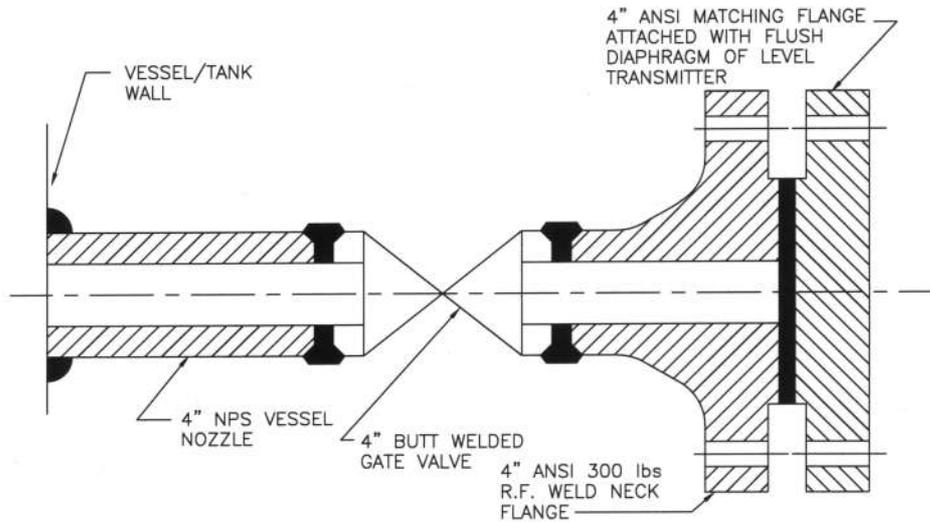
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LEVEL MEASUREMENT



NOTES:-

1. THIS TYPE OF PROCESS CONNECTION SHALL BE USED FOR LEVEL GAUGE AND EXTERNAL CAGE TYPE FLOAT OR DISPLACER OPERATED LEVEL SWITCH.
2. FOR GAUGES 3/4" NIPPLE ALONG WITH 3/4" SW SOURCE VALVE AND FOR SWITCHES 1" NIPPLE ALONG WITH 1" SW SOURCE VALVE SHALL BE PROVIDED AS PROCESS CONNECTION.
3. SOURCE CONNECTION ON VESSEL SHOULD NOT BE LOCATED AT PLACES SUBJECTED TO INTERFACE AND TURBULENCE FROM INLETS AND OUTLETS.
4. IF LOWER CONNECTION IS TAKEN FROM BOTTOM OF THE VESSEL THEN THE NIPPLE MUST BE 100 mm TO 150 mm ABOVE THE BOTTOM OF THE VESSEL.



NOTES:-

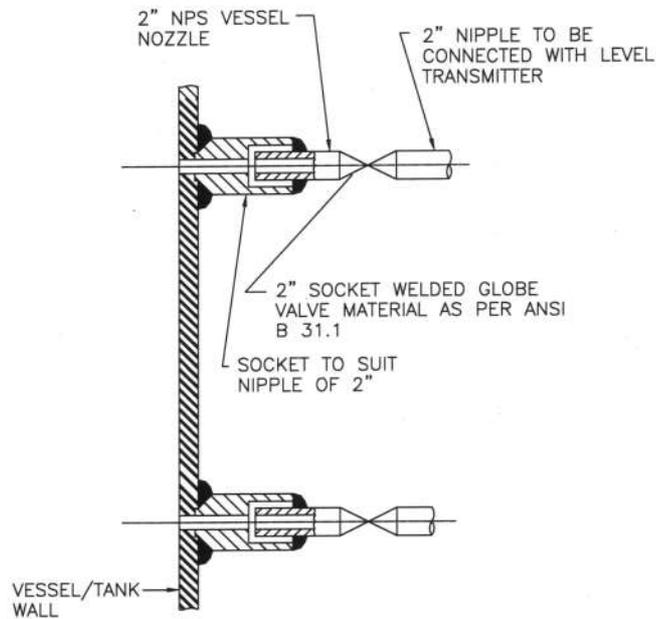
1. THIS TYPE OF PROCESS CONNECTION SHALL BE PROVIDED FOR TANK LEVEL MEASUREMENT OF VISCOUS OR CORROSIVE LIQUID USING FLUSH DIAPHRAGM/WAFER TYPE LEVEL TRANSMITTER.
2. WELDING OF MATCHING FLANGE TO GATE VALVE SHALL BE DONE BY BIDDER.

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LEVEL MEASUREMENT



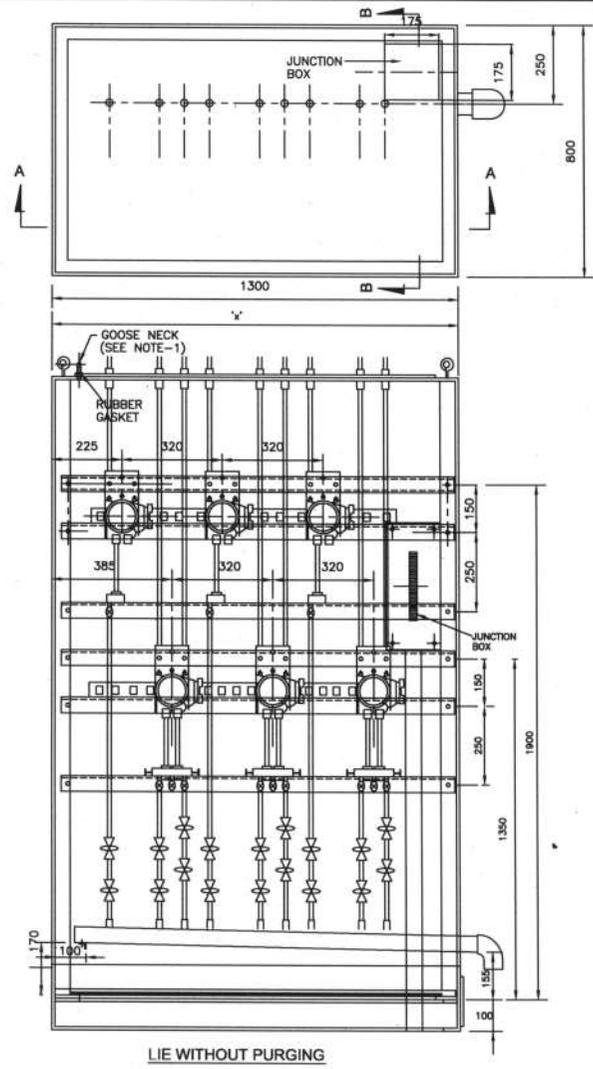
NOTES:—

1. THIS TYPE OF PROCESS CONNECTION SHALL BE USED FOR DISPLACER TYPE LEVEL TRANSMITTER.
2. SOURCE CONNECTION ON VESSEL SHOULD NOT BE LOCATED AT PLACES SUBJECTED TO INTERFACE AND TURBULENCE FROM INLETS AND OUTLETS.
3. IF LOWER CONNECTION IS TAKEN FROM BOTTOM OF THE VESSEL THEN THE NIPPLE MUST BE 100 mm TO 150 mm ABOVE THE BOTTOM OF THE VESSEL.

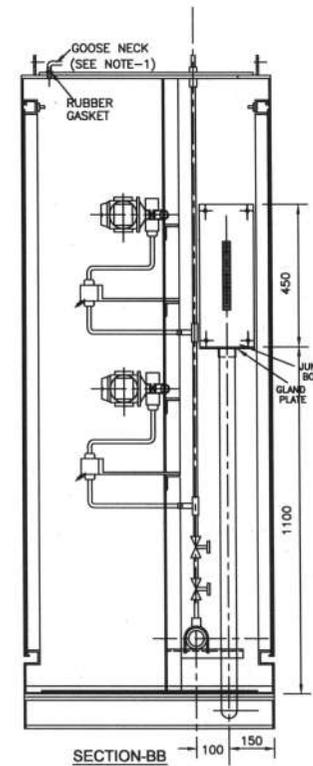
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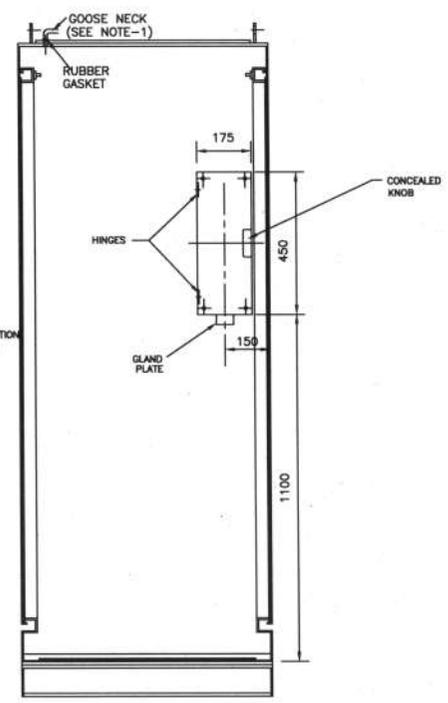
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LIE WITHOUT PURGING



SECTION-BB



SIDE ELEVATION

LIE TYPE	MAX. NO. OF TRANSMITTERS	DIMENSION 'X' (mm)
A	6	1250
B	4	930
C	2	630

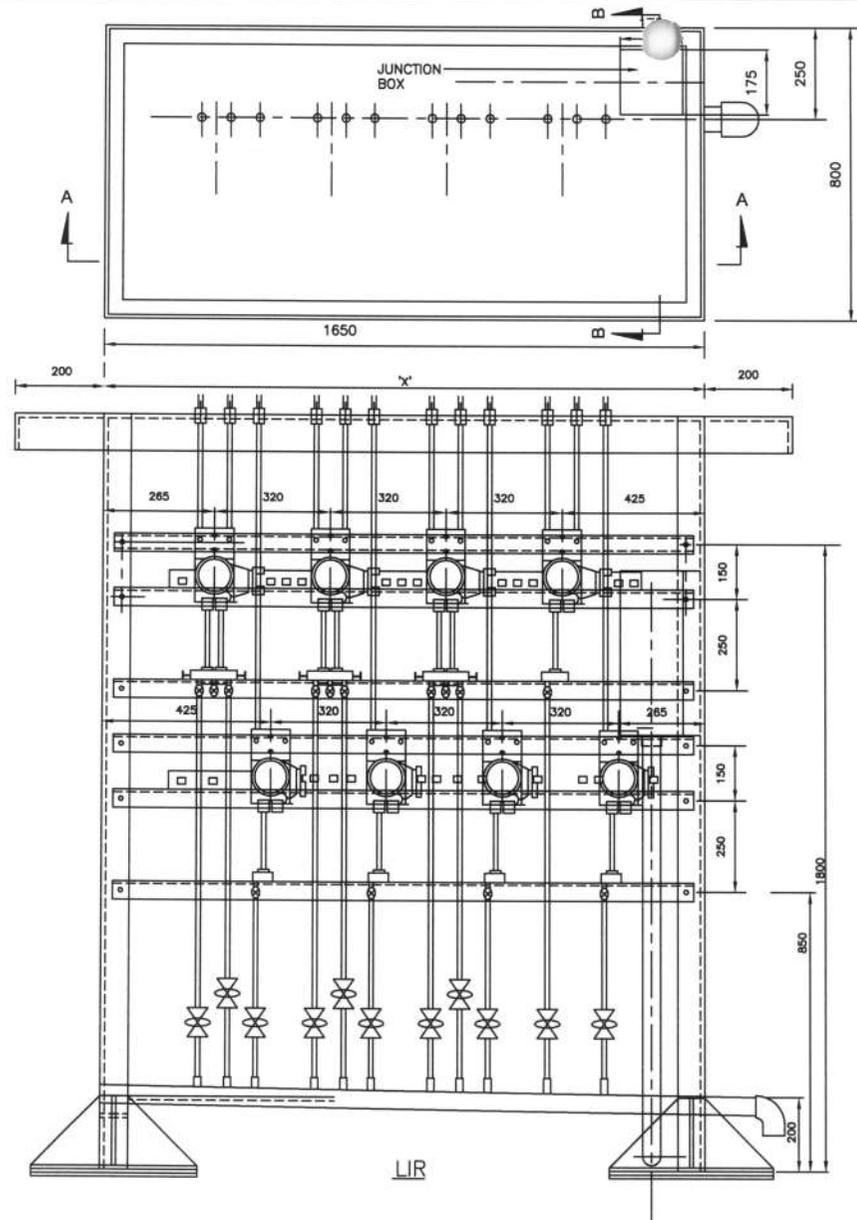
NOTES:-

1. TO BE PROVIDED FOR LIEs USED IN STEAM & WATER APPLICATION.
2. MATERIAL OF JBs FOR LIEs SHALL BE SAME AS THAT OF LIE.

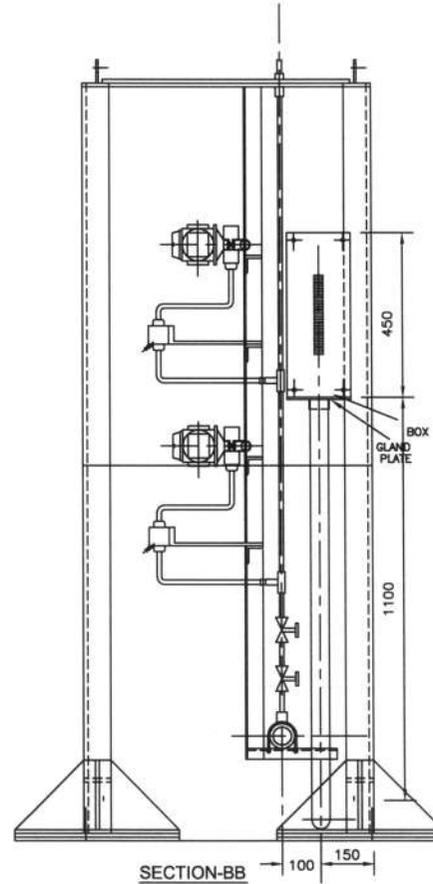
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PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK	
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REV. NO.	DESCRIPTION	M	E
		C	C&I
		ARCH.	APPO
		DATE	21.08.12
SIZE	SCALE	DRG. NO.	REV. NO.
A2	N.T.S.	0000-999-POI-A-064	B
SHEET 01 OF 03			

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SECTION-AA
LIR WITHOUT PURGING



SECTION-BB

LIR TYPE	MAX. NO. OF TRANSMITTERS	DIMENSION 'X' (mm)
A	8	1650
B	6	1330
C	4	1010

NOTE:-

1. MATERIAL OF JB_s FOR LIRs SHALL BE SAME AS THAT OF LIR.

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PROJECT TYPICAL THERMAL POWER PROJECT

TITLE TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK

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	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I)	

LOCAL CONTROL PANEL

|



SPECIFICATION FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS -999- 145 -054A	
VOLUME	II B
SECTION	D
REV. NO. 03	DATE : 16-09-2013
SHEET	1 OF 6

1.0 SCOPE

This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site, supervision, erection, and commissioning at site of Local Panels required for control and monitoring of the Auxiliary Plant & Equipment.

2.0 CODES AND STANDARDS

- 2.1 All the equipments specified herein shall comply with the requirements of the latest issue of the relevant National and International standards.
- 2.2 As a minimum requirement, the following standards shall be complied with:
- a) IS-6005 : 1998 : Code of practice for phosphating of iron and steel.
 - b) IS-5 : 2007 : Colors for ready mixed paints and enamels.
 - c) IS-1248:2003 : Direct Acting Indicating Analog Elec Measuring Instruments.
 - d) IS/IEC 60947:Part 1:2004 : Low Voltage switchgear & control gear: Part-I (General Rules)
 - e) IS-8828:1996 : Circuit breaker for household and similar installations.
 - f) IS-13947 (Part-I):1993 : Low Voltage switchgear & control gear : Part-I (General Rules)
 - g) ISA-18.1:1979 : Annunciator Sequences and Specification
 - h) NFPA-496:2003 : Purged & Pressurised Enclosure for Electrical Equipment in Hazardous Locations.

3.0 TECHNICAL REQUIREMENTS

3.1 Panel Construction

- 3.1.1 The local panels shall house the secondary instruments, annunciation system, Single loop controller, Control switches / push buttons, indicating lamps/LED cluster, relays, timers and other devices required for operation and monitoring of the equipment locally.
- 3.1.2 The panels shall be of free standing type either welded construction on angle iron (minimum section of 50 x 50 x 4 mm) structure or folded construction by sheet metal formation depending upon the equipments to be mounted on it. The panels shall be robustly built and stiffeners as necessary shall be provided.
- 3.1.3 The panel shall be suitably reinforced to ensure adequate support for all instruments mounted thereon. All welds on exposed panel surfaces shall be ground smooth.
- 3.1.4 The salient features of construction shall be:
- Sheet material: Cold rolled sheet steel
 - Frame thickness: Not less than 3.0mm
 - Enclosure thickness: Not less than 3.0 mm for load bearing sections (Mounted with instruments)
2.0 mm for doors and Not less than 2.0 mm for others
 - Panel Height: Not less than 2365 mm (Refer data sheet-A (No. PES-145A-DS1-0)
 - Gland plate thickness: 3.0mm
 - Base channel: ISMC 100 with anti-vibration mounting & foundation bolts.
- 3.1.5 The panel shall be provided with rear doors with integral lockable handle. The door when locked shall be held at minimum three places. The door width shall not be more than 550mm. The doors shall be provided with suitable stiffeners to prevent buckling. The handle shall be on the right side of the door. The door shall be removable type with concealed hinges to facilitate maintenance work. Suitable pocket inside the door shall be provided for keeping the drawings / documents. Double door shall be provided with suitable glass windows, as per the requirement.
- 3.1.6 Suitable neoprene gasket shall be provided on all doors and removable covers. Suitable ventilation system along with louvers shall be provided at bottom and top of the doors covered with removable wire mesh.



SPECIFICATION FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS -999- 145 -054A	
VOLUME	II B
SECTION	D
REV. NO. 03	DATE : 16-09-2013
SHEET	2 OF 6

- 3.1.7 The class of protection shall be in accordance with IP-55 unless otherwise specified in the data sheet – A (No. PES-145-54A-DS1-0).
- 3.1.8 All steel surfaces shall be cleaned by sand / pellet blasting, treated for pickling, degreasing and phosphating etc. by seven tank method. The panel shall have a high quality finish and appearance. The panel shall be painted with two coats of primer followed by two coats of epoxy / synthetic enamel based final paint of color shade and finish as given in data sheet-A (No. PES-145A-DS1-0). Minimum thickness of the paint shall be 85 microns for external paint and 70 microns for internal paint.
- 3.1.9 The cable glands of the required size and type as given in data sheet-A (No. PES-145A-DS1-0) shall be supplied alongwith the Panel.
- 3.1.10 All operable and indicating devices shall be mounted on the front of the panel while aux. Relays / timers MCBs etc. required for realization of control logics shall be mounted on a mounting plate inside the panel. Auxiliary relays and timers etc. shall be grouped according to the control function.
No operable or indicating devices shall be mounted below 750 mm and above 1800 mm (w.r.t. finished ground level). The devices shall be located in such a way so as to ensure easy access for operation / maintenance.
- 3.1.11 Single / dual control power supply feeders of voltage class as specified in data sheet-A (No. PES-145A-DS1-0) shall be provided by the purchaser. In case redundant power supply feeders are provided then auto changeover unit shall be mounted on the panel are in the panel supplier's scope. Where DC control power supply is specified an additional 240V, 50 Hz AC supply feeder for powering of space heater and lighting shall be provided by the purchaser. Suitable arrangement shall be provided inside the panel to receive and terminate the power supply feeder(s). For this purpose MCBs of suitable current rating shall be provided by the vendor. A supervisory relay along with a pilot lamp to indicate control supply 'ON' shall be provided on the panel. Any other power supply required for the operation of the devices mounted in the panel shall be arranged by the vendor.
- 3.1.12 The internal wiring shall be carried out with 1100 volt grade PVC insulated copper multi strand wire / flexible of 1.5mm² size. AC & DC wires shall be kept separate from each other. Separate coloured wires to be used for AC and DC circuits. All wires shall be properly numbered and identified with ferrules as per the Control scheme / wiring diagram. Wires shall be routed and run through PVC troughs.
- 3.1.13 Terminal blocks shall be clip on type, 1100 volts grade. Separate terminal blocks shall be used for AC & DC circuits. The terminals shall be suitable for terminating 0.5 mm² to 2.5mm² external cables. The TB points in terminal block shall be cage clamp type / screw type. The terminal for ammeters shall be provided with removable links for shorting CTs. Each terminal strip shall be provided with identification strip. The terminal shall not be mounted below 250 mm height from finished floor. The panel shall have ten (20) percent spare terminal.
- 3.1.14 The interior of each panel shall be suitably illuminated through fluorescent lamps / tube lights with shrouded cover of minimum 15W operable on 240V 50 Hz AC power supply through panel door switch. A 15 Amp. 3-pin Power receptacle shall be provided.
- 3.1.15 Suitable space heaters operable on 240 Volts 50 Hz AC power system shall be provided at the panel bottom. These shall be designed to maintain the panel temperature five (5) deg. C above the ambient temperature during maintenance shutdown. Suitable isolating and control devices comprising of MCB, thermostat etc. shall be provided for the space heater.
- 3.1.16 The panel shall be provided with a copper earth bus of 25 x 6 mm size running throughout the width of the panel. It shall be terminated internally with 10 mm bolts at extreme ends for connection to; main station earth. The panel mounted equipments / devices shall be connected to earth bus through green coloured PVC insulated stranded copper conductor of 2.5 mm² size.
- 3.1.17 Local Panel shall be provided with main name plate of 150 mm x 40 mm size having inscription of 20 mm height. The individual devices on the panels shall be as provided with separate name plate with inscription of 3 mm height. The instrument / devices shall be provided with stick on label plates inside the panel. The material of the main and individual labels shall be three (3) ply 3 mm thick Traffolyte



SPECIFICATION FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS -999- 145 -054A	
VOLUME	II B
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SHEET	3 OF 6

Sheet / 2 mm Anodised Aluminium Plate. The inscription shall be with white letters on black background on traffolyte sheet. The labels shall be fixed by self tapping non-rusting screws.

3.1.18 Vendor shall furnish electric load and heat load list (in case panel is to be placed in ac environment) of each panel.

3.2 Hazardous Area Panel Requirement

3.2.1 The Local Panel located in hazardous area shall be pressurized as per NFPA-496 requirements to render it non-hazardous. Alarms shall be provided for local and remote annunciation when pressurisation falls below 2.5 mm of water column. Protection shall be of type Z of NFPA-496. It shall not be possible to switch ON the power of purged section unless it is purged as per the recommendation of NFPA-496. Vendor must provide a protective device on the panel to protect the panel from over pressurisation.

3.2.2 Vendor shall supply pressurisation kit consisting of valves, restriction orifices, dual filter regulation, pressure gauges, pressure switches, rotameter etc. Pressurisation kit shall be surface mounting on a metal board and located outside the local panel. Pressurisation kit shall further consist of solenoid valve flow switch, timer blow off safety device etc., so as to make purging fully automatic. However final start shall be manual. Panel protection against over pressure to be provided as per NFPA-496.

3.2.3 Pressurised local control panel pressurization kit assembly design shall provide minimum leakage flow through the Local Control Panel. Panel venting shall be as per NFPA-496.

3.2.4 All components in the local panel like indicating instruments, push buttons switches, lamps etc., which are required to be energized without panel pressurization or before completion of purge cycle shall be explosion proof as per NEMA-7 & suitable for area classification.

3.2.5 All push buttons etc. requiring frequent operation during machine running shall have good positive sealing. Weatherproof housing or cover to be provided wherever necessary. Vendor shall provide pressurisation bypass switch outside explosion proof enclosure of pressurized panel with lamp indication. This shall be used only during maintenance. All hinges, screws, other non-painted metallic parts shall be of stainless steel material.

3.2.6 Provision to switch off manually all types of power shall be provided in the panel. In addition, it shall also be possible to switch off power circuits / components which are powered from motor control centre or control room manually in case of pressurization failure. All such cables from MCC and main control room shall be terminated in explosion proof boxes (NEMA-7).

3.3 Control & Monitoring devices

3.3.1 Instruments like Indicators, recorders, single loop controllers etc. as applicable and specified elsewhere for the plant / equipment shall be supplied and mounted on the panel.

3.3.2 Alarm Annunciator System

It shall be solid state discrete facia type having a sequence of ISA-S18.1A or as specified, opaque facia windows of 70 mm x 50 mm size, having two (2) lamps per window, and hooter of 10W, and provision for repeat group alarm at remote. The annunciator shall be provided with ten (10) percent spare windows or minimum two (2) windows along with electronics.

3.3.3 Relays

The relays shall be electromagnetic type suitable for specified control supply. Its contact configuration and rating shall be suitable for the specified control function. However minimum contact rating shall be 5 Amp AC & 2 Amp DC as applicable. There shall be ten (10) percent spare contacts.

3.3.4 Timers

The timers shall be electronic type suitable for specified control supply. Its contact configuration and rating shall be suitable for the specified control function. However, minimum contact rating shall be 5 Amp AC & 2 Amp DC as applicable.



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3.3.5 Control / Selector Switches

Switches shall be Rotary Cam type with minimum of 5 Amps AC & 2 Amp DC continuous current rating. Selector switches shall be stay put type while control switches shall be spring-return-to-neutral type. Contact configuration and rating shall be as per the control function requirement. The switches shall be lockable type wherever specified. Each switch shall be provided with engraved plates indicating the switch position / functions.

3.3.6 Push Buttons / Indicating Lights

The push buttons shall be momentary action self-resetting type, however stop P.B. for unidirectional drives shall be provided with manual reset facility. Its contact configuration & rating shall be as required for the control function but minimum 2 NO + 2 NC of 5 Amp. AC rating. It shall have round coloured projecting tab and engraved escutcheon plate / inscription plate. Colour coding of push buttons shall be as under:

RED	Motor OFF / Valve CLOSE	YELLOW	Alarm acknowledge	Left Hand Side
GREEN	Motor ON / Valve OPEN	BLACK	Lamp test	Right Hand Side

Indicating lights shall be suitable for direct connections across specified power supplies. It shall be fitted with built in resistance to prevent circuit tripping on shorting of lamp filament. It shall be fitted with LED cluster type lamp replaceable from front.

GREEN	Motor OFF / Valve CLOSED condition	AMBER	Motor tripped	Left Hand Side
RED	Motor ON / Valve OPEN condition	WHITE	Normal / healthy	Right Hand Side

3.3.7 Ammeters

Ammeter shall be 96 x 96 mm size, 90 deg. deflection, 1.5% accuracy, 1 Amp. CT operated or with 4-20mA input and Flush mounting type as called for in the data sheet-A (No. PES-145-54A-DS1-0). Ammeters for motors shall have six (6) times folded scale at upper end to enable motor starting current indication

3.3.8 Miniature Circuit Breaker (MCB)

These shall be instantaneous magnetic trip type for short circuit in addition to current time inverse delayed thermal trip feature for over current protection. The housing of MCB shall be made of non-ignitable, high impact material. It shall have minimum short circuit rating of 9 KA for AC Voltages and 4 KA for DC Voltages.

3.3.9 Makes of various instruments / devices shall be as given below

1.	Alarm Annunciators	:	Procon / IIC
2.	Ammeters	:	AEP / IMP
3.	Control / Selector Switches	:	Alsthom / Kaycee / Siemens / L&T
4.	Push Buttons / Indicating Lamps	:	Siemens / L&T / Teknic / Alsthom
5.	Auxiliary Relays	:	Jyoti / Siemens / L&T / OEN
6.	Timers	:	L&T / Alsthom / Bhartiya Cutler Hammer
7.	MCBs	:	S&S Power Engg. / Indo Asian / MDS
8.	Terminal Blocks	:	Jyoti / Elmex

4.0 TESTING AND INSPECTION

4.1 The bidder shall adopt suitable quality assurance program to ensure that the equipments offered will meet the specification requirements in full.

4.2 BHEL's standard Quality Plan for LCP is enclosed with the specification. The bidder shall furnish his acceptance to BHEL's QP and submit the signed and stamped copy of QP along with the offer.



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4.3 The vendor shall conduct the following tests as a minimum requirement:

4.3.1 Routine Tests

1. High Voltage (H.V.)
2. Insulation Resistance (I.R.)
3. Functional

4.3.2 Type Tests

1. Enclosure Class Test

5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables

The bidder shall supply all commissioning spares and consumables 'as required' during Start-up, as part of the main equipment supply.

5.2. Mandatory Spares

The bidder shall offer alongwith main offer, the Mandatory Spares as specified elsewhere in the specification. The Mandatory Spares offered shall be of the same make and type as the main equipment.

5.3. Recommended Spares

The bidder shall furnish a list of Recommended Spares indicating the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation alongwith unit rate against each item to enable BHEL/BHEL's Customer to place a separate order later, if required.

6.0 DRAWINGS AND DOCUMENTS

6.1 The bidder shall furnish the following documents in required number of copies along with the bid :

1. Data Sheet no. PES-145A-DS1-0
2. General Arrangement Drawing.
3. Catalogue and technical information for instruments and devices.
4. Quality Plan.

6.2 The vendor shall furnish the following documents in required number as agreed after the award of contract:

1. Data Shee No. PES-145A-DS2-0
2. GA Drawing indicating layout of instruments, construction details, foundation details, cable gland plate alongwith cable glands and all details mentioned in this specification.
3. Control Schematic Diagram along with grouping of different terminals for various functions.
4. Catalogue and technical information for instruments and devices with selected options clearly marked.
5. O&M Manuals.
6. "As Built" Drawing.
7. CDs.

7.0 MARKING AND PACKING

7.1 Panel with all instruments / devices mounted on it shall be suitably packed & protected for the entire period of despatch, storage and erection against impact, abrasion, corrosion, incidental damage due



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to vermin, sunlight, high temperature, rain moisture, humidity, dust, sea-water spray (where applicable) as well as rough handling and delays in Transit and storage in open.

8.0 APPLICABLE DATA SHEET FORMS

This document shall be read with one or more of the following data sheet forms :

- Data sheet A&B for Local Panels : Data sheet no. PES-145A-DS1-0
- Data sheet C for Local Panels : Data sheet no. PES-145A-DS2-0

	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I)	

QUALITY ASSURANCE



MEASURING INSTRUMENTS

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Item Components Sub System Assembly	Attributes Characteristics								
	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (As applicable)	Hydro Test(R)	Material Test certificate ®
1. PR Gauge (IS-3624)	Y	Y	Y	Y	Y				
2. Temp. Gauge (BS-5235)	Y	Y	Y	Y	Y				
3. Pr./D.P.Switch(BS-6134)	Y	Y	Y	Y	Y	Y			
4. Electronic Transmitter(IEC-60770)	Y	Y	Y	Y	Y	Y			
5. Temp. Switch	Y	Y	Y	Y	Y	Y			
6. Electrical Metering Instrument (IS-1248)	Y	Y	Y	Y	Y	Y			
7. Transducer (IS-14570)	Y	Y	Y	Y	Y	Y			
8. Thermocouples (IEC – 584 / ANSI-MC-96.1)	Y	Y	Y	Y	Y	Y			
9. RTD(IS-2848)	Y	Y	Y	Y	Y	Y			
10. Thermowell	Y		Y				Y	Y	Y

R-Routine Test A- Acceptance Test Y – Test applicable

Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.

MEASURING INSTRUMENTS

Page- 2/2

Item Components Sub System Assembly	Attributes Characteristics												
	GA, Dimensions, Paint Thickness (R)	Make, Model, Type, Rating ,BOM(R)	Process / Electrical connection (R)	Calibration/Functional (R)	Requirement as per standard (R)	WPS approval (A)	Non-destructive testing (R)	Calculation for accuracy (R)	HV/ IR Test (R)	IBR Certification as applicable (R)	Hydro test (R)	Material test certificate (A)	Integral Testing of complete System
11. Orifice plate(BS-1042)	Y	Y	Y	Y*	Y	Y*	Y*			Y	Y*	Y	
12. Flow nozzle(BS-1042)	Y	Y	Y	Y*	Y	Y	Y			Y	Y	Y	
13. Impact head type element	Y	Y	Y				Y					Y	
14. Electronics Water Level Indicator (EWLI)	Y	Y	Y		Y		Y		Y	Y	Y	Y	Y
15. Flue Gas & Ambient Air Analysers	Y	Y	Y	Y					Y				Y
16- SWAS System with Analyser & Chiller#	Y	Y	Y	Y			Y		Y	Y	Y	Y	Y
R-Routine Test A- Acceptance Test Y – Test applicable *Calibration to be carried out on one flow element of each type and size if calibration carried out as type test same shall not be repeated. ** As applicable #Vaccuminasation test of chiller assembly													
Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.													

CLAUSE NO.

QUALITY ASSURANCE



POWER SUPPLY FOR C&I SYSTEMS (UPS/BATTERY/BATTERY CHARGER/ACDB/DCDB)																																				
ITEMS	TESTS	Visual/dimension/rating/ Paint Adhesion/ Thickness (R)		General arrangement/BOM/make of components /Mimic ®		Efficiency .regulation(R)		Input voltage variation (A)		Out put voltage and frequency adi. range(A)		Preliminary light load test(R)		Load transfer retransfer test (R) *		AC input failure and return test (R)		Parallel operation and current division(R)		Relative harmonic content(R)		Restart with PRI A.C and battery (separately)(R)		System transfer and retransfer (R) *		Asynchronous transfer(R)		Ripple content(R)		Load limiter operation (R)		IR/HV(R)		Tests as per standard &specification (R)&(A)		
		UPS/CONVERTER (IEC-146 PT-4)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VOLTAGE STABILISER	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
LEAD ACID BATTERY (PLANTE)-IS-1652																																				Y
Ni-CD BATTERY(IS-10918/IEC-623)																																				Y
ACDB/DCDB	Y	Y																																	Y	Y
BATTERY CHARGER	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
R-Routine Test		A- Acceptance Test						Y – Test applicable																												
* Transfer time and Over shoot /under shoot during load & system transfer shall be recorded.																																				
<p>Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.</p>																																				

TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI, PART-B
BID DOC NO.: 4540-001A-2

SUB-SECTION-E-53
POWER SUPPLY

PAGE 1 OF 1



INSTRUMENTATION CABLE

ITEMS	TESTS														
	Conductor Resistance @ & (A)	High Voltage @ & (A)	Insulation Resistance @ & (A)	Constructional detail, dimensions (A)	Outer-Sheath/core marking, end sealing (A)	Thermal Stability (A) +	Visual, Surface finish (A) +	Electrical Parameters ** (A) +	Persulphate Test (A) +	Overall/Coverage/Continuity (A)	Swidesh chimney Test (SS-4241475) (A) ++	FRLS Test * (A) ++	Tensile & Elongation before & after aging (A) ++	Vol. Resistivity. at room & Elevated Temp. (A) ++	Spark test report review @
1. Instrument cable twisted and shielded															
Conductor(IS-8130)	Y			Y			Y								
Insulation(VDE-207)				Y	Y	Y	Y						Y		Y
Pairing/Twisting				Y	Y		Y								
Shielding				Y			Y			Y					
Drain wire	Y			Y			Y		Y	Y					
Inner Sheath				Y	Y	Y	Y					Y	Y		
Outer Sheath				Y	Y	Y	Y					Y	Y		
Over all cable	Y	Y	Y	Y	Y		Y	Y			Y			Y	
Cable Drums(IS-10418)				Y			Y								

Note : High Temp. cables shall be subjected to tests as per VDE-207(Part-6) Compensating cables shall be checked for Thermal EMF/Endurance test as per IS 8784.
Note : This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating his practice & Procedure along with relevant supporting documents during QP finalization for all items.
Note : @ - Routine Test A - Acceptance Test Y - Test Applicable
Note : Sampling Plan for Acceptance test shall be as per IS 8784 (As applicable)
 • * FRLS Tests: Oxygen / Temp Index (ASTM D-2863), Smoke Density Rating (ASTM – D 2843), HCL Emission (IEC-754-1)
 • ** Characteristic Impedance, Attenuation, Mutual Capacitance, Cross Talk (As applicable)
 + Sample size will be One No. of each size/type per lot.
 ++ Sample size will be One No. sample for complete lot offered irrespective of size/type.

CLAUSE NO.

QUALITY ASSURANCE



ELECTRICAL ACTUATOR WITH INTEGRAL STARTER

Test/Attributes Characteristics													
ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING	RPM ®	No Load Current ®	IR & HV Test®	Mounting Dimension®	All routine Test as per Standard & Specification®	Correct Phase Sequence®	Operation & Setting of limit Switch/Torque Switch®	Stall Torque/Current (A)	Hand Wheel operation/ Auto de clutch function (A)	Function of Aux. like Potentiometer, space heater, position indicator ®	EPT output ®	Local/ Remote (Open-Stop-Close) Operation®	Safety check (Single phasing, Phase correction, Tripping etc.) (A)

ELECTRICAL ACTUATOR with Integral Starter , Non-Intrusive Electrical Actuator (EN15714-2)													
Motor	Y	Y	Y	Y	Y								
Final Testing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the practices and procedure adopted along with relevant supporting documents.

- SIL 2 certificate if applicable

® - Routine Test (A) - Acceptance Test Y - Test applicable

CLAUSE NO.	TECHNICAL REQUIREMENTS						
3.00.00	TYPE TEST REQUIREMENT FOR OTHER C&I SYSTEMS					NTPC's Approval Req. On Test Certificate	
	Sl. No	Item	Test Requirement	Standard	Test To Be Conducted		
	Col 1	Col 2	Col 3	Col 4	Col 5		Col 6
	1	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No		Yes
	2	Instrumentation Cables Twisted & Shielded*					
		-Conductor	Resistance test	VDE-0815	No		Yes
			Diameter test	IS-10810	No		Yes
			Tin Coating test (Persulphate test)	IS-8130	No		Yes
		-Insulation	Loss of mass	VDE 0472	No		Yes
			Ageing in air ovens**	VDE 0472	No		Yes
			Tensile strength and elongation test before and after ageing**	VDE 0472	No		Yes
			Heat shock	VDE 0472	No		Yes
			Hot deformation	VDE 0472	No		Yes
			Shrinkage	VDE 0472	No		Yes
			Bleeding & blooming	IS-10810	No		Yes
	-Inner sheath***	Loss of mass	VDE 0472	No	Yes		
		Heat shock	VDE 0472	No	Yes		
		Cold bend/ cold impact test	VDE 0472	No	Yes		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	PAGE 4 OF 8				

CLAUSE NO.	TECHNICAL REQUIREMENTS				
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
	-Outer sheath	Loss of mass	VDE 0472	No	Yes
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes
		Colour fastness to water	IS-5831	No	Yes
		Cold bend/cold impact test	VDE-0472	No	Yes
		Oxygen index test	ASTMD-2863	No	Yes
		Smoke Density Test	ASTMD-2843	No	Yes
		Acid gas generation test	IEC-60754-1	No	Yes
	-fillers	Oxygen index test	ASTMD-2863	No	Yes
		Acid gas generation test	IEC-60754-1	No	Yes
	-AL-MYLAR shield	Continuity test		No	Yes
		Shield		No	Yes
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	PAGE 5 OF 8		

CLAUSE NO.	TECHNICAL REQUIREMENTS				
	<p style="text-align: center;">thickness</p> <p style="text-align: center;">Overlap test</p> <p>-Over all cable</p> <p style="text-align: center;">Flammability Test</p> <p style="text-align: center;">Swedish Chimney Test</p> <p style="text-align: center;">Noise interference</p> <p style="text-align: center;">Dimensional checks</p> <p style="text-align: center;">Cross talk</p> <p style="text-align: center;">Mutual capacitance</p> <p style="text-align: center;">HV test</p> <p style="text-align: center;">Drain wire continuity</p> <p>* 1.0 All cables to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last Ten years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.</p> <p>2.0 In case the Contractor is not able to submit report of the type test(s) conducted within last Ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract free of cost to the Owner and submit the reports for approval.</p> <p>**These tests shall be carried out as per VDE0207 Part 6 & ASTM D-2116 for TEFLON insulated & outer sheathed cables</p> <p>***Applicable for armoured cables only</p> <p>3 DC Power Supply System (Applicable for each model and rating)</p> <p>1)The Type Test reports for offered rectifier module and the controller module irrespective of the rectifier bank shall be acceptable</p>	<p style="text-align: center;">IEEE 383</p> <p style="text-align: center;">SEN 4241475</p> <p style="text-align: center;">IEEE Trans- actions</p> <p style="text-align: center;">IS 10810</p> <p style="text-align: center;">VDE-0472</p> <p style="text-align: center;">VDE-0472</p> <p style="text-align: center;">VDE-0815</p>	<p style="text-align: center;">No</p>	<p style="text-align: center;">Yes</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	PAGE 6 OF 8		

CLAUSE NO.	TECHNICAL REQUIREMENTS			
		<p>Surge Withstand Capability(SWC)</p> <p>Dry Heat Test</p> <p>Damp Heat test</p> <p>Vibration test</p> <p>Electrostatic discharge test</p> <p>Radio frequency immunity test</p> <p>Electromagnetic field immunity</p> <p>Degree of Protection</p> <p>As per standard (col 4)</p>	<p>(ANSI / IEEE No C37.90.1)or (IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18).</p> <p>IEC-60068-2-2 No or equivalent</p> <p>IEC-60068-2-30 No or IEC-60068-2-78 or equivalent</p> <p>IEC-60068-2-6 No or equivalent</p> <p>IEC 61000-4-2 No or equivalent</p> <p>IEC-61000-4-6 No or equivalent</p> <p>IEC 61000-4-3 No or equivalent</p> <p>IS-13947 or equivalent</p> <p>IS-10918 (Ni-Cd Batteries)</p> <p>IS-1652 (Lead Acid Plant Batteries)</p> <p>(ANSI / IEEE No C37.90.1)or (IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-</p>	<p>Yes</p>
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2</p>	<p>SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS</p>	<p>PAGE 7 OF 8</p>	

CLAUSE NO.	TECHNICAL REQUIREMENTS				
		4-18).			
	Dry Heat Test	IEC-60068-2-2 or equivalent	No	Yes	
	Damp Heat test	IEC-60068-2-30 or IEC-60068-2-78 or equivalent	No	Yes	
	Vibration test	IEC-60068-2-6 or equivalent	No	Yes	
	Electrostatic discharge test	IEC 61000-4-2 or equivalent	No	Yes	
	Radio frequency immunity test	IEC-61000-4-6 or equivalent	No	Yes	
	Electromagnetic field immunity	IEC 61000-4-3 or equivalent	No	Yes	
	Degree of protection test	IS-13947	No	Yes	
	Fuse Clearing Capability	Approved procedure	No	Yes	
	Short Circuit current capability	IEC 60146-2	No	Yes	
6	Public Address System				
	IP based PA system components	As per Standard	IEC 60268-16	No	Yes
7	Control Valves	CV test	ISA 75.02& 75.11	No	Yes
8	Flow Nozzle Orifice plates	Calibration	ASME PTC BS 1042	No	Yes
	<p>## The contractor shall submit for Employers approval the reports of all the type test as per latest IS-10918 carried out within last ten years from the date of Bid opening and the test(s) should have been either conducted at an independent laboratory or in presence of owner's representative. The complete type test reports shall be for any rating of Battery in a particular group based on plate dimensions being manufactured by supplier.</p> <p>Note:</p> <p>Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.</p>				
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	PAGE 8 OF 8		

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>REFERENCE CODES AND STANDARDS FOR CONTROL AND INSTRUMENTATION</p> <p>The design, manufacture, inspection, testing & installation of all equipment and system covered under this specification shall conform to the latest editions of codes and standards mentioned below and all other applicable VDE, IEEE, ANSI, ASME, NEC, NEMA, ISA AND Indian Standards and their equivalents.</p> <p>Temperature Measurements</p> <ol style="list-style-type: none"> 1. Instrument and apparatus for temperature measurement - ASME PTC 19.3 (1974). 2. Temperature measurement - Thermocouples ANSI MC 96.1 - 1982. 3. Temperature measurement by electrical Resistance thermometers - IS:2806. 4. Thermometer - element - Platinum resistance - IS:2848. <p>Pressure Measurements</p> <ol style="list-style-type: none"> 1. a) Instruments and apparatus for pressure measurement - ASME PTC 19.2 (1964). <li style="padding-left: 20px;">b) Electronic transmitters BS:6447. 2. Bourdon tube pressure and vacuum gauges - IS:3624 - 1966. 3. Process operated switch devices (Pr. Switch) BS-6134. <p>Flow Measurements</p> <p>Instruments and apparatus for flow measurements - ASME PTC 19.5 (1972) Interim supplement, Part-II.</p> <p>Measurement of fluid flow in closed conduits - BS-1042.</p> <p>Electronic Measuring Instrument & Control Hardware/ Software</p> <ol style="list-style-type: none"> 1. Automatic null balancing electrical measuring instruments - ANSI C 39.4 (Rev. 1973): IS:9319. 2. Safety requirements for electrical and electronic measuring and controlling instrument - ANSI C 39.5 - 1974. 3. Compatibility of analog signals for electronic industrial process instruments - ISA - S 50.1 (1982) ANSI MC 12.1 - 1975. 4. Dynamic response testing of process control instrumentation ISA - S 26 (1968). 			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 98 OF 114	

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	<ol style="list-style-type: none"> 5. Surge Withstand Capability (SWC) tests - ANSI C 37.90 a/IEEE-472 or suitable class of IEC-255-4 equivalent to ANSI C37.90a/IEEE-472. 6. Printed circuit boards - IPC TM - 650, IEC 326 C. 7. General requirement and tests for printed wiring boards - IS 7405 (Part-I) 1973. 8. Edge socket connectors - IEC 130-11. 9. Requirements and methods of testing of wire wrap terminations DIN 41611 Part-2. 10. Dimensions of attachment plugs & receptacles - ANSI C 73 - 1973 (Supplement ANSI C 73 a - 1980). 11. Direct acting electrical indicating instrument - IS:1248 - 1968 (R). 12. Standard Digital Interface for Programmable Instrumentation - IEEE-488.2 - 1990. 13. Information Processing Systems - Local Area Networks - Part 2 : Logical Link Control - IEEE-802.2 - 1989. 14. Standard for Local Area Networks : Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1985. 15. Supplements A, B, C and E to Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1988. 16. Standard for Local Area Networks : Token - Passing Bus Access Method - IEEE-802.4 - 1985. 17. Standard for Local Area Networks : Token - Ring Access Method and Physical Layer Specification - IEEE-802.5 - 1985. 18. IEEE Guide to Software Requirements Specifications - IEEE-830 - 1984. 19. Hardware Testing of Digital Process Computers - ISA RP55.1 - 1983. 20. Electromagnetic Susceptibility of Process Control Instrumentation - SAMA PMC 33.1 - 1978. 21. Interface Between the Data Terminal Equipment and Data Circuit - Terminating Equipment Employing Serial Binary Data Interchange - EIA-232-D-1987. 22. Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment, Part 3 : Radiated Electromagnetic Field Requirements - IEC 801-3-1984. 			
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p style="text-align: center;">GENERAL TECHNICAL REQUIREMENTS</p>	<p style="text-align: center;">PAGE 99 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>Instrument Switches and Contact</p> <ol style="list-style-type: none"> 1. Contact rating - AC services NEMA ICS 2 - 1978 (with revision through May 1983), Part - 2-125, A6000. 2. Contact rating - DC services NEMA ICS 2-1978 Part-2 125, N600. <p>Enclosures</p> <ol style="list-style-type: none"> 1. Type of Enclosures - NEMA ICS Part - 6 - 1978 (with Rev. 1 4/80) through 110.22 (Type 4 to 13). 2. Racks, panels and associated equipment - EIA : RS - 310 C- 1983 (ANSI C 83.9 - 1972). 3. Protection class for Enclosures, cabinets, control panels & desks - IS:2147 - 1962. <p>Apparatus, enclosures and installation practices in hazardous area</p> <ol style="list-style-type: none"> 1. Classification of hazardous area - NFPA 70 - 1984, Article 500. 2. Electrical Instruments in hazardous dust location - ISA - 512.11, 1973. 3. Intrinsically safe apparatus - NFPA 493 1978. 4. Purged and pressurised enclosure for electrical equipment in hazardous location - NFPA 496-1982. 5. Enclosures for Industrial Controls and Systems - NEMA IS 1.1 - 1977. <p>Sampling System</p> <ol style="list-style-type: none"> 1. Stainless steel material of tubing and valves for sampling system - ASTM 296-82, Grade 7 P 316. 2. Submerged helical coil heat exchangers for sample coolers ASTM D11 92-1977. 3. Water and steam in power cycle - ASME PTC 19.11. 4. Standard methods of sampling system - ASTM D 1066-99. <p>Annunciators</p> <ol style="list-style-type: none"> 1. Specifications and guides for the use of general purpose annunciators - ISA S 19.1, 1979. 2. Surge withstand capability tests - ANSI C 37.90a - 1989/IEEE-472 or suitable class of IEC 255-4 equivalent to ANSI C37.90a 1989/IEEE-472 3. Damp heat cycling test - IS:2106 			
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	<p>4. Specification for Electromagnetic Susceptibility - SAMA DMC 33, 1/78</p> <p>Protections</p> <ol style="list-style-type: none"> 1. Relays and relay system associated with electric power apparatus. ANSI C 37.90, 1 - 1989. 2. General requirements & tests for switching devices for control and auxiliary circuits including contactor relays - IS:6875 (Part-I) - 1973. 3. Turbine water damage prevention - ASME TDP-1-1980. 4. Boiler safety interlocks - NFPA Section 85 B - 1984, 85 C - 1991. <p>UPS System</p> <ol style="list-style-type: none"> 1. Practices and requirements for semi-conductor power rectifiers - ANSI C 34.2, 1973. 2. Relays and relays system associated with electrical power apparatus - ANSI C 3.90 - 1983. 3. Surge withstand capability test - ANSI C 37.90 1 -1989. 4. Performance testing of UPS - IEC 146. 5. Stationary cells & Batteries Lead Acid type (with tubular positive plates) specification IS-1651-1991. 6. Recommended practice for sizing large lead storage batteries for generating stations & sub-stations - IEEE-485-1985. 7. Printed Circuit Board - IPC TM 650, IEC 326C. 8. General Requirements & tests for printed wiring boards, IS:7405 (Part-I) 1973. <p>Control Valves</p> <ol style="list-style-type: none"> 1. Control valve sizing - Compressible & Incompressible fluids - ISA S 75.01-1985. 2. Face to face dimensions of control valves - ANSI B 16.00 - 1973. 3. ISA Hand Book of Control Valves - (ISBN : B: 1047-087664-234-2). 4. Codes for pressure piping - ANSI B 31.1 5. Control Valve leak class - ISA RP 39.6 			
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	<p>Process Connection & Piping</p> <ol style="list-style-type: none"> 1. Codes for pressure piping "power piping" - ANSI B 31.1. 2. Seamless carbon steel pipe ASTM - A - 106. 3. Forged & Rolled Alloy steel pipe flanges, forged fittings and valves and parts - ASTM - A - 182. 4. Material for socket welded fittings - ASTM - A - 105. 5. Seamless ferritic alloy steep pipe - ASTM - A - 335. 6. Pipe fittings of wrought carbon steel and alloy steel - ASTM - A - 234. 7. Composition bronze of ounce metal castings - ASTM - B - 62. 8. Seamless Copper tube, bright annealed - ASTM - B - 168. 9. Seamless copper tube - ASTM - B - 75. 10. Dimension of fittings - ANSI - B - 16.11. 11. Valves flanged and butt welding ends - ANSI - B - 16.34. <p>Instrument Tubing</p> <ol style="list-style-type: none"> 1. Seamless carbon steel pipe - ASTM - A 106. 2. Material of socketweld fittings - ASTM - A105. 3. Dimensions of fittings - ANSI - B - 16.11. 4. Code for pressure piping, welding, hydrostatic testing - ANSI B 31.1. <p>Cables</p> <ol style="list-style-type: none"> 1. Thermocouples extension wires/cables - ANSI MC 96.1 - 1992. 2. Requirements for copper conductor-Wiring cables for telecommunications & information processing system - VDE:0815. 3. Colour coding of single or multi-pair cables - ICEA - S - 61-402 (third edition) NEMA WCS - 1979 with revisions through 2/83. 4. Insulation & Sheathing compounds for cables : VDE 0207 (Part-4, 5 & 6). 5. Guide design and installation of cable systems in power generating stations (insulation, jacket materials) - IEEE Std. 422-1977. 6. Rules for Testing insulated cables and flexible cables : VVDE - 0472 7. Requirements of vertical flame propagation test - IEEE 383 - 1974 (R 1980) 			
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TITLE:
**TECHNICAL SPECIFICATION FOR
PRE TREATMENT PLANT (PT PLANT)
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-158A-A001

VOLUME II-B

SECTION-D

REV. NO. 00

DATE:

**SECTION-D
(GENERAL TECHNICAL REQUIRMENT)**

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
1.00.00	<p>INTRODUCTION</p> <p>This part covers technical requirements which will form an integral part of the Contract. The following provisions shall supplement all the detailed technical specifications and requirements brought out in Section-VI, the Technical Specification and the Technical Data Sheets.</p>			
2.00.00	<p>BRAND NAME</p> <p>Whenever a material or article is specified or described by the name of a particular brand, manufacturer or vendor, the specific item mentioned shall be understood to be indicative of the function and quality desired, and not restrictive; other manufacturer's products may be considered provided sufficient information is furnished to enable the Employer to determine that the products proposed are equivalent to those named.</p>			
3.00.00	<p>BASE OFFER & ALTERNATE PROPOSALS</p> <p>The Bidder's proposal shall be based upon the use of equipment and material complying fully with the requirements specified herein. It is recognized that the Contractor may have standardized on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered, provided the base offer is in line with technical specifications and such proposals meet the specified design standards and performance requirement and are acceptable to the Employer. Sufficient amount of information for justifying such proposals shall be furnished to Employer alongwith the bid to enable the Employer to determine the acceptability of these proposals.</p>			
4.00.00	<p>COMPLETENESS OF FACILITIES</p>			
4.01.00	<p>Bidders may note that this is a EPC Package contract. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure a completely engineered plant shall be provided.</p>			
4.02.00	<p>All equipments furnished by the Contractor shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation of the equipment and for the safety of the operating personnel, as required by applicable codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions.</p> <p>All same standard components/ parts of same equipment provided, shall be interchangeable with one another.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>		<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 1 OF 114</p>

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
4.03.00	For the C&I systems, the Contractor shall be required to provide regular information about future upgrades and migration paths to the Employer.			
5.00.00	CODES & STANDARDS			
5.01.00	<p>In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India as well as of the locality where they will be installed, including the following :</p> <ul style="list-style-type: none"> a) Indian Electricity Act b) Indian Electricity Rules c) Indian Explosives Act d) Indian Factories Act and State Factories Act e) Indian Boiler Regulations (IBR) f) Regulations of the Central Pollution Control Board, India g) Regulations of the Ministry of Environment & Forest (MoEF), Government of India h) Pollution Control Regulations of Department of Environment, Government of India i) State Pollution Control Board. j) Rules for Electrical installation by Tariff Advisory Committee (TAC). (k) Building and other construction workers (Regulation of Employment and Conditions of services) Act, 1996 (l) Building and other construction workers (Regulation of Employment and Conditions of services) Central Rules, 1998 (m) Explosive Rules, 1983 (n) Petroleum Act, 1984 (o) Petroleum Rules, 1976, (p) Gas Cylinder Rules, 1981 			
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
5.02.00	<p>(q) Static and Mobile Pressure Vessels (Unified) Rules, 1981</p> <p>(r) Workmen's Compensation Act, 1923</p> <p>(s) Workmen's Compensation Rules, 1924</p> <p>(t) NTPC Safety Rules for Construction and Erection</p> <p>(u) NTPC Safety Policy</p> <p>(v) Any other statutory codes / standards / regulations, as may be applicable.</p> <p>Unless covered otherwise in the specifications, the latest editions (as applicable as on the date of bid opening), of the codes and standards given below shall also apply:</p> <p>a) Bureau of Indian standards (BIS)</p> <p>b) Japanese Industrial Standards (JIS)</p> <p>c) American National Standards Institute (ANSI)</p> <p>d) American Society of Testing and Materials (ASTM)</p> <p>e) American Society of Mechanical Engineers (ASME)</p> <p>f) American Petroleum Institute (API)</p> <p>g) Standards of the Hydraulic Institute, U.S.A.</p> <p>h) International Organization for Standardization (ISO)</p> <p>i) Tubular Exchanger Manufacturer's Association (TEMA)</p> <p>j) American Welding Society (AWS)</p> <p>k) National Electrical Manufacturers Association (NEMA)</p> <p>l) National Fire Protection Association (NFPA)</p> <p>m) International Electro-Technical Commission (IEC)/ European Norm (EN)</p> <p>n) Expansion Joint Manufacturers Association (EJMA)</p> <p>o) Heat Exchange Institute (HEI)</p> <p>p) IEEE standard</p>			
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
<p>5.03.00</p> <p>5.04.00</p> <p>5.05.00</p> <p>5.06.00</p> <p>5.07.00</p> <p>5.08.00</p> <p>6.00.00</p> <p>6.01.00</p>	<p>q) JEC standard</p> <p>Other International/ National standards such as DIN, VDI, BS, GOST etc. shall also be accepted for only material codes and manufacturing standards, subject to the Employer's approval, for which the Bidder shall furnish, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned elsewhere in the specification together with the complete word to word translation of the standard that is normally not published in English.</p> <p>As regards highly standardized equipments such as Steam Turbine and Generator, National /International standards such as JIS, DIN, VDI, ISO, SEL, SEW, VDE, IEC & VGB shall also be considered as far as applicable for Design, Manufacturing and Testing of the respective equipment. However, for those of the above equipment not covered by these National / International standards, established and proven standards of manufacturers shall also be considered.</p> <p>In the event of any conflict between the codes and standards referred to in the above clauses and the requirement of this specification, the requirement of Technical Specification shall govern.</p> <p>Two (2) English language copies of all national and international codes and/or standards used in the design of the plant and equipment shall be provided by the Contractor to the Employer within two calendar months from the date of the Notification of Award.</p> <p>In case of any change in codes, standards & regulations between the date of bid opening and the date when vendors proceed with fabrication, the Employer shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Contractor to bring to the notice of the Employer such changes and advise Employer of the resulting effect.</p> <p>A detailed list of standards apart from those mentioned in the respective detailed specifications in other parts of Section-VI to which all equipment/systems/civil works should conform as indicated in this Part C and elsewhere in the specification.</p> <p>EQUIPMENT FUNCTIONAL GUARANTEE</p> <p>The functional guarantees of the equipment under the scope of the Contract is given in Section-VI Part - A & B of Technical Specifications. These guarantees shall supplement the general functional guarantee provisions covered under Defect liabilities Section-IV, General Conditions of Contract.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 4 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
6.02.00	Liquidated damages for shortfall in meeting functional guarantee(s) during the performance and guarantee tests shall be assessed and recovered from the Contractor as specified elsewhere in this specification.			
7.00.00	DESIGN OF FACILITIES/ MAINTENANCE & AVAILABILITY CONSIDERATIONS			
7.01.00	DESIGN OF FACILITIES			
	All the design procedures, systems and components proposed shall have already been adequately developed and shall have demonstrated good reliability under similar conditions elsewhere.			
	The Contractor shall be responsible for the selection and design of appropriate equipments to provide the best co-ordinated performance of the entire system. The basic requirements are detailed out in various clauses of the Technical Specifications. The design of various components, assemblies and subassemblies shall be done so that it facilitates easy field assembly and dismantling. All the rotating components shall be so selected that the natural frequency of the complete unit is not critical or close to the operating range of the unit.			
7.02.00	MAINTENANCE AND AVILABILITY CONSIDERATIONS			
	Equipment/works offered shall be designed for high availability, low maintenance and ease of maintenance. The Bidder shall specifically state the design features incorporated to achieve high degree of reliability/ availability and ease of maintenance. The Bidder shall also furnish details of availability records in the reference plants stated in his experience list.			
	Bidder shall state in his offer the various maintenance intervals, spare parts and man-hour requirement during such operation. The intervals for each type of maintenance namely inspection of the furnace, inspection of the entire hot gas path, turbine & equipments, inspection of the steam path and the minor and major overhauls shall be specified in terms of fired hours, clearly defining the spare parts and man-hour requirement for each stage.			
	Lifting devices i.e. hoists and chain pulley jacks, etc. shall be provided by the contractor for handling of any equipment or any of its part having weight in excess of 500 Kgs during erection and maintenance activities.			
	Lifting devices like lifting tackles, slings, etc. to be connected to hook of the hoist / crane shall be provided by the contractor for lifting the equipment and accessories covered under the specification.			
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
8.00.00	DOCUMENTS, DATA AND DRAWINGS TO BE FURNISHED BY CONTRACTOR			
8.01.00	<p>Bidders may note that this is an EPC Package contract. Each of the plant and equipment shall be fully integrated, engineered and designed to perform in accordance with the technical specification. All engineering and technical services required to ensure a completely engineered plant shall be provided in respect of mechanical, electrical and power systems, control & instrumentation, civil & structural works as per the scope.</p> <p>Each main and auxiliary equipment/item of the plant including instruments shall be assigned a unique tag number. The assignment of tag numbers shall be in accordance with KKS system. In all drawings/documents/data sheet etc. KKS tag number of the equipment/item/instrument etc. shall be indicated.</p> <p>The Contractor shall furnish engineering data /drawings in accordance with the schedule of information as specified in Technical Data Sheets and Technical Specification.</p> <p>A comprehensive engineering and quality coordination procedure shall be finalized with the successful bidder covering salient features as described in this section of specifications.</p>			
8.02.00	The number of copies/prints/CD-ROMs/manuals to be furnished for various types of document is given in Annexure-VI to this Part-C, Section-VI of the Technical Specification.			
8.03.00	The documentation that shall be provided by the Contractor is indicated in the various sections of specification. This documentation shall include but not be limited to the following:			
8.03.01	<p>A) BASIC ENGINEERING DOCUMENTATION</p> <p>Prior to commencement of the detailed engineering work, the Contractor shall furnish a Plant Definition Manual within 12 weeks from the date of the Notification of Award. This manual shall contain the following as a minimum:</p> <ul style="list-style-type: none"> i) System description of all the mechanical, electrical, control & instrumentation & civil systems. ii) Technology scan for each system / sub-system & equipment. iii) Selection of appropriate technology / schemes for various systems/ subsystems including techno-economic studies between various options. 			
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	<p>iv) Optimization studies including thermal cycle optimization.</p> <p>v) Sizing criteria of all the systems, sub-systems/ equipments/ structures/ equipment foundations alongwith all calculations justifying and identifying the sizing and the design margins.</p> <p>vi) Schemes and Process & Instrumentation diagrams for the various systems/ sub-system with functional write-ups.</p> <p>vii) Water Balance diagram.</p> <p>viii) Operation Philosophy and the control philosophy of the Main Plant and other plants.</p> <p>ix) General Layout plan of the power station incorporating all facilities in Bidder's as well as those in the Employer's scope. This drawing shall also be furnished in the form of CD-ROMs to the Employer for engineering of areas not included in bidder's scope.</p> <p>x) Basic layouts and cross sections of the main plant building (various floor elevations), boiler, fuel oil area, transformer yard, switchyard and other areas included in the scope of the bidder.</p> <p>xi) Documentation in respect of Quality Assurance System as listed out elsewhere in this specification.</p> <p>The successful bidder shall furnish within three (3) weeks from the date of Notification of Award, a list of contents of the Plant Definition Manual (PDMs) including techno-economic studies, which shall then be mutually discussed & finalised with the Employer.</p> <p>B) DETAILED ENGINEERING DOCUMENTS</p> <p>i) General layout plan of the station.</p> <p>ii) Layouts, general arrangements, elevations and cross-sections drawings for all the equipment and facilities of the plant.</p> <p>iii) Flow diagram, Process and Instrumentation diagrams along with write up and system description.</p> <p>iv) Start-up curves for boiler and both turbines and boiler combined together as a unit for various start-ups, viz. Cold, Warm and Hot start up.</p> <p>v) Piping isometric, composite layout and fabrication drawings.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 7 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<ul style="list-style-type: none"> vi) Piping engineering diagrams, pipe and fittings schedules, valve schedules, hanger and support schedules, insulation schedules. vii) Technical data sheets for all bought out and manufactured items. Contractor shall use the Employer's specifications as a base for placement of orders on their sub vendors. viii) Detailed design calculations for components, system, piping etc., wherever applicable including sizing calculations for all auxiliaries like Mills, Fans, BFPs, CEPs, Heaters/ Deaerators, Air cooled Condensers, Vacuum pumps etc. ix) Boiler pressure part schedule and sizing calculations. Boiler performance data and boiler design dossier. x) Transient, hydraulic and thermal stress analysis of piping and system wherever applicable & input and output data alongwith stress analysis isometrics showing nodes. xi) Thermal cycle information (heat balance diagrams, boiler performance calculations, condenser and heat exchanger thermal calculations etc.). xii) Characteristic Curves/ Performance Correction Curves. Hydraulic & Mechanical design calculations for condensers & heaters. xiii) Comprehensive list of all Terminal Points which interface with Employer's facilities, giving details of location, terminal pressure, temperature, fluid handled & end connection details, forces, moments etc. xiv) Power supply single line diagram, block logics, control schematics, electrical schematics, etc. xv) Protection system diagrams and relay settings. xvi) Cables schedules and interconnection diagrams. xvii) Cable routing plan. xviii) Instrument schedule, measuring point list, I/O list, Interconnection & wiring diagram, functional write-ups, installation drawings for field mounted instruments, logic diagrams, control schematics, wiring and tubing diagrams of panels and enclosures etc. Drawings for open loop and close loop controls (both hardware and software). Motor list and valve schedule including type of actuator etc. 			
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p style="text-align: center;">GENERAL TECHNICAL REQUIREMENTS</p>	<p style="text-align: center;">PAGE 8 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
8.03.02	<p>xix) Alarm and annunciation/ Sequence of Event (SOE) list and alarms & trip set points.</p> <p>xx) Sequence and protection interlock schemes.</p> <p>xxi) Type test reports, insulation co-ordination study report and power system stability study report.</p> <p>xxii) Control system configuration diagrams and card circuit diagrams and maintenance details.</p> <p>xxiii) Detailed DDCMIS system manuals.</p> <p>xxiv) Detailed flow chart for digital control system.</p> <p>xv) Mimic diagram layout, Assignment for other application engg.</p> <p>xxvi) Civil and Structural works drawings and documents for all structures, facilities, architectural works, foundations underground and overground works and super-structural works as included in the scope of the bidder civil calculation sheets including structural analysis and design alongwith output results.</p> <p>xxvii) Underground facilities, levelling, sanitary, land scaping drawings.</p> <p>xxviii) Geotechnical investigation and site survey reports (if and as applicable).</p> <p>xxix) Model study reports wherever applicable.</p> <p>xxx) Functional & guarantee test procedures and test reports.</p> <p>xxxi) Documentation in respect of Quality Assurance System, and Documentation in respect of Commissioning, as listed out elsewhere in this specification.</p> <p>The Contractor's while submitting the above documents/ drawings for approval/ reference as the case may be, shall mark on each copy of submission the reference letter alongwith the date vide which the submissions are made.</p> <p>INSTRUCTION MANUALS</p> <p>The Contractor shall submit to the Employer, draft Instruction Manuals for all the equipments covered under the Contract by the end of one year from the date of his acceptance of the Letter of Award. The Instruction manuals shall contain full details required for erection, commissioning, operation and maintenance of each</p>			
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	<p>equipment. The manual shall be specifically compiled for this project. After finalisation and approval of the Employer the Instruction Manuals shall be submitted as indicated in Annexure-IV. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals have been supplied to the Employer. The Instruction Manuals shall comprise of the following.</p> <p>A) ERECTION MANUALS</p> <p>The erection manuals shall be submitted at least three (3) months prior to the commencement of erection activities of a particular equipment/system. The erection manual should contain the following as a minimum.</p> <ol style="list-style-type: none"> a) Erection strategy. b) Sequence of erection. c) Erection instructions. d) Critical checks and permissible deviation/tolerances. e) List of tools, tackles, heavy equipments like cranes, dozers, etc. f) Bill of Materials g) Procedure for erection and General Safety procedures to followed during erection/installation. h) Procedure for initial checking after erection. i) Procedure for testing and acceptance norms. j) Procedure / Check list for pre-commissioning activities. k) Procedure / Check list for commissioning of the system. l) Safety precautions to be followed in electrical supply distribution during erection. <p>B) OPERATION & MAINTENANCE MANUALS</p> <ol style="list-style-type: none"> a) The manual shall be a two rim PVC bound stiff sided binder able to withstand constant usage or where a thicker type is required it shall have locking steel pins, the size of the manual shall not be larger than international size A3. The cover shall be printed with the Project 			
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	<p>Name, Services covered and Volume / Book number Each section of the manual shall be divided by a stiff divider of the same size as the holder. The dividers shall clearly state the section number and title. All written instructions within the manual not provided by the manufacturers shall be typewritten with a margin on the left hand side.</p> <p>b) The arrangement and contents of O & M manuals shall be as follows:</p> <p>1) <u>Chapter 1 - Plant Description:</u> To contain the following sections specific to the equipment/system supplied</p> <ul style="list-style-type: none"> (a) Description of operating principle of equipment / system with schematic drawing / layouts. (b) Functional description of associated accessories / controls. Control interlock protection write up. (c) Integrated operation of the equipment alongwith the intended system. (This to be given by the supplier of the Main equipment by taking into account the operating instruction given by the associated suppliers). (d) Exploded view of the main equipment, associated accessories and auxiliaries with description. Schematic drawing of the equipment alongwith its accessories and auxiliaries. (e) Design data against which the plant performance will be compared. (f) Master list of equipments, Technical specification of the equipment/ system and approved data sheets. (g) Identification system adopted for the various components, (it will be of a simple process linked tagging system). (h) Master list of drawings (as built drawing - Drawings to be enclosed in a separate volume). <p>2) <u>Chapter 2.0 - Plant Operation:</u> To contain the following sections specific to the equipment supplied</p> <ul style="list-style-type: none"> (a) Protection logics provided for the equipment alongwith brief philosophy behind the logic, Drawings etc. (b) Limiting values of all protection settings. (c) Various settings of annunciation/interlocks provided. 			
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	<p>(d) Startup and shut down procedure for equipment alongwith the associated systems in step mode.</p> <p>(e) Do's and Don'ts related to operation of the equipment.</p> <p>(f) Safety precautions to be taken during normal operation. Emergency instruction on total power failure condition/lubrication failure/any other conditions.</p> <p>(g) Parameters to be monitored with normal value and limiting values.</p> <p>(h) Equipment isolating procedures.</p> <p>(i) Trouble shooting with causes and remedial measures.</p> <p>(j) Routine testing procedure to ascertain healthiness of the safety devices alongwith schedule of testing.</p> <p>(k) Routine Operational Checks, Recommended Logs and Records</p> <p>(l) Change over schedule if more than one auxiliary for the same purpose is given.</p> <p>(m) Preservation procedure on long shut down.</p> <p>(n) System/plant commissioning procedure.</p> <p>3) <u>Chapter 3.0 - Plant Maintenance</u>- To contain the following sections specific to the equipment supplied.</p> <p>(a) Exploded view of each of the equipments. Drawings alongwith bill of materials including name, code no. & population.</p> <p>(b) Exploded view of the spare parts and critical components with dimensional drawings (In case of Electronic cards, the circuit diagram to be given) and spare parts catalogue for each equipment.</p> <p>(c) List of Special T/ P required for Overhauling /Trouble shooting including special testing equipment required for calibration etc.</p> <p>(d) Stepwise dismantling and assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained etc. Clearance to be maintained etc.</p>			
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8.03.03	<p>(e) Preventive Maintenance schedules linked with running hours/calendar period alongwith checks to be carried out.</p> <p>(f) Overhauling schedules linked with running hours/calendar period alongwith checks to be done.</p> <p>(g) Long term maintenance schedules</p> <p>(h) Consumables list alongwith the estimated quantity required during normal running and during maintenance like Preventive Maintenance and Overhauling.</p> <p>(i) List of lubricants with their Indian equivalent, Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at longer intervals to ensure trouble free operation and quantity required for complete replacement.</p> <p>(j) Tolerance for fitment of various components.</p> <p>(k) Details of sub vendors with their part no. in case of bought out items.</p> <p>(l) List of spare parts with their Part No, total population, life expediency & their interchangeability with already supplied spares to NTPC.</p> <p>(m) List of mandatory and recommended spare list along with manufacturing drawings, material specification & quality plan for fast moving consumable spares.</p> <p>(n) Lead time required for ordering of spares from the equipment supplier, instructions for storage and preservation of spares.</p> <p>(o) General information on the equipment such as modification carried out in the equipment from its inception, equipment population in the country / foreign country and list of utilities where similar equipments have been supplied.</p> <p>After finalization and approval of the Employer, the O & M Manuals shall be submitted as indicated in Annexure-VI. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals (both erection and O & M manuals have been supplied to the Employer.</p> <p>If after the commissioning and initial operation of the plant, the instruction manuals (Erection and /or O &M manuals) require modifications/additions/ changes, the same shall be incorporated and the updated final instruction manuals shall be submitted by</p>			
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	<p>the Contractor to the Employer for records and number of copies shall be as mentioned in Annexure-VI.</p>			
8.03.03	<p>PLANT HANDBOOK AND PROJECT COMPLETION REPORT</p>			
8.03.03.01	<p>PLANT HANDBOOK</p>			
	<p>The Contractor shall submit to the Employer a preliminary plant hand book preferably in A-4 size sheets which shall contain the design and performance data of various plants, equipments and systems covering the complete project including</p> <ul style="list-style-type: none"> i) Design and performance data. ii) Process & Instrumentation diagrams. iii) Single line diagrams. iv) Sequence & Protection Interlock Schemes. v) Alarm and trip values. vi) Performance Curves. vii) General layout plan and layout of main plant building and auxiliary buildings viii) Important Do's & Don't's <p>The plant handbook shall be submitted within twelve (12) months from the date of award of contract. After the incorporation of Employer's comments, the final plant handbook complete in all respects shall be submitted three (3) months before start-up and commissioning activities.</p>			
8.03.03.02	<p>PROJECT COMPLETION REPORT</p> <p>The Contractor shall submit a Project Completion Report at the time of handing over the plant.</p>			
8.03.04	<p>DRAWINGS</p> <ul style="list-style-type: none"> a) i) All the plant layouts shall be made in computerized 3D modelling system. The Employer reserves the right to review the 3D model at different stages during the progress of engineering. The layout drawings submitted for Employer's review shall be fully dimensioned and extracted from 3D model after interference check. ii) All documents submitted by the Contractor for Employer's review shall be in electronic form (soft copies) along with the desired number 			
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	<p>of hard copies as per Annexure-VI of Part-C. The soft copies shall be uploaded by the vendors in C-folders, a Web-based system of NTPC ERP, for which a username and password will be allotted to the new vendor by NTPC.</p> <p>Similarly, the vendor can download the drawings/documents, approved/ commented by NTPC, through above site.</p> <p>The soft copies of identified drawings/documents shall be in pdf format, whereas the attachments/reply to the submitted document(s) can be in .doc, .xls, .pdf, .dwg or .std formats.</p> <p>iii) Final copies of the approved drawings along with requisite number of hard copies shall be submitted as per Annexure-VI of Part-C.</p> <p>iv) Contractor shall prepare the model of all the facilities located within plant boundary covering facilities in Main Plant Block area and Balance of plant (BOP) area in an integrated & intelligent 3D software solution. Main Plant Block area shall include Transformer Yard, TG building (including all facilities), Boiler area, ESP area, chimney area, FGD area and any other facility located in main plant block. BOP area shall include all facilities pertaining to AHP, CHP, LHP, GHP, DM PT plant, pipe & cable racks and any other facility located within plant boundary.</p> <p>All piping layouts, equipment layouts, floor plans, ducting layout (Air/flue gas, A/C, Ventilation etc.), General Arrangement drawings and RCC layout of major buildings and structural arrangement drawings shall necessarily be extracted from the aforesaid 3D model and submitted for employer's review along with the 3D review model to enable NTPC to review and approve these drawings.</p> <p>Contractor shall prepare and provide 3D design review model (network ready, which shall include visual interference check, walk-through animation, video simulation for major equipment placement and removal, visual effect, photo realism etc.), which is extracted from intelligent 3D model and shall make a presentation of the same every 3 months from LOA to enable NTPC to review the progress of engineering or as & when required by employer.</p> <p>The complete 3D data (editable model) which shall be utilised for all future detailed engineering related to maintenance, operation, R&M, efficiency improvement of the project etc. Complete 3D model along with as built GADs, layout, isometrics, reports extracted and 3D models for all disciplines , with any other document generated from 3D model and naming conventions with as-built updates along with complete reference databases, component catalogues for all the size range shall be handed over to owner. Apart from the 3D Model, all</p>			
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	<p>drawings like GADs, Isometrics etc. extracted from the model shall also be submitted by the Contractor in Electronic form. 3D model along with complete Project databases shall be submitted at each model review stage and as final as-built. The contractor shall also submit all the configuration files, customization files, templates and all referenced databases.</p> <p>All input files of software used for design of Equipments / Piping like CAESAR2 files, input files for Pressure vessel design, data sheets etc., shall be handed over to NTPC as per NTPC specifications for hand over of Engineering Information.</p> <p>Further, two Licenses of the used 3D Modelling Software (One for Engineering View and One for Site View) shall be provided along with compatible Hardware for possible review and study of the Model Files being submitted by the Bidder Time to time.</p> <p>All software provided shall necessarily include cost for perpetual license(s) for use on all the machines and an Annual maintenance contract (AMC) which shall include software upgrades as & when released by the software agency for a period of three years after warranty/guarantee period .</p> <p>Hand over Plan: There shall be continuous hand over of documents and data at various stages of the project including rules and trigger points for hand over of data to NTPC shall be at 30%, 60% and 90 % of 3D model stage. Database backup shall be taken every month and handed over to NTPC.</p> <p>b) All documents/text information shall be in latest version of MS Office/MS Excel/PDF format as applicable.</p> <p>c) All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail indicating the type, size, arrangement, weight of each component for packing and shipment, the external connection, fixing arrangement required, the dimensions required for installation and interconnections with other equipments and materials, clearance and spaces required between various portions of equipment and any other information specifically requested in the drawing schedules.</p> <p>d) Each drawing submitted by the Contractor (including those of sub-vendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, notings, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.</p> <p>e) The drawings submitted by the Contractor (or their subvendors) shall bear Employer's drawing number in addition to contractor's (their sub-vendor's)</p>			
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	<p>own drawing number. Employer's drawing numbering system shall be made available to the successful bidder to enable him to assign Employer's drawing numbers to the drawings to be submitted by him during the course of execution of the Contract.</p> <p>Similarly, all the drawings/ documents submitted by the Contractor during detailed engineering stage shall be marked "FOR APPROVAL" or "FOR INFORMATION" prior to submission in line with suggestive MDL.</p> <p>Further, space shall be identified on each drawing for Approval stamp and electronic signature.</p> <p>f) The furnishing of detailed engineering data and drawings by the Contractor shall be in accordance with the time schedule for the project. The review of these documents/ data/ drawings by the Employer will cover only general conformance of the data/ drawings/ documents to the specifications and contract, interfaces with the equipments provided by others and external connections & dimensions which might affect plant layout. The review by the Employer should not be construed to be a thorough review of all dimensions, quantities and details of the equipments, materials, any devices or items indicated or the accuracy of the information submitted. The review and/ or approval by the Employer/ Project Manager shall not relieve the Contractor of any of his responsibilities and liabilities under this contract.</p> <p>g) After the approval of the drawings, further work by the Contractor shall be in strict accordance with these approved drawings and no deviation shall be permitted without the written approval of the Employer.</p> <p>h) All manufacturing, fabrication and execution of work in connection with the equipment / system, prior to the approval of the drawings, shall be at the Contractor's risk. The Contractor is expected not to make any changes in the design of the equipment /system, once they are approved by the Employer. However, if some changes are necessitated in the design of the equipment/system at a later date, the Contractor may do so, but such changes shall promptly be brought to the notice of the Employer indicating the reasons for the change and get the revised drawing approved again in strict conformance to the provisions of the Technical Specification.</p> <p>i) Drawings shall include all installations and detailed piping layout drawings. Layout drawings for all piping of 65 mm and larger diameter shall be submitted for review/ approval of Employer prior to erection. Small diameter pipes shall however be routed as per site conditions in consultation with site authority/ representative of Employer based on requirements of such piping indicated in approved/ finalised Flow Scheme/ Process & Instrumentation Diagrams and/or the requirements cropping up for draining & venting of larger diameter piping or otherwise after their erection as per actual physical condition for the entire scope of work of this package.</p>			
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	<p>Assessing & anticipating the requirement and supply of all piping and equipment shall be done by the contractor well in advance so as not to hinder the progress of piping & equipment erection, subsequent system charging and its effective draining & venting arrangement as per site suitability.</p> <p>j) As Built Drawings</p> <p>After final acceptance of individual equipment / system by the Employer, the Contractor will update all original drawings and documents for the equipment / system to “as built” conditions and submit no. of copies as per Annexure VI.</p> <p>k) Drawings must be checked by the Contractor in terms of its completeness, data adequacy and relevance with respect to Engineering schedule prior to submission to the Employer. In case drawings are found to be submitted without proper checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission. The contractor shall make a visit to site to see the existing facilities and understand the layout completely and collect all necessary data/ drawings at site which are needed as an input to the engineering. The contractor shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well as interface engineering & integration of systems, facilities, equipment & works under Employer's scope and submit all necessary drawings/ documents for the same.</p> <p>l) The Contractor shall submit adequate prints of drawing / data / document for Employer's review and approval. The Employer shall review the drawings and return soft copy to the Contractor authorizing either to proceed with manufacture or fabrication or marked to show changes desired. When changes are required, drawings shall be re-submitted promptly, with revisions clearly marked, for final review. Any delays arising out of the failure of the Contractor to submit/rectify and resubmit in time shall not be accepted as a reason for delay in the contract schedule.</p> <p>m) All engineering data submitted by the Contractor after final process including review and approval by the Project Manager/ Employer shall form part of the contract documents and the entire works covered under these specification shall be performed in strict conformity with technical specifications unless otherwise expressly requested by the Project Manager in writing.</p>			
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<p>8.03.05</p> <p>8.03.05.01</p> <p>8.03.05.02</p> <p>8.03.05.03</p>	<p>e-Learning Package:</p> <p>e-learning packages shall be supplied for the equipment / system for the following Steam Turbine Generator & auxiliaries and Steam Generator & auxiliaries along with associated electrical and C&I system.</p> <p>Steam Turbine Generator & Auxiliaries</p> <p>Steam Turbine including stop valves, control valves, overload valves and cross over piping. Steam Turbine Auxiliary Systems including Quick Closing and Ordinary NRVs, Turbine gland sealing system, Lubricating oil system and its purification system, Centralized oil storage and its purification system, Control fluid and its purification system, governing and protection system, exhaust hood spray cooling system, drainage and vent system, turbine preservation system, HP/LP Bypass system.</p> <p>Generator and Auxiliary System including Generator, complete hydrogen cooling, carbon dioxide and nitrogen gas systems as applicable, complete seal oil system, complete water cooling system where applicable and complete excitation system.</p> <p>Condensing Plant including Condenser, Condenser air evacuation system and Condenser on load tube cleaning system as applicable etc.</p> <p>Drip Pump along with all accessories as applicable, Condensate Extraction Pumps along with all accessories, Deaerator level Control Station, Feed Water Heating Plant including Drain Cooler, low pressure heaters, deaerator and feed storage tank, high pressure heaters and associated accessories, Boiler Feed Pumps along with all accessories, Drive Turbine for Boiler Feed Pump along with all accessories, Feed regulating station, Make up system to Condenser, Gland Steam Condenser Recirculation System, Turbine Hall EOT Cranes and EOT Crane for Boiler Feed Pump as applicable.</p> <p>Steam Generator & Auxiliaries</p> <p>Furnace/evaporator, separator & drain collection vessel, superheater, reheater, economiser, startup recirculation & drain system, desuperheating spray system, safety valves, soot blowing system, draft plant including FD & ID fans, PA fan, air preheaters, SCAPH, coal preparation and firing system including raw coal feeder and pulverisers, coal burners, fuel oil system and oil burners, Electrostatic precipitator, NOx control system and Flue gas desulphurisation system, Aux. PRDS system.</p> <p>These packages shall be installed on the Learning Management Server (LMS) of Power Management Institute (PMI), NTPC located at Noida. The Engineer- In-Charge (EIC) for the e-learning modules shall be from PMI.</p> <p>1. The objective of the e-Learning package consisting of courses for erection, commissioning, operation and maintenance of equipment / system as specified</p>			
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	<p>above is to facilitate the employees to have first hand information / requirement with respect to above activities for the supplied equipment / system .</p> <p>2. The bidder shall submit e-learning courses each for erection, commissioning, operation and maintenance of each of the equipment / system supplied as above.</p> <p>a. The erection course(s) should include instructions on pre-checks, prerequisites, erection strategy, erection procedure etc.</p> <p>b. The commissioning course(s) should include instructions on pre-commissioning, commissioning, initial operation etc.</p> <p>c. The operation course(s) should include instructions on the permissive, interlocks, physical check-ups, start-up, shutdown and protections etc.</p> <p>d. The maintenance course(s) should include instructions on predictive, preventive, breakdown and overhauling.</p> <p>Depth of coverage of above courses shall be as specified for “Instruction Manuals” in above clauses. A literature on caution / safety while handling equipment / system for the above modules shall follow the description of the said equipment /system.</p> <p>3. The e-Learning packages on equipment / system shall be installed by the vendor and shall be successfully test run in the presence of EIC or representative before acceptance by NTPC. The vendor will also give the master copy in form of Flash Drive/CD/DVD. The respective module for erection & commissioning shall be delivered and successfully test run at least three months before the scheduled start of the corresponding activity at site.</p> <p>The respective module for operation & maintenance shall be delivered and successfully test run at least three months before scheduled first synchronization of first unit.</p> <p>4. e-Learning course broad requirements:</p> <p>a. The courses shall be web based and mobile based Application type. It shall run on all possible versions of web browser like Internet Explorer, Google Chrome, Firefox etc. on Laptop/Desktop and shall be Smartphone/Tablet/Mobile responsive. The Mobile responsive courses shall run on Android, Windows Mobile, Blackberry, iOS etc.</p> <p>b. The courses shall support liquid/fluid page layout so that the entire screen gets adjusted to PC, Laptop, Smartphone/Mobile, Tablet and any other display devices.</p> <p>c. Course content text shall be in English language and be associated with a voiceover in English language with Indian accent.</p>			
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	<p>d. Courses shall be SCORM (Sharable Content Object Reference Model) compliant, version 1.2 which is compatible with LMS at PMI.</p> <p>e. Each course shall have every physical and functional detail of the equipment / system supplied.</p> <p>f. Each of the e-Learning course shall be based on multiple web pages and mobile pages with multiple modules.</p> <p>g. There shall be option for self-assessment test after every course. In case the user doesn't opt for self-assessment test the user shall be able to go to the next course. There shall be no restriction in no. of times for repeating the assessments. All correct answers along with the answers marked by the users shall be displayed at the end of test/quiz.</p> <p>h. If Java and Flash, as applicable are not available in the system to run the package, then there shall be a prompt message for updation of the same.</p> <p>i. Each course shall have a self-running interactive content with navigation buttons containing forward, backward, pause, bookmark and menu options in the course window.</p> <p>j. The course shall contain chapter titled 'Introduction/overview' that explains the purpose of the course.</p> <p>k. The course content shall contain descriptive text shall be factual, specific, terse, clearly worded, and simply illustrative, so that the user can understand it.</p> <p>l. The system shall provide the user with the ability to select the information with a Cursor.</p> <p>m. The course menu should contain table of content linked to concerned pages. The user shall be given the capability to access all of the functions available on the system through a menu system. This shall consist of active buttons, which shall control a hierarchy of pull down/pop-up menus. Menu shall appear quickly and exist only while a selection is being made. The user shall be given the capability to position the cursor or pointer on the menu item and use pointer device such as mouse to activate the function.</p> <p>n. Every course shall contain the 3D design/drawing/exploded view/360° turn around view of the equipment/system, textual description of the equipment/system and its functionality with video (as applicable), animation and audio.</p> <p>o. The users shall be able to control audio sound level associated with the courses.</p> <p>p. Drawings / text in the courses shall be scalable (Zoom In/ Out).</p> <p>q. The user shall have the capability to record a bookmark to mark displayed information for later recall, whenever he accesses the same course next time.</p>			
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<p>8.04.00</p> <p>8.05.00</p> <p>8.05.01</p>	<p>Notes:</p> <ol style="list-style-type: none"> 1. e-learning Package of an equipment / system shall include e-learning courses for each of erection, commissioning, operation and maintenance of that equipment / system. 2. e-learning courses on erection, commissioning, operation and maintenance of an equipment / system shall include e-learning lessons/chapters/modules (as required) for erection, commissioning, operation and maintenance respectively of that equipment / system. 3. The vendor shall get the approval of one sample course from EIC before proceeding for further courses. <p>Provision for Fail Safe operation of vital Equipments</p> <p>All the Plant and equipments / Systems supplied under the contract shall be designed following “Fail Safe” concept. In case of failure of Power supply like Electric power, Hydraulic pressure, Pneumatic pressure, Vacuum etc. the system should be designed in such a way that the equipment/Valves/dampers etc. shall always move/remains (as applicable) to safest position as per system requirement to ensure safety of Man and Machinery.</p> <p>Engineering Co-ordination Procedure</p> <p>The following principal coordinators will be identified by respective organizations at time of award of contract:</p> <p>NTPC Engineering Coordinator (NTPC EC):</p> <p>Name : _____</p> <p>Designation : _____</p> <p>Address : _____</p> <p>a) Postal : _____</p> <p>b) Telegraphic / e-Mail : _____</p> <p>c) FAX : _____ TELEPHONE : _____</p> <p>Contractor’s/ Vendor’s Engineering Coordinator (VENDOR EC):</p> <p>Name : _____</p> <p>Designation : _____</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 22 OF 114</p>	

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8.05.02 8.05.03	<p>Address :</p> <p>a) Postal :</p> <p>b) Telegraphic / e-Mail :</p> <p>c) FAX : TELEPHONE :</p> <p>All engineering correspondence shall be in the name of above coordinators on behalf of the respective organizations.</p> <p>Contractor's/Vendor's Drawing Submission and Approval Procedure:</p> <p>a) All data/information furnished by Vendor in the form of drawings/ documents/catalogues or in any other form for NTPC's information/ interface and or review and approval are referred by the general term "drawings".</p> <p>b) Not used</p> <p>c) All drawings (including those of subvendor's) shall bear at the right hand bottom corner the 'title plate' with all relevant information duly filled in. The Contractor shall furnish this format to his sub-vendor along with his purchase order for sub-vendor's compliance.</p> <p>d) Not used</p> <p>e) The contractor shall make a visit to site to see the existing facilities and understand the layout completely and collect all necessary data / drawings at site which are needed as an input to the engineering. The contractor shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well as interface engineering & integration of systems, facilities, equipment & works under Employer's scope and submit all necessary drawings/ documents for the same.</p> <p>f) Drawings must be checked by the Contractor in terms of its completeness, data adequacy and relevance with respect to engineering schedule prior to submission to the Employer. In case drawings are found to be submitted without proper endorsement for checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission.</p> <p>g) The Contractor shall submit drawing / data / document for Employer's review and approval. The drawings submitted by the Contractor/vendor shall be reviewed by NTPC and their comments shall be forwarded within three (3) weeks of receipt of drawings. Upon review of each drawing, depending on</p>			
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	<p>the correctness and completeness of the drawing, the same will be categorized and approval accorded in one of the following categories:</p> <p>CATEGORY- I: Approved</p> <p>CATEGORY- II Approved, subject to incorporation of comments/ modification as noted. Resubmit revised drawing incorporating the comments.</p> <p>CATEGORY –III Not approved. Resubmit revised drawings for approval after incorporating comments/ modification as noted.</p> <p>CATEGORY -IV For information and records.</p> <p>h) Contractor shall resubmit the drawings approved under Category II, III & IVR within two (2) weeks of receipt of comments on the drawings, incorporating all comments. Every revision of the drawing shall bear a revision index wherein such revisions shall be highlighted in the form of description or marked up in the drawing identifying the same with relevant revision Number enclosed in a triangle (eg. 1, 2, 3 etc). Contractor shall not make any changes in the portions of the drawing other than those commented. If changes are required to be made in the portions already approved, the Contractor shall resubmit the drawing identifying the changes for Employer’s review and approval. Drawings resubmitted shall show clearly the portions where the same are revised marking the relevant revision numbers and Employer shall review only such revised portion of documents.</p> <p>i) In case, the Contractor/ Vendor does not agree with any specific comment, he shall furnish the explanation for the same to NTPC for consideration. In all such cases the Contractor shall necessarily enclose explanations along with the revised drawing (taking care of balance comments) to avoid any delay and/or duplication in review work.</p> <p>j) It is responsibility of the Contractor/ Vendor to get all the drawings approved in the Category I & IV (as the case may be) and complete engineering activities within the agreed schedule. Any delay arising out of submission and modification of drawings shall not alter the contract completion schedule.</p> <p>k) If Contractor/ Vendor fails to resubmit the drawings as per the schedule, construction work at site will not be held up and work will be carried out on the basis of comments furnished on previous issues of the drawing.</p> <p>l) These comments will be taken care by the contractor while submitting the revised drawing.</p>			
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	<p>The contractor shall use a single transmittal for drawings. Submission. This shall include transmittal numbers and date, number of copies being sent, names of the agencies to whom copies being sent, drawing number and titles, remarks or special notes if any etc.</p>			
8.06.00	ENGINEERING PROGRESS AND EXCEPTION REPORT			
8.06.01	<p>The Contractor shall submit every month an Engineering progress and Exception Report giving the status of each engineering information including</p> <p>a) A list of drawings/engineering information which remains unapproved for more than four (4) weeks after the date of first submission</p> <p>b) Drawings which were not submitted as per agreed schedule.</p>			
8.06.02	<p>The draft format for this report shall be furnished to the Employer within four (4) weeks of the award of the contract, which shall then be discussed and finalised with the Employer.</p>			
9.00.00	TECHNICAL CO-ORDINATION MEETING			
9.01.00	<p>The Contractor shall be called upon to organise and attend monthly Design/ Technical Co-ordination Meetings (TCMs) with the Employer/Employer's representatives and other Contractors of the Employer during the period of contract. The Contractor shall attend such meetings at his own cost at NEW DELHI / NOIDA or at mutually agreed venue as and when required and fully co-operate with such persons and agencies involved during the discussions.</p>			
9.02.00	<p>The Contractor should note that Time is the essence of the contract. In order to expedite the early completion of engineering activities, the comments of the Employer shall be discussed across the table during the above Technical Co-ordination Meeting (s) wherein best efforts shall be made by both sides to ensure the approval of the drawing.</p>			
9.02.01	<p>The Contractor shall ensure availability of the concerned experts / consultants/ personnel who are empowered to take necessary decisions during these meetings. The Contractor shall be equipped with necessary tools and facilities so that the drawings/documents can be resubmitted after incorporating necessary changes and approved during the meeting itself.</p>			
9.02.02	<p>Should any drawing remain unapproved for more than six (6) weeks after it's first submission, this shall be brought out in the monthly Engineering Progress and Exception Report with reasons thereof.</p>			
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9.03.0	<p>Any delays arising out of failure by the Contractor to incorporate Employer's comments and resubmit the same during the TCM shall be considered as a default and in no case shall entitle the Contractor to alter the Contract completion date.</p>			
10.00.00	<p>DESIGN IMPROVEMENTS</p> <p>The Employer or the Contractor may propose changes in the specification of the equipment or quality thereof and if the parties agree upon any such changes the specification shall be modified accordingly.</p> <p>If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any changing the price and/or schedule of completion before the Contractor proceeds with the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly.</p>			
11.00.00	<p>EQUIPMENT BASES</p> <p>A cast iron or welded steel base plate shall be provided for all rotating equipment which is to be installed on a concrete base, unless otherwise specifically agreed to by the Employer. Each base plate shall support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units, shall have a raised lip all around, and shall have threaded drain connections.</p>			
12.00.00	<p>PROTECTIVE GUARDS</p> <p>Suitable guards shall be provided for protection of personnel on all exposed rotating and/or moving machine parts. All such guards shall be designed for easy installation and removal for maintenance purpose.</p>			
13.00.00	<p>LUBRICANTS, SERVO FLUIDS AND CHEMICALS</p>			
13.01.00	<p>All the first fill and one year's topping requirement of consumables such as greases, oils, lubricants, servo fluids / control fluids, gases (excluding H₂, CO₂ and N₂ for Generator) etc. which will be required to put the equipment covered under the scope of specifications into successful commissioning/initial operation and to establish completion of facilities shall be supplied by the contractor. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum.</p> <p>Bidder scope shall include supply of H₂, CO₂ and N₂ as applicable for the Generator till successful commissioning of Generator.</p> <p>Bidder shall supply a quantity not less than 10% of the full charge or one (1) year topping requirement mentioned above (Whichever is higher) of each variety of lubricants, servo fluids, gases etc. (as detailed above) used which is expected to be</p>			
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	utilized during the first year of operation. This additional quantity shall be supplied in separate containers.			
13.02.00	<p>As far as possible lubricants marketed by the Indian Oil Corporation shall be used. The variety of lubricants shall be kept to a minimum possible.</p> <p>Detailed specifications for the lubricating oil, grease, gases, servo fluids, control fluids, chemicals etc. required for the complete plant covered herein shall be furnished. On completion of erection, a complete list of bearings/ equipment giving their location and identification marks shall be furnished to the Employer alongwith lubrication requirements.</p>			
14.00.00	LUBRICATION			
14.01.00	Equipment shall be lubricated by systems designed for continuous operation. Lubricant level indicators shall be furnished and marked to indicate proper levels under both standstill and operating conditions.			
15.00.00	MATERIAL OF CONSTRUCTION			
15.01.00	All materials used for the construction of the equipment shall be new and shall be in accordance with the requirements of this specification. Materials utilised for various components shall be those which have established themselves for use in such applications.			
16.00.00	RATING PLATES, NAME PLATES & LABELS			
16.01.00	Each main and auxiliary item of plant shall have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which shall be engraved manufacturer's name, equipment, type or serial number together with details of the ratings, service conditions under which the item of plant in question has been designed to operate, and such diagram plates as may be required by the Employer.			
16.02.00	Each item of plant shall be provided with nameplate or label designating the service of the particular equipment. The inscriptions shall be approved by the Employer or as detailed in appropriate section of the technical specifications.			
16.03.00	Such nameplates or labels shall be of white non-hygroscopic material with engraved black lettering or alternately, in the case of indoor circuit breakers, starters, etc. of transparent plastic material with suitably coloured lettering engraved on the back.			
16.04.00	Items of plant such as valves, which are subject to handling, shall be provided with an engraved chromium plated nameplate or label with engraving filled with enamel. The name plates for valves shall be marked in accordance with MSS standard SP-25 and ANSI B 16.34 as a minimum.			
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16.05.00	<p>Hanger/ support numbers shall be marked on all pipe supports, anchors, hangers, snubbers and restraint assemblies. Each constant and variable spring support shall also have stamped upon it the designed hot and cold load which it is intended to support.</p>			
16.06.00	<p>Valves, steam traps and strainers shall be identified by Employer's tag number of a metal tap permanently attached to non-pressure parts such as the yoke by a stainless steel wire. The direction of flow shall also be marked on the body.</p>			
16.07.00	<p>Safety and relief valves shall be provided with the following:</p> <ol style="list-style-type: none"> a) Manufacturer's identification. b) Nominal inlet and outlet sizes in mm. c) Set pressure in Kg/cm² (abs). d) Blowdown and accumulation as percentage of set pressure. e) Certified capacity in Kg of saturated steam per hour or in case of liquid certified capacity in litres of water per minute. 			
16.08.00	<p>All such plates, instruction plates, etc. shall be bilingual with Hindi inscription first, followed by English. Alternatively, two separate plates one with Hindi and the other with English inscriptions may be provided.</p>			
16.09.00	<p>All segregated phases of conductors or bus ducts, indoor or outdoor, shall be provided with coloured phase plates to clearly identify the phase of the system.</p>			
17.00.00	<p>TOOLS AND TACKLES</p> <p>The Contractor shall supply with the equipment one complete set of all special tools and tackles and other instruments required and other instruments for the erection, assembly, disassembly and proper maintenance of the plant and equipment and systems (including software). These special tools will also include special material handling equipment, jigs and fixtures for maintenance and calibration / readjustment, checking and measurement aids etc. A list of such tools and tackles shall be submitted by the Bidder alongwith the offer.</p> <p>The price of each tool / tackle shall be deemed to have been included in the total bid price. These tools and tackles shall be separately packed and sent to site. The Contractor shall also ensure that these tools and tackles are not used by him during erection, commissioning and initial operation. For this period the Contractor should bring his own tools and tackles. All the tools and tackles shall be of reputed make acceptable to the Employer.</p>			
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18.00.00	WELDING			
18.01.00	If the manufacturer has special requirements relating to the welding procedures for welds at the terminals of the equipments to be performed by others the requirements shall be submitted to the Employer in advance of commencement of erection work.			
19.00.00	COLOUR CODE FOR ALL EQUIPMENTS/ PIPINGS/ PIPE SERVICES			
19.01.00	All equipment/ piping/ pipe services are to be painted by the Contractor in accordance with Employer's standard colour coding scheme, which will be furnished to the Contractor during detailed engineering stage.			
20.00.00	PROTECTION AND PRESERVATIVE SHOP COATING			
20.01.00	PROTECTION			
	All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either metallic or a non-metallic protection device. All ends of all valves and piping and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. All primers/paints/coatings shall take into account the hot humid, corrosive & alkaline, subsoil or over ground environment as the case may be. The requirements for painting specification shall be complied with as detailed out in Part-A & B of the Technical Specification.			
20.02.00	PRESERVATIVE SHOP COATING			
	All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall be treated beforehand and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scales, oxides and other coatings and prepared in the shop. The surfaces that are to be finish-painted after installation or require corrosion protection until installation, shall be shop painted as per the requirements covered in the relevant part of the Technical Specification.			
	Transformers and other electrical equipments, if included shall be shop finished with one or more coats of primer and two coats of high grade resistance enamel. The finished colors shall be as per manufacturer's standards, to be selected and specified by the Employer at a later date.			
20.03.00	Shop primer for all steel surfaces which will be exposed to operating temperature below 95 degrees Celsius shall be selected by the Contractor after obtaining specific approval of the Employer regarding the quality of primer proposed to be applied. Special high temperature primer shall be used on surfaces exposed to temperature			
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	<p>higher than 95 degrees Celsius and such primer shall also be subject to the approval of the Employer.</p>			
20.04.00	<p>All other steel surfaces which are not to be painted shall be coated with suitable dust preventive compound subject to the approval of the Employer.</p>			
20.05.00	<p>All piping shall be cleaned after shop assembly by shot blasting or other means approved by the Employer. Lube oil piping or carbon steel shall be pickled.</p>			
20.06.00	<p>Painting for Civil structures and equipment/system covered under this package shall be done as specified under technical requirements on civil works in relevant part of this specifications.</p>			
21.00.00	<p>QUALITY ASSURANCE PROGRAMME</p>			
21.01.00	<p>To ensure that the equipment and services under the scope of contract whether manufactured or performed within the Contractor's works or at his sub-contractor's premises or at the Employer's site or at any other place of work are in accordance with the specifications, the Contractor shall adopt suitable quality assurance programme to control such activities at all points, as necessary. Such programmes shall be outlined by the Contractor and shall be finally accepted by the Employer/authorised representative after discussions before the award of the contract. The QA programme shall be generally in line with ISO-9001/IS-14001. A quality assurance programme of the contractor shall generally cover the following:</p> <ol style="list-style-type: none"> a) His organisation structure for the management and implementation of the proposed quality assurance programme b) Quality System Manual c) Design Control System d) Documentation Control System e) Qualification data for Bidder's key Personnel. f) The procedure for purchase of materials, parts, components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc. g) System for shop manufacturing and site erection control including process controls and fabrication and assembly controls. h) Control of non-conforming items and system for corrective actions. i) Inspection and test procedure both for manufacture and field activities. 			
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	<p>j) Control of calibration and testing of measuring testing equipments.</p> <p>k) System for Quality Audits.</p> <p>l) System for indication and appraisal of inspection status.</p> <p>m) System for authorising release of manufactured product to the Employer.</p> <p>n) System for handling storage and delivery.</p> <p>o) System for maintenance of records, and</p> <p>p) 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 .Formats for the same will be shared along with QA Coordination procedure.</p>				
22.00.00	GENERAL REQUIREMENTS - QUALITY ASSURANCE				
22.01.00	<p>All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme. An indicative programme of inspection/tests to be carried out by the contractor 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 contractor's responsibility to draw up and implement such programme duly approved by the Employer. The detailed Quality Plans for manufacturing and field activities shall be drawn up by the Bidder and will be submitted to Employer for approval. Schedule of finalisation of such quality plans will be finalised before award on enclosed format No. QS-01-QAI-P-1/F3-R0. Monthly progress reports shall be furnished.</p>				
22.02.00	<p>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 Contractor's/ Sub-contractor's/ sub-supplier'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. The Quality Plan shall be submitted on electronic media through C-folders, a web based system of NTPC ERP, for review and approval.</p>				
22.03.00	<p>Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Contractor's "Site Quality Control Organisation", during various stages of site activities starting from receipt of materials/equipment at site.</p>				
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22.04.00	<p>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 Employer's approval without which manufacturer shall not proceed. These approved documents shall form a part of the contract. In these approved Quality Plans, Employer shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of the Employer's Project Manager or his authorised representative and beyond which the work will not proceed without consent of Employer in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Employer along with technical justification for approval and dispositioning.</p>			
22.05.00	<p>The contractor shall submit to the Employer Field Welding Schedule for field welding activities in the format enclosed at Annexure-V. The field welding schedule shall be submitted to the Employer along with all supporting documents, like welding procedures, heat treatment procedures, NDT procedures etc. at least ninety days before schedule start of erection work at site.</p>			
22.06.00	<p>The contractor shall have suitable Field Quality Organization with adequate manpower at Employer's site, to effectively implement the Field Quality Plan (FQP) and Field Quality Management System for site activities. The contractor shall submit the details of proposed FQA setup (organizational structure and manpower) for employer's approval. The FQA setup shall be in place at least one month before the start of site activities.</p>			
22.07.00	<p>No material shall be despatched from the manufacturer's works before the same is accepted by Employer's Project Manager/Authorised representative and duly authorised for despatch by issuance of Material Dispatch Clearance Certificate (MDCC / CHP Clearance).</p>			
22.08.00	<p>All material used for equipment manufacture including casting and forging etc. shall be of tested quality as per relevant codes/standards. Details of results of the tests conducted to determine the mechanical properties; chemical analysis and details of heat treatment procedure recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and/or agreed details</p>			
22.09.00	<p>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 Employer.</p> <p>All welding/brazing procedures shall be submitted to the Employer or its authorized representative prior to carrying out the welding/brazing.</p>			
22.10.00	<p>All brazers, welders and welding operators employed on any part of the contract either in Contractor's/his sub-contractor's works or at site or elsewhere shall be</p>			
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	<p>qualified as per ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the Employer. All welding / brazing procedures qualified / used at shop, will be made available to NTPC during audit / inspection. Procedures to be qualified at site will be submitted to NTPC for approval.</p>			
22.11.00	Not Used.			
22.12.00	<p>For all IBR pressure parts and high pressure piping welding, the latest applicable requirements of the IBR (Indian Boiler Regulations) shall also be essentially complied with. However, other piping shall be as per relevant code. Similarly, any other statutory requirements for the equipment/systems shall also be complied with. On all back-gauged welds MPI/LPI shall be carried before seal welding</p>			
22.13.00	<p>All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.</p>			
22.14.00	<p>No welding shall be carried out on cast iron components for repair.</p>			
22.15.00	<p>Unless otherwise proven and specifically agreed with the Employer, welding of dissimilar materials and high alloy materials shall be carried out at shop only.</p>			
22.16.00	<p>All non-destructive examination shall be performed in accordance with written procedures as per International Standards, The NDT operator shall be qualified as per SNT-TC-IA (of the American Society of non-destructive examination). NDT shall be recorded in a report, which includes details of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job.</p>			
22.17.00	<p>In general all plates of thickness greater than 40mm & for pressure parts plates of thickness equal to or greater than 25mm shall be ultrasonically tested otherwise as specified in respective equipment specification. All bar stock/Forging of diameter equal to or greater than 40 mm shall be Ultrasonically tested.</p>			
22.17.00	<p>The Contractor shall list out all major items/ equipment/ components to be manufactured in house as well as procured from sub-contractors (BOI).</p> <p>All the sub-vendors proposed by the Main contractor for procurement of major bought out items including castings, forgings, semi-finished and finished components/equipment etc., list of which shall be drawn up by the Contractor and finalised with the Employer, shall be subject to Employer's approval on enclosed format as Annexure-III.</p> <p>List of NTPC approved sub vendors against similar Pkg/items is attached as Section-VI, Part-B ,Chapter E-60 Indicative sub-vendor list.</p> <p>The contractor's proposal for any new sub vendor for any of the items identified in indicative sub-vendor list shall necessarily be furnished in the sub vendor questionnaire & main Contractor Evaluation report format attached as Annexure- VII with all relevant documents and main contractor's own assessment report</p>			
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	<p>assessed as per their quality management system for NTPC review and acceptance .</p> <p>New sub vendor proposal will only be considered for NTPC review, provided the proposal is received sufficiently in time: 90 days prior to ordering date of a Bought-Out Items/Start of Manufacturing so as not to impede the progress of the contract.</p> <p>Major checks and quality requirements as mentioned below shall necessarily be assessed by main contractor and complied with documentary support in case the same is not the part of their Quality management system.</p> <ol style="list-style-type: none"> i. Duly Filled Main supplier Evaluation Report. ii. Duly Filled Sub-Supplier Questionnaire. iii. Factory Registration Certificate. iv. Overall Organization Chart with Manpower details (Design, Manufacturing, Quality etc.) v. Supply reference list of the Sub-Supplier indicating similar product supply order reference no., customer name, rating of product, date /year of supply, date / year of commissioning. vi. List of Manufacturing Equipment available with sub vendor. vii. List of Testing Equipment available with sub vendor. viii. Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any. ix. Details of Outsourced Manufacturing Processes, if any. x. Quality control exercised during receipt, in-process & final inspection. xi. Compliance of Statutory requirements (As applicable) <p>After first submission of proposal to NTPC , In absence of relevant documents/ Incompleteness of the proposal, The main contractor will be given a period of maximum 10 days to submit the compliance of the NTPC comments. In case of noncompliance it will be presumed that main contractor is not serious about pursuing the proposal & the proposal will be foreclosed.</p> <p>The proposed Sub vendor will be assessed broadly on following criteria</p> <ol style="list-style-type: none"> i) Quality Management System Compliance including raw material/BOI control, traceability & control over outsources process ii) Design Capabilities (As applicable) iii) Manufacturing, Testing & Storage Facility iv) Processing Capabilities v) Supply Experience vi) Safety Aspect <p>In case of major observations or non-compliance observed during sub vendor works visit (Jointly with the main contractor) with respect to the submitted documents, proposed sub vendor will not be considered for acceptance and Main contractor will be solely responsible in such cases.</p> <p>Monthly progress reports on sub-vendor detail. Submission / approval shall be furnished preferably on enclosed format at Annexure-IV. Such vendor approval shall not relieve the contractor from any obligation, duty or responsibility under the contract.</p>			
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22.18.00	<p>For components/equipment procured by the contractors for the purpose of the contract, after obtaining the written approval of the Employer, the contractor's purchase specifications and inquiries shall call for quality plans to be submitted by the suppliers. The quality plans called for from the sub-contractor shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the vendor's quality control organisation, the relevant reference documents/standards used, acceptance level, inspection of documentation raised, etc. Such quality plans of the successful vendors shall be finalised with the Employer and such approved Quality Plans shall form a part of the purchase order/contract between the Contractor and sub-contractor. Within two (2) weeks of the release of the purchase orders /contracts for such bought out items /components, a copy of the same without price details but together with the detailed purchase specifications, quality plans and delivery conditions shall be furnished to the Employer on the monthly basis by the Contractor along with a report of the Purchase Order placed so far for the contract.</p>			
22.19.00	<p>Employer reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor's or their sub-contractor's quality management and control activities. The contractor shall provide all necessary assistance to enable the Employer carry out such audit and surveillance.</p>			
22.20.00	<p>The contractor shall carry out an inspection and testing programme during manufacture in his work and that of his subcontractor's and at site to ensure the mechanical accuracy of components, compliance with drawings, conformance to functional and performance requirements, identity and acceptability of all materials parts and equipment. Contractor shall carry out all tests/inspection required to establish that the items/equipment conform to requirements of the specification and the relevant codes/standards specified in the specification, in addition to carrying out tests as per the approved quality plan.</p>			
22.21.00	<p>Quality audit/surveillance/approval of the results of the tests and inspection will not, however, prejudice the right of the Employer to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Contractor in ensuring complete conformance of the materials/equipment supplied to relevant specification, standard, data sheets, drawings, etc.</p>			
22.22.00	<p>For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.</p>			
22.23.00	<p>Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Employer/ authorised representative.</p>			
22.24.00	<p>Environmental Stress Screening Environmental stress screening test process / procedure for eliminating infant mortile components for DDCMIS / PLC based system & for other systems having</p>			
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22.25.00	<p>substantial electronics components (as determined by employer) like Electronic transmitter, CCTV components, PA systems etc. shall be furnished for NTPC acceptance</p> <p>The Contractor / Sub-contractor shall carry out routine test on 100% item at contractor / sub-contractor's works. The quantum of check / test for routine & acceptance test by employer shall be generally as per criteria / sampling plan defined in referred standards. Wherever standards have not been mentioned quantum of check / test for routine / acceptance test shall be as agreed during detailed engineering stage.</p>			
22.26.00	<p>Software Reliability / Quality Certification</p> <p>Certification from OEM's authorized signatory that software offered with DDCMIS, PLC, CCTV, PA, Pyrometer, CEMS, AAQMS, EQMS, BHMS etc. declaring that the all the offered software(s) had gone through the established software quality test and offered software is not of β-version and offered software is also free from all known bugs as on date of approval of systems documents by NTPC as a part of quality documentation review and approval process during detail engineering.</p>			
23.00.00	<p>QUALITY ASSURANCE DOCUMENTS</p>			
23.01.00	<p>The Contractor shall be required to submit the QA Documentation in soft copies, as identified in respective quality plan with tick (✓) mark.</p>			
23.01.01	<p>Each QA Documentation shall have a project specific Cover Sheet bearing name & identification number of equipment and including an index of its contents with page control on each document.</p> <p>The QA Documentation file shall be progressively completed by the Supplier's sub-supplier to allow regular reviews by all parties during the manufacturing.</p> <p>The final quality document will be compiled and issued at the final assembly place of equipment before despatch. However, soft copies will be furnished not later than two (2) weeks.</p>			
23.02.00	<p>Typical contents of QA Documentation is as below:-</p> <ul style="list-style-type: none"> (a.) Quality Plan (b.) Material mill test reports on components as specified by the specification and approved Quality Plans. (c.) Manufacturer / works test reports/results for testing required as per applicable codes and standard referred in the specification and approved Quality Plans. (d.) Non-destructive examination results /reports including radiography interpretation reports. Sketches/drawings used for indicating the method of traceability of the radiographs to the location on the equipment. 			
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<p>23.03.00</p> <p>23.04.00</p>	<p>(e.) Heat Treatment Certificate/Record (Time- temperature Chart)</p> <p>(f.) All the accepted Non-conformance Reports (Major/Minor)/deviation, including complete technical details / repair procedure).</p> <p>(g.) CHP / Inspection reports duly signed by the Inspector of the Employer and Contractor for the agreed Customer Hold Points.</p> <p>(h.) Certificate of Conformance (COC) wherever applicable.</p> <p>(i.) MDCC</p> <p>Similarly, the contractor shall be required to submit soft copies containing QA Documentation pertaining to field activities as per Approved Field Quality Plans and other agreed manuals/ procedures, prior to commissioning of individual system.</p> <p>Before despatch / commissioning of any equipment, the Supplier shall make sure that the corresponding quality document or in the case of protracted phased deliveries, the applicable section of the quality document file is completed. The supplier will then notify the Inspector regarding the readiness of the quality document (or applicable section) for review.</p> <p>(a.) If the result of the review carried out by the Inspector is satisfactory, the Inspector shall stamp the quality document (or applicable section) for release.</p> <p>(b.) If the quality document is unsatisfactory, the Supplier shall endeavor to correct the incompleteness, thus allowing to finalize the quality document (or applicable section) by time compatible with the requirements as per contract documents. When it is done, the quality document (or applicable section) is stamped by the Inspector.</p> <p>(c.) If a decision is made for despatch, whereas all outstanding actions cannot be readily cleared for the release of the quality document by that time, the supplier shall immediately, upon shipment of the equipment, send a copy of the quality document Review Status signed by the Supplier Representative to the Inspector and notify of the committed date for the completion of all outstanding actions & submission. The Inspector shall stamp the quality document for applicable section when it is effectively completed. The submission of QA documentation package shall not be later than two (2) weeks after the despatch of equipment.</p>			
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23.05.00	<p>TRANSMISSION OF QA DOCUMENTATION</p> <p>On release of QA Documentation by Inspector, one set of quality document shall be forwarded to Corporate Quality Assurance Department and other set to respective Project Site of Employer.</p> <p>For the particular case of phased deliveries, the complete quality document to the Employer shall be issued not later than two (2) weeks after the date of the last delivery of equipment.</p>			
24.00.00	<p>PROJECT MANAGER'S SUPERVISION</p>			
24.01.00	<p>To eliminate delays and avoid disputes and litigation, it is agreed between the parties to the Contract that all matters and questions shall be referred to the Project Manager and without prejudice to the provisions of 'Arbitration' clause in Section GCC, the Contractor shall proceed to comply with the Project Manager's decision.</p>			
24.02.00	<p>The work shall be performed under the supervision of the Project Manager.</p> <p>The scope of the duties of the Project Manager pursuant to the Contract, will include but not be limited to the following:</p> <ul style="list-style-type: none"> (a.) Interpretation of all the terms and conditions of these documents and specifications (b.) Review and interpretation of all the Contractor's drawing, engineering data, etc. (c.) Witness or his authorised representative to witness tests and trials either at the manufacturer's works or at site, or at any place where work is performed under the contract (d.) Inspect, accept or reject any equipment, material and work under the contract (e.) Issue certificate of acceptance and/or progressive payment and final payment certificates (f.) Review and suggest modifications and improvement in completion schedules from time to time, and (g.) Supervise Quality Assurance Programme implementation at all stages of the works. 			
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25.00.00	INSPECTION, TESTING AND INSPECTION CERTIFICATES			
25.01.00	<p>The word 'Inspector' shall mean the Project Manager and/or his authorised representative and/or an outside inspection agency acting on behalf of the Employer to inspect and examine the materials and workmanship of the works during its manufacture or erection.</p>			
25.02.00	<p>The Project Manager or his duly authorised representative and/or an outside inspection agency acting on behalf of the Employer shall have access at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Project Manager and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.</p>			
25.03.00	<p>The Contractor shall give the Project Manager/Inspector fifteen (15) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the Inspector's. The Project Manager/Inspector, unless the witnessing of the tests is virtually waived and confirmed in writing, will attend such tests within fifteen (15) days of the date on which the equipment is noticed as being ready for test/inspection failing which the contractor 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 two (2) copies.</p>			
25.04.00	<p>The Project Manager or Inspector shall within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Contractor, 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 Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall inform in writing to the Project Manager/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.</p>			
25.05.00	<p>When the factory tests have been completed at the Contractor's or subcontractor's works, the Project Manager /Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Project Manager /Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Project Manager /Inspector. Failure on the part of Project Manager /Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests or the issue of the certificates shall not bind the Employer to accept the equipment should it, on further tests after erection be found not to comply with the contract.</p>			
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25.06.00	<p>In all cases where the contract provides for tests whether at the premises or works of the Contractor or any sub-contractor, the Contractor, except where otherwise specified shall provide free of charge such items as labour, material, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Project Manager /Inspector or his authorised representatives to carry out effectively such tests on the equipment in accordance with the Contractor and shall give facilities to the Project Manager/Inspector or to his authorised representative to accomplish testing.</p>			
25.07.00	<p>The inspection by Project Manager / Inspector and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the contract.</p>			
25.08.00	<p>To facilitate advance planning of inspection in addition to giving inspection notice as specified at clause no. 25.03.00 - of this chapter, the Contractor 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.</p>			
25.09.00	<p>All inspection, measuring and test equipment used by contractor shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Contractor shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by NTPC. Wherever asked specifically, the contractor shall re-calibrate the measuring/test equipment in the presence of Project Manager / Inspector.</p>			
25.10.00	<p>ASSOCIATED DOCUMENT FOR QUALITY ASSURANCE PROGRAMME</p>			
25.10.01	<p>List of items requiring quality plan and sub supplier approval. Format No.: QS-01-QAI-P-01/F3-R0 (Annexure-III).</p>			
25.10.02	<p>Status of items requiring Quality Plan and sub supplier approval. Format enclosed at Annexure-IV.</p>			
25.10.03	<p>Field Welding Schedule Format enclosed at Annexure-V.</p>			
25.11.00	<p>TESTING OF MAJOR DESIGN FEATURES:</p> <p>The major design features of the system shall be demonstrated by the Contractor at the Contractor's works or any other place mutually agreed within Six months from the date of LOA. These are the system function tests, which have a major impact on the detailed system design & finalization of important engineering documents like configuration, functional grouping, BOM etc., but do not require a fully engineered system for conductance. Bidder shall identify these features & include detailed test procedures in the bid, which shall be finalized during discussions with the bidder</p>			
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25.12.00 25.12.01	<p>before award. The developments and any augmentation of standard features undertaken by the Bidder to fulfill the various specification requirements, shall be also be tested during these major design tests. This shall include but not be limited to the following.</p> <ul style="list-style-type: none"> a) System accuracy tests of DDCMIS for the various type of inputs identified in Part-B. b) Loop reaction time for sample loops/ logics. c) SOE functionality tests. d) Server changeover. e) Various response times, having serious implication on operation & maintenance philosophy. f) Duty cycle of controller/ HMIPIS with simulated load, representative of the final engineered load. g) Connectivity of Switchgear DDCMIS with Switchgear Relay Network. <p>The results of the above tests, after its acceptance by the Employer, shall be properly documented and submitted to Employer.</p> <p>If any of the envisaged tests have been carried out by Bidder in a previous NTPC project, then the same need not be specifically conducted by the Bidder for this project, provided it is clearly established by the Bidder & accepted by the Employer that there is no difference between the system offered for this project & the previous NTPC project with respect to the test. However, even in such a case, test report of the previous project shall be submitted by the Bidder as a part of MDFT (Major Design Feature Test) test report.</p> <p>DEMONSTRATION OF APPLICATION ENGINEERING</p> <p>Contractor shall prepare and submit typical implemented scheme in their system (Control system & HMI) on sample basis. The typical cases to be covered shall include but not be limited to the following.</p> <ul style="list-style-type: none"> (i) Logics/Loops: <ul style="list-style-type: none"> a) Drive logics implementation for each type of binary drive along with its display in HMI. b) Sequence implementation along with its display in HMI. 			
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<p>25.12.02</p> <p>25.12.03</p> <p>26.00.00</p> <p>26.01.00</p>	<p>c) Single non-cascade controller implementation.</p> <p>d) Cascade loop implementation.</p> <p>e) Master slave implementation with different slave combination.</p> <p>f) Temperature & pressure compensation for flow signals & pressure compensation for level signals as applicable.</p> <p>(ii) HMI Functions:</p> <p>a) LVS Annunciation.</p> <p>b) Graphics.</p> <p>c) HSR</p> <p>d) Logs/Reports.</p> <p>e) Calculations (Basic & Performance Calculations).</p> <p>The above typical cases shall be finalized with the Employer through Technical Co-ordination meetings.</p> <p>After review and finalization of the typical cases, the implementation of each logic & control loop shall be carried out by the Contractor. After implementation of these logics & loops, the Contractor shall test each logic /loop and record the observations and demonstrate to Employer at Employer premises during engineering finalization. Any modifications as a result of the demonstration shall be done and documented as part of the test report along with the final scheme. Similarly, HMI functions shall also be demonstrated by the Contractor at Employer premises & the results shall be documented as part of test report.</p> <p>During the integrated testing at the Contractor's works, only sample checks shall be done by the Employer for the items covered in above application engineering demonstration.</p> <p>PRE-COMMISSIONING AND COMMISSIONING FACILITIES</p> <p>(a) As soon as the facilities or part thereof has been completed operationally and structurally and before start-up, each item of the equipment and systems forming part of facilities shall be thoroughly cleaned and then inspected jointly by the Employer and the Contractor for correctness of and completeness of facility or part thereof and acceptability for initial pre-commissioning tests, commissioning and start-up at Site. The list of pre-commissioning tests to be performed shall be as mutually agreed and</p>	<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p> <p>PAGE 42 OF 114</p>

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26.01.00	<p>included in the Contractor's quality assurance programme as well as those included in Part-D, Section-VI and elsewhere in the Technical Specifications.</p> <p>(b) The Contractor's pre-commissioning/ commissioning/start-up engineers, specially identified as far as possible, shall be responsible for carrying out all the pre-commissioning tests at Site. On completion of inspection, checking and after the pre-commissioning tests are satisfactorily over, the commissioning of the complete facilities shall be commenced during which period the complete facilities, equipments shall be operated integral with sub-systems and supporting equipment as a complete plant.</p> <p>(c) All piping system shall be flushed, steam blown, air blown as required and cleanliness demonstrated using acceptable industry standards. Procedures to accomplish this work shall be submitted for approval to the Employer six months prior to the respective implementations. The Employer will approve final verification of cleanliness.</p> <p>(d) The time consumed in the inspection and checking of the units shall be considered as a part of the erection and installation period.</p> <p>(e) The check outs during the pre-commissioning period should be programmed to follow the construction completion schedule. Each equipment/system, as it is completed in construction and turned over to Employer's commissioning (start-up) Engineer(s), should be checked out and cleaned. The checking and inspection of individual systems should then follow a prescribed schedule to be agreed by Employer.</p> <p>(f) The Contractor during initial operation and performance testing shall conduct vibration testing to determine the 'base line' of performance of all plant rotating equipment. These tests shall be conducted when the equipment is running at the base load, peak load as well as lowest sustained operating condition as far as practicable.</p> <p>Contractor shall furnish the commissioning organization chart for review & acceptance of employer at least eighteen months prior to the schedule date of synchronization of 1st unit. The chart should contain:</p> <p>(1.) Biodata including experience of the Commissioning Engineers. (2.) Role and responsibilities of the Commissioning Organisation members. (3.) Expected duration of posting of the above Commissioning Engineers at site.</p>			
26.02.00	<p>Initial Operation</p> <p>(a) On completion of all pre-commissioning activities/ tests and as a part of commissioning the complete facilities shall be put on 'Initial Operation' during which period all necessary adjustments shall be made while operating over the full load range enabling the facilities to be made ready for the Guarantee Tests.</p>			
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26.03.00	<p>(b) The 'Initial Operation' of the complete facility as an integral unit shall be conducted for 720 continuous hours. During the period of initial operation of 720 hours, the unit shall operate continuously at full rated load for a period not less than 72 hours.</p> <p>The Initial Operation shall be considered successful, provided that each item/part of the facility can operate continuously at the specified operating characteristics, for the period of Initial Operation with all operating parameters within the specified limits and at or near the predicted performance of the equipment/ facility.</p> <p>The Contractor shall intimate the Employer about the commencement of initial operation and shall furnish adequate notice to the Employer in this respect.</p> <p>(c) Any loss of generation due to constraints attributable to the Employer shall be construed as Deemed Generation.</p> <p>(d) An Initial Operation report comprising of observations and recordings of various parameters to be measured in respect of the above Initial Operation shall be prepared by the Contractor. This report, besides recording the details of the various observations during initial operation shall also include the dates of start and finish of the Initial Operation and shall be signed by the representatives of both the parties. The report shall have sheets, recording all the details of interruptions occurred, adjustments made and any minor repairs done during the Initial Operation. Based on the observations, necessary modifications/repairs to the plant shall be carried out by the Contractor to the full satisfaction of the Employer to enable the latter to accord permission to carry out the Guarantee tests on the facilities. However, minor defects which do not endanger the safe operation of the equipment, shall not be considered as reasons for with- holding the aforesaid permission.</p> <p>Guarantee Tests</p> <p>a) The final test as to prove the Functional Guarantees shall be conducted at Site by the Contractor in presence of the Employer. The contractor's Commissioning, start-up Engineer shall make the unit ready to conduct such test before start of initial operation. Such test shall be conducted along with the Initial Operations.</p> <p>b) These tests shall be binding on both the parties of the Contract to determine compliance of the equipment with the functional guarantee.</p> <p>c) For performance/ demonstration tests instrumentations, of accuracy class shall be as per specified test codes. The numbers and location of the instruments shall be as per the specified test codes. In addition the values of parameters shall be logged from the information system provided under Employer's Distributed Digital Control Monitoring and Information system. Test will be conducted at specified load points.</p>			
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26.04.00	<p>d) Any special equipment, tools and tackles required for the successful completion of the Guarantee Tests shall be provided by the Contractor, free of cost.</p> <p>e) The Guarantee tests and specific tests to be conducted on equipments have been brought out in detail elsewhere in the specifications.</p> <p>Before start of commissioning of critical equipment, Commissioning Clearance Certificate (CCC) to be submitted by Main contractor. List of the critical equipments and CCC format will be provided along with QA Coordination procedure.</p>			
27.00.00	<p>TAKING OVER</p> <p>Upon successful completion of Initial Operations and all the tests conducted to the Employer's satisfaction, the Employer shall issue to the Contractor a Taking over Certificate as a proof of the final acceptance of the equipment. Such certificate shall not unreasonably be withheld nor will the Employer delay the issuance thereof, on account of minor omissions or defects which do not affect the commercial operation and/or cause any serious risk to the equipment. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of the Contract after issuance of such certificate.</p>			
28.00.00	<p>TRAINING OF EMPLOYER'S PERSONNEL</p>			
28.01.00	<p>The scope of service under training of Employer's engineers shall include a training module covering the areas of Operation & Maintenance.</p> <p>Such training should cover the following areas as a minimum in order to enable these personnel to individually take the responsibility of operating and maintaining the power station in a manner acceptable to the Employer:</p> <p>(a) Training for Steam Generator & ESP Equipment, TG & Auxiliaries and related equipments.</p> <p>(b) Training for Electric Systems including VFD and Electric power supply system.</p> <p>(c) Training for other SG/TG related C&I systems/equipments including training on Flame Monitoring System, Furnace and Flame Viewing System , Turbine Supervisory System (TSS) including vibration analyzer, vibration monitoring system axial shift, eccentricity measurements etc. for Main Turbine, BFP Turbine etc. Burner management study, control loop study, misc. system for SG C&I, EHTC, Turbine stress control system, Turbine protection system, ATRS, instrumentation etc.</p> <p>c1: Training on Engineering, Model building,pre-testing, Post -test fine tuning of Advance process control systems with faculty having experience of atleast 5 years in Model Process Control.</p> <p>(d) Training for special packages specified elsewhere in Technical Specification, Section-VI.</p>			
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- (e) Training for various C&I systems/equipment supplied includes the following:
 - i) DDCMIS - Human Machine Interface – Hardware & Operating System
 - ii) DDCMIS-Human Machine Interface System Engineering & Application Software.
 - iii) DDCMIS – Control System Hardware and Control system Application Software.
 - iv) DDCMIS – Operator Training : Use of the system at Works + at site.
 - v) DDCMIS – Specialized Network security.
- (f) Training for power cycle piping/critical piping.
- (g) Training for UPS systems Annunciation system, SWAS, PA system, flue gas analyzers, CCTV and 24 VDC system.
- (h) Training on following aspects of fieldbus (i) Hardware & Software features (ii) System design, diagnostic and testing (iii) maintenance, troubleshooting and fault analysis.
- (i) Training on Non-Intrusive hardwired Electric Actuator and Fieldbus based Electric Actuator along with detail training on Foundation Fieldbus/ Profibus interface used in actuator
- (k) Training for numerical relays & networking systems supplied under MV & LT switchgear system.
- (l) Training courses on offered PLC system in the following areas:
 - (a.) Operator training
 - (b.) Hardware Maintenance training
 - (c.) Software training
 - (d.) Any other specialized training as required for system operation and maintenance.
- (m) Training for Ash Handling System & Coal Handling Plant Equipment and Auxiliaries

Area	Topics	Mandays
Ash Handling Plant	Product design - Basic design features - Theory & principle of operation - Latest technological trends in Ash handling plant and design Plant Visit - Operational feedback	300

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS								
		<ul style="list-style-type: none"> - O&M history/problems related to Ash handling plant Visit to Manufacturer's Work - Manufacturing process of Ash handling equipments - Testing facilities Operation & Maintenance of Plant - Trouble shooting and fault analysis - Familiarization of special maintenance techniques - Special tool and tackles familiarization 							
	<p style="text-align: center;">Coal Handling Plant</p>	<p>Product design</p> <ul style="list-style-type: none"> - Basic design features - Theory & principle of operation - Latest technological trends in Coal handling plant and design <p>Plant Visit</p> <ul style="list-style-type: none"> - Operational feedback - O&M history/problems related to Coal handling plant Visit to Manufacturer's Work - Manufacturing process of Coal handling equipments - Testing facilities Operation & Maintenance of Plant - Trouble shooting and fault analysis - Familiarization of special maintenance techniques - Special tool and tackles familiarization 	150						
	<p>n) Training for UF Membranes, RO membranes, Zero Liquid Discharge (ZLD) Chlorine Di-Oxide (ClO₂) generation & dosing system, Condensate Polishing Plant (CPU) and CW Treatment System.</p>								
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Area</th> <th style="width: 60%;">Topics</th> <th style="width: 20%;">MANDAYS</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">UF Membranes</td> <td> <p>Product design</p> <ul style="list-style-type: none"> -Basic design features -Theory & principle of operation -Latest technological trends in Ultrafiltration membranes and design -CIP & CEB of UF system <p>Plant Visit</p> </td> <td style="text-align: center; vertical-align: top;">7</td> </tr> </tbody> </table>	Area	Topics	MANDAYS	UF Membranes	<p>Product design</p> <ul style="list-style-type: none"> -Basic design features -Theory & principle of operation -Latest technological trends in Ultrafiltration membranes and design -CIP & CEB of UF system <p>Plant Visit</p>	7		
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TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 47 OF 114						

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS									
	<ul style="list-style-type: none"> -Operational feedback -O&M history/problems related to UF membranes Visit to Manufacturer's Work -Manufacturing process of UF membranes and equipment -Testing facilities Operation & Maintenance of Plant -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization 									
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		एनटीपीसी NTPC
	Zero Liquid Discharge (ZLD)	System Design - Plant water optimization and Scheme to achieve the ZLD - Basic design features - Latest technological trends for ZLD in Thermal Power Plant Plant Visit - Operational feedback - O&M history/problems related to plant	5
	Chlorine Di-Oxide (ClO₂) generation & dosing system	System/Product Design - Basic design features - Theory & principle of operation - Latest technological trends in Chlorine Di-Oxide (ClO ₂) generation & dosing system and design aspects & Selection criteria. Plant Visit - Operational feedback - O&M history/ problems related to ClO ₂ plant Performance Test of generator - Generator capacity performance testing. Operation & Maintenance of Plant -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization	5
	Condensate Polishing Plant (CPU)	System/Product Design - Basic design features including Pre-filters - Theory & principle of operation - Latest technological trends in CPU & Pre-filters and design aspects & Selection criteria. Plant Visit - Operational feedback - O&M history / problems related to CPU plant Visit to Manufacturer's Work -Manufacturing process of pre-filters and major equipment	3
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 49 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS						
		<ul style="list-style-type: none"> -Testing facilities <p>Operation & Maintenance of Plant</p> <ul style="list-style-type: none"> -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization 					
	<p>CW Treatment System</p>	<p>System/Product Design</p> <ul style="list-style-type: none"> - Basic design features - Theory & principle of operation - Latest technological trends and design aspects & Selection criteria. <p>Operation & Maintenance of Plant</p> <ul style="list-style-type: none"> - Operational feedback - O&M history / problems related to plant - Trouble shooting and fault analysis Familiarization of special maintenance techniques - Special tool and tackles familiarization 	<p>3</p>				
<p>Note: One week shall constitute of five (5) man days.</p>							
<p>(o) Training for Substation Automation System</p>							
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<p>MANDAYS: 60 (Total) inclusive of visit to Manufacturer's site)</p>							
<p>(p) Training on Erection methodologies for all the Sub-packages, System and Equipments associated with the EPC Package, including a visit to power plant construction site.</p>							
<p>The exact details, extent and schedule for training shall be as finalized during detailed engineering and shall be subject to Employer's approval.</p>							
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 50 OF 114</p>				

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
28.03.00	<p>The scope of services under training shall also necessarily include training of Employer's Engineering personnel covering entire scope for the package. This shall cover all disciplines viz, Mechanical, Electrical, C&I , QA etc. and shall include all the related areas like Design familiarization, training on product design features and product design software of major equipment and systems, engineering, manufacturing, erection, commissioning, training on operating features of equipment, quality assurance and testing, plant visits and visits to manufacturer's works, exposure to various kinds of problems which may be encountered in fabrication, manufacturing erection, welding etc.</p>			
28.04.00	<p>Contractor shall also arrange for training of Employer's personnel in respect of fire detection and protection systems and other Balance of Plant equipments.</p>			
28.05.00	<p>Contractor shall provide training on application of PAUT (Phased array ultrasonic testing) and TOFD (Time of flight diffraction) techniques for two weeks (at least 80 Hours). The training shall be arranged at least six months prior to the start of erection works of SG & TG works.</p>			
28.06.00	<p>Exact details, extent of training and the training schedule shall be finalized based on the Bidder's proposal within two (2) months from placement of award.</p>			
28.07.00	<p>In all the above cases, the lodging and boarding of the Employer's personnel shall be at the cost of Bidder. The Bidder shall make all necessary arrangements towards the same.</p>			
28.08.00	<p>Take off prices (product wise) should be indicated by the Bidder in the Bid Proposal Sheets. Employer reserves the right to include or exclude these item(s) during placement of Award.</p>			
	<p>Note:</p> <ol style="list-style-type: none"> 1. For training purposes, one (1) man month implies 30 working days (excluding all intervening holidays) per person. 2. The total man months in each area shall be divided into suitable number of modules which shall be discussed and finalized during post award stage. 3. Duration of each module shall not be less than 10 (ten) working days out of which 20 % shall be for plant/manufacturers' works visits and 80% shall be classroom training. 4. A) Location of classroom training for engineering shall be at Design/Engineering office. B) Classroom training for erection/O&M shall be at location of Manufacturers' works. 			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 51 OF 114</p>	

CLAUSE NO.

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28.09.00

TRAINING REQUIRED IN MAN MONTH

Area	Engineering (Man months)	Erection (Man months)	O&M (Man months)
Steam Turbine Generator and its Auxiliaries including electricals	6.5	9.0	23
Steam Generator and its Auxiliaries including electricals	6.5	9.0	23
Station C&I (Control and Instrumentation)	3.5	5.5	10
Ash Handling Plant	2.0	3.0	5.0
Coal Handling Plant	1.0	1.5	2.5
UF Membranes, RO Membranes, ZLD, Chlorine Di Oxide (ClO2) generation & dosing system, Condensate Polishing Plant (CPU), CW Treatment System	0.2	0.3	0.5
Substation Automation System	0.3	0.7	1
Total	20	29	65

29.00.00

SAFETY ASPECTS DURING CONSTRUCTION AND ERECTION

In addition to the requirements given in Erection Conditions of Contract (ECC) the following shall also cover:

- i) Working platforms should be fenced and shall have means of access.
- ii) Ladders in accordance with Employer's safety rules for construction and erection shall be used. Rungs shall not be welded on columns. All the stairs shall be provided with handrails immediately after its erection.

**TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATIONS
SECTION VI, PART-C
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**GENERAL TECHNICAL
REQUIREMENTS**

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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
30.00.00	<p>NOISE LEVEL</p> <p>The equivalent 'A' weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) meter horizontally from the nearest surface of any equipment/machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA except for</p> <ul style="list-style-type: none"> i) Safety valves and associated vent pipes for which it shall not exceed 105 dBA-115 dBA. ii) Regulating drain valves in which case it shall be limited to 90 dBA-115 dBA. iii) Mill noise which will be limited to 85-90 dBA. iv) TG unit in which case it shall not exceed 90 dBA. v) For HP-LP bypass valves and other intermittently operating control valves, the noise level shall be within the limit of 90 dBA. vi) For BFP Motor Noise level shall be within the limit of 90 dBA. 			
31.00.00	<p>PACKAGING, TRANSPORTATION AND STORAGE</p> <p>All the equipments 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. While packing all the materials, the limitation from the point of view of the sizes of railway wagons available in India should be taken account of. The Contractor shall be responsible for any loss or damage during transportation, handling and storage at site due to improper packing and preservation. The Contractor shall ascertain the availability of Railway wagon sizes from the Indian Railways or any other agency concerned in India well before effecting despatch of equipment. Before despatch it shall be ensured that complete processing and manufacturing of the components is carried out at shop, only restricted by transport limitation, in order to ensure that site works like grinding, welding, cutting & preassembly to bare minimum. The Employer's Inspector shall have right to insist for completion of works in shops before despatch of materials for transportation.</p> <p>In addition to above, the contractor shall take all necessary measures for storage of all electronic equipment / systems at site in a dust free Air conditioned space ensuring proper temperature & humidity.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 53 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS																					
32.00.00	ELECTRICAL EQUIPMENTS/ENCLOSURES																					
32.01.00	All electrical equipments and devices, including insulation, heating and ventilation devices shall be designed for ambient temperature and a maximum relative humidity as specified elsewhere in the specifications.																					
33.00.00	INSTRUMENTATION AND CONTROL																					
	All instrumentation and control systems/ equipment/ devices/ components, furnished under this contract shall be in accordance with the requirements stated herein, unless otherwise specified in the detailed specifications.																					
33.01.00	All instrument scales and charts shall be calibrated and printed in metric units and shall have linear graduation. The ranges shall be selected to have the normal reading at 75% of full scale.																					
	<p>All scales and charts shall be calibrated and printed in Metric Units as follows:</p> <table border="0"> <tr> <td>1. Temperature</td> <td>- Degree centigrade (deg C)</td> </tr> <tr> <td>2. Pressure</td> <td>- Kilograms per square centimetre (Kg/cm²). Pressure instrument shall have the unit suffixed with 'a' to indicate absolute pressure. If nothing is there, that will mean that the indicated pressure is gauge pressure.</td> </tr> <tr> <td>3. Draught</td> <td>- Millimetres of water column (mm wc).</td> </tr> <tr> <td>4. Vacuum</td> <td>- Millimeters of mercury gauge (mm Hg) or water column (mm Wcl).</td> </tr> <tr> <td>5. Flow (Gas)</td> <td>- Tonnes/ hour</td> </tr> <tr> <td>6. Flow (Steam)</td> <td>- Tonnes/ hour</td> </tr> <tr> <td>7. Flow (Liquid)</td> <td>- Tonnes / hour</td> </tr> <tr> <td>8. Flow base</td> <td>- 760 mm Hg. 15 deg.C</td> </tr> <tr> <td>9. Density</td> <td>- Grams per cubic centimetre.</td> </tr> </table>				1. Temperature	- Degree centigrade (deg C)	2. Pressure	- Kilograms per square centimetre (Kg/cm ²). Pressure instrument shall have the unit suffixed with 'a' to indicate absolute pressure. If nothing is there, that will mean that the indicated pressure is gauge pressure.	3. Draught	- Millimetres of water column (mm wc).	4. Vacuum	- Millimeters of mercury gauge (mm Hg) or water column (mm Wcl).	5. Flow (Gas)	- Tonnes/ hour	6. Flow (Steam)	- Tonnes/ hour	7. Flow (Liquid)	- Tonnes / hour	8. Flow base	- 760 mm Hg. 15 deg.C	9. Density	- Grams per cubic centimetre.
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33.02.00	All instruments and control devices provided on panels shall be of miniaturized design, suitable for modular flush mounting on panels with front draw out facility and flexible plan-in connection at rear.																					
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 54 OF 114																			

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
34.00.00	<p>ELECTRICAL NOISE CONTROL</p> <p>The equipment furnished by the Contractor shall incorporate necessary techniques to eliminate measurement and control problems caused by electrical noise. Areas in Contractor's equipment which are vulnerable to electrical noise shall be hardened to eliminate possible problems. Any additional equipment, services required for effectively eliminating the noise problems shall be included in the proposal. The equipment shall be protected against ESD as per IEC-61000-2. Radio Frequency interference (RFI) and Electro Magnetic Interference (EMI) protection against hardware damage and control system mal-operations/errors shall be provided for all systems as per EN-50082-2 (1995).</p>			
35.00.00	<p>SURGE PROTECTION FOR SOLID STATE EQUIPMENT</p> <p>All solid state systems /equipment shall be able to withstand the electrical noise and surge as encountered in actual service conditions and inherent in a power plant and shall meet the requirements of surge protection as defined in ANSI C37.90.1-1989 on its suitable equivalent class of IEC 254-4. Details of the features incorporated and relevant tests carried out. The test certificates. etc. shall be submitted by the Bidder.</p>			
36.00.00	<p>INSTRUMENT AIR SYSTEM</p> <p>The instrument air supply system as supplied by the Bidder for various pneumatic control & instrumentation devices like pneumatic actuators, power cylinders, E/P converters, piping / tubing etc.</p> <p>Each pneumatic instrument shall have an individual air shut - off valve. The pressure regulating valve shall be equipped with an internal filter, a 50 mm pressure gauge and a built-in filter housing blow down valve.</p>			
37.00.00	<p>TAPPING POINTS FOR MEASUREMENTS</p> <p>Tapping points shall include probes, wherever applicable, for analytical measurements and sampling.</p> <p>For direct temperature measurement of all working media, one stub with internal threading of approved pattern shall be provided along with suitable plug and washer. The Contractor will be intimated about thread standard to be adopted.</p> <p>The following shall be provided on equipment by the Bidder. The standard which is to be adopted, will be intimated to the Contractor.</p> <ul style="list-style-type: none"> i) Temperature test pockets with stub and thermowell ii) Pressure test pockets 			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>		<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 55 OF 114</p>

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
38.00.00	<p>SYSTEM DOCUMENTATION</p> <p>The Bidder shall provide drawings, system overview & description, hardware/software details, technical literature, functional & hardware schemes, bill of material, parts list, interconnection diagrams, data sheets, erection/ installation/ commissioning procedures, instruction/ operating manuals, etc. for each of the C& I system / sub-systems/ equipment supplied under this package. The documentation shall include complete details of the C&I systems/ sub-systems/ equipment to enable review by Employer during detailed engineering stage and to provide information to plant personnel for operation & Maintenance (including quick diagnostics & trouble shooting) of these C&I systems/ sub-systems/ equipment at site. The minimum documentation requirements for C&I systems shall be as stipulated under C&I "Technical Data Sheets" Part of specifications. In addition to this, system documentation for DDCMIS shall include as a minimum to that specified elsewhere in the Technical Specification.</p> <p>The exact format, submission schedule and contents of various documents shall be as finalised during detailed engineering stage.</p>			
38.01.00	<p>Bill of material (instrument list) for all C&I equipment/ devices shall be furnished by the bidder in standard formats as approved by the Employer.</p>			
39.00.00	<p>MAINTENANCE MANUALS OF ELECTRONIC MODULES</p> <p>The Contractor shall have to furnish two (2) sets of all maintenance manual of each and every electronic card/module as employed on the various systems and equipment including peripherals etc., offered by him. The Contractor will also have to furnish the data regarding the expected failure rate of various modules and other system components. Further, the contractor shall furnish a set of operating manuals which should include block diagrams, make, model/type, details wiring and external connection drawings etc. as required to do the testing and maintenance of the electronic modules.</p> <p>Backup & Restoration Procedures of DDCMIS, Station LAN & Advance Process Control shall be provided.</p>			
40.00.00	<p>MAKE IN INDIA REQUIREMENTS</p> <p>a) The bidder shall follow Indian laws, regulations and standards. There shall not be any restriction in terms of compliance to codes & standards of foreign origin only. The compliance to equivalent/better Indian as well as other codes & standards, wherever available, shall also be acceptable.</p> <p>b) The technologies/ products offered shall be environmentally friendly, consuming less energy, and safe, energy efficient, durable and long lasting under the prescribed operational conditions.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 56 OF 114</p>	

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<p>c)</p> <p>d)</p> <p>e)</p> <p>f)</p> <p>g)</p> <p>h)</p> <p>i)</p> <p>j)</p>	<p>The bidder/its sub vendor/supplier shall ensure supply of spares, materials and technological support for the entire life of the project.</p> <p>The bidder shall list out the products and components producing Toxic E-waste and other waste as specified. It shall have an Extended Producers Responsibility (EPR) so that after the completion of the lifecycle, the materials are safely recycled/ disposed of by the contractor and for this, the bidder has to establish recycling/disposal unit as specified.</p> <p>The equipment/ material sourced from foreign companies will be tested in accredited labs in India before acceptance wherever such facilities are available. The testing shall be carried out in accordance with MOP extant order/guidelines.</p> <p>The bidder shall have to furnish a certificate regarding cyber security/safety of the equipment/process to be supplied/services to be rendered as safe to connect.</p> <p>All applicable safety requirements shall be met. Regular safety audit shall be carried out by the manufacturer/ supplier.</p> <p>Wherever required, the foreign supplier shall establish fully functional service centers in India and shall keep spares/material locally for future needs of Employer.</p> <p>To protect the security, integrity and reliability of equipment in this package, it is essential to remove vulnerabilities arising out of the possibility of cyber-attack through malware/ Trojans etc. embedded in imported equipments. This requirement shall apply to any item imported for end use or to be used as a component, or as a part in manufacturing, assembling of any equipment or to be used in this package. Contractor shall comply all the requirements of Order No 25-11/6/2018-PG, dated 02/07/2020 (attached as Appendix-I), issued by Ministry of Power, Government of India and its subsequent amendments/revisions. Contractor shall furnish declaration of compliance of MOP order dated 02/07/2020 requirements with dispatch of equipment/ item. Further, Contractor shall furnish back up testing certificates, whenever Employer asks the same.</p> <p>All equipment/materials/parts/items required in this package which are domestically manufactured with sufficient domestic capacity as identified in Annexure-I of MOP order dated 16/11/2021 including its subsequent revisions (copy attached as Appendix-II) shall necessarily be sourced from the class-I local suppliers only as per the extant provisions of the Public Procurement (Preference to Make in India) Orders issued by DPIIT and MoP.</p> <p>Any violation w.r.t Make in India and minimum local content (MLC) requirements as specified shall be sole responsibility of the Bidder.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 57 OF 114</p>	

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Appendix-I

No.25-11/6/2018-PG
 Government of India
 Ministry of Power
 Shram Shakti Bhawan, Rafi Marg, New Delhi – 110001
 Tele Fax: 011-23730264

Dated 02/07/2020

ORDER

Power Supply System is a sensitive and critical infrastructure that supports not only our **national defence, vital emergency services** including health, disaster response, **critical national infrastructure** including classified data & communication services, defence installations and manufacturing establishments, logistics services but also the **entire economy** and the **day-to-day life** of the citizens of the country. Any danger or threat to Power Supply System can have catastrophic effects and has the potential to cripple the entire country. Therefore, the Power Sector is a **strategic and critical sector**.

The vulnerabilities in the Power Supply System & Network mainly arise out of the possibilities of cyber attacks through malware / Trojans etc. embedded in imported equipment. Hence, **to protect the security, integrity and reliability of the strategically important and critical Power Supply System & Network** in the country, the following directions are hereby issued :-

(1) All equipment, components, and parts imported for use in the Power Supply System and Network shall be tested in the country to check for any kind of embedded malware/trojans/cyber threat and for adherence to Indian Standards.

(2) All such testings shall be done in certified laboratories that will be designated by the Ministry of Power (MoP).

(3) Any import of equipment/components/parts from "prior reference" countries as specified or by persons owned by, controlled by, or subject to the jurisdiction or the directions of these "prior reference" countries will require prior permission of the Government of India

(4) Where the equipment/components/parts are imported from "prior reference" countries, with special permission, the protocol for testing in certified and designated laboratories shall be approved by the Ministry of Power (MoP).

This order shall apply to any item imported for end use or to be used as a component, or as a part in manufacturing, assembling of any equipment or to be used in power supply system or any activity directly or indirectly related to power supply system.

This issues with the approval of Hon'ble Minister of State for Power and New & Renewable Energy (Independent Charge).

(Goutam Ghosh)
 Director
 Tel: 011-23716674

To:

1. All Ministries/Departments of Government of India (As per list)
2. Secretary (Coordination), Cabinet Secretariat
3. Vice Chairman, NITI Aayog
4. Comptroller and Auditor General of India
5. Chairperson, CEA
6. CMDs of CPSEs/Chairman of DVC & BBMB/MD, EESL/DG, NPTI/DG, CPRI/DG, BEE/
7. All ASs/JSs/EA, MoP

Copy:

1. PS to Hon'ble PM, Prime Minister's Office
2. PS to Hon'ble MOS(IC) for Power and NRE
3. Sr. PPS to Secretary(Power)

**TALCHER THERMAL POWER PROJECT
 STAGE-III (2X660 MW)
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Appendix-II

No. A-1/2021-FSC-Part(5)
 Government of India
 Ministry of Power

Shram Shakti Bhawan, New Delhi
 Dated: 16th November, 2021

ORDER

Subject: Public Procurement (Preference to Make in India) to provide for Purchase Preference (linked with local content) in respect of Power Sector.

Reference: Department for Promotion of Industry and Internal Trade (DPIIT) Notification No. P-45021/2/2017-PP (BE-II) dated 16.09.2020.

The Government of India, Department for Promotion of Industry and Internal Trade (DPIIT) issued Public Procurement (Preference to Make in India), Order 2017, for encouraging 'Make in India' and promoting manufacturing and production of goods and services in India with a view to enhancing income and employment. Subsequently, DPIIT vide order No. P-45021/2/2017-PP (BE-II) dated 4th June, 2020 and further vide order dated 16th September, 2020 have issued the revised Public Procurement (Preference to Make in India) Order 2017.

2. In light of the Public Procurement (Preference to Make in India) Order 2017, this Ministry had notified purchase preference (linked with local content) for Hydro and Transmission sectors vide Order No. 11/05/2018-Coord dated 20.12.2018, for Thermal sector vide Order dated 28.12.2018 and for Distribution sector vide Order dated 17.03.2020. Further, a combined order dated 04.04.2020 was also issued in supersession of all previous orders to indicate equipment/material/components for which there was sufficient local capacity and competition and also to indicate conditions for including suitably in the tenders to be issued by the procurers. In furtherance of Para 19 of the DPIIT Notification No. P-45021/2/2017-PP(BE-II) dated 04.06.2020, Ministry of Power (MoP) issued a revised comprehensive Order dated 28.07.2020 (Annexure-I amended by order dated 17.09.2020).

3. DPIIT Notification No. P-45021/2/2017-PP(BE-II) dated 16.09.2020 has further revised its order dated 04.06.2020. Therefore, in supersession of all the aforementioned orders including order No.10/1/2019-St.Th. (Part-II) dated 20.03.2020 issued by this Ministry, the following has been decided:

- i. For the purpose of this order, the definitions of various terms used in the order, and provisions relating to (i) Eligibility of 'Class-I local supplier'/'Class-II local supplier'/'Non-local suppliers' for different types of procurement, (ii) purchase preference (iii) exemption to small purchases and (iv) margin of purchase preference shall be the same as in DPIIT order dated 16.09.2020, referred to above and extracts of the same is given at **Appendix**.
- ii. In procurement of all goods and services or works in respect of which there is sufficient local capacity and local competition as in **Annexure-I**, only "Class-I local supplier" shall be eligible to bid irrespective of purchase value. "Class-I local supplier" is a supplier or service provider whose goods, services or works offered for procurement meets the Minimum Local Content (MLC) as prescribed in Annexure-I of this order. "Class-II local supplier" means a

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supplier, as defined by DPIIT in its Order No. P-45021/2/2017-PP (BE-II) dated 16-09-2020.

iii. In the procurement of all goods and services or works other than those listed in Annexure-I, only "Class-I local supplier" and "Class-II local supplier" as defined in the order of this Ministry herewith shall be eligible to bid in procurement undertaken by procuring entities, except when Global Tender Enquiry has been issued. In Global tender enquiries, "Non-local suppliers" shall also be eligible to bid along with "Class-I local suppliers" and "Class-II local suppliers". In procurement of all goods, services or works not covered by sub-para 3(ii) above, and with estimated value of purchases less than Rs. 200 crores, in accordance with Rule 161(iv) of GFR, 2017, Global Tender Enquiry(GTE) shall not be issued except with the approval of the competent authority as designated by Department of Expenditure.

iv. For the purpose of this order, 'Works' means all works as per Rule 130 of GFR- 2017, and will also include 'turnkey works', Engineering, Procurement and Construction (EPC) contracts and service contracts including System Integrator (SI) contracts.

4. The list of items, in respect of which, local capacity with sufficient competition exists as per Annexure-I, will be reviewed at regular intervals with a view to increase number of items in this list and also to increase the MLC for each item, wherever it is less than 100%.

5. Purchase preference shall be given to local suppliers in accordance with para 3A of DPIIT Order dated 16.09.2020, and extracts of the same are given at Appendix.

6. Further, it has been decided to constitute a committee for independent verification of self-declarations and auditor's / accountant's certificates on random basis and in the case of complaints. The composition of the committee is given below:

Member (Planning), Central Electricity Authority (CEA)	Chairperson
Chief Engineer (PSETD), CEA	Member
Chief Engineer (HETD), CEA	Member
Chief Engineer (TETD), CEA	Member
Chief Engineer (DP&R), CEA	Member
As may be co-opted by CEA	External Expert
Chief Engineer (R&D), CEA	Convener

7. Further, it has also been decided to constitute a committee to examine the grievances in consultation with stakeholders and recommend appropriate actions to the Competent Authority in MoP. The composition of the Committee is given below:

Chairperson, CEA	Chairperson
Member (Hydro), CEA	Member



Member (Power System), CEA	Member
Member (Thermal), CEA	Convener

8. The complaint fee of Rs. 2 Lakhs or 1% of the value of the local item being procured (subject to maximum of Rs. 5 Lakhs), whichever is higher, shall be paid in the form of Demand Draft, drawn in favour of **PAO, CEA, New Delhi**. In case the complaint is found to be incorrect, the complaint fee shall be forfeited. In case, the complaint is upheld and found to be substantially correct, the deposited fee of the complainant would be refunded without any interest.

9. All other conditions, not stipulated in this order, shall be as laid down in the DPIIT's order No. P-45021/2/2017-PP (BE-II) dated 16.09.2020.

10. This order shall be applicable in respect of the procurement made by all attached or subordinate offices or autonomous bodies under the Government of India including Government Companies as defined in the Companies Act, and /or the States and Local Bodies making procurement under all Central Schemes/ Central Sector Schemes where the Scheme is fully or partially funded by the Government of India. The aforesaid orders shall also be applicable in respect of projects wherein funding of goods, services or works is by Power Finance Corporation (PFC) /Rural Electrification Corporation (REC) and any Financial Institution in which Government of India/ State Government share exists. This order shall be applicable to Tariff Based Competitive Bidding (TBCB) projects also. Procuring entities as defined in the DPIIT's Order dated 16.09.2020 are advised to revise their tender documents to fully comply with the said DPIIT's Order and the subsequent Orders that would be issued in this regard by DPIIT/ this Ministry from time to time.

11. All tenders for procurement by Central Government Agencies or the States and Local Bodies, as the case may be, have to be certified for compliance of the Public Procurement (Preference to Make in India) 'PPP-MII' Order by the concerned procurement officer of the Government Organization before uploading the same on the portal.

12. Exemption from meeting the stipulated local content is allowed as per clause 13 and 13A of PPP-MII Order dated 16.09.2020, if the manufacturer declares that the item is manufactured in India under a License from a foreign Manufacturer who holds Intellectual Property Rights (IPRs) and there is Transfer of Technology (ToT) with phasing to increase Minimum Local Content. For such items, if any CPSE under the administration of Ministry of Power requests exemption for any item, it shall be considered by Ministry of Power, on case to case basis.

13. In order to further encourage Make in India initiatives and promote manufacturing and production of goods and services in India, general guidelines as enclosed at **Annexure-II** may be adopted in an appropriate manner according to the circumstances by the procuring entities in their tendering process.

14. The procurers may specify the higher values of MLC than those specified in this Order in respect of goods, services or works covered in their tenders and award the weightage to the product of higher MLC for which they have to specify the criteria beforehand in their tender. The values given in Annexure-I are the minimum prescribed values for becoming a class-I local supplier for the products indicated therein.

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15. This issues with the approval of Hon'ble Minister for Power and New & Renewable Energy.

(S. Majumdar)

Under Secretary to the Government of India
Tele No. 011- 23356938

To:

1. Secretary to Government of India (All Ministries/ Departments of Government of India) (As per list)
2. Secretary (Coordination), Cabinet Secretariat
3. CEO, NITI Aayog
4. Chief Secretaries of all States/ UTs
5. Comptroller and Auditor General of India
6. Secretary, DPIIT, Chairman of Standing Committee for implementation of Public Procurement Order, 2017
7. Director General, Bureau of Indian Standards (BIS)
8. Joint Secretary, DPIIT, Member-Convener of Standing Committee for implementation of Public Procurement Order, 2017
9. Chairperson, CEA
10. CMDs of CPSEs, CMD NLC, Chairman of DVC/ BBMB/ EESL, DGs of BEE/ CPRI/ NPTI
11. All Additional Secretaries/ JSs/ EA/ CE, Ministry of Power

Copy to:

Director (Technical), NIC with a request to publish the Order on the website of Ministry of Power

**TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATIONS
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APPENDIX

Extracts of important provisions contained in DPIIT Order No. P-45021/2/2017-PP (BE-II) dated 16-09-2020

1. **Definitions** (Para 2 of DPIIT order):

'Local content' means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value, in percent.

'Class-I local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-I local supplier' under this Order.

'Class-II local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-II local supplier' but less than that prescribed for "Class-I Local supplier" under this Order.

'Non-Local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, has local content less than that prescribed for 'Class-II local supplier' under this Order.

'L1' means the lowest tender or lowest bid or the lowest quotation received in a tender, bidding process or other procurement solicitation as adjudged in the evaluation process as per the tender or other procurement solicitation.

'Margin of purchase preference' means the maximum extent to which the price quoted by a 'Class-I local supplier' may be above the L1 for the purpose of purchase preference.

'Nodal Ministry' means the Ministry or Department identified pursuant to this order in respect of a particular item of goods or services or works.

'Procuring entity' means a Ministry or department or attached or subordinate office of, or autonomous body controlled by, the Government of India and includes Government companies as defined in the Companies Act.

'Works' means all works as per Rule 130 of GFR- 2017, and will also include 'turnkey works'.

2. **Eligibility of 'Class-I local supplier'/ 'Class-II local supplier'/ 'Non-local suppliers' for different types of procurement** (Para 3 of DPIIT order)

(a) In procurement of all goods, services or works in respect of which the Nodal Ministry / Department has communicated that there is sufficient local capacity and local competition, only 'Class-I local supplier', as defined under the Order, shall be eligible to bid irrespective of purchase value.

(b) Only 'Class-I local supplier' and 'Class-II local supplier', as defined under the Order, shall be eligible to bid in procurements undertaken by procuring entities, except when Global tender enquiry has been issued. In global tender enquiries, 'Non-local suppliers' shall also be eligible to bid along with 'Class-I local suppliers' and 'Class-II local suppliers'. In procurement of all goods, services or works, not covered by 3(a) above, and with estimated value of purchases less than Rs 200 crores, in accordance with Rule 161(iv) of GFR, 2017 Global tender enquiry shall not

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	<p>be issued except with the approval of competent authority as designated by Department of Expenditure.</p> <p>(c) For the purpose of this Order, works includes Engineering, Procurement and Construction (EPC) contracts and services include System Integrator (SI) contracts.</p> <p>3. Purchase Preference (Para 3A of DPIIT order)</p> <p>(a) Subject to the provisions of this Order and to any specific instructions issued by the Nodal Ministry or in pursuance of this Order, purchase preference shall be given to 'Class-I local supplier' in procurements undertaken by procuring entities in the manner specified here under.</p> <p>(b) In the procurements of goods or works, which are covered by para 3(b) of DPIIT Order No. P-45021/2/2017-PP(BE-II) dated 16-09-2021 and which are divisible in nature, the " Class-I local supplier" shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:</p> <ol style="list-style-type: none"> i. Among all qualified bids, the lowest bid will be termed as L1 If L1 is 'Class-I local supplier', the contract for full quantity will be awarded to L1. ii. If L1 bid is not a 'Class-I local supplier', 50% of the order quantity shall be awarded to L1. Thereafter, the lowest bidder among the 'Class-I local supplier' will be invited to match the L1 price for the remaining 50% quantity subject to the Class-I local supplier's quoted price falling within the margin of purchase preference, and contract for that quantity shall be awarded to such 'Class-I local supplier' subject to matching the L1 price. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price or accepts less than the offered quantity, the next higher 'Class-I local supplier' within the margin of purchase preference shall be invited to match the L1 price for remaining quantity and so on, and contract shall be awarded accordingly. In case some quantity is still left uncovered on Class-I local suppliers, then such balance quantity may also be ordered on the L1 bidder. <p>(c) In the procurements of goods or works, which are covered by para 3(b) of DPIIT Order No. P-45021/2/2017-PP(BE-II) dated 16-09-2021 and which are not divisible in nature, and in procurement of services where the bid is evaluated on price alone, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:</p> <ol style="list-style-type: none"> iii. Among all qualified bids, the lowest bid will be termed as L1. If L1 is 'Class-I local supplier', the contract will be awarded to L1, iv. If L1 is not 'Class-I local supplier', the lowest bidder among the 'Class-I local supplier', will be invited to match the L1 price subject to Class-I local supplier's quoted price falling within the margin of purchase preference, and the contract shall be awarded to such 'Class-I local supplier' subject to matching the L1 price. v. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price, the 'Class-I local supplier' with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on and contract shall be awarded accordingly. In case none of the 'Class-I local supplier' within the margin of purchase preference matches the L1 price, the contract may be awarded to the L1 bidder. <p>(d) "Class-II local supplier" will not get purchase preference in any procurement, undertaken by procuring entities.</p>			
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	<p>4. Applicability in tenders where contract is to be awarded to multiple bidders (Para 3B of DPIIT order)- In tenders where contract is to be awarded to multiple bidders subject to matching of L1 rates or otherwise, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:</p> <p>a) In case there is sufficient local capacity and competition for the items to be procured, as notified by the Nodal Ministry, only 'Class-I local supplier' shall be eligible to bid. As such, the multiple supplier who would be awarded the contract, should be all and only 'Class-I local suppliers'.</p> <p>b) In other cases, 'Class-II local suppliers' and 'Non-Local suppliers' may also participate in the bidding process along with 'Class-I local supplier' as per provisions of this order.</p> <p>c) If 'Class-I local supplier' qualify for award of contract for at least 50% of the tendered quantity in any tender, the contract may be awarded to all the qualified bidders as per award criteria stipulated in the bid documents. However, in case 'Class-I local supplier' do not qualify for award of the contract for at least 50% of the tendered quantity, purchase preference should be given to the 'Class-I local supplier' over 'Class-II local supplier'/'Non-local suppliers' provided that their quoted rate falls within 20% margin of purchase preference of the highest quoted bidder considered for award of contract so as to ensure that the 'Class-I local suppliers' taken in totality or considered for award of contract for at least 50% of the tendered quantity.</p> <p>d) First purchase preference has to be given to the lowest quoting 'Class-I local supplier', whose quoted rates fall within 20% margin of purchase preference subject to its meeting the prescribed criteria for award of contract as also the constraints of maximum quantity that can be sourced from any single supplier. If the lowest quoting 'Class-I local supplier', does not qualify for purchase preference because of aforesaid constraints or does not accept the offered quantity, an opportunity may be given to next higher 'Class-I local supplier' falling within 20% margin of purchase preference, and so on.</p> <p>e) To avoid any ambiguity during bid evaluation process, the procuring entities may stipulate its own tender specific criteria for award of contract amongst different bidders including the procedure for purchase preference to 'Class-I local supplier' within the broad policy guidelines stipulate in sub-paras above.</p> <p>5. Exemption of small purchases (Para 4 in DPIIT order): Procurements where the estimated value to be procured is less than Rs. 5 lakhs shall be exempt from this Order. However, it shall be ensured by procuring entities that procurement is not split for the purpose of avoiding the provisions of this Order.</p> <p>6. Minimum Local Content (Para 5 in DPIIT order): The 'local content' requirement to categorize a supplier as 'Class-I local supplier' is minimum 50%. For 'Class-II local supplier', the local content requirement is minimum 20%. Nodal Ministry/Department may prescribe only a higher percentage of minimum local content requirement to categorize a supplier as 'Class-I local supplier'/'Class-II local supplier'. For the item for which Nodal Ministry/Department has not prescribed higher minimum local content notification under the order, it shall be 50% and 20% for 'Class-I local supplier'/'Class-II local supplier' respectively.</p>			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 65 OF 114	

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	<p>7. Vide DPIIT OM No. P-45021/102/2019-BE-IIPart(1) (E-50310) dated 4.03.2021 services such as transportation, insurance, installation, commissioning, training and after sales service support like AMC/CMC etc. shall not be considered as local value addition. Bidders offering imported products will fall under the category of Non- local suppliers. They can't claim themselves as Class-I local suppliers/Class-II local suppliers by claiming the services such as transportation, insurance, installation, commissioning, training and after sales service support like AMC/CMC etc. as local value addition.</p> <p>8. Margin of Purchase Preference (<i>Para 6 of DPIIT order</i>): The margin of purchase preference shall be 20%.</p> <p>9. Specifications in Tenders and other procurement solicitations (<i>Para 10 of DPIIT order</i>):</p> <ol style="list-style-type: none"> a. Every procuring entity shall ensure that the eligibility conditions in respect of previous experience fixed in any tender or solicitation do not require proof of supply in other countries or proof of exports. b. Procuring entities shall endeavour to see that eligibility conditions, including on matters like turnover, production capability and financial strength do not result in unreasonable exclusion of 'Class-I local supplier'/ 'Class-II local supplier' who would otherwise be eligible, beyond what is essential for ensuring quality or creditworthiness of the supplier. c. Procuring entities shall, within 2 months of the issue of this Order review all existing eligibility norms and conditions with reference to sub-paragraphs 'a' and 'b' above. d. Reciprocity Clause: <ol style="list-style-type: none"> i. When a Nodal Ministry/Department identifies that Indian suppliers of an item are not allowed to participate and/ or compete in procurement by any foreign government, due to restrictive tender conditions which have direct or indirect effect of barring Indian companies such as registration in the procuring country, execution of projects of specific value in the procuring country etc. it shall provide such details to all its procuring entities including CMDs/CEOs of PSEs/PSUs, State Governments and other procurement agencies under their administrative control and GeM for appropriate reciprocal action. ii. Entities of countries which have been identified by the nodal Ministry/Department as not allowing Indian companies to participate in their Government procurement for any item related to that nodal Ministry shall not be allowed to participate in Government procurement in India for all the items related to that nodal Ministry/Department, except for the list of items published by the Ministry/Department permitting their participation. iii. The stipulation in (ii) above shall be part of all tenders invited by the Central Government procuring entities stated in (i) above. All purchase on GeM shall also necessarily have the above provisions for items identified by nodal Ministry/Department. iv. State Governments should be encouraged to incorporate similar provisions in their respective tenders. v. The term 'entity' of a country shall have the same meaning as under the FDI Policy of DPIIT as amended from time to time. e. Specifying foreign certification/ unreasonable technical specifications/ brands/ models in the bid document is restrictive and discriminatory practice against local 			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 66 OF 114</p>	

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	<p>suppliers. If foreign certification is required to be stipulated because of non-availability of Indian Standards and/ or for any other reason, the same shall be done only after written approval of Secretary of Department concerned or any other authority having been designated such power by the Secretary of the Department concerned.</p> <p>f. "All administrative Ministries/Departments whose procurement exceeds Rs. 1000 Crore per annum shall notify/ update their procurement projections every year, including those of PSEs/PSUs, for the next 5 years on their respective website."</p>			
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Annexure-I

Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficient local capacity and competition	Class-I Local Supplier (Minimum Local Content (%))
(A) Common items for Transmission, Distribution and Generation Sector		
1	Power Transformers (up to 765 kV, including Generator transformers)	60
2	Instrument Transformer (up to 765 kV)	60
3	Transformer Oil Dry Out System (TODOS)	60
4	Reactors up to 765 kV	60
5	Oil Impregnated Bushing (up to 400 kV)	60
6	Resin Insulated Paper (RIP) bushings (up to 145 kV)	50
7	Circuit Breakers (up to 765 kV AC - Alternating Current)	60
8	Disconnectors/Isolators (up to 765 kV AC)	60
9	Wave trap (up to 765 kV AC)	60
10	Oil Filled Distribution Transformers up to & Including 33 kV [Cold Rolled Grain Oriented (CRGO)/Amorphous, Aluminium/Copper wound]	60
11	Dry Type Distribution Transformer upto and including 33 kV (CRGO/Amorphous, Aluminium/Copper wound)	60
12	Conventional Conductor	60
13	Accessories for Conventional conductors	60
14	High Temperature/High Temperature Low Sag (HTLS) conductors (such as Composite core, GAP, ACSS, INVAR, AL59) and Accessories	60
15	Optical ground wire (OPGW) – all designs	60
16	Fiber Optic Terminal Equipment (FOTE) for OPGW	50
17	OPGW related Hardware and Accessories	60
18	Remote Terminal Unit (RTU)	50
19	Power Cables and accessories up to 33 kV	60
20	Control cables including accessories	60
21	XLPE Cables up to 220 kV	60
22	Substation Structures	60
23	Transmission Line Towers	60
24	Porcelain (Disc/Long Rod) Insulators	60
25	Bus Post Insulators (Porcelain)	60
26	Porcelain Disc Insulators with Room Temperature Vulcanisation (RTV) coating	50
27	Porcelain Longrod Insulators with Room Temperature Vulcanisation (RTV) coating	50
28	Hardware Fittings for Porcelain Insulators	60
29	Composite/Polymeric Long Rod Insulators	60
30	Hardware Fittings for Polymer Insulators	60
31	Bird Flight Diverter (BFD)	60
32	Power Line Carrier Communication (PLCC) System (up to 800 kV)	60
33	Gas Insulated Switchgear (up to 400 kV AC)	60
34	Gas Insulated Switchgear (above 400 kV AC)	50
35	Surge/Lightning Arrester (up to 765 kV AC)	60
36	Power Capacitors	60
37	Packaged Sub-station (6.6 kV to 33 kV)	60
38	Ring Main Unit (RMU) (up to 33 kV)	60
39	Medium Voltage (MV) GIS Panels (up to 33 kV)	60
40	Automation and Control System/Supervisory Control and data Acquisition (SCADA) System in Power System	50
41	Control and Relay Panel (including Digital/Numerical Relays)	50
42	Electrical Motors 0.37 kW to 1 MW	60
43	Energy Meters excluding smart meters	50
44	Control & power cables and Accessories (up to 1.1 kV)	60
45	Diesel Generating (DG) set	60



Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficient local capacity and competition	Class-I Local Supplier (Minimum Local Content (%))
46	DC system (DC Battery & Battery Charger)	60
47	AC & DC Distribution Board	60
48	Indoor Air Insulated Switchgear (AIS) upto 33 kV	60
49	Poles (PCC, PSCC, Rolled Steel Joist, Rail Pole, Spun, Steel Tubular)	60
50	Material for Grounding/earthing system	60
51	Illumination system	60
52	Overhead Fault Sensing Indicator (FSI)	50
53	Power Quality Meters	50
54	Auxiliary Relays	50
55	Load Break Switch	50
(B) Hydro Sector		
56	Hydro Turbine & Associated equipment	
	a) Francis Turbine	60
	b) Kaplan Turbine	60
	c) Pelton Turbine	50
57	Main Inlet Valve & Associated Equipment	60
58	Penstock Protection Valve and Associated Equipment	60
59	Governing system & Accessories	60
60	Generator for Hydro Project & Associated Equipment	60
61	Static Excitation System	60
62	Workshop Equipment	60
63	Cooling Water System	60
64	Compressed Air System	60
65	Drainage/Dewatering System	60
66	Fire Protection System	60
67	Heating, Ventilation & Air Conditioning System (HVAC)	60
68	Oil Handling System	60
69	Mechanical Balance of Plant (BOP) Items	60
(C) Thermal Sector		
Boiler Auxiliaries		
70	Air Pre-Heater	60
71	Steam Coil Air Pre Heater (SCAPH)	60
72	Steam soot blowers [wall blowers & Long Retractable Soot Blower (LRSB)]	60
73	Auxiliary Steam Pressure Reducing & Desuperheating (PRDS)	60
74	Fuel oil system	60
75	Seal air Fan	60
76	Ducts and dampers	60
77	Duct expansion joints	60
78	Blowdown tanks	60
79	Coal burners and oil burners	60
80	Coal mills	60
81	Gear Box of Coal Mill	50
82	Coal feeders	60
83	Primary Air Fans	60
84	Forced Draft Fans	60
85	Induced Draft Fans	60
86	Forced Draft (FD)/Induced Draft (ID)/ Primary Air (PA) Fan Servo Motor Assembly	50
87	Tubes (Carbon Steel)	50
88	Steam pipes (Carbon Steel)	50
89	Steam drum	50
90	Separator	50
91	Selective Catalytic Reduction (SCR)	50



Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficient local capacity and competition	Class-I Local Supplier (Minimum Local Content (%))
	Electro-Static Precipitators (ESPs)	
92	Casing	60
93	Electrodes	60
94	Rapping System	60
95	Hopper Heaters	60
96	Transformer Rectifiers	60
97	Insulators	60
	Turbine & Auxiliaries	
98	Turbine (High Pressure/Intermediate Pressure/Low Pressure)	50
99	Condensate Extraction Pumps	60
100	Condenser On line Tube Cleaning System (COLTC)	60
101	Debris filters	60
102	Deaerator	60
103	Drain Cooler and Flash Tank	60
104	ECW Pump	50
105	Plate Heat Exchanger	50
106	Self-cleaning filters	50
107	Condensate Polishing Units (CPUs)	60
108	Chemical Dosing System	60
109	Oil Filter	60
110	Gland Steam Condenser	60
111	Oil Purifying Centrifuge	50
112	Water Cooled Condenser	50
113	Boiler Feed Pumps (BFPs)	50
	Generator and Auxiliaries	
114	Generator (including Seal Oil System, Hydrogen Cooling System, Stator water cooling system)	60
	Electrical Works	
115	Control and metering equipment	60
	Control & Instrumentation System (C&I System)	
116	Thermocouples	50
117	Measuring instruments [Resistance Temperature Detectors (RTDs)], Local gauges	50
118	Actuators (Pneumatic and conventional electric)	50
119	Interplant Communication/ Public Address (PA) system except IP based	50
	Coal Handling Plant	
120	Conveyors	60
121	Wagon Tippler	60
122	Side Arm Charger	60
123	Paddle feeder	60
124	Crushers & Screens	60
125	Dust suppression (dry fog & plain water) system	60
126	Air Compressors	50
127	Magnetic separators & metal detectors	60
128	Coal Sampling System	60
129	Stacker cum reclaimers	60
130	Belt weighing & monitoring system.	60
131	Wheel & axle assembly (without bearings) for Bottom Opening Bottom Release (BOBR) Wagons	60
	Ash Handling System	
132	Clinker grinder	60
133	Water jet ejectors	60
134	Scrapper chain conveyor	60
135	Dry fly ash vacuum extraction system	60
136	Pressure pneumatic conveying system	60



Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficient local capacity and competition	Class-I Local Supplier (Minimum Local Content (%))
137	Ash water & ash slurry pumps	60
138	Compressors, air dryers & air receivers	50
139	Ash water recovery system	60
Raw Water Intake & Supply System		
140	Travelling water screens	60
141	Raw water supply pumps	60
142	Valves, RE joints etc.	60
Water Treatment System and Effluent Treatment System		
143	Clarification plant	60
144	Filtration plant	60
145	Ultra filtration plant	50
146	Reverse Osmosis (RO) plant and its membrane	55
147	De-Mineralised water plant (DM Plant)	60
148	Chlorination plant	60
149	Chemical dosing system	60
150	Effluent Treatment Plant	60
Circulating Water (CW) & Auxiliary Circulating Water (ACW) System		
151	CW & ACW Pumps	60
152	Butter Fly (BF) valves, Non-return Valves (NRVs) etc.	60
153	Rubber Expansion (RE) joints	60
154	Air release valves	60
Cooling Towers (NDCT/ IDCT)-Natural-Draft and Induced Draft Cooling Tower		
155	Water Distribution System	60
156	Spray nozzles	60
157	Packing	60
158	Drift eliminators	60
159	Cooling Tower (CT) Fans (for Induced Draft Cooling Towers IDCT)	60
160	Gear boxes, shafts & motors (for IDCT)	60
Air Conditioning & Ventilation System		
161	Split & window air conditioners	60
162	Chilling/ condensing unit [upto 500 ton of refrigeration(TR)]	55
163	Air Handling Unit (AHU) and Fresh air unit	60
164	Cooling Towers	60
165	Air Washing Units (AWUs), axial fans, roof extractors	60
166	Ducts, louvers & dampers	60
Flue Gas Desulphurization (FGD)		
167	Spray Nozzles,	50
168	Spray header	50
169	Oxidation Blowers	50
170	Limestone wet Ball Mill	50
171	Slurry Handling Pumps for FGD system	50
172	Booster Fans for FGD system	50
173	Carbon Steel Ducts and Dampers for FGD	60
174	Storage Tanks and Silos	60
175	Process Water Pump for FGD system	50
(D) Other Common Items		
Fire protection and detection system		
176	Motor driven fire water pumps	60
177	Diesel engine driven fire water pumps	60
178	Hydrant system for the power plant.	60
179	High velocity water spray system	60
180	Medium velocity water spray system	60
181	Foam protection system	60
182	Inert gas flooding system	60



Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficient local capacity and competition	Class-I Local Supplier (Minimum Local Content (%))
183	Fire tenders	60
184	Portable fire-extinguishers	60
185	Cranes, EOT cranes, gantry crane & chain pulley blocks etc.	60
186	Elevator	60

(E) Minimum Local Content percentages in Engineering, Procurement & Construction (EPC) / Turnkey project

In case the contract is awarded through the EPC route, the contractor should comply with the requirement of MLC for individual items as listed in Annexure-I and should purchase these items only from Class-I Local supplier. In addition, MLC for complete EPC project may also be prescribed as below:

	(1) Package Based Works	Minimum Local Content (%)
1	Boiler	60
2	TG System (Water Cooled Condenser)	60
3	Ash Handling Plant	60
4	Coal Handling Plant	60
5	Electro-static Precipitator (ESP)	60
6	Circulating Water (CW) System	60
7	Cooling Tower	60
8	Water Treatment System	60
9	Air Conditioning System (below 500TR)	60
10	Flue Gas Desulphurisation (FGD) System	60
11	Station Control & Instrumentation (C&I)	50
12	Hydro Power Projects (Electro-Mechanical Works)	60
	Gas based generation	
	Overall Gas Turbine Package (on finished Product basis)	
13	< 44 MW	60
14	44 –145 MW	50
	Overall Combined Cycle Gas Turbine (CCGT) Package (on finished Product basis)	
15	< 44 MW	60
16	44 – 145 MW	60
17	> 150 MW	60
	(2) Project as a whole	
1	Works and service contracts in Power Sector	60
2	Transmission Line with Conventional conductors (ACSR, AAAC, AL-59 etc.)	60
3	Transmission Line with High temperature Low Sag (HTLS) conductors	60
4	HVAC Substation Air Insulated (AIS)	60
5	HVAC Substation Gas Insulated (GIS)	60
6	HVDC Substation	60
7	Distribution Sector	60

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p style="text-align: right;">Annexure-II</p> <p>General guidelines to be adopted selectively in an appropriate manner by the procuring entities in their tender documents.</p> <ol style="list-style-type: none"> 1. The bidder shall have to be an entity registered in India in accordance with law. 2. The bids shall be in the language as prescribed by the tenderer/procurer. 3. The bids shall be in Indian Rupees (INR) (in respect of local content only). 4. Indian subsidiaries of foreign bidders shall have to meet the qualifying criteria in terms of capability, competency, financial position, past performance etc. 5. The bidder shall follow Indian laws, regulations and standards. 6. To be eligible for participation in the bid, foreign bidders shall compulsorily set up their manufacturing units on a long term basis in India as may be specified by the tenderer/ procurer. 7. Similar or better technology than the technology offered in respect of material, equipment and process involved shall be transferred to India. Along with the transfer of technology, adequate training in the respective field shall also be provided. 8. Country of origin of the equipment/material shall be provided in the bid. 9. For supply of equipment / material from the country of origin other than India, the bidder shall submit performance certificate in support of satisfactory operation in India or a country other than the country of origin having climatic and operational conditions including ambient temperature similar to that of India for more than _____ years (to be specified by the procurer). 10. The technologies/ products offered shall be environmental friendly, consuming less energy, safe, energy efficient, durable and long lasting under the prescribed operational conditions. 11. The supplier shall ensure supply of spares, materials and technological support for the entire life of the project. 12. The manufacturers/ supplier shall list out the products and components producing Toxic E-waste and other waste as may be specified. It shall have an Extended Producers Responsibility (EPR) so that after the completion of the lifecycle, the materials are safely recycled / disposed of by the Manufacturer/ supplier and for this, the Manufacturer/supplier along with procurer has to establish recycling / disposal unit or as may be specified. 13. Minimum Local Content requirement for goods, services or works shall be in accordance with the conditions laid down in respective Order(s) of the sectors on Public Procurement (Preference to Make in India) to provide for purchase preference (linked with local content). 			
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p style="text-align: center;">GENERAL TECHNICAL REQUIREMENTS</p>	<p style="text-align: center;">PAGE 73 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>14. The equipment/ material sourced from foreign companies may be tested in accredited labs in India before acceptance wherever such facilities are available.</p> <p>15. The Tender fee and the Bank Guarantee (BG) shall be in Indian Rupees only.</p> <p>16. The bidder shall have to furnish a certificate regarding cyber security/safety of the equipment/process to be supplied/services to be rendered as safe to connect.</p> <p>17. Applicable safety requirements shall be met. Regular safety audit shall be carried out by the manufacturer/ supplier.</p> <p>18. Statutory laws/regulations including the labour and environmental laws shall be strictly complied with during supply, storage, erection, commissioning and operation process. A regular compliance report shall be submitted to the procurer/appropriate Authorities.</p> <p>19. Formation of new joint venture in India shall be permitted only with the Indian companies.</p> <p>20. Tendering by the agent shall not be accepted.</p> <p>21. In case local testing is not considered necessary by the procurer, the original test report in the language prescribed by the procurer may be accepted. The translated test report shall not be accepted unless it is notarised.</p> <p>22. Certification/compliance as per the Indian Standards/ International Standards/ Indian Regulations/ specified Standards shall be mandatory, where ever applicable.</p> <p>23. Quality assurance of the product shall be carried out by the procurer or an independent third party agency appointed by the procurer. Manufacturing Quality Plan as approved by the procurer shall be followed by the manufacturer/supplier.</p> <p>24. Wherever required by the procurer, foreign supplier shall establish fully functional service centers in India and shall keep spares/material locally for future needs of utilities.</p> <p>25. Arbitration proceedings shall be instituted in India only and all disputes shall be settled as per applicable Indian Laws.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 74 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
LIST OF CODES AND STANDARDS				
	Indian Standards	Title	International and Internationally recognised standards	
	IS:277	Galvanised steel sheets (plain or corrugated)		
	IS:655	Specification for metal air duct		
	IS:800	Code of practice for use of structural steel in general building construction	BS 449:1969 BS 5950 ASA A57, 1-1952	
	IS:807	Code of practice for design, manufacture, erection and testing (Structural portion) of cranes and hoists 6588 (Issued by Standards Association of Australia). DIN 120:1936 (Sheet 1) DIN 120:1936 (Sheet 2) 327 part-I, 1951 BS 466 part-II, 1960 BS 644:1960 BS 1757:1951 BS 2573:part-I:1960	Draft Revision of A.S. NO. CS.2 SAA Crane and Hoist code Doc:No. BU/4 Rev	
	IS:875	Code of practice for design loads (other than earthquake) for buildings and structures Leading standards (issued by Canadian Standard) DIN-1055-1955 (Issued by ASA)	National Building code of Canada (1953)-Part-IV Design section 4.1	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 75 OF 114	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
IS:1239 Part-I	Mild steel tubes	(ISO/R 65-1957) (ISO/R-64-1958) (ISO/R-65-1958) (BS 1387 : 1957)		
IS:1239 Part-II	Mild steel tubulars and other wrought steel pipe fittings	BS 1387 : 1967 BS 1387 :1967 BS 1740 :1965		
IS:2825	Code for unfired vessels			
IS:1520	Horizontal centrifugal pumps for clear cold and fresh water			
IS:1600	Code for practice for performance of constant speed IC Engines for general purpose			
IS:1601	Specification for performance of constant speed IC Engines for general Purpose			
IS:1893	Criteria for earthquake resistant design of structures			
IS1978-1971	Line Pipe April 1969.		API Standards 5L	
IS:2254-1970	Dimensions of vertical shaft motor for pumps		IEC Pub 72-1 part I NEMA Pub MG 1 1954	
IS:2266	Steel wire ropes for general engineering purposes		BS :302 : 1968	
IS:2312	Propellant type Ventilation fans			
IS:2365	Steel wire suspension ropes for lifts and hoists		BS : 1957	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 76 OF 114	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>IS:3346</p> <p>IS:3354</p> <p>IS:3401</p> <p>IS:3588</p> <p>IS:3589</p> <p>IS:3677</p> <p>IS:3815</p> <p>IS:3895</p> <p>IS:3963</p> <p>IS:3975</p> <p>IS:4503</p>	<p>Method for the determination of thermal conductivity of thermal insulation materials (two slab guarded hot plate method)</p> <p>Outline dimensions for electric lifts.</p> <p>Silica gel</p> <p>Specification for electrical axial flow fans</p> <p>Electrically welded steel pipes for water, gas and sewage (200mm to 2000 mm Nominal Diameter)</p> <p>Unbonded rock and slag wool for thermal insulation</p> <p>Point hook with shank for general engineering purposes</p> <p>Specification for monocrystalline semiconductor rectifier cells and stacks</p> <p>Roof extractor unit</p> <p>Mild steel wires, strips and tapes for armoring cables</p> <p>Shell and tube type heat Exchanger</p>	<p>DIN 52612 (Deutscher Normenausschuss)</p> <p>ASTM C 163-1964 (American Society of Testing and materials)</p> <p>ASTM C 167-1974</p> <p>ASTM C 177-1963</p> <p>BS 482 - 1968 Doc.:67/3 1284 (Revision of BS 2903) (Issued BS)</p>	
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 77 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>IS:4540</p> <p>IS:4671</p> <p>IS:4736</p> <p>IS:4894</p> <p>IS:5456</p> <p>IS:5749</p> <p>IS:6392</p> <p>IS:6524 Part-I</p> <p>IS:7098</p> <p>IS:7373</p> <p>IS:7938</p> <p>ISO:1217</p> <p>ASHRAE-33 and air heating coils.</p> <p>ASHRAE-52-76 particle matter.</p>	<p>Specification for monory-stallines rectifire assembly equipment</p> <p>Expanded polystyrene for thermal insulation purpose</p> <p>Hot dip zinc coating on steel tubes</p> <p>Centrifugal fans</p> <p>Code of practice for testing of positive displacement type air compressors and exhauster (For Test Tolerance Only)</p> <p>Forged ramshorn hooks Entwurf DIN 15402 Blett 1 Entwurf DIN 15402 BS 3017-1958</p> <p>Steel pipe flanges BS 4504 : 1969</p> <p>Code of practice for design of tower cranes Static and rail mounted BS 2799 : 1956</p> <p>Cross linked Polyethylene insulated PVC sheathed cables Standard No. 1 to IPCEA (USA) Pub. No. 5-66-524</p> <p>Specification for wrought aluminium and aluminium sheet and strips</p> <p>Air receivers for compressed air installation</p> <p>Displacement compressor-Acceptance test</p> <p>Methods of testing for rating of forced circulation air cooling</p> <p>Air cleaning device used in general ventilation for removing</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 78 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>ASHRAE-22-72</p> <p>ASHRAE 23-67</p> <p>ARI-450-6</p> <p>ARI-550</p> <p>ARI-410</p> <p>ARI-430/435 BS:848 (Part-1,2)</p> <p>BS:400</p> <p>BS:401</p> <p>CTI Code ACT-105</p> <p>ANSI-31.5</p> <p>ASME-PTC- 23-1958</p> <p>AMCA A-21C</p> <p>API:618</p> <p>HYDRAULIC INSTITUTE STANDARDS.</p> <p>HYDRANT SYSTEM MANUALS OF TAC.</p> <p>TAC MANUALS OF SPRAY SYSTEM</p> <p>NFPA USA/ NSC UK/ UL USA/ FM USA STANDARDS.</p> <p>INDIAN EXPLOSIVES ACT.</p> <p>INDIAN FACTORIES ACT.</p> <p>STANDARD OF TUBULAR EXCHANGER MANUFACTURER'S ASSOCIATION.</p>	<p>Method of testing for rating of water cooled refrigerant condensers.</p> <p>Methods of testing for rating of positive displacement refrigerant compressors.</p> <p>Standard for water cooled refrigerant condensers.</p> <p>Standard for centrifugal water chilling packages.</p> <p>Standard for forced circulation air cooling and air heating coils</p> <p>Central station AHU/Application of Central Station AHU Fans</p> <p>Low carbon steel cylinders for the storage & transport of permanent gases.</p> <p>Low carbon steel cylinders for the storage & transport of liquified gases.</p> <p>Acceptance test code for Water Cooling Tower.</p> <p>Refrigerant piping</p> <p>Atmospheric Water Cooling Equipment</p> <p>Test Code for air moving devices</p> <p>Reciprocating Compressor for general refinery services.</p>		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 79 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>CODE AND STANDARD FOR CIVIL WORKS</p> <p>Some of the applicable Standards, Codes and references are as follows:</p> <p>Excavation & Filling</p> <p>IS: 2720 (Part-II, IV TO VIII, XIV, XXI, XXIII, XXIV, XXVII TO XXIX, XL) Methods of test for soils-determination for water content etc.</p> <p>IS: 4701 Code of practice for earth work on canals.</p> <p>IS: 9758 Guidelines for Dewatering during construction.</p> <p>IS: 10379 Code of practice for field control of moisture and compaction of soils for embankment and sub-grade.</p> <p>Properties, Storage and Handling of Common Building Materials</p> <p>IS: 269 Specification for ordinary Portland cement, 33 grade.</p> <p>IS: 383 Specification for coarse and fine aggregates from natural sources for concrete.</p> <p>IS: 432 Specification for mild steel and (Parts 1&2) medium tensile steel bars and hard-drawn steel wires for concrete reinforcement.</p> <p>IS: 455 Specification for Portland slag cement.</p> <p>IS: 702 Specification for Industrial bitumen.</p> <p>IS: 712 Specification for building limes.</p> <p>IS: 808 Rolled steel Beam channel and angle sections.</p> <p>IS: 1077 Specification for common burnt clay building bricks.</p> <p>IS: 1161 Specification of steel tubes for structural purposes.</p> <p>IS: 1363 Hexagon head Bolts, Screws and nuts of production grade C.</p> <p>IS: 1364 Hexagon head Bolts, Screws and Nuts of Production grade A & B.</p> <p>IS: 1367 Technical supply conditions for Threaded fasteners.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 80 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>IS: 1489 (Part-I) (Part-II)</p> <p>IS: 1542</p> <p>IS: 1566</p> <p>IS: 1786</p> <p>IS: 2062</p> <p>IS: 2116</p> <p>IS: 2386 (Parts-I to VIII)</p> <p>IS: 3150</p> <p>IS: 3495 (Parts-I to IV)</p> <p>IS: 3812</p> <p>IS: 4031</p> <p>IS: 4032</p> <p>IS: 4082</p> <p>IS: 8112</p> <p>IS: 8500</p> <p>IS: 12269</p> <p>IS: 12894</p>	<p>Specification for Portland-pozzolana cement: Fly ash based. Calcined clay based.</p> <p>Specification for sand for plaster.</p> <p>Specification for hard-drawn steel wire fabric for concrete reinforcement.</p> <p>Specification for high strength deformed bars for concrete reinforcement.</p> <p>Specification for steel for general structural purposes.</p> <p>Specification for sand for masonry mortars.</p> <p>Testing of aggregates for concrete.</p> <p>Hexagonal wire netting for general purpose.</p> <p>Methods of tests of burnt clay building bricks.</p> <p>Specification for fly ash, for use as pozzolana and admixture.</p> <p>Methods of physical tests for hydraulic cement.</p> <p>Methods of chemical analysis of hydraulic cement.</p> <p>Recommendations on stacking and storage of construction materials at site.</p> <p>Specification for 43 grade ordinary portland cement.</p> <p>Medium and high strength structural steel.</p> <p>53 grade ordinary portland cement.</p> <p>Specification for Fly ash lime bricks.</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 81 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>Cast-In-Situ Concrete and Allied Works</p> <p>IS: 280 Specification for mild steel wire for general engineering purposes.</p> <p>IS: 456 Code of practice for plain and reinforced concrete.</p> <p>IS: 457 Code of practice for general construction of plain & reinforced concrete for dams & other massive structures.</p> <p>IS: 516 Method of test for strength of concrete.</p> <p>IS: 650 Specification for standard sand for testing of cement.</p> <p>IS: 1199 Methods of sampling and analysis of concrete.</p> <p>IS: 1791 General requirements for batch type concrete mixers.</p> <p>IS: 1838 (Part-I) Specification for preformed fillers for expansion joints in concrete pavements and structures (non-extruding and resilient type).</p> <p>IS: 2204 Code of practice for construction of reinforced concrete shell roof.</p> <p>IS: 2210 Criteria for the design of reinforced concrete shell structures and folded plates.</p> <p>IS: 2438 Specification for roller pan mixer.</p> <p>IS: 2502 Code of practice for bending and fixing of bars for concrete reinforcement.</p> <p>IS: 2505 General requirements for concrete vibrators, immersion type.</p> <p>IS: 2506 General requirements for concrete vibrators, screed board type.</p> <p>IS: 2514 Specification for concrete vibrating tables.</p> <p>IS: 2645 Specification for Integral cement water proofing compounds.</p> <p>IS: 2722 Specification for portable swing weigh batches for concrete. (single and double bucket type)</p> <p>IS: 2750 Specification for Steel scaffolding.</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 82 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>IS: 2751</p> <p>IS: 3025</p> <p>IS: 3366</p> <p>IS: 3370 (Part I to IV)</p> <p>IS: 3414</p> <p>IS: 3550</p> <p>IS: 3558 concrete.</p> <p>IS: 4014 (Parts I & II)</p> <p>IS: 4326 of buildings.</p> <p>IS: 4461</p> <p>IS: 4656</p> <p>IS: 4925</p> <p>IS: 4990</p> <p>IS: 4995 (Parts I & II)</p> <p>IS: 5256</p> <p>IS: 5525</p> <p>IS: 5624</p> <p>IS: 6461</p>	<p>Code of practice for welding of mild steel plain and deformed bars for reinforced concrete construction.</p> <p>Methods of sampling and test waste water.</p> <p>Specification for Pan vibrators.</p> <p>Code of practice for concrete structures for the storage of liquids.</p> <p>Code of practice for design and installation of joints in buildings.</p> <p>Methods of test for routine control for water used in industry.</p> <p>Code of practice for use of immersion vibrators for consolidating concrete.</p> <p>Code of practice for steel tubular scaffolding.</p> <p>Code of practice for earthquake resistant design and construction of buildings.</p> <p>Code of practice for joints in surface hydro-electric power stations.</p> <p>Specification for form vibrators for concrete.</p> <p>Specification for batching and mixing plant.</p> <p>Specification for plywood for concrete shuttering work.</p> <p>Criteria for design of reinforced concrete bins for the storage of granular and powdery materials.</p> <p>Code or practice for sealing joints in concrete lining on canals.</p> <p>Recommendations for detailing of reinforcement in reinforced concrete work.</p> <p>Specification for foundation bolts.</p> <p>Glossary of terms relating to cement concrete.</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 83 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>IS: 6494</p> <p>IS: 6509</p> <p>IS: 7861</p> <p>IS: 9012</p> <p>IS: 9103</p> <p>IS: 9417</p> <p>IS: 10262</p> <p>IS: 11384</p> <p>IS: 11504</p> <p>IS: 12118</p> <p>IS: 12200</p> <p>IS: 13311</p> <p>Part-1</p> <p>Part-2</p> <p>SP:23</p> <p>SP: 24</p> <p>SP: 34</p> <p>Precast Concrete Works</p> <p>SP: 7(PartVI/</p>	<p>Code of practice for water proofing of underground water reservoirs and swimming pools.</p> <p>Code of practice for installation of joints in concrete pavements.</p> <p>Code of practice for extreme weather concreting. (Parts I & II)</p> <p>Recommended practice for shot concreting.</p> <p>Specification for admixtures for concrete.</p> <p>Recommendations for welding cold worked steel bars for reinforced concrete construction.</p> <p>Recommended guidelines for concrete mix design.</p> <p>Code of practice for composite construction in structural steel and concrete.</p> <p>Criteria for structural design of reinforced concrete natural draught cooling towers.</p> <p>Specification for two-parts poly sulphide.</p> <p>Code of practice for provision of water stops at transverse contraction joints in masonry and concrete dams.</p> <p>Method of non-destructive testing of concrete.</p> <p>Ultrasonic pulse velocity.</p> <p>Rebound hammer.</p> <p>Handbook of concrete mixes</p> <p>Explanatory Handbook on IS: 456-1978</p> <p>Handbook on concrete reinforcement and detailing.</p> <p>National Building Code- Structural design of prefabrication and Sec.7) systems building.</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 84 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	IS: 10297	Code of practice for design and construction of floors and roofs using precast reinforced/prestressed concrete ribbed or cored slab units.	
	IS: 10505	Code of practice for construction of floors and roofs using pre-cast reinforced concrete units.	
	Masonry and Allied Works		
	IS: 1905	Code of Practice for Structural Safety of Buildings-Masonry walls.	
	IS: 2212	Code of Practice for Brickwork.	
	IS: 2250	Code of Practice for Preparation and use of Masonry Mortar.	
	SP: 20	Explanatory handbook on masonry code.	
	Sheeting Works		
	IS:277	Galvanised steel sheets (plain or corrugated).	
	IS: 459	Unreinforced corrugated and semi-corrugated asbestos cement sheets.	
	IS: 513	Cold-rolled carbon steel sheets.	
	IS: 730	Specification for fixing accessories for corrugated sheet roofing.	
	IS: 1626	Specification for Asbestos cement building pipes and pipe fittings, gutters and gutter fittings and roofing fittings.	
	IS: 2527	Code of practice for fixing rain water gutters and down pipe for roof drainage.	
	IS: 3007	Code of practice for laying of asbestos cement sheets.	
	IS: 5913	Methods of test for asbestos cement products.	
	IS: 7178	Technical supply conditions for tapping screw.	
	IS: 8183	Bonded mineral wool.	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 85 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>IS: 8869</p> <p>IS: 12093</p> <p>IS: 12866</p> <p>IS: 14246</p> <p>Fabrication and Erection of Structural Steel Work</p> <p>IS: 2016</p> <p>IS: 814</p> <p>IS: 1852</p> <p>IS: 3502</p> <p>IS: 6911</p> <p>IS: 3757</p> <p>IS: 6623</p> <p>IS: 6649</p> <p>IS: 800</p> <p>IS: 816</p> <p>IS: 4000</p> <p>IS: 9595</p> <p>IS: 817</p>	<p>Washers for corrugated sheet roofing.</p> <p>Code of practice for laying and fixing of sloped roof covering using plain and corrugated galvanised steel sheets.</p> <p>Plastic translucent sheets made from thermosetting polyester resin (glass fibre reinforced).</p> <p>Specification for continuously pre-painted galvanised steel sheets and coils.</p> <p>Specification for plain washers.</p> <p>Specification for covered Electrodes for Metal Arc Welding for weld steel.</p> <p>Specification for Rolling and Cutting Tolerances for Hot rolled steel products.</p> <p>Specifications for chequered plate.</p> <p>Specification for stainless steel plate, sheet and strip.</p> <p>Specification for high strength structural bolts</p> <p>Specification for high strength structural nuts.</p> <p>High Tensile friction grip washers.</p> <p>Code of practice for use of structural steel in general building construction.</p> <p>Code of practice for use of Metal Arc Welding for General Construction.</p> <p>Code of practice for assembly of structural joints using high tensile friction grip fasteners.</p> <p>Code of procedure of Manual Metal Arc Welding of Mild Steel.</p> <p>Code of practice for Training and Testing of Metal Arc Welders.</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 86 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>IS: 1811</p> <p>IS: 9178</p> <p>IS: 9006</p> <p>IS: 7215</p> <p>IS: 12843</p> <p>IS: 4353</p> <p>SP: 6 (Part 1 to 7)</p> <p>IS: 1608</p> <p>IS: 1599</p> <p>IS : 228</p> <p>IS : 2595</p> <p>IS : 1182</p> <p>IS : 3664</p> <p>IS : 3613</p> <p>IS : 3658</p> <p>IS : 5334</p>	<p>Qualifying tests for Metal Arc Welders (engaged in welding structures other than pipes).</p> <p>Criteria for Design of steel bins for storage of Bulk Materials.</p> <p>Recommended Practice for Welding of Clad Steel.</p> <p>Tolerances for fabrication steel structures.</p> <p>Tolerance for erection of structural steel.</p> <p>Recommendations for submerged arc welding of mild steel and low alloy steels.</p> <p>ISI Handbook for structural Engineers.</p> <p>Method of Tensile Testing of Steel products other than sheets, strip, wire and tube.</p> <p>Method of Bend Tests for Steel products other than sheet, strip, wire and tube</p> <p>Methods of chemical Analysis of pig iron, cast iron and plain carbon and low alloy steel.</p> <p>Code of Practice for Radio graphic testing.</p> <p>Recommended practice for Radiographic Examination of fusion welded butt joints in steel plates.</p> <p>Code of practice for Ultra sonic Testing by pulse echo method.</p> <p>Acceptance tests for wire flux combination for submerged Arc Welding.</p> <p>Code of practice for Liquid penetrant Flaw Detection.</p> <p>Code of practice for Magnetic Particle Flaw Detection of Welds.</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 87 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>Plastering and Allied Works</p> <p>IS : 1635 Code of practice for field slaking of Building lime and preparation of putty.</p> <p>IS : 1661 Application of cement and cement lime plaster finishes.</p> <p>IS : 2333 Plaster-of-paris.</p> <p>IS : 2402 Code of practice for external rendered finishes.</p> <p>IS : 2547 Gypsum building plaster.</p> <p>IS : 3150 Hexagonal wire netting for general purpose.</p> <p>Acid and Alkali Resistant Lining</p> <p>IS : 158 Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali & heat resisting.</p> <p>IS : 412 Specification for expanded metal steel sheets for general purpose.</p> <p>IS : 4441 Code of practice for use of silicate type chemical resistant mortars.</p> <p>IS : 4443 Code of practice for use of resin type chemical resistant mortars.</p> <p>IS : 4456 Method of test for chemical resistant tiles. (Part I & II)</p> <p>IS : 4457 Specification for ceramic unglazed vitreous acid resistant tiles.</p> <p>IS : 4832 Specification for chemical resistant mortars.</p> <p style="padding-left: 40px;">Part I Silicate type</p> <p style="padding-left: 40px;">Part II Resin type</p> <p style="padding-left: 40px;">Part III Sulphur type</p> <p>IS : 4860 Specification for acid resistant bricks.</p> <p>IS : 9510 Specification for bitumasitic, Acid resisting grade.</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 88 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>Water Supply, Drainage and Sanitation</p> <p>IS : 458 Specification for concrete pipes.</p> <p>IS : 554 Dimensions for pipe threads, where pressure tight joints are made on thread.</p> <p>IS : 651 Specification for salt glazed stoneware pipes.</p> <p>IS : 774 Flushing cisterns for water closets and urinals.</p> <p>IS : 775 Cast iron brackets and supports for wash basins and sinks.</p> <p>IS : 778 Copper alloy gate, globe and check valves for water works purposes.</p> <p>IS : 781 Cast copper alloy screw down bib taps and stop valves for water services.</p> <p>IS : 782 Caulking lead.</p> <p>IS : 783 Code of practice for laying of concrete pipes.</p> <p>IS : 1172 Basic requirements for water supply, drainage and sanitation.</p> <p>IS : 1230 Cast iron rain water pipes and fittings.</p> <p>IS : 1239 Mild steel tubes, tubulars and other wrought steel fittings.</p> <p>IS : 1536 Centrifugally cast (Spun) iron pressure pipes for water, gas and sewage.</p> <p>IS : 1537 Vertically cast iron pressure pipes for water, gas and sewage.</p> <p>IS : 1538 Cast iron fittings for pressure pipe for water, gas and sewage.</p> <p>IS : 1703 Ball valves (horizontal plunger type) including float for water supply purposes.</p> <p>IS : 1726 Cast iron manhole covers and frames.</p> <p>IS : 1729 Sand cast iron spigot and socket, soil, water and ventilating pipes, fittings and accessories.</p>		
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p style="text-align: center;">GENERAL TECHNICAL REQUIREMENTS</p>	<p style="text-align: center;">PAGE 89 OF 114</p>

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>IS : 1742</p> <p>IS : 1795</p> <p>IS : 1879</p> <p>IS : 2064</p> <p>IS : 2065</p> <p>IS : 2326</p> <p>IS : 2470 (Part-I & II)</p> <p>IS : 2501</p> <p>IS : 2548</p> <p>IS : 2556 (Part 1 to 15)</p> <p>IS : 2963</p> <p>IS : 3114</p> <p>IS : 3311</p> <p>IS : 3438</p> <p>IS : 3486</p> <p>IS : 3589</p> <p>IS : 3989</p> <p>IS : 4111 (Part I to IV)</p> <p>IS : 4127</p>	<p>Code of practice for building drainage.</p> <p>Pillar taps for water supply purposes.</p> <p>Malleable cast iron pipe fittings.</p> <p>Code of practice for selection, installation and maintenance of sanitary appliances.</p> <p>Code of practice for water supply in building.</p> <p>Automatic flushing cisterns for urinals.</p> <p>Code of practice for installation of septic tanks.</p> <p>Copper tubes for general engineering purposes.</p> <p>Plastic seat and cover for water-closets.</p> <p>Vitreous sanitary appliances (vitreous china).</p> <p>Non-ferrous waste fittings for wash basins and sinks.</p> <p>Code of practice for laying of cast iron pipes.</p> <p>Waste plug and its accessories for sinks and wash basins.</p> <p>Silvered glass mirrors for general purposes.</p> <p>Cast iron spigot and socket drain pipes.</p> <p>Electrically welded steel pipes for water, gas and sewage (200mm to 2000mm nominal diameter).</p> <p>Centrifugally cast (Spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.</p> <p>Code of practice for ancillary structure in sewerage system.</p> <p>Code of practice for laying of glazed stone-ware pipes.</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 90 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>IS : 4764</p> <p>IS : 4827</p> <p>IS : 5329</p> <p>IS : 5382</p> <p>IS : 5822</p> <p>IS : 5961</p> <p>IS : 7740</p> <p>IS : 8931</p> <p>IS : 8934</p> <p>IS : 9762</p> <p>IS : 10446</p> <p>IS : 10592</p> <p>IS : 12592</p> <p>IS : 12701</p> <p>SP: 35</p> <p>-</p> <p>Doors, Windows and Allied Works</p> <p>IS : 204</p> <p>Part-I</p> <p>Part-II</p>	<p>Tolerance limits for sewage effluents discharged into inland-surface waters.</p> <p>Electro plated coating of nickel and chromium on copper and copper alloys.</p> <p>Code of practice for sanitary pipe work above ground for buildings.</p> <p>Rubber sealing rings for gas mains, water mains and sewers.</p> <p>Code of practice for laying of welded steel pipes for water supply.</p> <p>Cast iron grating for drainage purpose.</p> <p>Code of practice for road gullies.</p> <p>Cast copper alloy fancy bib taps and stop valves for water services.</p> <p>Cast copper alloy fancy pillar taps for water services.</p> <p>Polyethylene floats for ball valves.</p> <p>Glossary of terms for water supply and sanitation.</p> <p>Industrial emergency showers, eye and face fountains and combination units.</p> <p>Specification for precast concrete manhole covers and frames.</p> <p>Rotational moulded polyethylene water storage tanks.</p> <p>Handbook on water supply and drainage.</p> <p>Manual on Sewerage and sewage treatment (Published by CPH & EEO) As updated.</p> <p>Tower Bolts</p> <p>Ferrous metals.</p> <p>Nonferrous metals.</p>	
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 91 OF 114</p>

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	IS : 208 IS : 281 IS : 362 IS : 420 IS : 1003 Part-I door IS : 1038 IS : 1081 IS : 1341 IS : 1361 IS : 1823 IS : 1868 IS : 2202 (Part-II) IS:2209 IS:2553 IS:2835 IS:3548 IS:3564 IS : 3614 IS:4351 IS:5187 IS:5437	Door Handles. Mild steel sliding door bolts for use with padlocks. Parliament Hinges. Specification for putty, for use on metal frames. Specification for timber panelled and glazed shutters- (Part-I) shutters. Steel doors, windows and ventilators. Code of practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators. Steel butt hinges. Steel windows for industrial buildings. Floor door stoppers. Anodic coatings on Aluminium and its alloys. Specification for wooden flush door shutters (solid core type); particle board face panels and hard board face panels Mortice locks (vertical type). Safety glass Flat transparent sheet glass. Code of practice for glazing in buildings. Door closers (Hydraulically regulated). Fire check doors; plate, metal covered and rolling type. Steel door frames. Flush bolts. Wired and figured glass	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 92 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	IS:6248	Metal rolling shutters and rolling grills.	
	IS:6315	Floor springs (hydraulically regulated) for heavy doors.	
	IS:7196	Hold fasts.	
	IS:7452	Hot rolled steel sections for doors, windows and ventilators.	
	IS:10019	Mild steel stays and fasteners.	
	IS:10451	Steel sliding shutters (top hung type).	
	IS:10521	Collapsible gates.	
	Roof Water Proofing and Allied Works		
	IS:1203	Methods of testing tar and bitumen.	
	IS:1322	Specification for bitumen felts for water proofing and damp proofing.	
	IS:1346	Code of practice for water proofing of roofs with bitumen felts.	
	IS:1580	Specification for bituminous compound for water proofing and caulking purposes.	
	IS:3067	Code of practice for general design details and preparatory work for damp proofing and water proofing of buildings.	
	IS:3384	Specification for bitumen primer for use in water proofing and damp proofing.	
	Floor Finishes and Allied Works		
	IS:1237	Specification for cement concrete flooring tiles.	
	IS:1443	Code of practice for laying and finishing of cement concrete flooring tiles.	
	IS:2114	Code of practice for laying in-situ terrazzo floor finish.	
	IS:2571	Code of practice for laying in-situ cement concrete flooring.	
	IS:3462	Specification for unbacked flexible PVC flooring.	
	IS:4971	Recommendations for selection of industrial floor finishes.	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 93 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	IS:5318 IS:8042 IS:13801 Painting and Allied Works IS:162 IS:1477 Part-I Part-II IS:1650 IS:2074 IS:2338 Part-I Part-II IS:2395 Part-I Part-II IS:2524 Part-I Part-II IS:2932 IS:2933 IS:4759 IS:5410	Code of practice for laying of flexible PVC sheet and tile flooring. Specification for white portland cement. Specification for chequered cement concrete flooring tiles. Specification for fire resisting silicate type, brushing, for use on wood, colour as required. Code of practice for painting of ferrous metals in buildings. Pretreatment. Painting. Specification for colours for building and decorative finishes. Specification for red oxide-zinc chrome, priming, ready mixed paint air drying. Code of practice for finishing of wood and wood based materials. Operations and workmanship Schedules Code of practice for painting concrete, masonry and plaster surfaces. Operations and workmanship. Schedule. Code of practice for painting of nonferrous metals in buildings. Pretreatment. Painting. Specification of synthetic enamel paint, exterior, under-coating and finishing. Specification enamel paint, under coating and finishing. Code of practice for hot dip zinc coating on structural steel and other allied products. Specification for cement paint	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 94 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>IS:5411 (Part-I)</p> <p>IS:6278</p> <p>IS:10403</p> <p>Piling and Foundation</p> <p>IS:1080</p> <p>IS:1904</p> <p>IS:2911</p> <p>IS:2950</p> <p>IS:2974 (Part-I TO V)</p> <p>IS:6403</p> <p>IS:8009</p> <p>Part-I</p> <p>Part-II</p> <p>IS:12070</p> <p>DIN:4024</p> <p>VDI:2056</p> <p>VDI:2060</p> <p>Stop Log and Trash Rack</p> <p>IS:4622</p> <p>IS:5620</p> <p>IS:11388</p> <p>IS:11855</p> <p>Roads</p>	<p>Specification for plastic emulsion paint-for exterior use</p> <p>Code of practices for white washing and colour washing.</p> <p>Glossary of terms relating to building finishes.</p> <p>Code of practice for design and construction of simple spread foundations.</p> <p>Code of practice for design and construction of foundations in Soils; General Requirements.</p> <p>Code of practice for designs and construction of Pile foundations (Relevant Parts).</p> <p>Code of practice for designs and construction of Raft (Part-I) foundation.</p> <p>Code of practice for design and construction of machine foundations.</p> <p>Code of practice for determination of Allowable Bearing pressure on Shallow foundation.</p> <p>Code of practice for calculation of settlement of foundation subjected to symmetrical vertical loads.</p> <p>Shallow foundations.</p> <p>Deep foundations.</p> <p>Code of practice for design and construction of shallow foundations on rocks.</p> <p>Flexible supporting structures for machines with rotating machines.</p> <p>Criteria for assessing mechanical vibrations of machines.</p> <p>Criteria for assessing rotating imbalances in machines.</p> <p>Recommendations for fixed - wheel gates structural design.</p> <p>Recommendations for structural design criteria for low head slide gates.</p> <p>Recommendations for design of trash rack for intakes.</p> <p>General requirements for rubber seals for hydraulic gates.</p>	
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 95 OF 114</p>

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>IRC:5</p> <p>IRC:14</p> <p>IRC:16</p> <p>IRC:19</p> <p>IRC:21</p> <p>IRC:34</p> <p>IRC:36</p> <p>IRC:37</p> <p>IRC:56</p> <p>IRC:73</p> <p>IRC:86</p> <p>IRC:SP:13</p> <p>IRC - Public- ation</p> <p>IS:73</p> <p>Loadings</p> <p>IS:875 (Pt. I to V)</p> <p>IS:1893</p> <p>IS:4091</p> <p>IRC:6</p> <p>M.O.T.</p> <p>Safety</p> <p>IS:3696 (Part I & II)</p>	<p>Standard specifications and Code of practice for road bridges, section-I general Features of Design.</p> <p>Recommended practice of 2cm thick bitumen and tar carpets.</p> <p>Specification for priming of base course with bituminous primers.</p> <p>Standard specifications and code of practice for water bound macadam.</p> <p>Standard specifications and Code of practice for road bridges, section-III - Cement concrete (plain and reinforced).</p> <p>Recommendations for road construction in waterlogged areas.</p> <p>Recommended practice for the construction of earth embankments for road works.</p> <p>Guidelines for the Design of flexible pavements.</p> <p>Recommended practice for treatment of embankment slopes for erosion control.</p> <p>Geometric design standards for rural (non-urban) highways.</p> <p>Geometric Design standards for urban roads in plains.</p> <p>Guidelines for the design of small bridges & culverts.</p> <p>Ministry of Surface Transport (Roads Wing), Specifications for road and bridge works.</p> <p>Specification for paving bitumen</p> <p>Code of practice for design loads other than earthquake) for buildings and structures.</p> <p>Criteria for earthquake resistant design of structures.</p> <p>Code of Practice for design and construction of foundation for transmission line towers & poles.</p> <p>Standard specifications & code of practice for road bridges, Section-II Loads and stresses.</p> <p>Deptt. of railways Bridge Rules.</p> <p>Safety code for scaffolds and ladders.</p>		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 96 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>IS:3764</p> <p>IS:4081</p> <p>IS:4130</p> <p>IS:5121</p> <p>IS:5916</p> <p>IS:7205</p> <p>IS:7293</p> <p>IS:7969</p> <p>IS:11769</p> <p>- Indian Explosives Act. 1940 as updated.</p> <p>Architectural design of buildings</p> <p>SP:7</p> <p>SP:41</p> <p>Miscellaneous</p> <p>IS:802</p> <p>(Relevant parts)</p> <p>IS:803</p> <p>IS:10430</p> <p>IS:11592</p> <p>IS:12867</p> <p>CIRIA</p> <p>Publication</p>	<p>Safety code for excavation work.</p> <p>Safety code for blasting and related drilling operations.</p> <p>Safety code for demolition of buildings.</p> <p>Safety code for piling and other deep foundations.</p> <p>Safety code for construction involving use of hot bituminous materials.</p> <p>Safety code for erection on structural steelwork.</p> <p>Safety code for working with construction machinery.</p> <p>Safety code for handling and storage of building materials</p> <p>Guidelines for safe use of products containing asbestos.</p> <p>National Building Code of India</p> <p>Handbook on functional requirements of buildings (other than industrial buildings)</p> <p>Code of practice for use of structural steel in overhead transmission line towers.</p> <p>Code of practice for design, fabrication and erection of vertical mild steel cylindrically welded in storage tanks.</p> <p>Creteria for design of lined canals and liner for selection of type of lining.</p> <p>Code of practice for selection and design of belt conveyors.</p> <p>PVC handrails covers.</p> <p>Design and construction of buried thin-wall pipes.</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 97 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>REFERENCE CODES AND STANDARDS FOR CONTROL AND INSTRUMENTATION</p> <p>The design, manufacture, inspection, testing & installation of all equipment and system covered under this specification shall conform to the latest editions of codes and standards mentioned below and all other applicable VDE, IEEE, ANSI, ASME, NEC, NEMA, ISA AND Indian Standards and their equivalents.</p> <p>Temperature Measurements</p> <ol style="list-style-type: none"> 1. Instrument and apparatus for temperature measurement - ASME PTC 19.3 (1974). 2. Temperature measurement - Thermocouples ANSI MC 96.1 - 1982. 3. Temperature measurement by electrical Resistance thermometers - IS:2806. 4. Thermometer - element - Platinum resistance - IS:2848. <p>Pressure Measurements</p> <ol style="list-style-type: none"> 1. a) Instruments and apparatus for pressure measurement - ASME PTC 19.2 (1964). <li style="padding-left: 2em;">b) Electronic transmitters BS:6447. 2. Bourdon tube pressure and vacuum gauges - IS:3624 - 1966. 3. Process operated switch devices (Pr. Switch) BS-6134. <p>Flow Measurements</p> <p>Instruments and apparatus for flow measurements - ASME PTC 19.5 (1972) Interim supplement, Part-II.</p> <p>Measurement of fluid flow in closed conduits - BS-1042.</p> <p>Electronic Measuring Instrument & Control Hardware/ Software</p> <ol style="list-style-type: none"> 1. Automatic null balancing electrical measuring instruments - ANSI C 39.4 (Rev. 1973): IS:9319. 2. Safety requirements for electrical and electronic measuring and controlling instrument - ANSI C 39.5 - 1974. 3. Compatibility of analog signals for electronic industrial process instruments - ISA - S 50.1 (1982) ANSI MC 12.1 - 1975. 4. Dynamic response testing of process control instrumentation ISA - S 26 (1968). 			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 98 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<ol style="list-style-type: none"> 5. Surge Withstand Capability (SWC) tests - ANSI C 37.90 a/IEEE-472 or suitable class of IEC-255-4 equivalent to ANSI C37.90a/IEEE-472. 6. Printed circuit boards - IPC TM - 650, IEC 326 C. 7. General requirement and tests for printed wiring boards - IS 7405 (Part-I) 1973. 8. Edge socket connectors - IEC 130-11. 9. Requirements and methods of testing of wire wrap terminations DIN 41611 Part-2. 10. Dimensions of attachment plugs & receptacles - ANSI C 73 - 1973 (Supplement ANSI C 73 a - 1980). 11. Direct acting electrical indicating instrument - IS:1248 - 1968 (R). 12. Standard Digital Interface for Programmable Instrumentation - IEEE-488.2 - 1990. 13. Information Processing Systems - Local Area Networks - Part 2 : Logical Link Control - IEEE-802.2 - 1989. 14. Standard for Local Area Networks : Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1985. 15. Supplements A, B, C and E to Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1988. 16. Standard for Local Area Networks : Token - Passing Bus Access Method - IEEE-802.4 - 1985. 17. Standard for Local Area Networks : Token - Ring Access Method and Physical Layer Specification - IEEE-802.5 - 1985. 18. IEEE Guide to Software Requirements Specifications - IEEE-830 - 1984. 19. Hardware Testing of Digital Process Computers - ISA RP55.1 - 1983. 20. Electromagnetic Susceptibility of Process Control Instrumentation - SAMA PMC 33.1 - 1978. 21. Interface Between the Data Terminal Equipment and Data Circuit - Terminating Equipment Employing Serial Binary Data Interchange - EIA-232-D-1987. 22. Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment, Part 3 : Radiated Electromagnetic Field Requirements - IEC 801-3-1984. 			
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p style="text-align: center;">GENERAL TECHNICAL REQUIREMENTS</p>	<p style="text-align: center;">PAGE 99 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>Instrument Switches and Contact</p> <ol style="list-style-type: none"> 1. Contact rating - AC services NEMA ICS 2 - 1978 (with revision through May 1983), Part - 2-125, A6000. 2. Contact rating - DC services NEMA ICS 2-1978 Part-2 125, N600. <p>Enclosures</p> <ol style="list-style-type: none"> 1. Type of Enclosures - NEMA ICS Part - 6 - 1978 (with Rev. 1 4/80) through 110.22 (Type 4 to 13). 2. Racks, panels and associated equipment - EIA : RS - 310 C- 1983 (ANSI C 83.9 - 1972). 3. Protection class for Enclosures, cabinets, control panels & desks - IS:2147 - 1962. <p>Apparatus, enclosures and installation practices in hazardous area</p> <ol style="list-style-type: none"> 1. Classification of hazardous area - NFPA 70 - 1984, Article 500. 2. Electrical Instruments in hazardous dust location - ISA - 512.11, 1973. 3. Intrinsically safe apparatus - NFPA 493 1978. 4. Purged and pressurised enclosure for electrical equipment in hazardous location - NFPA 496-1982. 5. Enclosures for Industrial Controls and Systems - NEMA IS 1.1 - 1977. <p>Sampling System</p> <ol style="list-style-type: none"> 1. Stainless steel material of tubing and valves for sampling system - ASTM A 296-82, Grade 7 P 316. 2. Submerged helical coil heat exchangers for sample coolers ASTM D11 92-1977. 3. Water and steam in power cycle - ASME PTC 19.11. 4. Standard methods of sampling system - ASTM D 1066-99. <p>Annunciators</p> <ol style="list-style-type: none"> 1. Specifications and guides for the use of general purpose annunciators - ISA S 19.1, 1979. 2. Surge withstand capability tests - ANSI C 37.90a - 1989/IEEE-472 or suitable class of IEC 255-4 equivalent to ANSI C37.90a 1989/IEEE-472 3. Damp heat cycling test - IS:2106 			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 100 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>4. Specification for Electromagnetic Susceptibility - SAMA DMC 33, 1/78</p> <p>Protections</p> <ol style="list-style-type: none"> 1. Relays and relay system associated with electric power apparatus. ANSI C 37.90, 1 - 1989. 2. General requirements & tests for switching devices for control and auxiliary circuits including contactor relays - IS:6875 (Part-I) - 1973. 3. Turbine water damage prevention - ASME TDP-1-1980. 4. Boiler safety interlocks - NFPA Section 85 B - 1984, 85 C - 1991. <p>UPS System</p> <ol style="list-style-type: none"> 1. Practices and requirements for semi-conductor power rectifiers - ANSI C 34.2, 1973. 2. Relays and relays system associated with electrical power apparatus - ANSI C 3.90 - 1983. 3. Surge withstand capability test - ANSI C 37.90 1 -1989. 4. Performance testing of UPS - IEC 146. 5. Stationary cells & Batteries Lead Acid type (with tubular positive plates) specification IS-1651-1991. 6. Recommended practice for sizing large lead storage batteries for generating stations & sub-stations - IEEE-485-1985. 7. Printed Circuit Board - IPC TM 650, IEC 326C. 8. General Requirements & tests for printed wiring boards, IS:7405 (Part-I) 1973. <p>Control Valves</p> <ol style="list-style-type: none"> 1. Control valve sizing - Compressible & Incompressible fluids - ISA S 75.01-1985. 2. Face to face dimensions of control valves - ANSI B 16.00 - 1973. 3. ISA Hand Book of Control Valves - (ISBN : B: 1047-087664-234-2). 4. Codes for pressure piping - ANSI B 31.1 5. Control Valve leak class - ISA RP 39.6 			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 101 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>Process Connection & Piping</p> <ol style="list-style-type: none"> 1. Codes for pressure piping "power piping" - ANSI B 31.1. 2. Seamless carbon steel pipe ASTM - A - 106. 3. Forged & Rolled Alloy steel pipe flanges, forged fittings and valves and parts - ASTM - A - 182. 4. Material for socket welded fittings - ASTM - A - 105. 5. Seamless ferritic alloy steep pipe - ASTM - A - 335. 6. Pipe fittings of wrought carbon steel and alloy steel - ASTM - A - 234. 7. Composition bronze of ounce metal castings - ASTM - B - 62. 8. Seamless Copper tube, bright annealed - ASTM - B - 168. 9. Seamless copper tube - ASTM - B - 75. 10. Dimension of fittings - ANSI - B - 16.11. 11. Valves flanged and butt welding ends - ANSI - B - 16.34. <p>Instrument Tubing</p> <ol style="list-style-type: none"> 1. Seamless carbon steel pipe - ASTM - A 106. 2. Material of socketweld fittings - ASTM - A105. 3. Dimensions of fittings - ANSI - B - 16.11. 4. Code for pressure piping, welding, hydrostatic testing - ANSI B 31.1. <p>Cables</p> <ol style="list-style-type: none"> 1. Thermocouples extension wires/cables - ANSI MC 96.1 - 1992. 2. Requirements for copper conductor-Wiring cables for telecommunications & information processing system - VDE:0815. 3. Colour coding of single or multi-pair cables - ICEA - S - 61-402 (third edition) NEMA WCS - 1979 with revisions through 2/83. 4. Insulation & Sheathing compounds for cables : VDE 0207 (Part-4, 5 & 6). 5. Guide design and installation of cable systems in power generating stations (insulation, jacket materials) - IEEE Std. 422-1977. 6. Rules for Testing insulated cables and flexible cables : VVDE - 0472 7. Requirements of vertical flame propagation test - IEEE 383 - 1974 (R 1980) 			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 102 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>8. Standard specification for tinned soft or annealed copper wire for electrical purpose - ASTM B-33-81.</p> <p>9. Oxygen index and temperature index test - ASTM D - 2863.</p> <p>10. Smoke density measurement test - ASTM D - 2843.</p> <p>11. Acid gas generation test - IEC - 754 - 1.</p> <p>12. Swedish Chimney test - SEN - 4241475 (F3).</p> <p>13. Teflon (FEP) insulation & sheath test - ASTM D - 2116.</p> <p>14. Thermocouple compensating cables - Testing requirements & sampling plan IS:8784.</p> <p>15. PVC insulated electric cables for working voltage upto and including 1100 V - IS:1554 (Part-I).</p> <p>Cable Trays, Conduits</p> <p>1. Guide for design and installation of cable systems in power generating station (Cable trays, support systems, conduits) - IEEE Std. 422, 1977, NEMA VE-1 1979, NFPA 70-1984.</p> <p>2. -do- Test Standards. NEMA VE-1-1979.</p> <p>3. Zinc coating "hot dip" on assembled products for galvanising of carbon steel cable trays - ASTM A - 386-78.</p> <p>Public Address System</p> <p>1. Specifications for loud speakers - IS:7741 (Part-I, II and III)</p> <p>2. Code of safety requirement for electric mains operated audio amplifiers - IS:1301</p> <p>3. Specification for Public Address Amplifiers - IS:10426.</p> <p>4. Code of practice for outdoor installation of PA system - IS:1982.</p> <p>5. Code of practice for installation for indoor amplifying and sound distribution system - IS:1881.</p> <p>6. Basic environmental testing procedures for electronic and electrical items - IS:9000.</p> <p>7. Characteristics and methods of measurements for sound system equipment - IS:9302</p> <p>8. Code of practice of electrical wiring installations (System voltage not exceeding 650 volts) - IS:732</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 103 OF 114</p>	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>9. Rigid steel conduits for electric wiring - IS:9537 (Part-I and II)</p> <p>10. Fittings for rigid steel conduits for electrical wiring - IS:2667</p> <p>11. Degree of protection provided by enclosure for low voltage switchgear and control gear - IS:2147.</p> <p>Vibration Monitoring System</p> <p>1. API 670 - 1994</p> <p>2. BS : 4675 Part-2</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2</p>	<p>GENERAL TECHNICAL REQUIREMENTS</p>	<p>PAGE 104 OF 114</p>	

ANNEXURE-III

	Project :	Stage ::	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL					DOC. NO.:		
	Package :							REV. NO.:		
	Supplier :		DATE :							
	Contractor No. :		PAGE : OF							
SUB-SYSTEM :										
S. N.	Item	QP/ Insp. Cat.	QP No.	QP Sub. Schedule	QP approval schedule	Proposed sub-supplier	Place	Sub-suppliers approval status / category	Sub-supplier Details submission schedule	Remarks

LEGENDS
SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)
A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter “A” in the list alongwith the condition of approval, if any.
DR – For these items “Detailed required” for NTPC review. To be identified with letter “DR” in the list.
NOTED – For these items vendors are approved by Main Supplier and accepted by NTPC without specific vendor approval from NTPC. To be identified with “NOTED.”
QP/INSPN CATEGORY:
CAT-I : For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.
CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP.
CAT-III : For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.
UNITS/WORKS : Place of manufacturing Place of Main Supplier of multi units/works.

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ANNEXURE-IV

	Project :	Stage ::	STATUS OF ITEM REQUIRING QP& SUB-SUPPLIER APPROVAL					DOC. NO.:			
	Package :						REV. NO.:				
	Contractor :						DATE :				
	Contractor No. :						PAGE : OF				
S. N.	Item / Service	QP/ Insp. Cat.	QP Sub. Schedule Approval schedule	Date of sub-mission	Date of commt Appl.	Status Code C/II/I	Proposed Sub-suppliers	Place of manufacturing works	Approval Status	Sub-supplier detail submission schedule	Remarks
FORMAT						1/1	Engg. Div. / QA&I				

TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC.NO.: CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENT	PAGE 106 OF 114
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ANNEXURE-V

	Project : _____		Stage : _____		FIELD WELDING SCHEDULE (To be raised by the contractor) Welding Code:							DOC. NO.: _____				
	Contractor : _____											REV. NO.: _____				
	Contractor No. : _____				DATE : _____											
	System : _____				PAGE : _____ OF _____											
Sl. No.	DRG No. for Weld Location and Identification mark	Description of parts to welded	Matl. Spec.	Dimensions		Process of welding	Type of Weld	Electrode filler spec.	WPS. No.	Min. pre-heat	Heat treatment		NDT method/ Quantum	REF		Remarks
											Temp.	Holding time		Spec. No.	ACC Norm Ref.	
NOTES:																
SIGNATURE																
FORMAT						1/1						Engg. Div. / QA&I				

TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC.NO.: CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENT	PAGE 107 OF 114
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CLAUSE NO.

GENERAL TECHNICAL REQUIREMENTS (Annexure-VI)



S. No.	Description of Drgs./Docs.	No. of Prints	No. of Portable Hard Disk
1	Drawings, Data sheets, Design calculations, Purchase specifications and other documents		
	First submission and submission with major changes		
	▪ Layout (A0&A1 sizes)	4	-
	▪ Other Drawings/Documents (A0 & A1 sizes)	2	-
	▪ P&ID (All sizes)	4	-
	a) Final drawings/documents (Directly to site)	6	2
	b) "As Built" Drawing/Documents (Directly to site)	6	2
	c) Analysis reports of Equipments / piping / structures components/system employing software packages as detailed in the specifications.	2	2
2	Erection Manual (Directly to site)	4 sets	2
3	i) Operation & Maintenance manual First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2
4	i) Plant Hand Book First Submission	1	1
	ii) Final Submission (Directly to site)	4 sets	2
5	i) Commissioning and Performance Test Procedure manual First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2

TALCHER THERMAL POWER PROJECT
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CLAUSE NO.

GENERAL TECHNICAL REQUIREMENTS (Annexure-VI)



S. No.	Description of Drgs./Docs.	No. of Prints	No. of Portable Hard Disk
6	Performance and Functional Guarantee Test Report	2 sets	-
	i) First Submission		
	ii) Approved Copies (Direct to Site)	4 sets	2
7	Project Completion Report (Directly to site)	6 sets	2

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STAGE-III (2X660 MW)
EPC PACKAGE**

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एनटीपीसी NTPC	CORPORATE QUALITY ASSURANCE/ कॉर्पोरेट गुणवत्ता आश्वासन MAIN CONTRACTOR'S PROPOSAL CUM EVALUATION REPORT मुख्य संविदाकार प्रस्ताव सह मुल्यांकन रिपोर्ट
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Ref No: संदर्भ सं.:				Date: तिथि:			
i.	Main Contractor मुख्य संविदाकार						
ii.	Project परियोजना						
iii.	Package Name पैकेज का नाम				Package No पैकेज सं.		
iv.	Proposed Item/Scope of Sub-contracting उप-संविदा(अनुबंध) का प्रस्तावित मद/ दायरा						
v.	Item covered under निम्नलिखित के अंतर्गत शामिल मद	Schedule-1 /अनुसूची- 1			As per contract clause No- अनुबंध के अनुसार खंड सं.-- -		
		Schedule-2 अनुसूची- -2					
vi.	<p>If item is Schedule-1 and proposed sub-vendor is indigenous, Main Contractor to explain how the contractual provisions will be fulfilled</p> <p>/यदि मद अनुसूची -1 है और प्रस्तावित उप-विक्रेता स्वदेशी है, तो मुख्य संविदाकार को स्पष्ट करना होगा कि संविदा/अनुबंध के प्रावधान कैसे पूरे किए जाएंगे</p>						
vii.	Name and Address of the proposed Sub-vendor's works /प्रस्तावित सब-वेंडर का नाम तथा पता						
viii.	PO placement date/ Start of manufacturing (if self-manufactured) as per L2 network पीओ नियोजन की तिथि / एल- 2 नेटवर्क के अनुसार विनिर्माण (यदि स्व-निर्मित है) की शुरुआत						
ix.	Item Description (Type/Size/Rating/Scope of Sub-Contracting) मद का विवरण (प्रकार / आकार / रेटिंग / उप-अनुबंध का दायरा)	Total quantity of proposed item envisaged in this package (Nos/ Running Meters/ Kgs/ Tons etc) इस पैकेज में परिकल्पित प्रस्तावित मद की कुल मात्रा (संख्या / क्रियाशील मीटर / किलोग्राम / टन आदि)	Quantity proposed to be procured from proposed sub-vendor (Nos/ Running Meters /Kgs /Tons etc) प्रस्तावित उप-विक्रेता (संख्या / क्रियाशील मीटर / किलोग्राम / टन आदि) से खरीदी जाने वाली मात्रा	Timeline for quantity requirements as per project schedule & whether the proposed Sub-vendor equipped with adequate capacity to supply proposed order quantity in time / परियोजना समय सूची के अनुसार मात्रा आवश्यकताओं के लिए समय-सीमा और क्या प्रस्तावित उप-विक्रेता समय पर प्रस्तावित मांग की मात्रा की आपूर्ति करने में पूरी तरह से सक्षम है			
x.	Supply experience of the proposed sub-vendor (including supplies to Main Contractor, if any) for similar item/scope of sub-contracting, for last 3 years (Note:- Only relevant experience details w.r.t. proposed item/scope of subcontracting to be brought out here) पिछले 3 वर्षों के लिए उप-अनुबंध के समान मद / दायरे के लिए प्रस्तावित सब-वेंडर (मुख्य संविदाकार हेतु						

CORPORATE QUALITY ASSURANCE/ कॉर्पोरेट गुणवत्ता आश्वासन
MAIN CONTRACTOR'S PROPOSAL CUM EVALUATION REPORT
मुख्य संविदाकार प्रस्ताव सह मुल्यांकन रिपोर्ट

आपूर्ति, यदि कोई हो, सहित) का आपूर्ति अनुभव (नोट: - उप-अनुबंध के प्रस्तावित मद / दायरे के संबंध में केवल प्रासंगिक अनुभव के विवरण का उल्लेख हो									
<i>Project/Package</i> परियोजना/पैकेज	<i>Customer Name</i> ग्राहक का नाम	<i>Supplied Item</i> (<i>Type/Rating/Model /Capacity/Size etc</i>) आपूर्ति मद (प्रकार/रेटिंग /माडल /क्षमता/आकार आदि)	<i>PO ref no/date</i> पीओ संदर्भ सं. /तिथि	<i>Supplied Quantity</i> आपूर्ति की मात्रा	<i>Date of Supply</i> आपूर्ति की तिथि				
<i>We confirm that as per our assessment, the proposed sub-vendor has requisite capabilities & supply experience and is suitable for supplying the proposed item/scope of sub-contracting/हम अपने आकलन के अनुसार इस बात की पुष्टि करते हैं कि, प्रस्तावित उप-विक्रेता के पास अपेक्षित क्षमता और आपूर्ति करने का अनुभव है और उप-अनुबंध के दायरे /प्रस्तावित मद की आपूर्ति के लिए उपयुक्त है।</i>									
<i>Name:</i> नाम:		<i>Desig:</i> पद:		<i>Contact No:</i> दूरभाष सं.:		<i>Sign:</i> हस्ताक्षर:		<i>Date:</i> तिथि:	

Company's Seal/Stamp:- कंपनी का मुहर:-

i.	Item/Scope of Sub-contracting उप-संविदा(अनुबंध) का मद/ दायरा	
ii.	Address of the registered office पंजीकृत कार्यालय का पता 	Details of Contact Person संपर्क व्यक्ति का विवरण (Name, Designation, Mobile, Email) (नाम, पदनाम, मोबाइल, ईमेल)
iii.	Name and Address of the proposed Sub-vendor's works where item is being manufactured प्रस्तावित उप-विक्रेता के कार्यों का नाम और पता, जहां मद का निर्माण किया जा रहा है 	Details of Contact Person: संपर्क व्यक्ति का विवरण (Name, Designation, Mobile, Email) (नाम, पदनाम, मोबाइल, ईमेल)
iv.	Annual Production Capacity for proposed item/scope of sub-contracting उप-संविदा(अनुबंध) के प्रस्तावित मद / दायरे के लिए वार्षिक उत्पादन क्षमता	
v.	Annual production for last 3 years for proposed item/scope of sub-contracting उप-संविदा(अनुबंध) के प्रस्तावित मद / दायरे के लिए पिछले 3 वर्षों का वार्षिक उत्पादन	
vi.	Details of proposed works प्रस्तावित कार्यों का विवरण	
1.	Year of establishment of present works वर्तमान फैक्टरी की स्थापना का वर्ष	
2.	Year of commencement of manufacturing at above works उपरोक्त फैक्टरी में निर्माण कार्य शुरू होने का वर्ष	
3.	Details of change in Works address in past (if any) पूर्व में फैक्टरी स्थल में परिवर्तन का विवरण (यदि कोई हो)	
4.	Total Area कुल क्षेत्र Covered Area शामिल क्षेत्र	
5.	Factory Registration Certificate फैक्टरी पंजीकरण प्रमाण पत्र	Details attached at Annexure – F2.1 विवरण अनुलग्नक- एफ 2.1 पर संलग्न है
6.	Design/ Research & development set-up डिजाइन / अनुसंधान और विकास सेटअप (No. of manpower, their qualification, machines & tools employed etc.) (श्रमिकों की संख्या, उनकी योग्यता, मशीन और उपलब्ध उपकरण आदि)	Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design Details attached at Annexure – F2.2 (if applicable) लागू / लागू नहीं, अगर विनिर्माण मुख्य संविदाकार / खरीददार के डिजाइन के अनुसार है। विवरण अनुलग्नक –एफ 2.2 पर संलग्न है। (यदि लागू हो)
7.	Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc) मैनपावर विवरण के साथ समग्र संगठन का चार्ट (डिजाइन / विनिर्माण / गुणवत्ता आदि)	Details attached at Annexure – F2.3 विवरण अनुलग्नक – F2.3 में संलग्न है।
8.	After sales service set up in India, in case of foreign sub-vendor(Location, Contact Person, Contact details etc.) भारत	Applicable / Not applicable लागू / लागू नहीं

	में विक्री सेवा की स्थापना के बाद, विदेशी उप-विक्रेता के मामले में(स्थल , संपर्क व्यक्ति, संपर्क विवरण आदि)	<i>Details attached at Annexure – F2.4</i> विवरण अनुलग्नक -2.4 पर संलग्न है।			
9.	<i>Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any</i> फ्लोचार्ट सहित विनिर्माण प्रक्रिया निष्पादन योजना , जिसमें आउटसोर्स प्रक्रिया, यदि कोई हो, सहित कच्चे माल से तैयार उत्पाद तक विनिर्माण के विभिन्न चरणों को दर्शाया गया हो,	<i>Details attached at Annexure – F2.5</i> विवरण अनुलग्नक - F2.5में संलग्न है।			
10.	<i>Sources of Raw Material/Major Bought Out Item</i> कच्चे माल के स्रोत / खरीदे हुए मुख्य मद	<i>Details attached at Annexure – F2.6</i> विवरण अनुलग्नक - F2.6में संलग्न है।			
11.	<i>Quality Control exercised during receipt of raw material/BOI, in-process , Final Testing, packing</i> कच्चे माल / खरीदे हुए मद, प्रक्रियाबद्ध, अंतिम परीक्षण, पैकिंग करते समय गुणवत्ता नियंत्रण	<i>Details attached at Annexure – F2.7</i> विवरण अनुलग्नक - F2.7 पर संलग्न है			
12.	<i>Manufacturing facilities (List of machines, special process facilities, material handling etc.)</i> विनिर्माण सुविधा(मशीनों की सूची , विशेष प्रक्रिया सुविधाएं, सामग्री रख-रखाव आदि)	<i>Details attached at Annexure – F2.8</i> विवरण अनुलग्नक - F2.8में संलग्न है।			
13.	<i>Testing facilities (List of testing equipment)</i> परीक्षण सुविधाएं(परीक्षण उपकरण की सूची)	<i>Details attached at Annexure – F2.9</i> विवरण अनुलग्नक – F2. 9 में संलग्न है।			
14.	<i>If manufacturing process involves fabrication then-</i> यदि निर्माण प्रक्रिया में फेब्रिकेशन की गई है तो- <i>List of qualified Welders</i> पात्र वेल्डर की सूची <i>List of qualified NDT personnel with area of specialization</i> विशेषज्ञता के क्षेत्र सहित पात्र एनडीटी कार्मिकों की सूची	<i>Applicable / Not applicable</i> लागू / लागू नहीं <i>Details attached at Annexure – F2.10</i> विवरण अनुलग्नक - F2.10में संलग्न है। <i>(if applicable)</i> लागू / लागू नहीं			
15.	<i>List of out-sourced manufacturing processes with Sub-Vendors’ names & addresses</i> सब-वेंडर द्वारा बाह्य स्रोतों (उनके नाम और पते सहित)से करवाएं गए निर्माण प्रक्रियाओं की सूची	<i>Applicable / Not applicable</i> लागू / लागू नहीं <i>Details attached at Annexure. –F2.11</i> विवरण अनुलग्नक - F2.10में संलग्न है। <i>(if applicable)</i> (यदि लागू हो)			
16.	<i>Supply reference list including recent supplies</i> नवीनतम आपूर्ति सहित आपूर्ति संदर्भ सूची	<i>Details attached at Annexure – F2.12</i> विवरण अनुलग्नक - F2.12 में संलग्न है। <i>(as per format given below)</i> (नीचे दिए गए प्रारूप के अनुसार)			
<i>Project/ package परियोजना /पैकेज</i>	<i>Customer Name</i> ग्राहक का नाम	<i>Supplied Item (Type/Rating/Model /Capacity/Size etc)</i> आपूर्ति की गई वस्तु (प्रकार / रेटिंग / मॉडल / क्षमता / आकार आदि)	<i>PO ref no/date</i> पीओ संदर्भ सं. / तिथि	<i>Supplied Quantity</i> आपूर्ति की मात्रा	<i>Date of Supply</i> आपूर्ति की तारीख
17.	<i>Product satisfactory performance feedback letter/certificates/End User Feedback</i> उत्पाद के संतोषजनक प्रदर्शन संबंधी फीडबैक पत्र / प्रमाण पत्र / अंतिम उपयोगकर्ता फीडबैक			<i>Attached at annexure - F2.13</i> अनुलग्नक F2. 3पर संलग्न है	
18.	<i>Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product</i>			<i>Applicable / Not applicable</i> लागू / लागू नहीं	

**CORPORATE QUALITY ASSURANCE/ कॉर्पोरेट गुणवत्ता आश्वासन****SUB-VENDOR QUESTIONNAIRE/ सब-वेंडर प्रश्नावली**

	<i>(similar or higher rating)</i> प्रस्तावित उत्पाद (एक समान या उच्च रेटिंग वाले) के लिए टाइप टेस्ट रिपोर्ट (टाइप टेस्ट विवरण, रिपोर्ट संख्या, एजेंसी, जांच की तारीख) का सारांश नोट: - रिपोर्ट प्रस्तुत करने की आवश्यकता नहीं है <i>Note:- Reports need not to be submitted</i>	<i>Details attached at Annexure – F2.14</i> विवरण अनुलग्नक - F2.1 4में संलग्न है <i>(if applicable)</i> (यदि लागू हो)	
19.	<i>Statutory / mandatory certification for the proposed product</i> प्रस्तावित उत्पाद के लिए वैधानिक / अनिवार्य प्रमाणीकरण	<i>Applicable / Not applicable</i> लागू / लागू नहीं <i>Details attached at Annexure – F2.15</i> <i>(if applicable)</i> (यदि लागू हो)	
20.	<i>Copy of ISO 9001 certificate</i> आईएसओ 9001 प्रमाण पत्र की प्रति <i>(if available)</i> (यदि उपलब्ध हो)	<i>Attached at Annexure – F2.16</i> अनुलग्नक में संलग्न - F2.1 6 है	
21.	<i>Product technical catalogues for proposed item (if available)</i> प्रस्तावित मद के लिए उत्पाद तकनीकी कैटलॉग (यदि उपलब्ध हो)	<i>Details attached at Annexure – F2.17</i> विवरण अनुलग्नक - F2.1 7 में संलग्न है	
<i>Name:</i> नाम:	<i>Desig:</i> पद:	<i>Sign:</i> हस्ता क्षर:	<i>Date:</i> तिथि:

Company's Seal/Stamp:- कंपनी की मुहर / मोहर: -

GENERAL TECHNICAL REQUIREMENT OF WATER TREATMENT SYSTEM/PLANT

**TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CS-4540-001A-2**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	MECHANICAL SYSTEMS & EQUIPMENT			
1.00.00	GENERAL			
1.00.01	<p>The scope of the water Treatment plant includes Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of complete Water treatment System including all Civil, Electrical and Control & Instrumentation works. Broad scope of work described below shall be read in conjunction with the Data Sheets, Electrical works, Control & Instrumentation works and Civil works, various subsections of Part-B of this Technical Specification and relevant Tender drawings. The broad scope of Water Treatment Plant includes but not limited to the following systems and equipment. The items/equipment though not specifically mentioned but are needed to make the system/plant complete shall also be furnished, erected, and commissioned unless otherwise specifically excluded.</p>			
1.00.02	<p>The analysis of Raw water to be adopted for design of water treatment plant is enclosed elsewhere in the technical specification. Bidder to decide the design filter water analysis for RO/DM based on the Pre-treatment.</p>			
1.01.00	WATER PRE-TREATMENT PLANT			
1.01.01	<p>PT- CW System</p> <ul style="list-style-type: none"> a) Raw water pipe (CS) up to the aerator through a set of Control Valve & Isolation Valves for Control Valves. b) One (1) number Aerator and one (1) number stilling chamber of RCC Construction of required capacity along with isolation gates at the inlet to the inlet channels for PT-CW system clarifier. c) Three (3) numbers of inlet channels with flow measuring element in each channel (parshall flume) of RCC Construction. d) One (1) number bypass channel of RCC Construction to by-pass clarifier(s) with required isolation gate(s). e) Three (3) numbers of reactor type clarifiers of RCC Construction each of required capacity including associated equipment and drives for PT-CW system. f) One (1) number Clarified Water Storage Tank/Clarified water distribution chamber of RCC Construction with required isolation valves/gates. g) Outlet channels of RCC Construction from Clarifiers up to the Clarified Water Storage Tank/Clarified water distribution chamber. h) Interconnection between the clarified water outlet channel and outlet channel of PT-DM System. <p>Plant Potable Water Transfer System</p> <ul style="list-style-type: none"> a) Outlet channel of RCC Construction from Clarifiers header up to the Gravity filters of Potable Water System b) Two (2) numbers of Gravity Filters (Potable Water System) of RCC Construction with all accessories as described elsewhere, interconnecting piping, valves etc. c) One (1) number filtered water reservoir (in twin sections located below the filters) of RCC Construction, filtered water sump and common filtered water pump house for PT –Potable water & PT-DM systems. 			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2	SUB SECTION- IIA-10 WATER TREATMENT PLANT	PAGE 1 OF 12	

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
<p>1.01.03</p> <p>1.01.04</p>	<p> d) Two (2) numbers of Potable water pumps(colony), its drives, associated suction pipes from filtered water sump, isolation valves, pump(s) discharge pipes (CS), non-return valves & isolation valves at the discharge etc. e) Two (2) numbers of Potable water pumps (Plant), its drives, associated pipes, isolation valves, non-return valves & isolation valves at the discharge etc. f) Two (2) numbers of air blowers of oil free type of required capacity, its drives and associated accessories, air (Galvanized CS) piping from blowers to each section of the filter for air scouring of filters during backwash operation. g) One (1) number electrically operated monorail hoist(s) (common for both PT-DM & PT-Potable System) of required capacity for handling all the pumps, blowers, drives etc. h) Interconnecting air (Galvanised CS) piping, valves etc. from the blowers to each Gravity filter for air scouring of filters during backwash operation. </p> <p>PT- DM System</p> <p> a) Raw water pipe (CS) up to the aerator through a set of Control Valve & Isolation Valves for Control Valves. b) One (1) number Aerator and one (1) number stilling chamber of RCC Construction of required capacity along with isolating gates at the inlet to the inlet channels for PT-DM system clarifier. c) One (1) number inlet channel of RCC Construction with flow measuring element in each channel (parshall flume). d) One (1) number bypass channel of RCC Construction to by-pass clarifier(s) with required isolation gate(s). e) One (1) number reactor type clarifier of RCC Construction of required capacity including associated equipment and drives for PT-DM system. f) Outlet channel of RCC Construction from Clarifier up to the Gravity filters of PT-DM System g) Two (2) numbers of Gravity Filters (PT-DM System) of RCC Construction with all accessories as described elsewhere, interconnecting piping, valves etc. h) Two (2) numbers of air blowers of oil free type of required capacity, its drives and associated accessories, air (Galvanised CS) piping from blowers to each section of the filter for air scouring of filters during backwash operation. i) Filtered water Transfer pumps or Filter water supply pumps (UF Feed pumps), associated piping, valves & drives for feeding to DM plant etc. j) Interconnecting air (Galvanised CS) piping, valves etc. from the blowers to each Gravity filter for air scouring of filters during backwash operation. </p> <p>Chemical House Equipment</p> <p> a) Two (2) numbers of electrically operated monorail hoists for transporting the chemicals from the ground floor to the respective preparation tanks and required number of weighing scales. b) Lime preparation & dosing system consisting of required number of RCC lime slaking tanks, RCC lime solution preparation tanks, agitators, lime slurry transfer pumps, </p>	<p> TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE </p>	<p> TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2 </p>	<p> SUB SECTION- IIA-10 WATER TREATMENT PLANT </p> <p> PAGE 2 OF 12 </p>

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
<p>1.02.00</p> <p>1.02.01</p>	<p>lime solution dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc.</p> <p>c) Alum Solution preparation & dosing system consisting of required number of RCC Alum solution preparation tanks, agitators, alum solution dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc.</p> <p>d) FeCl₃ preparation & dosing system consisting of required number of preparation tanks, agitators, dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc. (in case of PT-DM System Option-2)</p> <p>e) PE dosing system consisting of required number of tanks, agitators, dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc. (in case of PT-DM System)</p> <p>f) PAC dosing system consisting of required number of tanks, agitators, dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc.</p> <p>g) One (1) number RCC overhead filtered water storage tank of required capacity, on top of chemical house with water supply line from the discharge of filtered water pumps, associated valves, piping, fittings etc.</p> <p>h) Mechanical Ventilation system for complete chemical house building covering chemical storage area, chemical preparation area, toilets etc.</p> <p>CHLORINE DI-OXIDE (ClO₂) PLANT</p> <p>PT ClO₂ System</p> <p>The contractor's minimum scope of supply for Chlorine di-oxide plant (PT system) shall be in general but not limited to the following:</p> <p>a) 2 (Two) Nos. (1W+1S) Automatic Chlorine-di-oxide underwater generators of submerged/encapsulated type.</p> <p>b) 1x100% HCl dosing pump for each Chlorine-di-oxide generator. Total nos. of HCl dosing pumps shall be Two (2) Nos (1W+1S).</p> <p>c) 1x100% NaClO₂ dosing pump for each Chlorine-di-oxide generator. Total nos. of NaClO₂ dosing pumps shall be Two (2) Nos (1W+1S).</p> <p>d) Two (2) Nos (2x100%) horizontal centrifugal type Dilution water pump along with all accessories.</p> <p>Two (2) Nos. Online Residual Chlorine dioxide analyzer in the potable/raw water systems.</p> <p>1 No. handheld Calorimeter for on-spot measurement of residual ClO₂</p> <p>e) 2 Nos. ClO₂ leak sensor with detector inside the room (common for PT & CW). Industrial type-high decibel hooter shall also be provided.</p> <p>f) 1 No. safety shower with eye wash facility (Common for PT & CW).</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2</p>	<p>SUB SECTION- IIA-10 WATER TREATMENT PLANT</p>	<p>PAGE 3 OF 12</p>	

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.02.02	<p>g) Safety equipments (common for both CW & PT ClO₂ systems): 4 Nos. respiratory equipment; 4 Nos. canister type gas mask; 4 Nos. safety helmets, goggles, rubber boots, gloves and coloured vests (aprons), 4 nos. of ammonia torches, 4 Nos. of emergency repair kit, 4 Nos Weather socks provided at a suitable location on the building, display charts, safety checks, maintenance procedure, Emergency action plan etc.</p> <p>h) Complete piping (including interconnecting), all fittings, bends, tees, reducers, flanges, nuts & bolts, gaskets, specials, isolation valves, permanent strainers etc, including pipe racks and supports, jointing etc, and any other work as required for the system.</p> <p>i) Necessary Ventilation equipments & systems.</p> <p>j) Any other items/equipment if required for completeness of the system, safety requirements and to make the plant complete & safely operational.</p> <p>CW ClO₂ System</p> <p>The contractor's minimum scope of supply for Chlorine di-oxide plant (CW system) shall be in general but not limited to the following:</p> <p>a) 2 (Two) Nos. (2W) Automatic Chlorine-di-oxide underwater generators of submerged/encapsulated type.</p> <p>b) 1x100% HCl dosing pump for each Chlorine-di-oxide generator with a common standby. Total nos. of HCl dosing pumps shall be Three (3) Nos (2W+1S).</p> <p>c) 1x100% NaClO₂ dosing pump for each Chlorine-di-oxide generator with a common standby. Total nos. of NaClO₂ dosing pumps shall be Three (3) Nos (2W+1S).</p> <p>d) Three (3) Nos (3x100%) horizontal centrifugal type Dilution water pumps along with all accessories.</p> <p>e) 2 Nos. (one per unit) of Online Residual Chlorine dioxide analyzer in the Cooling Water Return Header.</p> <p>f) 1 No. portable ORP meter (common for CW & PT ClO₂ systems).</p> <p>g) Complete piping (including interconnecting), all fittings, bends, tees, reducers, flanges, nuts & bolts, gaskets, specials, isolation valves, permanent strainers etc, including pipe racks and supports, jointing etc, and any other work as required for the system.</p> <p>h) Necessary Ventilation equipment & systems.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2</p>	<p>SUB SECTION- IIA-10 WATER TREATMENT PLANT</p>	<p>PAGE 4 OF 12</p>	

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES		
<p>1.02.03</p>	<div style="text-align: right;"></div> <p>i) Any other items/equipment if required for completeness of the system, safety requirements and to make the plant complete & safely operational.</p> <p>The contractor's minimum scope of supply shall also include common (catering requirement of PT & CW ClO₂ Systems) chemical storage and unloading facilities which shall be in general but not limited to the following:</p> <p>a) Three (3) Nos (3x100%) of Bulk Acid Storage Tanks (33% HCl) (Tanks shall have net effective storage capacity of 15 days (minimum 4 hours dosing/day in case of CW System and continuous dosing in case of PT system) requirement or 3 x 35 m³ whichever is higher excluding free board and dead storage) with all nozzles, vents, fume collection/absorber, Density indicator, neutralization system, drain, overflows etc. These tanks shall be of FRP (with UV protection) construction.</p> <p>b) Three (3) Nos (3x100%) of Sodium Chlorite Bulk Storage Tanks (31% NaClO₂) (Tanks shall have net effective storage capacity of 15 days (minimum 4 hours dosing/day in case of CW System and continuous dosing in case of PT system) requirement or 3x 35 m³ whichever is higher excluding free board and dead storage) with all nozzles, vents, fume collection/absorber, Density indicator, neutralization system, drain, overflows etc. These tanks shall be of FRP (with UV protection) construction.</p> <p>c) Two (2) Nos. (1W+1S) (2x100%) horizontal centrifugal type Unloading cum Transfer pumps (33% HCl) along with all accessories.</p> <p>d) Two (2) Nos. (1W+1S) (2x100%) horizontal centrifugal type Unloading cum Transfer pumps (31% NaClO₂) along with all accessories.</p> <p>e) Complete piping (including interconnecting), all fittings, bends, tees, reducers flanges, nuts & bolts, gaskets, specials, isolation valves, permanent strainers etc, including pipe racks and supports, jointing etc, and any other work as required for the system.</p>		
<p>1.03.00</p>	<p>LIQUID EFFLUENT TREATMENT PLANT</p>		
<p>1.03.01</p>	<p>PT- Plant Clarifier Sludge Disposal System</p> <p>a) One (1) number RCC sludge pit (2 sections) to collect sludge from all the clarifiers of PT-CW system, PT-DM system & Tube settlers/Lamella clarifiers of required capacity, sludge piping from clarifiers up to the pit, associated valves etc.</p> <p>b) Sludge disposal pumps of required capacity, its drives, associated valves, piping etc.</p> <p>c) Air blowers of oil free type of required capacity, its drives and associated accessories, air (Galvanised CS) piping from blowers to each section of the sludge pit for air scouring of sludge.</p>		
<p>1.03.02</p>	<p>Filter Back Wash Waste Disposal System</p> <p>a) One (1) number RCC Filter backwash waste collection pit of required capacity to collect the backwash water from filters, back wash waste water piping from filters up to the pit, associated valves etc.</p>		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2</p>	<p>SUB SECTION- IIA-10 WATER TREATMENT PLANT</p>	<p>PAGE 5 OF 12</p>

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
<p>1.03.03</p>	<p>b) Backwash water pumps, its drives, associated piping and valves from the above pumps to stilling chamber of PT-DM system.</p> <p>Waste Service Water Treatment System</p> <p>a) One (1) number RCC waste service water sump (WSWS) (2 sections) for collection of various wastewaters of the plant.</p> <p>b) Facility to collect free oil from these sumps to a MS oil drum of 200 litre capacity with the help of Drum type (2 Nos.) oil skimmers, Centrifuge (1 no.) of required capacity.</p> <p>c) Waste service water transfer pumps to transfer the waste service water from the sump to the tube settlers/lamella clarifiers, its drives associated piping (CS) & valves etc.</p> <p>d) Two (2) numbers tube settlers/lamella clarifiers of RCC Construction along with RCC flash mixers and RCC flocculation chambers. Both the flash mixers and flocculation chambers shall be provided with agitators (SS-316 construction).</p> <p>e) The capacity of waste service water sump and tube settlers/lamella clarifiers shall meet the requirement of waste service water & other wastewater collected from various plant areas other than coal slurry settling pond (CSSP).</p> <p>f) One (1) number (twin section) of RCC treated water tank/CMB for collection of treated water. Treated water pumps of capacity required to transfer the treated service water, its drives, associated piping (CS) & valves etc.</p> <p>g) Sludge Pipeline (Cast Iron) with associated valves from the tube settlers/ lamella clarifiers by gravity flow up to the common sludge pit.</p>			
<p>1.03.04</p>	<p>Coal Handling Plant Run-Off Water Treatment System</p> <p>a) Inlet connection channel from drain in Coal Stockyard area up to the Coal Slurry Settling (CSSP) Pond to transfer wastewater laden with coal dust to the CSSP.</p> <p>b) Coal Slurry Settling (CSSP) Ponds of RCC Construction each of specified size/capacity</p> <p>c) Coagulant-aid tanks of MS rubber lined construction.</p> <p>d) One (1) number decanted water sump of RCC Construction (2 sections) to receive decanted water from above settling ponds of required size/capacity and discharge channel from the CSSP to decanted water sump.</p> <p>e) Required number of Coal Decanted Water Pumps and Clarifier feed pumps (CSSP area) of required capacity, its drives, associated piping (CS), valves etc.</p> <p>f) Two (2) numbers portable submersible type pumps of capacity 100 m³/hr, 20 MWC for draining the water from the CSSPs, with hose pipes etc.</p> <p>g) One (1) number stilling chamber, One (1) numbers of reactor clarifiers of RCC construction, RCC channels, distribution chamber etc. of required capacity to receive excess storm water from settling ponds, required number of pumps, piping, valves etc. to discharge treated supernatant water to CW channel. Provision of diverting the treated supernatant water to storm water drain & WSWS shall also be provided. Necessary lime dosing facility for neutralization like preparation tanks, dosing tanks, pumps (2x100%), piping etc.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>		<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2</p>	<p>SUB SECTION- IIA-10 WATER TREATMENT PLANT</p>	<p>PAGE 6 OF 12</p>

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES		
2.00.00	<div style="text-align: right; margin-bottom: 10px;">  </div> <p>h) Lime preparation & dosing system consisting of required number of RCC lime slaking tanks, RCC lime solution preparation tanks, agitators, lime slurry transfer pumps, lime solution dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc.</p> <p>i) Alum Solution preparation & dosing system consisting of required number of RCC Alum solution preparation tanks, agitators, alum solution dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc.</p> <p>j) Suitable synthetic flocculent dosing shall also be provided to increase the settling rate suspended solids. Flocculent preparation & dosing system consisting of required number of preparation tanks, agitators, dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc. shall be provided.</p> <p>k) Chemical storage and dosing area for Coal Handling Plant Run-Off Water Treatment System shall be separately provided under shed. Chemical storage shall be designed to meet minimum 15 days requirement.</p> <p>l) The sludge removed from underflow of the clarifier shall be dewatered using the Filter press for dried coal particles to be reused. Required numbers of filter presses, necessary pumps, piping, valves etc. shall be provided.</p> <p>DEMINERALISATION (DM) PLANT</p> <p>A) OPTION – 1 (ION EXCHANGE BASED DM PLANT)</p> <p>a) Filtered Water transfer Pumps of required capacity, its drives & associated piping from filtered water pump house (in PT area) to DM Plant.</p> <p>b) Two (2) numbers of Activated carbon filters with all accessories.</p> <p>c) Two (2) numbers of Weak Cation exchanger units & Two (2) numbers of Strong Cation exchanger units with all accessories.</p> <p>d) Two (2) numbers of Degasser system comprising of Degasser Tower, storage tank, Air Blowers [two (2) numbers per degasser tower] & its drives and Three (3) numbers of Degassed water transfer pumps & its drives with all accessories.</p> <p>e) Two (2) numbers of Weak Anion exchanger units & Two (2) numbers of Strong Anion exchanger units with all accessories.</p> <p>f) Two (2) numbers of Mixed bed unit along with Two (2) numbers air blowers with its drives and all accessories.</p> <p>g) Two (2) numbers of UF feed Tanks complete with all accessories, three (3) nos. ultrafiltration UF feed pumps complete with drive motors and accessories as required, two (2) nos. Ultrafiltration skids (Polishing UF) complete with all necessary piping, valves and, instrumentation etc.</p> <p>h) Two (2) nos. UF backwash pumps, Two (2) nos. of UF fast flush pumps complete with drive motors and accessories as required.</p> <p>i) One (1) no. UF CIP/CEB system for chemical cleaning with tanks, agitators with motor, piping arrangements with accessories, Two (2) nos. (2x100%) CIP/CEB pumps complete with drive motors.</p> <p>j) Complete Hydrochloric acid handling, measuring tanks and dosage system.</p>		
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2</p>	<p style="text-align: center;">SUB SECTION- IIA-10 WATER TREATMENT PLANT</p>	<p style="text-align: center;">PAGE 7 OF 12</p>

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	<p>k) Complete Alkali handling, measuring tanks and dosage system.</p> <p>l) Required numbers of safety shower units and adequate number of Eye- fountains to protect against any chemical hazard.</p> <p>m) Two (2) numbers of DM water storage tanks with all accessories.</p> <p>n) Required numbers of DM water pumps for regeneration system and its drives.</p> <p>o) Neutralizing waste disposal system - All DM plant Effluent drains (except backwash water from AC filters and fast/final rinse waste water of Ion-Exchangers units) shall be connected to the Neutralisation Pit. Neutralised waste shall be pumped to Ash Slurry Sump/tank. Additionally, provision for diverting N-pit waste to CMB shall also be provided. UF back wash water shall also be led to this N-pit.</p> <p>p) Backwash water from AC filters and fast/final rinse waste water of Ion-Exchangers units shall be connected to the backwash sump and same shall be led into the inlet channel of PT-DM clarifier of Water Pretreatment Plant.</p> <p>q) First fill of filter media for AC filters & First fill of resins for all Ion Exchange units.</p> <p>r) Interconnecting piping, valves, fittings and accessories including Pre-Cast RCC pipes at road crossing as required.</p> <p>s) Supply and application of final painting to all the equipment, piping & accessories.</p> <p>t) All approach ladders and operation/maintenance platforms, handrails as required for various equipment, valves and instruments, support trestles, bridges, brackets, bolts, nuts, clamps etc. for the associated piping are under bidder's scope.</p> <p>u) Suitable MS Epoxy Painted elevated Access Platform to be provided for internal inspection of all the AC Filters and Ion Exchanger vessels.</p> <p>v) Required numbers of DM water makeup pumps and drives & associated valves and piping etc.</p> <p>w) Required numbers of Boiler Fill pumps and drives & associated Valves and piping etc.</p> <p>x) Required numbers of condensate transfer pumps and drives & associated Valves and piping etc.</p> <p>y) Brine Solution Preparation Tank and Brine transfer pumps, piping and valves.</p> <p>z) Provision of hot water supply to the ACF units from the hot water tank shall be made for rejuvenation of activated carbon and the DM regeneration pumps to be sized considering above requirement in addition to required for regeneration.</p> <p>B) OPTION-2 (UF+RO+MB BASED DM PLANT)</p> <p>1. ULTRAFILTRATION (UF) SYSTEM</p> <p>a) UF Feed Pumps with electrical motor drives, suction & discharge pipe header, valves and all accessories.</p> <p>b) Ultra filtration system membranes skids (UF) (2x60%) (Pressurized type) along with basket strainers and necessary valves, piping, fittings etc.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2</p>	<p>SUB SECTION- IIA-10 WATER TREATMENT PLANT</p>	<p>PAGE 8 OF 12</p>	

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES		
	<div style="text-align: right; margin-bottom: 10px;">  </div> <p>c) UF backwash pumps along with flushing tanks and pumps, CEB tank, chemical dosing system, required storage tank etc. CIP system (as applicable) shall be provided as per manufacturer's standard.</p> <p>d) UF streams shall be pressurized type. Details of UF are furnished in Part-B of Technical Specification.</p> <p>e) Two (2) numbers of UF permeate water storage tanks of required capacity/sizes with required isolation Valves.</p> <p>f) UF permeate transfer pumps of required capacity, its drives, associated valves, piping etc.</p> <p>g) Platform, ladders etc. to facilitate approach to various tanks, manholes/hand-holes, sight-glass, operation & maintenance of valves, instruments etc shall be provided.</p> <p>h) Associated Piping, Valves, Instrumentation & Fittings etc to make the system complete.</p> <p>2. MICRON CARTIRDGE FILTERS</p> <p>a) Micron Cartridge Filters (MCF) shall be sized for rated capacity of UF permeate transfer pumps.</p> <p>b) The design pressure of vessel shall be at least 115% of sum of shut-off head of UF permeate transfer pumps and suction head available.</p> <p>3. RO SYSTEM</p> <p>a) Required numbers of High Pressure (HP)-RO feed pumps with electric motor drives, suction header from discharge header of Cartridge filters & discharge pipe header, valves, accessories, associated piping, fitting etc.</p> <p>b) Three (3) (3x50%) (2W+1S) numbers of RO Streams/trains module rack assemblies, sampling facilities and automatically operated reject control valves, piping, fittings etc.</p> <p>c) Complete system for chemical cleaning and flushing system comprising the necessary tanks and pumps for RO trains/streams. The effluent of RO chemical cleaning shall be led to the sludge pit.</p> <p>d) Complete degasser system for removal of CO₂ in permeate water from RO units, consisting of one degasser towers of required capacity with spray nozzles, mist eliminators, packing, packing support structures, operating platforms, ladders, gratings etc.</p> <p>e) Two (2) numbers of RO permeate water storage tanks of required capacity and required numbers of Degasser Blowers for Degasser.</p> <p>f) Required number of Degassed water/RO permeate transfer pumps of required capacity with electrical motor drives, suction & discharge pipe, valves, accessories etc.</p>		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2</p>	<p>SUB SECTION- IIA-10 WATER TREATMENT PLANT</p>	<p>PAGE 9 OF 12</p>

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	 <p>g) Four (4) (4x50%) (2W+2S) numbers of Mixed Bed units along with two (2) numbers air blowers with its drives and all accessories. The regeneration system shall be designed to regenerate two (2) MB units simultaneously.</p> <p>h) Complete Hydrochloric acid handling, measuring tanks and dosage system.</p> <p>i) Complete Alkali handling, measuring tanks and dosage system.</p> <p>j) Required number of safety shower units and adequate number of Eye- fountains to protect against any chemical hazard.</p> <p>k) Neutralizing waste disposal system - All DM plant Effluent drains (except backwash water from AC filters and fast/final rinse waste water of Ion-Exchangers units) shall be connected to the Neutralisation Pit. Neutralised waste shall be pumped up to Ash Slurry Sump/tank. Additionally, provision for diverting N-pit waste to CMB shall also be provided.</p> <p>l) Approach ladders and operation/maintenance platforms, handrails as required for various equipment, valves and instruments. Construction of support trestles, bridges, brackets, bolts, nuts, clamps etc. for the associated piping and fittings etc.</p> <p>m) Adequate space for access and maintenance shall be provided for HP pumps (at the end of pump bay) and UF & RO membrane racks (at the sides).</p> <p>n) Two (2) numbers of DM water storage tanks with all accessories.</p> <p>o) Two (2) (2 X 100%) of DM water pumps for regeneration system and its drives.</p> <p>p) Required number of DM water makeup pumps and drives & associated Valves and piping etc.</p> <p>q) Required number of Boiler Fill pumps and drives & associated Valves and piping etc.</p> <p>r) Required number of Condensate transfer pumps and drives & associated Valves and piping etc.</p> <p>s) Supply of Antiscalant and Antioxidant applicable as offered for RO skids for a period of one (1) year from the date of successful commissioning of the proposed water treatment plant.</p> <p>t) RO Reject water piping from RO trains up to CHP tank. The effluent of RO chemical cleaning shall be led to the sludge pit.</p> <p>u) Required platform, ladders etc. to facilitate approach to various tanks, manholes/hand-holes, sight-glass, operation & maintenance of valves, instruments etc. shall be provided.</p> <p>v) Interconnecting piping, valves, fittings etc.</p> <p>4. CHEMICAL STORAGE & DOSING SYSTEM</p>		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2</p>	<p>SUB SECTION- IIA-10 WATER TREATMENT PLANT</p>	<p>PAGE 10 OF 12</p>

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	<p>a) Complete system for coagulant handling, preparation and dosing system comprising the necessary bulk coagulant storage tanks, required structures, operating platforms, ladders etc., Coagulant unloading cum transfer pumps, its drives, required suction & discharge piping, valves, fittings etc., required numbers of Coagulant preparation tanks & its accessories, required numbers of Coagulant dosing pumps, its drives, piping, valves, fittings etc., dosing piping from the pumps up to the clarifiers.</p> <p>b) Complete system for coagulant aid handling, preparation and dosing system comprising the necessary coagulant aid preparation tanks, required structures, operating platforms, ladders etc., required numbers of Coagulant aid dosing pumps, its drives, piping, valves, fittings etc., dosing piping from the pumps up to the clarifiers as the case may be and as required for the process.</p> <p>c) Bulk anti-scalant storage tank(s), required numbers of anti-scalant preparation tanks & its accessories, required number of anti-scalant dosing pumps, its drives, required suction & discharge piping, valves, fittings, etc., dosing piping from the pumps up to the dosing point as required for the process.</p> <p>d) Bulk antioxidant storage tank(s), required numbers of Anti-oxidant preparation tanks & its accessories, required numbers of Anti-oxidant dosing pumps, its drives, required suction & discharge piping, valves, fittings, etc., dosing piping from the pumps up to the dosing point as required for the process.</p> <p>e) Required numbers of Hydrochloric Acid unloading cum transfer pumps, its drives, required suction & discharge piping, valves, fittings etc., required numbers of Bulk storage tanks for Hydrochloric acid of 30-33% concentration & its accessories, required numbers of Acid (HCl) measuring tanks & its accessories, required numbers of Acid (HCl) dosing pumps/ejectors for pH control of RO system and for Mixed Bed regeneration, its drives, required piping, valves, controls etc., dosing piping from the pumps up to dosing points and whenever pH control is required as per process requirement.</p> <p>f) Required numbers of Sodium Hydroxide (Alkali) unloading pumps, its drives, required suction & discharge piping, valves, fittings etc., required numbers of Sodium Hydroxide (Alkali) transfer cum re-circulation pumps, its drives, required suction & discharge piping, valves, fittings etc., required numbers of Bulk storage tanks for Alkali (NaOH in lye form), operating platforms, ladders, etc., required number of Alkali preparation tank & its accessories, required numbers of Alkali measuring tanks for pH control of RO System & its accessories, required numbers of Alkali (NaOH) dosing pumps/ejectors for pH control of RO system and Mixed Bed regeneration, its drives, required piping, valves, fittings, etc., dosing piping from the pumps up to dosing point wherever pH control is required as per process requirement.</p> <p>g) Required platform, ladders etc. to facilitate approach to various tanks, manholes/hand-holes, sight-glass, operation & maintenance of valves, instruments etc. shall be provided.</p> <p>h) Required number emergency safety shower with eye wash units in the Chemical Storage Handling facility at each location such as Acid/Alkali Storage area, Chemical storage area, Chlorination plant area and Chemical preparation & doing equipment area.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2</p>	<p>SUB SECTION- IIA-10 WATER TREATMENT PLANT</p>	<p>PAGE 11 OF 12</p>	

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES		
<p>3.00.00</p> <p>4.00.00</p> <p>5.00.00</p>	<div style="text-align: right;"></div> <p>i) All Interconnecting piping, valves, fittings etc.</p> <p>Drainage pumps along with all accessories.</p> <p>Mobile cranes of suitable capacity confirming to relevant IS code are to be provided as under.</p> <p>a) PT Plant & DM Plant Area: 2 Nos. mobile cranes</p> <p>b) The capacity of mobile cranes shall be calculated based on the maximum load to be lifted with 25% margin.</p> <p>Note: Proper approach road for movement to pump house/shed is to be made.</p> <p>Any other equipment envisaged by the bidder to meet the system requirement.</p>		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.CS-4540-001A-2</p>	<p>SUB SECTION- IIA-10 WATER TREATMENT PLANT</p>	<p>PAGE 12 OF 12</p>



TITLE:
**TECHNICAL SPECIFICATION FOR
 PRE TREATMENT PLANT (PT PLANT)
 TALCHER THERMAL POWER PROJECT
 STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-158A-A001

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SECTION-D

REV. NO. 00

DATE:

GENERAL TECHNICAL REQUIREMENT OF WATER TREATMENT SYSTEM/PLANT (CONT.)

1.00.00	<p>Water treatment plant</p> <p>A. Pre-treatment system</p> <p>Design criteria of Pre-Treatment Plant for Circulating Water (PT-CW) & DM system (PT-DM):</p> <ol style="list-style-type: none"> 1) "PT-CW" System with minimum three (3) reactor type clarifiers, one (1) number aerator (1x100%) & one (1) number stilling chamber (1x100%) (Common for all the Clarifiers), three (3) Inlet channels of RCC Construction with flow measuring element (Parshall flume), outlet Channels, Clarified Water Storage Tank, bypass channel to by-pass the clarifier(s). 2) "PT-DM" System with one (1) number reactor type clarifier (1x100%), one (1) number aerator (1x100%) & one (1) number stilling chamber (1x100%), one (1) number inlet channel of RCC Construction with flow measuring element (Parshall flume) and two (2) numbers of Gravity filters (2x100%), Gravity Filter blowers (2x100%) filtered water reservoir (twin section), pump house etc. 3) "PT-Potable" System with two (2) numbers of Gravity filters (2x100%), Gravity Filter blowers (2x100%), filtered water reservoir (twin section), pump house etc.
	<ol style="list-style-type: none"> 4) Three (3) numbers (3x100%) Filtered Water Transfer Pumps shall be provided for Ion Exchange based DM plant. In case of UF+RO+MB plant be envisaged for DM water, three (3x100%) numbers Filtered Water Supply Pumps (UF Feed Pumps) shall be provided. 5) Interconnection provision shall be provided between the clarified water outlet channels of PT-CW System with the PT-DM System to have flexibility in operation. 6) Chemical House: A common two (2) storey Chemical house of RCC construction shall be provided to install various Chemical dosing equipment, pumps, tanks, piping etc. of PT-CW & Potable, PT-DM, PT-RO plant (As applicable) : <ol style="list-style-type: none"> a) Lime preparation & dosing system consisting of minimum two (2) nos. of RCC lime slaking tanks, minimum three (3) nos. of lime solution Preparation tanks of RCC construction, agitators, lime slurry transfer pumps (2x100%), lime solution dosing pumps (2x100%) etc. b) Alum Solution preparation & dosing system consisting of minimum four (4) nos of Alum solution preparation tanks, agitators, alum solution dosing pumps (3W+1S) for PT-CW Clarifiers, (2x100%) for PT-DM Clarifier, (2x100%) for Lamella clarifier/tube settlers etc. c) FeCl₃ (35-45 % conc.) (in case of PT-RO) preparation & dosing system consisting of minimum two (2) nos. of dosing tanks, agitators, coagulant unloading and transfer pumps (2x100%), FeCl₃ dosing pumps (2x100%) etc. d) PE dosing system consisting of minimum two (2) nos. of dosing tanks, agitators (SS-316), dosing pumps (2x100%) (in case of PT-RO) etc. e) PAC dosing system shall consist of minimum two (2) numbers of storage cum dosing tanks, agitators, dosing pumps (2x100%), unloading pumps (2x100%) etc.



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**TECHNICAL SPECIFICATION FOR
PRE TREATMENT PLANT (PT PLANT)
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

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- f) Coagulant handling, storage, and dosage system with bulk Coagulant storage tanks (2), capacities of both tanks together shall be sized for one(1) month's storage, the tank shall be fitted with vent, drain, overflow seal pots etc., Coagulant unloading cum transfer pumps (2x100%), Coagulant preparation tanks (2) with motorized agitator, capacities of both tanks together shall be sized to prepare and store 1 day requirement of Coagulant, Coagulant dosing pumps (2x100%).
- g) Coagulant aid handling, storage, and dosage system with bulk Coagulant storage for one(1) month's storage with design dose, Coagulant aid dosing pumps (2x100%), Coagulant aid preparation tanks (2) with motorized agitator, capacities of both tanks together shall be sized to prepare and store 1 day requirement of Coagulant aid.
- h) Anti-scalant handling, storage, and dosage system with bulk storage for one(1) month's storage with design dose, Anti-scalant preparation tanks (2) with motorized agitator, capacities of both tanks together shall be sized to prepare and store 1 day requirement of Anti-scalant, Anti-scalant dosing pumps (2x100%).

- i) Anti-oxidant handling, storage, and dosage system with bulk storage for one(1) month's storage with design, Anti-oxidant preparation tanks (2) with motorized agitator, capacities of both tanks together shall be sized to prepare and store 1 day requirement of Anti-oxidant, Anti-oxidant dosing pumps (2x100%).
- j) Two (2) numbers of electrically operated mono-rail hoists each of 1 Ton capacity in chemical preparation area to handle chemicals from ground floor to first floor.
- k) Two (2) numbers of weighing scales at ground floor for weighing of chemicals being handled during storage and preparation.
- l) Emergency safety showers with eyewash units shall be provided in the Chemical Storage Handling facility at strategic locations such as Acid/Alkali Storage area, outdoor Chemical storage area, ClO₂ plant area and Chemical preparation & dosing equipment area. Filtered water shall be used for safety showers.
- m) One (1) number Overhead (OST) Storage Tank shall be provided on the top of chemical house to provide adequate storage of filtered water to be used for preparation of the chemicals, flushing of equipment, back washing of gravity filters etc.

7) Chemical house and Filter house shall be RCC buildings.



TITLE:
TECHNICAL SPECIFICATION FOR
PRE TREATMENT PLANT (PT PLANT)
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

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B. Liquid effluent treatment plant (LETP)

1. PT - plant clarifier sludge disposal system

- a). One (1) number RCC sludge pit (in 2 sections) to collect sludge from all the clarifiers of PT-CW system, PT-DM system & Lamella clarifiers/tube settlers and any other effluent connected to this sump envisaged.
- b). Two (2) numbers air blowers (2x100%) for the air agitation system of the sludge pit.
- c). Three (3) (3x50%) numbers of sludge disposal pumps.

2. Filter back wash waste disposal system

- a) One (1) number RCC Filter backwash waste collection pit (in 2 sections) to collect the backwash water from all the filters excluding Ultra filtration system. The filters backwash water shall be collected and recycled back to the PT-DM clarifier.
- b) Two (2) (2x100%) (1W+1S) numbers of backwash disposal pumps shall be provided.

B.Common Technical Requirement for systems (Pre Treatment Plant).

- a) Cranes & Hoists should be sized to handle heaviest component to be handled with 25% margin (with minimum capacity if specifically indicated elsewhere for any system/equipment) and should comply to IS: 3177/IS: 3938 (as applicable).
- b) Unless specifically mentioned, design criteria of Piping, Valves, rubber expansion, should be as per sub section LP Piping.
- c) Painting requirement shall be as per Painting specification unless otherwise specified.
- d) AC & Ventilation be as per sub section AC and Ventilation.

**GENERAL TECHNICAL REQUIREMENT OF
WATER TREATMENT SYSTEM/PLANT
(CONT.)**

**TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-B
BID DOC. NO. CS-4540-001A-2**

CLAUSE NO.	<p style="text-align: center;">TECHNICAL REQUIREMENTS</p> 		
<p>1.00.00</p> <p>1.01.00</p>	<p>WATER TREATMENT PLANT</p> <p>General</p> <p>This Chapter describes the system description, minimum Technical Requirements of the Water Treatment plant and associated equipment. The minimum technical requirements for plant and equipment shall include, but not be limited to the following:</p> <p>System description</p> <ol style="list-style-type: none"> 1) The Pre-treatment plant would be designed to remove suspended/colloidal matter in the raw water. Pre-treatment plant shall be provided for Circulating water system (PT-CW System) and Demineralised water system (PT-DM system). The plant shall consist of clarifiers for PT-CW & PT-DM system. The clarified water shall be used as make-up to CW system either by pumping or by gravity. Clarified water makeup shall be used for various systems like Air conditioning & ventilation system, FGD system, Service water etc. and any other system as envisaged by the bidder in design. CW blow down water shall be used for Ash handling system, FGD system and any other system as envisaged by the bidder in design. Service water provision for CHP dust suppression system shall also be kept. Gravity Filters shall be envisaged for DM and Potable water system. The filtered water shall be used in DM plant to produce demineralized water of specified quality. A common chemical house shall be provided to store chemicals, dosing equipment etc. Chemical house and Filter house shall be RCC buildings. 2) Chlorine di-oxide plant for CW system (CW-CIO₂) & PT system (PT-CIO₂) shall be installed in a common location/building if layout permits. Chlorine di-oxide shall be generated at site (in situ safe generation that takes place completely in water) from Acid-Chlorite process using 33% commercial grade HCl and 31% Sodium Chlorite (NaClO₂) solution in presence of motive water. Bulk storage tanks for NaClO₂ shall be kept under shed. Neutralization system shall be provided for the ClO₂ plant(s) to neutralize chemicals from the plant. The Chlorine di-oxide plant shall be installed in RCC building. 3) The contractor shall provide either Ion exchange-based DM plant or RO based DM plant. The capacity of DM plant either by Ion exchange process or RO process shall be sized to meet the makeup water requirement of the steam cycle, make up water to close circuit equipment cooling water (ECW) system, stator water cooling system etc. and any other requirements as envisaged by the Contractor. Reject from RO plant shall be recycled and reused in coal handling plant suitably. DM Plant (either by Ion exchange process or RO process) shall be kept under steel shed open from side. DM plant regeneration area shall be kept under steel shed. Pump houses shall be envisaged under steel shed unless otherwise specified. 4) Wastewater Treatment System & ZLD: An effluent management scheme for the plant consisting of collection, treatment, maximum recycle & reuse shall be adopted by the contractor to optimize the make-up water requirement and minimizing various plant effluent water, and for meeting and maintaining the Zero-liquid discharge (ZLD) of the plant. The contractor shall provide a detailed scheme and write-up for the Zero liquid discharge to be envisaged for the plant during detailed engg. The minimum technical requirements shall include, but not be limited to the following: <ol style="list-style-type: none"> a) Treating the service water effluents from various plant areas in ETP and treated service water from Treated Water Tank/CMB used for recycling/re-use in plant. The filter backwash water to be recycled back to the CW Clarifier. The filter backwash water of DM Plant to be recycled DM Clarifier. The effluent waste from DM Plant/ClO₂ plant etc. to be neutralized and pumped to Ash slurry sump/tank. Power cycle blow down shall be recycled to condenser with provision for recycling the same to the CW system with suitable quenching arrangement. b) Coal laden water in the plant shall be treated in settling ponds and decanted water recycled/reused in Coal handling plant suitably. Coal settling ponds and 		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2</p>	<p>SUB-SECTION A - 14 WATER TREATMENT PLANT</p>	<p>PAGE 1 OF 36</p>



2.02.00

Chemical House

- hand railing for the clarifiers for good approach. Permanent ladder shall also be provided (not rungs) for approaching the sludge pipeline valves for maintenance.
- 6) The sludge valves shall be operatable from the top of the sludge chamber through head stock and extended spindle arrangement.

- 1) The storage rooms shall have suitable bins/partitions sufficiently large to accommodate for lime and alum. The chemical house shall have sufficient unloading space, wide corridors for movement of chemicals, office, toilet etc. as required.
- 2) In the first floor of chemical house, all chemical preparation tanks and dosing equipment shall be located. Suitable staircases, walkways, platforms etc. shall be provided to have clear access to different units.
- 3) Quick lime (purity of 75% CaO) shall be dissolved in the slaking tanks and the resultant slurry (about 10% W/V) from the slaking tanks shall be transferred to the lime solution preparation tanks by the lime slurry transfer pumps. The lime solution dosing system shall be of re-circulating type.
- 4) Alum solution preparation tanks and dosing equipment shall be sized for a continuous alum dosage of 70 ppm considering the clarifiers to be operating at the maximum capacity.
- 5) Operating platforms shall be provided for all the structures such as Aerators, Stilling chambers, Clarifiers, Sludge chamber etc. along with step ladders and hand railings. All the sumps, tanks, reservoirs, and other water retaining structures shall be provided with approach ladders (i.e. step ladders with hand railing) from operating platforms/ground level.
- 6) All the metallic parts of equipment of Pre-treatment plant (PT) and effluent treatment plant (ETP) which are embedded in concrete or in contact with water shall be painted with three coats of bitumastic heavy duty paint over a coat of primer to prevent corrosion unless otherwise specified and total thickness shall be 400 microns.
- 7) All the other parts of the PT Plant and ETP shall be painted with one coat of primer and three coats of chlorinated rubber paint and total thickness shall be 200 microns. The concrete parts encountering water shall be painted with three (3) coats of bitumastic heavy-duty paint of 400 microns thick.
- 8) All the tanks shall be provided with vent, overflow, drain and sample connections. Effective capacity for chemical tanks & water retaining structures/ tanks/sumps means the capacity between the bottoms of the overflow nozzle to the top of the outlet nozzle. Outlet nozzle center line shall be kept at least 200 mm from the Invert Level of the Chemical tanks /Water retaining structures /Tanks/Sumps. A minimum free board of 300 mm shall be provided in all the water retaining structures of Pre-treatment plant and Effluent treatment plant above the maximum water level at design flow condition/overflow level.
- 9) Maximum operating speed of all the pumps shall be limited to 1500 rpm or less unless specified otherwise.
- 10) Various equipment in the PT Plant will be sized for the following minimum Chemical Dosing Requirements:

a)	Alum	70 mg/litre on 100% basis
b)	Lime	30 mg/litre on 100% basis

- 11) For all pumps, while calculating the pump head, 10% margin shall be considered on friction losses.

12) The maximum support length in meters for MS pipe shall be as follows

a)	Pipe dia (mm)	1200	1000	800
b)	Span (meters)	12	10	10

For pipe sizes less than 800 NB, span shall be provided as per ANSI B31.1

2.03.00

Gravity filter

- 1) The inlet channel from clarifiers to gravity filters shall be designed considering operation of all the gravity filters including standby filters under exigency.
- 2) Only one filter shall be backwashed at a time. Backwashing of filters shall be done in not less than 24 hours. The velocity of water during backwashing shall not exceed 35.0 m/hr., when air scouring is employed. Air blower shall be used for air scouring of filter bed.
- 3) At least 50% free board shall be left over the filtering media to facilitate backwashing. The filtering medium shall be washed, screened, and hydraulically graded anthracite coal or sand having an aggregated depth not less than 1200 mm.

4) Anthracite shall have the following properties: -

Uniformity coefficient	1.6
Hardness	2.5 to 3.5 (Mho scale)
Dust content	Less than 1%
Specific gravity	1.75 (Approx.)

Anthracite shall be free from iron sulfide, clay, shale, long, thin or scale pieces

5) Sand shall have the following properties: -

Sand shall be of hard and resistant quartz or quartzite and free of clay particles, soft grains, and dirt. Effective size shall be 0.45 to 0.70 mm. Uniformity coefficient shall not be more than 1.7 or less than 1.3. Ignition loss should not exceed 0.7 per cent by weight. Soluble fraction in hydrochloric acid shall not exceed 5.0% by weight. Silica content should not be less than 90%. Wearing loss shall not exceed 3%. Specific gravity shall be in the range between 2.55 to 2.65.

Sand should be clean and well graded. Sand filter shall have a HCL solubility of less than 5% when tested in accordance with AWWA B 11.53.

3.00.00

Other design and construction features

3.01.00

Aerator & Stilling Chamber

The aerator shall be of stepped design and shall allow water to flow downward after spreading over inclined thin sheets and the turbulence is secured by allowing the water to pass through a series of steps and baffles. The chlorine di-oxide dosing shall be done in the stilling chamber before and after aerator by using diffusers of proven design.

3.02.00

Clarifiers

3.02.01

The clarifier shall be solid contact reactor type with integral variable speed impeller/ turbine to internally re-circulate water and sludge at adjustable rate to produce consistent water quality at varying hydraulic load and turbidity.

3.02.02

The Clarifiers shall be provided with following features:

- 1) The sludge blanket shall be suspended and maintained in the lower portion. The clarifier unit shall be circular, central feed type with concentric recirculation zone (rapid mixing),

CLAUSE NO.	<p style="text-align: center;">TECHNICAL REQUIREMENTS</p> 				
3.03.00	<p>reaction zone (slow mixing) and clarification zone in RCC construction. Clarifiers shall be provided with radial launders.</p> <ol style="list-style-type: none"> 2) Bridge type rake arm and suitable equipment such as turbine/ impeller shall be provided for internal sludge recirculation. 3) The design of the turbine/impeller shall be such as not to break the flocs during recirculation. 4) Suitable mechanism for varying the recirculation rate shall also be provided such that the reactor clarifier shall be capable of operating at varying hydraulic load and turbidity with consistent effluent quality. 5) The bottom of clarifier shall be sloped towards the center and mechanically driven sludge scraper and collector shall be used to remove the settled sludge down the sloping bottom to the central sludge area. Rubber squeezer pads shall be provided on sludge scraper and skimmer. 6) Sludge removal system design shall consist of central sludge area with rotating pickets and back flush arrangement for proper control of sludge accumulation at the bottom. Suitable scum collecting arrangement shall be provided in the clarifying section for removal of floating debris, foam etc. if possible. The scrapper shall consist of blades which are inclined to the radius in the opposite direction to that of the floor scrapper. 7) The rake bridge and agitators shall be constructed of structural steel and suitably braced to provide rigidity. 8) Sludge blow off shall be affected by the static head of water in the clarifier unit. Main sludge disposal line, which includes a blow-off valve, shall drain sludge to the sludge disposal pump sump. This is an intermittent operation. Continuous sludge disposal line consists of telescopic standpipe, the top of which is maintained at a desired elevation to ensure trickle flow of water or sludge water mixture to the sludge sump. 9) Suitable sampling connections from the various levels and zones of clarifier and at the outlet shall be provided for performance monitoring. 10) Each of the clarifier shall be provided with a gate at the outlet for isolation of any of the clarifier for maintenance. <p>Filters back washing</p> <ol style="list-style-type: none"> 1) Filter Box shall be of watertight RCC structure. Gravity Filters of Potable Water System & DM System shall be covered with RCC roof. 2) The capacity of the overhead filtered water tank shall meet the backwash flow rate for simultaneous backwash of one (1) number of gravity filter (both the sections) each of Potable System and DM system. 3) The inlet distribution shall be designed to give uniform distribution and flow without channeling and obstruction. Proven type under drain collecting system provided. 4) Each filter bed outlet shall be provided with rate of flow controller and rate of flow indicator and a loss of head gauge. The manual extension spindles of all the valves of filters shall be operatable from the operating floor of filter bed. Each of the Gravity filter shall be provided with drain connections with isolating valves for draining complete filter water channel and filter bed. 5) Platform over each of the gravity filters with hand railing shall be provided for the inspection of backwashing operation and filter bed. These platforms shall be approachable from the operating floor of gravity filters through doors. 6) Only valves shall be used for different process of filters. Suitable sampling point with sample valve shall be provided at the effluent of each filter. 	<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2</p>	<p>SUB-SECTION A - 14 WATER TREATMENT PLANT</p>	<p>PAGE 5 OF 36</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS											
3.04.00	<p>Filtered Water Sumps</p> <p>Filtered water from the two (2) sections of the filtered water reservoir shall enter the sump through two (2) numbers of isolation valves.</p>											
3.05.00	<p>Overhead Filtered Water Storage Tank</p> <p>The overhead tank shall have approach from chemical house through permanent staircases (RCC) and door.</p>											
3.06.00	<p>Overflow & drain disposal system</p> <p>The overflow & drains from the various chemical tanks and floor wash drains shall be led to the PT Plant clarifier sludge sump. The overflow & drains from structures and piping handling clear raw water, clarified water and filtered water in the Pre-treatment plant such as Stilling chamber, Inlet chamber shall be led to the filter backwash sump. The overflow & drains from the filtered water reservoir, filtered water sump etc. shall be led to the filter backwash sump. Overflow from filtered water overhead tank shall be led to the inlet channel of Gravity Filters of PT-DM. Concrete sewerage pipe/Hume pipe shall not be used for any of the drain disposal system.</p>											
3.07.00	<p>PT Plant Clarifier sludge disposal system</p> <p>One (1) number sludge pit, in twin sections shall be provided to collect the sludge from all the clarifiers/tube settlers/lamella periodically. The sludge shall be transferred to the ash slurry tank/sump by means of sludge transfer pumps. Each section of the pit shall be provided with agitation by recirculation (jetting nozzles) system and air agitation system. Two (2) numbers air blowers shall be used for the air agitation system of the sludge pit.</p>											
3.08.0	<p>Filter Backwash Water Disposal System</p> <p>Filter backwash water shall be led to a separate sump (twin section). Each section of the sump shall be provided with agitation by recirculation (jetting nozzles) system and air agitation system. Air blower shall be used for the air agitation system of the sump.</p>											
3.09.00	<p>Clarified Water/Other Storage Tanks</p> <p>The water tank shall be provided with access rungs and dewatering pits.</p>											
3.10.00	<p>Waste Service Water Treatment System</p> <p>Hydraulics of the plant shall be such as to take an occasional overloading of 20% of the design flow rate.</p> <p>a) Design Conditions for tube settlers/lamella clarifiers:</p> <table border="1"> <thead> <tr> <th></th> <th><u>Inlet quality</u></th> <th><u>Outlet quality</u></th> </tr> </thead> <tbody> <tr> <td>i)</td> <td>Turbidity 500 NTU (max)</td> <td>10 NTU (max)</td> </tr> <tr> <td>ii)</td> <td>Oil content 50 ppm (max)</td> <td>5 ppm (max)</td> </tr> </tbody> </table> <p>b) Wastewater collection Sump & Pumping scheme</p> <p>1) Service water effluents (after floor washing etc.), other plant effluents etc. having high-suspended solids require treatment for removal of total suspended solids (TSS).</p> <p>2) The minimum technical requirements for waste service water system (WSWS) shall include, but not be limited to:</p> <ol style="list-style-type: none"> a) Collection sump(s) in different areas/clusters, b) Waste service water sump (WSWS) c) Tube settlers/Lamella clarifiers (2x100%) d) Oil skimmer (2x100%) Oil centrifuge (2x100%) e) Pumps, (n+1) f) Chemical storage, handling, and dosing equipment etc. 				<u>Inlet quality</u>	<u>Outlet quality</u>	i)	Turbidity 500 NTU (max)	10 NTU (max)	ii)	Oil content 50 ppm (max)	5 ppm (max)
	<u>Inlet quality</u>	<u>Outlet quality</u>										
i)	Turbidity 500 NTU (max)	10 NTU (max)										
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<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>		<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2</p>	<p>SUB-SECTION A - 14 WATER TREATMENT PLANT</p>	<p>PAGE 6 OF 36</p>								

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3.11.00	<p>3) The treated water shall be reused/recycled suitably in plant like in service water etc. A Waste service water sump (WSWS) shall be provided for collection of service water effluents from various areas/clusters. Waste service water transfer pumps shall be installed in WSWS to pump waste service water to Tube settlers/Lamella clarifiers.</p> <p>4) Chemical dosing (Alum & lime) shall be provided for these Tube settlers/Lamella clarifiers in the chemical house.</p> <p>5) The treated water from Tube settlers/Lamella clarifiers shall be led to Treated water tank/Central monitoring basin (CMB) of twin sections of RCC construction. Provision for diverting clarified water to service water tank shall be provided. Capacity of each section shall be suitable for storing 60 minutes of discharge from one Tube settler/lamella clarifier. Service water transfer pumps shall be provided for plant service water network etc.</p> <p>6) Oil skimmer(s) shall be provided in the waste service water sump so that oil impurities floating on the sump is skimmed and collected in a tank located over ground. Facility shall be provided to collect free oil to a MS oil drums of 200 liters capacity. Trolley mounted oil centrifuge of suitable capacity shall be provided to collect and purify the oil of the Waste Service Water System.</p> <p>c) Tube Settler/Lamella Clarifier</p> <p>1) The tube settler/Lamella Clarifier (counter flow or cross flow type) with flash mixer and Flocculation Chamber at its upstream (all RCC), with minimum 1-minute storage for flash mixer and 10-minute storage for flocculation chamber at the design flow rate. Design of the sludge removal system should be such as to reduce loss of water during sludge blow off within 5% of rated flow. Design flow velocity shall be not more than 5 m³/hr/m². Minimum side water depth of the unit is 4 M.</p> <p>2) The cross-sectional area of each tube shall be such that the effective hydraulic diameter is 60 mm (min). The material of tube pack shall be UV inhibited virgin PVC. In case of plate type separator, the plates shall be made of GRP (glass reinforced plastic). The resin for the manufacturing of GRP plates shall be orthophthallic type.</p> <p>3) The length of the tubes/plates through which the water flow shall not be less than 1.5 m, the tubes/plates shall be inclined by 50-80 deg. angle to the horizontal.</p> <p>4) Sludge removal system shall be designed to thicken the sludge to minimum 2% consistency before disposing from separator bottom, angle of inclination of sludge hopper shall be minimum 55° to horizontal plane.</p> <p>5) Walkway (bridge) and platform to approach all the internals shall be provided. Clear width of the bridge shall not be less than 1200 mm. Suitable walkway around periphery of tube settler/clarifier with hand-railing, access ladder with platform, hand railing to be provided. Suitable water jet arrangement shall be provided. All the pipelines carrying the sludge shall be provided with flushing connection. Separate pumps and piping shall be provided.</p> <p>Coal Handling Plant Run-Off Water Treatment System</p> <p>1) The settling ponds shall be designed to take care of flow conditions which may occur during the rainstorm. Interconnection shall be provided between the ponds such that flexibility of selecting any pond remains.</p> <p>2) The exit for run-off water from the settling pond shall be such that the short-circuiting of water is avoided. For this purpose, water shall be allowed to traverse under a breast wall located about 5 meters ahead of outlet side of the pond.</p> <p>3) Runoff water from coal slurry settling pond would be led to a sump and pumped (2x100%) for re-use in Coal handling plant and as well as treated in clarifier (1x100%)</p>		
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	<p>for recycle/reuse in CW system. Provision for diverting treated supernatant water to storm water drain & WSWS with pumps (2x100%) and isolating valves in the lines.</p> <p>4) Adequate steps/stairs to be provided in coal settling pond for manual cleaning of pond.</p> <p>4.00.0 Demineralisation plant (DM plant) ((Option I)</p> <p>The minimum technical requirements equipment shall include, but not be limited to the following:</p> <p>4.01.0 General requirement</p> <ol style="list-style-type: none"> 1) All the vessel internals of activated carbon filters, ion-exchanges units, and degasser units such as inlet distributor, regenerant distributor, under drain system etc. shall be of proven design. 2) All valves used with vessels shall be suitably arranged in the front in accessible position, for manual operation in case of emergency. The valves under automatic operation of DM Plant shall be operated pneumatically by diaphragm actuator. 3) All dematerializing streams shall be designed to run continuously at its rated capacity and simultaneously under parallel operations. 4) Suitable permanent flushing connections shall be provided for all pipelines carrying acid and alkali. 5) The pipelines which are immersed inside the drain trench or in Neutralization pits shall be rubber lined to a height of at least 600 mm from the maximum liquid level apart from internal rubber lining. 6) All the external parts of equipment of complete DM Plant shall be painted chlorinated rubber paint unless specified otherwise. 7) The unloading pumps area shall be provided with a kerb wall and the kerbed area shall also be provided with Acid proof lining. Suitable dyke wall/barrier shall also be given in between chemical tanks to avoid any kind of mixing. 8) Suitable sampling points shall be provided for ACF, all Ion exchange units of DM plant. <p>5.00.00 Design and construction features</p> <p>5.01.00 Activated Carbon Filters (ACF)</p> <ol style="list-style-type: none"> 1) Design and Fabrication of the vessel should be according to subsection titled "Pressure & Storage vessel" of Part-B of this Technical Specification. 2) The activated carbon shall be of good quality suitable for removal of odor, chlorine, and dissolved organic substances. 3) Suitable (at least 75%) free board shall be provided over the filtering medium below the backwash outlet nozzle and in straight portion of vessel to facilitate backwashing. 4) The inlet distribution (preferably header-lateral type) and under drain collecting system (header-lateral/strainer-on-plate) shall be so designed as to give uniform distribution and flow without channeling and obstruction. <p>5.02.00 Ion Exchange Units</p> <ol style="list-style-type: none"> 1) Design and Fabrication of the vessels should be according subsection titled "Pressure & Storage vessel" of Part-B of this Technical Specification. 		
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	<p>system and/or actual field performances of plants using a similar technique, indicating the quantity of chemicals required for regeneration, in particular, besides other parameters.</p> <ol style="list-style-type: none"> 5) The process calculation shall be furnished by the bidder indicating the various steps of regeneration, regeneration level employed, total and used exchange capacity of resins in various exchangers, resin quantity provided in ion exchange vessel etc. The bidder shall furnish relevant resin literature & curves indicating various parameters and exchange capacity & regeneration levels selected along with the process calculations. 6) The process calculation along with the operating exchange capacity and regeneration levels vetted by resin manufacturer and the resin performance curves especially applicable for this plant shall also be submitted during detailed engg. 7) Regeneration facilities offered shall be complete with acid/alkali measuring tanks, ejectors for dosing of chemicals. Alkali flakes shall be used for preparing alkali solution of adequate strength in the preparation tanks. Acid or alkali from the measuring tank, shall be injected to exchangers by means of hydraulically operated ejector or metering pumps at suitable strength. 8) Separate acid measuring tank and ejector (one each) shall be provided for cation & MB and separate alkali measuring tank and ejector (one each) for anion & MB shall be provided. Suitable inter connection of dosing system shall be provided for flexibility of operation. 9) Automatic block and bleed valves shall be provided at the regenerant inlet line(s) to each exchanger of Strong Acid (SAC) Cation, Strong Basic (SBA) Cation & Mixed (MB) Bed. 10) Suitable sampling connection shall be provided for acid/ alkali storage, preparation & handling equipment. <p>5.04.00 Alkali Diluent Water Heater.</p> <p>For heating of alkali diluent water, 2x50% electrical heating coil in a tank of mild steel rubber lined construction shall be provided. The tank shall be sized based on 125% of the regeneration water requirement of one anion and one mixed bed (effective Capacity 10 cum (minimum). The tank shall be provided with burn out protection, pressure relief valve, temperature indicator, etc. The heater shall be controlled by the temperature switches provided on the tank. All tank internals, including the inlet water tail pipe shall be rubber lined inside and rubber covered outside or of SS-304 stainless steel.</p> <p>5.05.00 Exchange Resin</p> <ol style="list-style-type: none"> 1) Cation and anion resin shall be of reputed make and proven type and must have been in use in demineralising plants capable of producing water of quality as specified or better, for a period of not less than three (3) years. 2) Cation and anion resin charge shall consist of material properly selected washed, processed and graded to provide the guaranteed capacity and life and shall have adequate abrasion resistance during its guaranteed life. 3) The cation exchanger resin used in the strong cation unit and mixed bed exchanger shall be strongly acidic, high capacity polystyrene resin in the bead form. 4) The anion exchanger resin used in strong anion unit & mixed bed shall be strongly basic, high capacity resin (Type-I) in bead form to the satisfaction of the Engineer. The anion resin shall be able to withstand a temperature of 60 deg. C (minimum) continuously. 		
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	<p>Type-II anion resin shall not be accepted. Strong Base Anion resin (or weak base Anion in case of hookup) shall be MACROPOROUS type only.</p> <p>5) Each stream shall be provided with independent headers from the outlet of Activated carbon filters. However, suitable inter-connecting lines, valves shall be provided at outlet/inlet of each unit to facilitate the changeover.</p> <p>6) Bidder shall design the DM water chains in such a way that any chain can be regenerated without the necessity of other chain being put into operation.</p> <p>5.06.00 Degasser System</p> <p>Degasser tower shall be designed to reduce dissolved CO₂ in treated water to the level as indicated in the guarantees. Blowers shall be provided to remove CO₂ from water. Each tower shall be provided with a storage tank to store degassed water.</p> <p>5.07.00 Polishing UF</p> <p>Commercially proven hollow-fiber, high volume pressurized type UF membranes of Polysulfone, Poly Vinylidene Di Fluoride (PVDF) or Poly Ether Sulfone (PES) with spiral glass outer wraps shall be supplied. Gross maximum design flux rate shall not be more than 60 l/m²/h. Filtration direction may be either Out-to-In or In-to-Out. Minimum design UF recovery shall be at least 92% of the influent with a colloidal silica rejection of not less than 99.5%. Maximum Membrane pore size shall be 10000 Dalton MWCO (Molecular weight cut off).</p> <p>5.08.0 Safety and Protection</p> <p>Automatic safety shower units consisting drench shower and eye bath shall be provided near regeneration area & chemical storage area to provide adequate spray of water to protect operating personnel against any chemical hazard.</p> <p>The shower shall receive supply of water from the filtered water system and will be actuated by standing on platform beneath the showers through mechanical linkage.</p> <p>5.09.00 Wastewater Neutralizing Arrangement</p> <p>Bidder shall design the demineralising plant in such a way that the regenerant effluent from cation and anion units and from the mixed bed unit are self neutralising. Provision shall however be made to dose acid, alkali, and lime to neutralise the effluent, whenever required.</p> <p>5.09.01 Sump & Trenches of wastewater</p> <p>Wastewater from all vessels namely Activated Carbon Filter, Cation, Anion and Mixed Bed exchangers will be led into individual sumps near each vessel. Bidder shall provide measuring orifice board into the sump. Wastewater after being metered through the orifice board, will be led by gravity into trench, suitably lined and finally to the neutralising pit. The backwash wastewater from Activated Carbon Filters and Rinse wastewater generated during regeneration of the DM stream shall be routed through separate effluent channel (acid/alkali proof tile lined) and shall be terminated in Backwash/ Rinse Wastewater sump. The Backwash/ Rinse Wastewater sump shall be lined with acid/alkali proof tile. The backwash water recycling/reused in Clarifier of Pre-treatment Plant.</p> <p>5.09.02 Waste Neutralising Pits</p> <p>One (1) number RCC pit in twin compartment design shall be provided. Suitable baffles shall be installed in the pits/effluent trench to mix the wastes during their passage to neutralise the effluent. Suitable priming chamber shall be provided in case horizontal pumps are offered. Chemical (Acid/Alkali) lines from bulk storage tanks (acid) & alkali preparation tanks shall be</p>			
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<p>5.09.05</p> <p>5.10.00</p> <p>6.00.00</p>	<p>routed and terminated to neutralising pits. Provision shall be made to dose lime solution in the neutralising pit. Suitable proven agitation system (e.g. air agitation/venturi mixing etc.) shall be provided for proper mixing and maintaining uniform pH value of the wastewater in addition to recirculation system.</p> <p>Filter Back Washing</p> <p>Backwashing of filters shall be done once in 24 hours. The inlet distribution and under drain collecting system shall be so designed as to give uniform distribution and flow without channeling and obstruction. The under-drain system may either be of header lateral or manufacturer's standard design.</p> <p>Pressure Filter Design features</p> <p>Pressure filters shall be designed for surface flow rate. Design and Fabrication of the vessel should be according to subsection titled "Pressure & Storage vessel" of Part-B of this Technical Specification.</p> <ol style="list-style-type: none"> 1) Maximum velocity of filtration shall be 10 m/hr. at design capacity and velocity during backwashing shall not exceed 35.0 m/hr. when air scouring is employed. 2) Air blowers (2x100%) shall be used for air scouring of filter bed. The filter shall be designed to handle an inlet turbidity of 20 NTU. 3) At least 75% free board shall be left over the filtering media to facilitate backwashing. 4) The total design backwash quantity shall not exceed minimum 2% of the treated water flow over a period of twenty-four hours or between two successive backwashes from each filter. 5) The filtering medium shall be washed, screened, and hydraulically graded anthracite coal or sand having an aggregated depth not less than 1200 mm. 6) Details of layers of pressure filter medium and Anthracite and Sand properties: Refer Gravity filter. <p>Control & operation of the DM plant</p> <ol style="list-style-type: none"> 1) The control & operation of various systems described below is indicative only and the actual control & operation philosophy shall be finalized with during detailed engineering based on which the control logic is to be built by the contractor in DDCMIS. Complete DM Plant operation shall be through mimics on OWS/LVS The sequence startup mode (Automatic, semi-automatic and operator guided mode) shall be provided shall be of the following types 2) In case of failure of control system, the DM plant valves shall be operated manually by means of manual operator of solenoid valves (as well as by hand wheel of valves) locally. 3) Acid and alkali unloading pumps, agitators of alkali preparation tanks & day tanks and alkali transfer pumps shall have provisions of local start also. 4) Complete stream shall be isolated automatically from SERVICE in case any of the following take place and an alarm displayed. 5) Differential conductivity of the effluent is less or totalised flow and sodium leakage from the cation is high. Conductivity of the effluent or totalised flows from anion is high. Conductivity or silica content of the effluent or totalised flow from mixed bed is high. 6) The operation of alkali/acid inlet valves at ejectors shall be interlocked with the availability of dilution water in the respective ejectors. 	<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2</p>	<p style="text-align: center;">SUB-SECTION A - 14 WATER TREATMENT PLANT</p> <p style="text-align: center;">PAGE 12 OF 36</p>

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	<p>7) Common conductivity meter shall be employed for measuring conductivity in the effluent line and rinse lines for anion and mixed bed exchangers. During rinsing of anion and mixed bed unit, the respective analyzer shall be connected to rinse line automatically, in the end of the rinse cycle.</p> <p>8) During rinsing of mixed bed unit, the analyzer of silica shall automatically be connected to the stream which is under regeneration to ascertain the completion of rinsing operation.</p> <p>9) Only one stream shall be regenerated at a time. However, all the streams can be put to service simultaneously. The alkali diluent heater shall be controlled by measuring the temperature of water in the heater.</p> <p>10) For all the pumps, blowers etc. which form part of the automatic operation, facilities through control system shall be provided for Auto/remote manual/Local mode selection wherever specified. Wherever standby equipment is provided, selection of the same shall be possible from the control system. The selected standby equipment shall start automatically in case of failure of working equipment. For, other drives which are not involved in continuous running or automatic operation, facilities through control system shall be provided for remote/local selection.</p> <p>6.01.00 Backwash pit and pumping scheme</p> <p>1) At a specific water level in the sump, selected pump(s) shall start, and backwash wastewater shall be recycled back to the clarifiers. Upon reaching predetermined low level, one of the operating pumps shall be stopped and further reduction in level shall result into stoppage of all the operating pumps.</p> <p>2) The pit level shall be available to operator and in case of very high level, the operator shall be alerted to avoid starting of backwash/rinse operation so that the pit does not overflow.</p> <p>6.02.00 Neutralization pit and pumping scheme</p> <p>1) At a specific water level in the sump, selected pump (s) shall start, and backwash wastewater shall be recycled back to the pit and after achieving desired pH level, the wastewater shall be pumped out to Ash slurry sump. Upon reaching predetermined low level, operating pumps shall be stopped and further reduction in level shall result into stoppage of all the operating pumps.</p> <p>2) The pit(s) level status shall be available to operator and in case of very high level; the operator shall be alerted to avoid starting of regeneration operation so that the pits do not overflow.</p> <p style="text-align: center;">DM Plant (Option II)</p> <p>7.00.00 General</p> <p>7.01.00 The scope of work covered under this specification include but not limited to design, fabrication, manufacture and assembly, inspection, shop testing at manufacturers works and transportation to site, supply, erection of complete UF-RO Plant, Chemical Storage & Handling etc.</p> <p>7.02.00 Contractor shall take full responsibility for system sizing based upon actual equipment to be provided. Contractor shall confirm sizing of all systems and components, including pipes, pumps, and ancillary systems along with relevant calculations. All materials and components of valves, pumps, piping, tanks and other equipment and appurtenances shall be compatible with the respective fluid herein.</p> <p>7.03.00 Equipment shall be fabricated, assembled, installed, and placed in proper operating condition</p>		
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<p>8.00.00</p> <p>8.01.00</p>	<p>in full conformity with detail drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer as approved by the engineer.</p> <p>The minimum technical requirements equipment shall include, but not be limited to the following:</p> <p>Technical requirements</p> <p>Ultrafiltration (UF)</p> <p>UF system shall include, but not be limited to the following:</p> <ol style="list-style-type: none"> 1) UF membrane shall be capable of producing UF permeate by removing colloidal silica level to the extent suitable for downstream reverse osmosis (RO) unit. 2) The system shall be designed to allow multiple starts and stops without affecting the service life of the membranes. The system may experience extended periods of no flow; system design shall protect the system against periods of no flow as recommended by membrane manufacturer. 3) Provisions for local grab sampling points shall be provided to monitor UF performance for UF feed, strainer backwash, UF permeate water, UF backwash, UF neutralized backwash water as a minimum. 4) Each stream/train shall be provided with 1x100% automatic self-cleaning strainers (SS) at inlet with about 100 microns. 5) UF membranes shall be hollow-fiber, pressurized type, MOC Polyvinylidene di fluoride (PVDF) or Polyether sulfone (PES). Gross maximum design flux rate shall not be more than 60 l/m²/h. Design UF recovery shall not be less than 92%. Pore size of membrane shall not be more than 0.04 micron. In the event of fiber breakage, the affected module shall be easily identifiable on the Rack through use of clearly visible inspection window built into the filtrate discharge pipe. 6) An on-line membrane flushing system shall be provided to flush the UF membranes prior to shutting down. 7) UF feed pumps and UF backwash pumps shall be provided with variable speed drives (VFD). Capacity of each UF permeate water storage tank shall be sized for minimum one (1) hour retention 8) Spent chemicals from the chemically enhanced backwashing & CIP shall be neutralized in Neutralization pit. 9) Online Turbidity transmitter shall be provided to measure UF filtrate turbidity with high turbidity alarm interlocked to shut down of UF system if high turbidity is sustained for a pre-set time. Automatic on/off valves and filtrate flow transmitters shall be provided to automatically conduct air integrity test of UF membrane modules. 10) Membrane cleaning system shall be provided as per recommendation membrane designer and membrane manufacturer. The cleaning system shall be connected to the UF trains with permanent hard pipes. 11) After the manufacture, following tests for membrane shall be demonstrated at membrane manufacturer's works in the presence of Employer's representative and contractor: <ol style="list-style-type: none"> i). Bubble Point Test in one batch ii). Integrity test (Pressure decay test/vacuum hold test) for 1 % of total membrane population. 		
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	<p>The responsibility for conducting the test (Bubble Point, Integrity) will be with the Contractor and Contractor shall make all the arrangements for carrying out tests at membrane manufacturer's works. In case the test facilities are not available at manufacturer's works, the test may be carried out at any other test facility with the approval of Employer. The cost associated with testing at contractor's works or at any other test facility shall be borne by the contractor & shall be included in the contract price.</p> <p>12) Integrity test shall be carried out in accordance with ASTM D 6908-06, Standard Practice for Integrity Testing of Water Filtration Membrane Systems (Pressure decay test/vacuum hold test) and approved test procedure. Bidder shall submit the test procedure for Employer's approval. Design calculations of Ultra filtration system shall be vetted by membrane manufacturer</p> <p>8.02.00 Cartridge filters</p> <p>The filter elements shall be cylindrical cartridges constructed from continuously wound polypropylene fibers, which have a 5-micron nominal 90% efficient rating. Polypropylene material shall be 100% polypropylene with no binders, resins lubricants or other residue from the manufacturing process. The filter vessel shall be designed in accordance with ASME boiler and pressure vessel code section VIII, division I.</p> <p>9.00.00 Reverse Osmosis system</p> <p>RO system shall include, but not be limited to the following:</p> <p>9.01.00 Requirements of RO plant</p> <ol style="list-style-type: none"> 1) Each RO stream shall be provided with a dedicated HP pump. The HP pump designed to operate in the entire range of operation of the feed system. 2) The permeate water is discharged to product water system where it is treated to for removal of excess CO₂, correction of pH, correction of alkalinity (for potabilisation, if applicable) etc. and stored. 3) Permeate shall be delivered to respective Degassifier thru dedicated Suck-back arrangement (if applicable). Cleaning and Flushing systems shall be provided for membrane protection. 4) All wetted parts in the plant shall be constructed with suitable corrosion resistant material suiting to the fluid. <p>9.02.00 RO membrane assembly</p> <p>Each stream shall be capable of operating either independently or in combination with the other ones. The streams shall be skid-mounted and be furnished complete with all headers and related piping, mounted on the skid. The skid shall be designed to provide ample room for servicing and monitoring the equipment. The isolation or removal of an individual permeator for testing or servicing shall be possible while the RO-train is in operation, by means of flexible, self-closing couplings.</p> <p>9.03.00 RO membrane</p> <p>The Reverse osmosis membrane shall be spiral wound type. The membrane shall be non-telescopic, non-flexing and leak free. The RO membranes shall be supplied from manufacturers well experienced in RO plant design of stream capacity comparable to that of this project. This shall be demonstrated by the Bidder with adequate references of his selected membrane manufacturer(s). He also shall include a design calculation of the RO</p>		
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9.04.00	<p>plant by his preferred manufacturer(s)</p> <p>The process design shall take into consideration specified <i>fouling allowance and salt passage</i> during the guaranteed (specified) life of the membrane. Standard Length & Diameter of membrane used for design should be available from at least three manufacturers to deliver water of specified quality so that Employer may install membranes from other manufacturers during operation stage of the plant.</p> <p>Pressure vessels</p> <p>Pressure vessels shall have a diameter and length to contain required numbers standard diameter, standard length spiral wound elements Materials to be selected shall meet the following minimum requirements:</p> <table border="0"> <tr> <td>i)</td> <td>Membranes</td> <td>As per manufacturer</td> </tr> <tr> <td>ii)</td> <td>Pressure vessels</td> <td>PP or proven material as per manufacturer</td> </tr> <tr> <td>iii)</td> <td>End caps or plates</td> <td>Non-metallic material of proven reliability; Fiberglass epoxy as minimum requirement</td> </tr> <tr> <td>iv)</td> <td>Segmental rings, Connectors,</td> <td>Corrosion resistant material conforming to ASTM A312 SS-316 or equiv.</td> </tr> </table> <p>The design, fabrication, and testing requirements for the pressure vessels shall be in accordance with ASME Section X to allow a code stamp, or meet the minimum requirements of ASME Section X.</p>			i)	Membranes	As per manufacturer	ii)	Pressure vessels	PP or proven material as per manufacturer	iii)	End caps or plates	Non-metallic material of proven reliability; Fiberglass epoxy as minimum requirement	iv)	Segmental rings, Connectors,	Corrosion resistant material conforming to ASTM A312 SS-316 or equiv.
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9.05.00	<p>High pressure pump and Energy recovery units</p> <p>The HP feed pump (SS-316) shall be of centrifugal type. Selection of parameters (Capacity & Head) of HP Pump, its drive shall consider requirements of membrane manufacturer and shall be designed to deliver required parameters throughout the design life of membrane.</p>														
9.06.00	<p>Clean in place system (CIP)</p> <p>The cleaning system shall be designed for cleaning and sterilizing of minimum one train of the RO system separately. The RO-plant shall be provided with fixed pipe connections. Provisions must be made for the neutralization and disposal of chemical cleaning waste via the brine reject.</p> <p>Flushing system (if applicable)</p> <p>Flushing system consisting 2 x 100% flushing pumps shall be provided to enable flush-out of the RO unit stream including HP pump, with Low TDS permeate water during shut down of the stream.</p>														
09.07.00	<p>Sample panel</p> <p>Each RO unit/train shall be fitted with a fiberglass sample board, which shall be mounted adjacent to the unit. The panel and supports shall have all fiberglass constructions with a minimum 8" wide trough under the sample cocks with 1" PVC drainpipe routed to the trenches. Sample tubing shall be black tubing. The sample panel shall use 1/4" SS sample cocks to sample the following</p> <table border="0"> <tr> <td>i)</td> <td>Feed (locate on common manifold)</td> </tr> </table>			i)	Feed (locate on common manifold)										
i)	Feed (locate on common manifold)														
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2</p>	<p>SUB-SECTION A - 14 WATER TREATMENT PLANT</p>	<p>PAGE 16 OF 36</p>												

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p>ii) Concentrate (locate on common manifold)</p> <p>iii) Permeate (locate on common manifold)</p> <p>iv) Permeate from each pressure vessel</p> <p>Sample valves shall be SS white snap-action valves and shall be fitted with plastic nozzles tubes.</p> <p>09.08.00 Degasser system</p> <p>Degasser tower shall be designed to reduce dissolved Carbon-dioxide (CO₂) in treated water to the level indicated in the guarantees. Fill Material of degasser tower shall be Polypropylene or equivalent. Blowers shall be provided to remove CO₂ from water. Degasser tower & degassed water tank shall be internally rubber lined of minimum thickness of 4.5 mm and externally painted with epoxy.</p> <p>09.09.00 Piping/Valves</p> <p>The Technical requirement of Piping, Valves & fittings shall be as defined/specified under subsection titled "Piping, Valves & Fittings" in Part-B of Technical Specification</p> <p>10.00.00 Mixed Bed (MB) Polisher Units</p> <p>The minimum technical requirements equipment shall include, but not be limited to the following:</p> <p>Design surface flow rate at design flow shall not be more than 35 m³/m²/hr. Resins-strongly acidic and strongly basic Type-I, both the resin shall be of high capacity polystyrene resins in bead form. Total resin bed depth shall be 1.0 m (min). Air-blowers for mixed beds shall be provided. Mixed Bed shall be regenerated after minimum 30 hours of operation followed by regeneration period not exceeding 6 hours.</p> <p>10.00.00 UF & RO system (Control & Operation philosophy)</p> <ol style="list-style-type: none"> The control & operation of various systems described below is indicative only and the actual control & operation philosophy shall be finalized with during detailed engineering based on which the control logic is to be built by the contractor in DDCMIS. Normally drawl of product water (either raw water or DM water) requirement plant shall be from a single tank while the other tanks shall be in filling mode from the RO streams/trains. Operation of pumps which draw water from the storage tanks shall be interlocked with the tank level and /or pressure at the suction header, high pressure at the discharge header. The field instruments provided by Contractor along with tanks & suction header shall be used for implementation of such logic. It shall be possible by the Operator one or more tanks for drawl mode and other for filling mode. In auto mode, the tank (s) under drawl mode shall switch over to filling mode at a pre-set level in tank and drawl for the plant shall be continued from the tanks which were under filling mode. Upon reaching high level in all the storage tanks, the running streams/trains shall be shut down in sequence. Similarly, the low level in all the tanks shall initiate starting of stream(s) in sequence which are under standby mode/stopped. Post treatment of RO <p>Water flow to degassers shall be interlocked with the level in degassed water storage tanks as well as pH of permeate. Degasser blower's operation shall be interlinked with the operation of associated degasser tower. The standby blower associated with the tower in operation shall come into operation in the event of failure of running blower. The operation of pumps shall be interlocked with the level of the degassed water tank. The performance of respective degasser shall be monitored thru measurement of conductivity & pH of product water.</p> 		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2</p>	<p>SUB-SECTION A - 14 WATER TREATMENT PLANT</p>	<p>PAGE 17 OF 36</p>

CLAUSE NO.	<p style="text-align: center;">TECHNICAL REQUIREMENTS</p> 		
	<p>5) RO system. RO plant shall be operated and controlled thru control system. The system shall provide the following:</p> <ul style="list-style-type: none"> i) Alarms for high permeate conductivity of each skid, Low pH of feed water, High pH of feed water, high feed water temperature, availability of chemical dosing system such as low level in dosing tanks, status of dosing pumps etc. ii) Continuous monitoring for Feed temperature, Feed pH, conductivity of feed water & permeate, SDI of Feed water, pressure of Feed water, permeate & concentrate, flow of feed water, Permeate & concentrate, residual chlorine of feed water. <p>The HP pumps shall be operated thru control system. Start/ Stop of HP pump shall be interlocked with opening & closing of suction & discharge valves. The pump shall start with its discharge valve closed and on stop/trip command the discharge shall be interlocked to close before the pump stops. Low pressure in the pump suction and high pressure in the pump discharge shall raise an alarm and trip the pump.</p> <p>The operation and control philosophy & instrumentation of Variable Frequency Drive (VFD) and Energy recovery units (ERU) (if applicable) shall be as per the recommendation of the manufacturer.</p> <p>6) Permeate transfer pumps. The pump shall be provided with interlocks to trip the pump on Low suction level. The low-pressure signal from pressure transmitter in the discharge header shall start the standby pump when the system is in auto mode.</p> <p>The HP pumps and motor bearings shall be provided with vibration monitoring for measuring vibration levels and vibration “High” and “High-High” alarm shall be annunciated.</p> <p>Additionally HP pump shall be tripped/shutdown under High conductivity in the RO permeate line, high pH in the Feed water line, high feed water temperature, low level in chemical dosing tank, high feed pressure, high differential pressure across permeators, high residual chlorine of feed water, high SDI in feed water and failure of flow control valve,</p> <p>7) Clean-in-place system The operation of agitators/mixers of chemical tank can also be initiated manually by means of local start/stop through DDCMIS, apart from automatic operation. (Option for local/remote control shall be selected through OWS of the control system.) During normal operation mixing shall be automatically started on the initiation of cleaning operation. The cleaning system pumps shall be started during the cleaning cycle progress. The pumps shall be provided with interlocks to trip on low level of chemical tanks. The cartridge filter shall be provided with a differential pressure measurement to monitor the pressure drop across the filter. Selection of RO block/train to be cleaned shall be manual through control system.</p> <p>8) Flushing system These pumps shall be selected started and stopped either locally, envisaged under DDCMIS or remotely thru control system (Option for local / remote control shall be selected through OWS of the control system.) During normal operation pump operation shall be automatically started on the initiation of flushing operation. Auto / manual selection switch is provided to select the mode of operation. The pump shall be provided with interlocks to trip the pump on Low suction level. The low-pressure signal from Pressure transmitter in the discharge header shall start the standby pump, when the system is in auto mode. Selection of RO block / train to be flushed cleaned shall be shall be manual through control system.</p> <p>9) Suck-back (If applicable) The operation of suck-back shall be automatic.</p>		
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2</p>	<p style="text-align: center;">SUB-SECTION A - 14 WATER TREATMENT PLANT</p>	<p style="text-align: center;">PAGE 18 OF 36</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
<p>10.01.00</p> <p>11.00.00</p> <p>11.01.00</p>	<p>UF system</p> <ol style="list-style-type: none"> 1) The control & operation of various systems described below is indicative only and the actual control & operation philosophy shall be finalized with during detailed engineering based on which the control logic is to be built by the contractor in DDCMIS. 2) The system shall provide the following: <ol style="list-style-type: none"> i) Alarms for, High permeate SDI, availability of chemical dosing system such as low level in dosing tanks, status of dosing pumps etc. ii) Continuous monitoring for pressure of Feed water, flow of feed water & Permeate. 3) Start/ Stop of feed pump shall be interlocked with opening & closing of suction & discharge valves The pump shall start with its discharge valve closed and on stop/trip command the discharge shall be interlocked to close before the pump stops. Low pressure in the pump suction and high pressure in the pump discharge shall raise an alarm and trip the pump. 4) The operation and control philosophy & instrumentation of variable frequency drive for UF units (VFD) (If applicable) shall be as per the recommendation of the manufacturer. 5) Also feed pump shall be tripped/shutdown under high feed pressure, high Differential pressure across permeators. <p>Flushing system</p> <p>Filter backwash operation shall be initiated whenever head loss across the filter reaches preset point or after specified filtration cycle or at the specified effluent quality of high SDI. The logic to be selected shall be decided by Operator through control system. Upon initiation, filter backwash shall proceed automatically.</p>	<p>Chlorine di-oxide (ClO₂) plant</p> <p>The minimum technical requirements equipment shall include, but not be limited to the following:</p> <p>The Contractor shall offer only proven design in successful operation in similar application at previous installations. Design capacity of generator(s) for CW system & PT system shall meet requirement for ClO₂ dosing for the total circulating water flow to maintain a free chlorine dioxide residual of at least 0.2 mg/l in the far reaches of the distribution system at all times. However, the minimum capacity of chlorine di-oxide plant(s) shall be as follows:</p> <p>CW System - Shock dosing is proposed to be provided, which shall be done minimum 3 times a day (once per shift).</p> <p>PT System - Continuous dosing is proposed to be provided.</p> <p>No stand-by generator is proposed in ClO₂ system for CW. However, stand-by equipment w.r.t pumps, tanks, piping & valves etc. shall be considered by Contractor. Chlorine-di-oxide dosing shall be provided at aerators, stilling chambers of PT systems. For controlling organics in circulating water system, ClO₂ dosing may be provided in CW Forebay channel.</p>	<p>Design requirement</p> <ol style="list-style-type: none"> 1) The chlorine di-oxide generators (Submerged / encapsulated type) shall ensure that the formation of the ClO₂ solution takes place completely underwater and the reaction chamber shall be surrounded by water to avoid any ClO₂ gas leak. 2) The ClO₂ shall be generated in diluted solution of concentration of ≤ 1500 mg/l. The generator/reactor shall have a yield of 90% or higher. For consumption of reagents, 90% yield should be considered. Provision for measuring the yield shall be provided.
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2</p>	<p>SUB-SECTION A - 14 WATER TREATMENT PLANT</p>	<p>PAGE 19 OF 36</p>

CLAUSE NO.	<p style="text-align: center;">TECHNICAL REQUIREMENTS</p> 		
	<p>3) The system shall also have necessary sampling valve for periodic measurement of concentration of ClO₂ at the generator outlet to prove and monitor the conversion efficiency of ClO₂ generator.</p> <p>4) The design of chlorine dioxide system should include safety, handling of precursor chemicals viz NaClO₂ and HCl, water source, chlorine dioxide distribution and physical location of all generation equipment & associated accessories.</p> <p>5) The contractor must include all the necessary additional features, functions & equipment for safe & consistent operation of chlorine di-oxide system, as per national & international guidelines and safety requirements. Certifications/Statutory clearances from directorate of explosives or any other authorities; if any required, shall be obtained by the contractor.</p> <p>6) The ClO₂ generation system shall have variable dosing rate of 10% to 100% of the design dosing rate or better.</p> <p>7) To have optimum accuracy, the dosing pumps used shall be with powerful variable speed stepper motor with internal stroke speed control and have a minimum turn down ratio of 1:800 for precise control of ClO₂ generation. Accuracy should be +/- 1 % or better. Dosing pump should have LCD display to see the capacity set and alarms if any.</p> <p>8) Dilution water pumps shall be equipped with suitable VFD to control the speed for varying the flow rate. Contractor shall provide neutralizing chemical for HCl and NaClO₂ and shall design the neutralization system with all required accessories. Separate Neutralization pits for HCl and NaClO₂ shall be provided.</p> <p>9) Chemical preparation tanks with necessary agitation requirement shall be provided as required. After neutralization, the neutralized wastewater shall be pumped to N-pit.</p> <p>10) The bulk storage Tanks shall be provided with dyke wall of suitable height (minimum 500mm). The dyke area shall be provided with Acid proof lining. The Unloading Pumps area shall be provided with a kerb wall and the kerbed area shall also be provided with Acid proof lining. Suitable dyke wall/barrier shall also be given in between HCl & NaClO₂ tanks to avoid any kind of mixing. Arrangements shall be made to transfer the chemical from one tank to another for greater flexibility & in case of leakage; provision shall be made to recycle the chemicals back to tanks from the dyke area for both chemicals (NaClO₂ & HCl).</p> <p>11) Bidder shall take full responsibility that all the materials and components of valves, pumps, piping and any other equipment and appurtenances shall be proven and compatible with the respective fluid therein.</p> <p>12) ClO₂ leak sensor with detector shall be installed inside the room. The least count of sensor shall be 0.1 ppm or better and the complete ClO₂ generation system including the dosing pumps shall stop automatically. The ClO₂ leak sensor shall be of reputed make with proven track record. Industrial type-high decibel hooters shall be provided for each of the ClO₂ plants (PT & CW).</p> <p>13) Air contact with chlorine dioxide solution should be controlled to limit the potential for explosive concentrations possibly building up within the reactor.</p> <p>14) The skid MOC shall be of carbon steel with suitable painting/coating having sufficient strength and rigidity to support the equipment contained in the skid.</p> <p>15) The following instruments shall be provided as a minimum.</p> <ol style="list-style-type: none"> a) pH in Chlorine di-oxide solution dosing line. b) Residual chlorine di-oxide (ClO₂) analyzer. c) Flow meters on all chemical feed lines, dilution water lines, and chlorine dioxide solution lines. 		
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2</p>	<p style="text-align: center;">SUB-SECTION A - 14 WATER TREATMENT PLANT</p>	<p style="text-align: center;">PAGE 20 OF 36</p>

CLAUSE NO.	<div style="text-align: center;"> TECHNICAL REQUIREMENTS  </div>										
	<p>d) Pressure indicator & controller on the water inlet line to ClO₂ generators, chlorine dioxide dosing controller, low vacuum switch, solenoid valves, etc., all complete and as required shall be provided.</p> <p>e) The dosing in inlet shall be automatically controlled based on the signal received from residual chlorine dioxide analyzer in the header.</p> <p>f) All chemical storage tanks shall have automatic high and low level cut off.</p> <p>g) Chlorine di-oxide leak detection system.</p> <p>h) In case of water supply to the generator stops, the chemical dosing pumps shall also stop automatically.</p> <p>i) Generator must be equipped with systems of dosing and/ or measurement for reagents and diluting water. These systems must be able to shut down the operation of the generator in case any of the supplies is cut off.</p> <p>11.02.00 Material of Construction</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><u>Components</u></td> <td style="width: 50%;"><u>Material of construction</u></td> </tr> <tr> <td>ClO₂ generator</td> <td>PVDF sandwiched with FRP protection for better reliability/Equiv. PVDF</td> </tr> <tr> <td>Piping & Valves</td> <td>Industrial Grade CPVC</td> </tr> <tr> <td>Chemical Storage Tanks</td> <td>FRP</td> </tr> </table> <p>11.03.00 Applicable Codes and Standards</p> <p>The design, material, construction, manufacture, inspection, testing and performance of the chlorine-dioxide plant shall comply with all currently applicable statutes, regulations, and safety codes in the locality where the equipment will be installed. The equipment shall also conform to the latest editions of all standards and codes (along with all addenda), mentioned below and elsewhere in the specification. Nothing in this specification shall be construed to relieve the contractor of this responsibility.</p> <p>i) ASME Standards for various tests and materials</p> <p>ii) ASME – Boiler and Pressure Vessels Code Section VIII, Div.1 and sect. IX.</p> <p>iii) ANSI B 16.5 Standard for Steel pipe flanges and flanged fittings.</p> <p>iv) IS – 5120 – Technical requirement for Rotodynamic pumps.</p> <p>v) Chlorine Institute Manual of USA</p> <p>vi) ASTM D 1784 and F 441 & F 439 - CPVC Pipe and Fittings.</p> <p>vii) ASTM and BIS Specifications for CPVC, PP, FRP</p> <p>11.04.00 Piping</p> <p>Industrial grade CPVC Schedule-80 piping shall be used which can withstand a temperature of minimum 60°C. The arrangement of piping and valves should be for ease of service and operation. Cleaning connections are to be provided for flushing. Piping should be lighter in weight with no corrosion and high fire performance. The piping should be easy to fabricate and assemble and in case of any damages, it should be easily replaceable.</p> <p>11.05.00 Valves</p> <p>All valves in Chemical dosing lines (Acid, Sodium chlorite, chlorine dioxide etc.) shall be of industrial grade CPVC PN16 rating (minimum). Type of valves and material of construction for various other applications in the ClO₂ plant shall be selected by the Contractor as per its proven practice. However, all the valves in contact with chlorine dioxide solution should be leak tight and preferably of diaphragm valves with Teflon diaphragm</p>			<u>Components</u>	<u>Material of construction</u>	ClO ₂ generator	PVDF sandwiched with FRP protection for better reliability/Equiv. PVDF	Piping & Valves	Industrial Grade CPVC	Chemical Storage Tanks	FRP
<u>Components</u>	<u>Material of construction</u>										
ClO ₂ generator	PVDF sandwiched with FRP protection for better reliability/Equiv. PVDF										
Piping & Valves	Industrial Grade CPVC										
Chemical Storage Tanks	FRP										
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2	SUB-SECTION A - 14 WATER TREATMENT PLANT	PAGE 21 OF 36								



12.00.00

Pre-treatment plant

DATA SHEETS

NO	DESCRIPTION	PT-CW System	PT-DM System	Coal Slurry settling System (CSSP)
I	Aerator, Stilling chamber and Inlet channel			
II –A)	Aerator/Stilling Chamber	PT-CW System	PT-DM System (Options-I & II)	Coal settling System (CSSP) (Stilling Chamber)
1)	Design Flow (min.)	4950 m ³ /hr.+ water loss through desludging or min 3% whichever is maximum.	300 m ³ /hr.+ water loss through desludging or min 3% whichever is maximum.	2000 m ³ /hr+ 3% for sludge
II-	CLARIFIERS			
1)	Type	----- Circular Reactor type -----		
2)	Design Flow of each clarifier (Net output) (minimum)	1650 m ³ /hr	300 m ³ /hr	2000 m ³ /hr
3)	Reaction Turbine	With variable frequency drive as per Manufacturer's Standard		
4)	Clarifiers Scrapers			
	a) Number	-----One (1) assembly per Clarifier-----		
	b) Material of construction	----- Mild steel with rubber inserts ----- (with bitumastic paint protective coating)		
	c) Drive	Slow speed Motor driven through reduction gear unit or variable frequency drive as per manufacturer's standard		

13..00.00

Gravity filters

NO	DESCRIPTION	PT-DM System (Ion Exchange)	PT-DM System (UF+RO+MB)	PT-Potable water System
I)	Gravity filters			
1)	Design flow per gravity filter	150 m ³ /h+2%	200 m ³ /h+2%	100m ³ /h+ 2%
2)	Air Scour Blowers			
	ii) Type	Rotary Twin lobe / centrifugal		
	iii) Capacity & head	As per design		
	Material of Construction			
	1) Casing, cover & stator	Cast Iron IS:210 Gr. FG 260		
	2) Impeller/Lobe	Cast Iron IS :210 Gr. FG 260		
	3) Shaft	Carbon steel BS:970 En-8/ANSI-I045		



V)	Filtered Water Reservoir/ Sump/ Pump House	PT – DM	PT – Potable
1)	Effective capacity of each reservoir/sump (minimum)	150 m ³	100 m ³
2)	Electric Monorail hoist in Filtered Water Pump house		
	a) Number	-----One (1) (Common)-----	
	b) Minimum Capacity	----- 2T -----	

14.00.0

~~Clarified Water Storage Tank /Sludge / Backwash Water Pit/Sump~~

I	Clarified Water Storage Tank/Distribution Chamber (Above Ground)	
1)	Effective Capacity (retention time)	Minimum 15 mins.
III	Sludge pit/sump & pump house (common)	
1)	Number of Sludge pit	One (1) in two (2) sections
2)	Effective capacity of each section	Not less than 200 Cu.m
IV	Backwash water Pit/Sump & pump house (common for PT-DM & PT-Potable)	
1)	Number of pits	One (1) in two (2) sections
2)	Effective capacity each section	Not less than 200 Cu.m
3)	Material of Construction	RCC with Acid alkali proof lining

15.00.00

Pumps (Vertical/Horizontal/Metering)

A. Vertical Sump Pumps		
NO	Application	Sludge, Wastewater, Back washing
1)	Service of duty	----- Continuous, Outdoor -----
2)	Type of pump	-----Non-clog ----
3)	Type of Discharge	---- Above Floor discharge -----
4)	Type of impeller	----- Open -----
	Suction condition	----- Submerged -----
5)	Minimum Water level	-----By Bidder -----
6)	Maximum Water level	--- Local Finished Grade level----
7)	Operating floor level	----Minimum 500 mm above FGL-
8)	Type of shaft coupling	-----Flexible / Rigid -----
9)	Material of Construction	
	Suction Bell /Casing	2.5 % Nickel Cast Iron, IS: 210 Grade FG 260; S-0.1% max. P-0.15% max.
	Impeller	ASTM A351 CF8M
	Shaft	----- SS-410 -----



A. Vertical Sump Pumps		
NO	Application	Sludge, Wastewater , Back washing
	Column pipe & Discharge pipe	IS:2062 (minimum thickness 8 mm) with 2 coats of epoxy coating inside & outside.
	Shaft enclosing tube (if applicable)	-----do-----
	Bolts & nuts	SS
	Base plate and Soleplate	CS (Minimum 10 mm thick)

B. Vertical Turbine (Wet pit) Type Pumps		
NO	Application	Coal Decanted Water
1)	Service of duty	-----Continuous, Outdoor-----
2)	Type of pump	Non-pull out type.
3)	Type of Discharge	-----Above Floor discharge-----
4)	Type of impeller	-----Closed / Semi-open-----
	Suction condition	-----Submerged-----
5)	Minimum Water level	----- By Bidder-----
6)	Maximum Water level	-Local Finished Grade Level (FGL)
7)	Sump Invert level	----- As per design-----
8)	Operating floor level	---Minimum 500 mm above FGL---
9)	Type of shaft coupling	-----Flexible / Rigid-----
10)	Material of Construction	
i)	Suction Bell	2.5%NiCl; IS: 210 Gr. FG 260; S-0.1%& P-0.15% max.
ii)	Casing/Bowl	2.5%NiCl; IS: 210 Gr. FG 260; S-0.1%& P-0.15% max.
iii)	Impeller	ASTM A 351 CF8M
iv)	Wearing rings (if applicable)	---As per manufacturer's Std --
v)	Impeller Shaft, Pump & line shaft	-----SS ASTM A 276 Gr. 410.-----
vi)	Shaft bearings	As per manufacturer's standard
vii)	Column pipe	IS:2062 (minimum thickness 8 mm) with 2 coats of epoxy coating inside & outside.
viii)	Bolts & nuts	SS
ix)	Base plate and Soleplate	IS: 2062 (Minimum 10 mm thick)
x)	Accessories to be provided with each pump	Companion flanges with nuts, bolts and gaskets, Positioning dowels, Eye bolts, lifting etc. Non –reverse ratchet shall be provided as per manufacturer's standard practice.

C	Horizontal Centrifugal pumps	
NO	Application	Filter water, DM water, Permeate water, Alkali, Degassed water, Flushing, Chemical cleaning, Brine Solution
1)	Service of duty	-----Continuous, outdoor -----
2)	Type of pump casing	----- Radially Split type -----
3)	Material of Construction	
i)	Casing	ASTM A351 CF8M
ii)	Impeller	ASTM A351 CF8M
	Wearing rings	SS – 316
iii)	Shaft	SS-410
iv)	Bolts & nuts	SS
v)	Base plate	CS (Minimum 10 mm thick)

D. Metering pumps – Alum dosing pumps					
No	Designation	:	PT-CW System	PT- DM System	Tube settlers/ Lamella Clarifiers
1)	Type	:	-----Simplex hydraulically operated Diaphragm type -----		
2)	Capacity (minimum)	:	As per design	As per design	As per design
3)	Head	:	As required	As required	As required
4)	Liquid to handled and concentration	:	----- Alum solution 10% W/V -----		
5)	Capacity control	:	10 --100% of capacity manually by micrometer dial		
6)	Pump stroke speed per minute	:	----- Maximum 100 -----		
7)	Material of Construction:				
	Liquid end (pump head valve, valve housing etc), valve spring		-----AISI -316 -----		
	Diaphragm		----- PTFE -----		
	Packing		----- PTFE -----		
	Shaft		Hardened steel EN8-BS-970)/ AISI-316--		
8)	Accessories		Pressure dampeners, Safety Relief valves etc. required		
E) Coal Handling Plant Run-Off Water Treatment System					
4)	Number of Coal Slurry Settling Ponds (CSSP)		Two (2)		
2)	Material of Construction		RCC		
3)	Capacity of each pond of CSSP		1000 cum (Min.)		
6)	Coal decanted sumps				
	i) Number of Sump		One(1) in two (2) sections		

16.00.00

Chemical house equipment

ii) Effective capacity of each section	Not less than 250 Cu.m
iii) Material of construction	-----RCC -----
iv) Coal decanted water pump	As specified

A. Chemical house equipment			
I) Weighing Scales			
1)	Type	Platform & Dial type/Electronic type	
2)	Number & Capacity	One of 0-500 Kg & One of 0-2000 Kg	
II) Monorail hoist			
1)	Type	Electrically operated	
2)	Number and Capacity	Two (2) numbers each of 1 Ton capacity	
III) Chemical Tanks			
		Lime Slaking Tanks	Alum Solution Preparation Tanks
1)	Number	Bidder to decide	
2)	Material of construction	RCC (with 2 coats of Bitumastic paint over 2 coats of primer)	RCC (with Acid/Alkali resistant tiles)
3)	Effective Capacity of each tank (minimum)	As per bidder's design	
4)	Agitator & Number	Motorized with reduction gear unit ; 1 per tank	
5)	Dissolving Chamber	-----SS-----	
6)	Agitator shaft & Impeller matl.	----- SS -316 -----	
B Chlorination (ClO₂) Plant			
I) ClO₂ Plant/ System		CW System	PT System
1)	Capacity (minimum)	2 x 75 kg/h (2W)	2 x 10 kg/h (1W+1S)
C) Waste Service Water Treatment System			
I) Sumps/ Tanks		Waste Service Water Sump (WSWS)	
1)	Effective capacity of each section	Not less than 250 Cu.m	
2)	Material of construction	-----RCC-----	
3)	Oil skimmer, centrifuge	As per system requirement	
II) Tube settlers/ Lamella clarifiers			
i)	Design Flow (net output)	Not less than 250 Cu.m/hr	
D) Treated/Service Water System			
I) Treated Water Tank/ CMB (Above Ground)			
1	Number of Treated/Service Water Tank	One (1) in two(2) sections	
2)	Effective Capacity each section (minimum)	250 Cu.m	
3	Material of construction	-----RCC -----	
XIV) Service Water Tank & Pump House			
1)	Number of Basin	One (1) number in twin sections	
2)	Material of Construction	RCC	

17.00.00

Ion exchanger unit (Cation exchangers, Anion exchangers and MB units)

3)	Effective Capacity each section (minimum)	250 Cu.m
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A	DM plant streams					
1)	Stream Capacity (Each)	120 Cum/hr				
B	Activated Carbon Filter					
1)	Type	Vertical shell type with dished ends				
2)	Number of units per stream	One (1)				
3)	Design Flow per unit (Net)	120 Cum /hr.				
4)	Period between two successive back wash (Design)	24 hours				
5)	Design surface flow at design flow (maximum)	15 m ³ /hr./m ²				
6)	Design Pressure of Vessel (minimum)	8 Kg/Sq.cm (g)				
7)	Filter Media / Resin	Activated Carbon				
8)	Minimum bed depth of filter media/ Resin	1200 mm				
9)	Supporting material for the fill	Graded gravel				
10)	Shell & dished end material	Mild Steel as per specified code				
11)	Internal painting	Epoxy Paint				
12)	External painting	Chlorinated Rubber Paint				
13)	Number of Manhole per Vessel	Minimum Two (2)				
14)	Number of Sight windows with minimum clear width of 75 mm	Minimum Two (2)				
C	Ion exchanger units	Cation Unit		Anion Unit		Mixed Bed unit
		Weak	Strong	Weak	Strong	
1)	Type	Vertical shell type with torispherical dished ends				
2)	Number of Streams	Two (2)	Two (2)	Two (2)	Two (2)	Two (2)
3)	Number of units per DM stream	-----One (1) -----				
4)	Design Flow per unit (Net) in m ³ /h	120		120		120
5)	Guaranteed Effluent Quality	Refer Subsection-IV of Part-A of Technical Specification				
6)	Period between two (Design) successive regenerations in hours	12		12		108
7)	Net output between two successive regenerations in m ³	1440		1440		12960
8)	Design surface flow at design flow (maximum)	As specified elsewhere				
9)	Resin	Weakly Acidic Carboxylic Group	Strongly acidic, high capacity	Tertiary Ammonia Group	Strong base, Type-I, high capacity	Strongly acidic and Strongly basic Type-I



A		DM plant streams		
1)	Stream Capacity (Each)	120 Cum/hr		
		Polystyrene resin in bead form	Polystyrene resin in bead form	Resins. Both resins of high capacity polystyrene resins in bead form.
10)	Resin Depth			
a)	Minimum bed depth of Resin for Counter current regenerated vessels over bed plate/header lateral.	----- 1000 mm -----		-----
b)	Minimum bed depth of filter Resin for Co-current regenerated vessels over bed plate/header lateral .	----- 800 mm -----		-----
c)	Minimum (Total) bed depth of Resin over bed plate/header lateral	-----		1000 mm
11)	Shell & dished end material	-----Mild Steel as per specified code -----		
12)	Design Pressure of Vessels	----- 8 Kg/cm ² (g) (minimum) -----		
13)	Shell (Internal) lining Material & Thickness	----- Rubber & minimum 4.5 mm (thick) -----		
14)	External painting	-----Chlorinated Rubber Paint -----		
15)	Number of Manhole per Vessel	-----Minimum Two (2) -----		
16)	No of Sight windows with minimum clear width of 75mm	----- Minimum Two (2) -----		
17)	Regeneration	By HCl	By NaOH	By HCl & NaOH

Degasser system

A		Degasser towers	
1)	Number of units per DM stream	One (1)	
2)	Type	Forced draft type	
3)	Design Flow per unit (Net) in Cu.m/hr	120	
4)	Fill Material	Polypropylene or equivalent	
5)	Shell material	Mild Steel as per specified code	
6)	Shell (Internal) lining Material & Thickness	Rubber & minimum 4.5 mm	
7)	External painting	Epoxy Paint	
B	DEGASSED WATER STORAGE TANK		

18.00.00

Brine preparation & pumping system

A Degasser towers		
1)	Number of units per DM stream	One (1)
1)	Type	Horizontal cylindrical atmospheric with dished ends
2)	Design Standard (for diameter, length & thickness)	As per BS: 2594. However, dished ends shall be of Torispherical type
3)	Number of units per DM stream	One (1)
4)	Useful (Effective) Capacity (minimum)	As per Bidder's design
5)	Shell material	Mild Steel as per specified code
6)	Shell (Internal) lining Material & Thickness	Rubber & minimum 4.5 mm
7)	External painting	Epoxy Paint

19.00.00

A. Regeneration (Chemical handling/Unloading & Storage) system

A Brine Solution Preparation Tank		
1)	Material of construction	Mild steel (Internally rubber lined and externally painted with epoxy paint)
2)	Number & Effective Capacity	As per Bidder's design
3)	Dissolving basket, Agitator	SS -316.

A) Chemical Unloading Pumps		Acid	Alkali
1)	Duty	Intermittent Intermittent	
2)	Material of Construction		
	i) Casing, impeller, wearing rings	PP	SS-316
	ii) Shaft, shaft sleeve	PP/ EN-8, Mfg. std.	SS-316
	iii) Sets of Hoses with coupling & Diaphragm type Isolation Valves	Material of Hose: Chemical resistant, UV inhibited PVC	
3)	Number/Length of Sets Required	Two (2)	

B. Regeneration storage, Chemical preparation & Dosing system

A) Bulk Storage Tanks		Acid	Alkali
1)	Type	Horizontal Cylindrical atmospheric with dished ends	
2)	Design Standard	As per BS: 2594, Dished ends shall be of Torispherical type	
4)	Liquid to be handled	HCl 30-33% Conc.	NaOH 48% Conc.
6)	Shell material	Mild Steel	
7)	Shell (Internal) lining Material & Thickness	Rubber Lining (4.5 mm Thick)	

VII-B) Tanks / Vessels		Acid Measuring Tank	Alkali Preparation Tank	Alkali Day Tank
1)	Type	Vertical Cylindrical atmospheric		
2)	Numbers required	Two (2)	Two(2)	Two (2)

3	Liquid to be handled	HCl	NaOH	NaOH
4	Minimum (Effective) Capacity	As per bidder design or 2 cum (whichever is minimum)	As per bidder design or 5 cum (whichever is minimum)	As per bidder design or 2 cum (whichever is minimum)
5	Location	----- To be designed for outdoor duty (Located under a roof without side walls) -----		
6	Shell material	----- Mild Steel as per specified code -----		
7	Shell (Internal) lining Material & Thickness	-----Rubber & minimum 4.5 mm -----		
8	External painting	-----Chlorinated Rubber Paint -----		
9	Material of Dissolving basket	Not applicable	SS -316	SS -316
VII-C) Tanks / Vessels –Contd		AC Filter for Alkali		Alkali Diluent Water Heating Tank
1	Type	Vertical Cylindrical Pressure vessel with dished ends		
2	Capacity	As per bidder design or 10 Cu.m/hr whichever is minimum		
3	Design surface flow	15 M ³ / hr / M ²	Not applicable (NA)	
4	Design Pressure of Vessel	----- 8 Kg/ Sqcm (minimum) -----		

19.01.00 Neutralizing system (DM Plant) (Option-I,II)
A) N-Pit

1)	Number	One (1) in two sections
2)	Material of Construction	R.C.C with acid/alkali proof tiles
3)	Corrosion Protection for gates	Acid/Alkali proof chlorinated paint & rubber lined.
4)	Effective capacity of each section	250 cum

B) N-Pit waste Re-circulation cum-disposal pumps

1)	Type of Pumps	Horizontal centrifugal with priming system
2)	Total Number of Pumps	Three (1W+1S +1 Maint.Spare)
3)	Duty	2-4 hrs every shift
4)	Liquid to be Handled	DM Plant Regeneration waste
5)	Pumps and drives to be designed	For Outdoor duty
6)	Suction condition	Suction from priming chamber/submerged (suction from pit)
7)	Guaranteed Flow of each pump	Capacity to evacuate total pit in 3 hours
8)	Total head	As reqd.
9)	Maximum pump Speed	1500 rpm (nominal)
10)	Type of pump casing	Preferably Radially Split type
11)	Type of impeller	Closed / Semi Open

C) Lime tanks for neutralisation

1)	Numbers. required	One (1)
2)	Type of construction	RCC
3)	Effective Capacity (Minimum)	2 CuM
4)	Inside protection	Epoxy

5)	Dissolving basket, Agitator	SS -316.
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D) Backwash wastewater collection & recycling system

D1	Back Wash Waste water Collection Pit & Sump (DM)	
1)	Number	One (Twin sections) with a common sump
2)	Material of construction	R.C.C. with Acid / Alkali proof lining
3)	Effective capacity each section	Not less than 150 Cu.M
4)	Corrosion Protection for gates	Acid/Alkali proof chlorinated paint & rubber lined.

D2	Back Wash Wastewater Recirculation cum disposal pump (Vertical Sump Pumps)	
1)	Location	In Filter Backwash Sump
2)	Capacity of each pump	Capacity to evacuate the pit in 2 hrs.
3)	Total head	As per bidder's design
4)	Type of pump	-----Vertical, non-clog, Sump pumps -----
5)	Type of Working Fluid	---Drains with particle size up to 40 mm
6)	Type of impeller	----- Open -----

20.00.00

DM water storage tanks (Option-I,II)

1)	Type	Vertical Cylindrical atmospheric
2)	Design Standard	IS :803
3)	Numbers required	Two (2)
4)	Shell material	Mild Steel as per specified code
5)	Shell thickness (min.)	Bottom most Course -10 mm Balance Courses – 8 mm
6)	Bottom Plate Thickness (min.)	10 mm
7)	Roof Plate Thickness (min.)	6 mm
8)	Internal Protection	Solvent free epoxy coating
9)	External painting	Epoxy Paint
10)	Manholes	Minimum 2 numbers (one on the shell and other on the roof)
11)	Accessories	a) Staircase & platform b) Vent, Overflow and drain connections c) Overflow seal d) CO ₂ absorbers in vent line e) Hand railing on the roof of the tank all around the tank
12)	Additional nozzle connections	a) Minimum Two (2) Numbers one of 250 NB size & another of 150 NB size at bottom level (for suction). b) Minimum Two (2) numbers one of 150 NB size & another of 100 NB size at the top level (for future filling)

21.00.00

UF-RO & MB Plant

22.00.00

A Ultrafiltration unit (UF)		
No	Descriptions	Parameter /Data
1)	Nos. of trains	2x60 %
2)	Feed Temperature	10-35 Deg C
3)	Recovery from UF	Not less than 92%
4)	UF Treated (Filtrate) Flow	Capacity of each UF to match with gross capacity of RO + water required for backwashing of UF+ Chemical preparation. Additional 5% margin over the total requirements
B Basket strainers		
1)	MOC	SS-316
C UF permeate water storage tank		
1)	Fluid to be Stored	Permeate Water produced from UF
2)	Type of Tanks	Vertical Cylindrical Atmospheric
3)	No of tanks	Two(2)
4)	Design Standard	IS : 803
5)	Effective capacity of Tank	Minimum 1 Hr. retention
6)	Material of construction	MS as per specified code
7)	Shell thickness	Bottom most layer : 10 mm (min.) Balance layer : 8 mm (min.)
8)	Bottom plate thickness	10 mm (minimum)
9)	Inside protection	Solvent free epoxy coating
10)	External painting	Epoxy coating.
11)	Accessories, Additional nozzle connections	Ref DM tank above

D. UF permeate transfer pumps		
No	Description	Parameters/ Data
1)	Purpose	To pump UF permeate to RO units via cartridge filters
2)	Type of pumps	Horizontal Centrifugal (With VFD)
3)	Design flow (Cum/hr)	To suit the gross capacity of RO system requirements
4)	Rated Head of pump in MWC	As per bidder's design

E. UF BACKWASH WATER PUMPS		
No	Description	Parameters/ Data
1)	Purpose	For backwashing and CEB of UF skids
2)	Design flow & head	As per bidder's design

Cartridge filters & RO trains/streams

A. Cartridge filters		
No	Description	Parameters/ Data
1)	Filtration Capacity of each filter	Capacity one CF same as capacity of one (1) UF
2)	Numbers	One (1) for each RO stream with a common standby.
3)	Filter Casing & Internals	SS -316
B. RO trains /streams		
1)	Number of trains	3x50% (2W+1S)
2)	Turn Down Capability	One or both the trains shall be operable as per requirement

3)	Design net capacity of each train (Permeate Flow)	Not less than 60 Cu.m/h
4)	Gross capacity of each train	Not less than 60 Cu.m/h +Internal consumption of RO system
5)	Number of Membrane (Block) per Train	One or more as per design
6)	No of Membranes per module	6 - 8
7)	Guaranteed Design Recovery	Not less than 85%
8)	Membrane type	Polyamide, Spiral wound
9)	Average Flux	<20 L/M ² h
10)	Fouling Allowance for design	Minimum 5% per year
11)	Salt passage increase	Minimum 10% per year
12)	End connectors	Victaulic coupling or equiv.(SS-316)
C. High pressure feed pump		
1)	Purpose	To pump filtered water at the downstream of Cartridge filters up to the Degasser towers through RO trains.
2)	Number of pumps	One(1) per RO train
3)	Type of Pumps	Centrifugal with VFD
4)	Design flow rate of each Pump	To suit the Gross capacity of each RO train
5)	Rated Head	1.10 x (RO train Feed Pressure + frictional loss in the system)
6)	Service Duty	Continuous
7)	Type of pump casing	As per manufacturer's standard
D. RO Permeate water storage tanks		
1)	Number required	Two (2)
2)	Effective Capacity of each tank	Minimum 1.5 Hr. retention
3)	Type and Pr. class	Vertical cylindrical atmospheric.
4)	Design Standard	As per IS: 803
5)	Material of construction	MS as per specified code
6)	Shell thickness	Bottom most layer : 10 mm (min.), Balance layer : 8 mm (min.)
	Bottom plate thickness	: 10 mm (min.)
7)	Inside protection	Solvent free epoxy coating.
8)	External painting	Epoxy coating.
9)	Accessories, Additional nozzle connections	Ref DM tank above
E. CHEMICAL CLEANING SYSTEM		
1. CHEMICAL TANKS		
1)	Numbers Required	One (1)
2)	Effective Capacity	As per bidder's design
2. CHEMICAL CLEANING PUMPS		
1)	Numbers Required	Two (2) (2x100%) (1W+1S)
2)	Type	Horizontal Centrifugal
3)	Design flow rate of each Pump	Suitable for cleaning of one (1) RO train/stream at a time.
F. FLUSHING SYSTEM		
1)	Numbers of Flushing pumps Required	Two (2) (2x100%)
2)	Type	Horizontal Centrifugal

23.00.00

3)	Design flow rate of each Pump	Suitable for cleaning of one RO train/stream at a time
G. DEGASSER SYSTEM		
1)	Degassed Tower, Degasser blower & pumps	Ref. for DM plant

MIXED BED (MB) POLISHER UNITS (RO PLANT)

1)	Type	Vertical shell type with dished ends
2)	Design flow per unit (net)	Not less than 60 M ³ /hr
3)	Gross flow rate per MB unit	To be decided by bidder considering DM water required for regeneration.
4)	Service Cycle (period between two (2) successive regenerations)	24 hrs.
5)	Design surface flow rate at design flow	Not more than 35 M ³ /M ² /hr
6)	Shell & dished end material	Mild steel as per specified code
7)	Shell lining	
	a)Material	Rubber
	b)Thickness	4.5 mm (minimum)
8)	External painting	Chlorinated rubber paint
9)	Manhole	Two (2) per vessel (Min.)
10)	Sight windows	Two (2) minimum per vessel (Minimum clear width shall be 75 mm)
11)	Resins	
	a)Type	Strongly acidic and strongly basic Type-I, both the resin shall be of high capacity polystyrene resins in bead form.
	b)Regeneration	By HCl and NaOH
	c)Total resin bed depth	1.0 M (min)
12)	Air-blowers for Mixed Beds	
	Number	Two (2x100%)
	Type	Centrifugal/Twin lobe type
	Capacity & Head	As required

24.00.00

Data sheet for UF/RO other system

A. SMBS & Antiscalant dosing system			
1)		SMBS dosing tank	Anti scalant dosing tank
	No of tanks	2 W	2W
	Capacity	500 Lit (Min)	500 Lit (Min)
	MOC	MSRL / FRP	MSRL / FRP
	Tank Mixer/Agitator	Turbine Agitator	Turbine Agitator
	MOC of Mixer/Agitator	SS-316	SS-316
2)		SMBS dosing pumps	Antiscalant dosing pumps
	No.	2(1W+1S)	2(1W+1S)
	Type	Positive displacement	Positive displacement
	MOC	PP	PP
B. UF Permeate transfer pumps and UF backwash water pumps			
	description	UF permeate transfer pumps	UF filtrate cum backwash water pumps

CLAUSE NO.	<div style="text-align: center;"> TECHNICAL REQUIREMENTS  </div>		
<p>25.00.00</p>	1) Purpose	To pump UF permeate to RO units via cartridge filters	To pump UF permeate to UF storage tank and backwashing of UF
	2) Type of pumps	Horizontal Centrifugal	Horizontal Centrifugal with VFD
	3) Design flow rate of each pump	To suit the gross capacity of RO requirements	As per bidder's design
	<p>Design features of "Pressure and Storage Vessels"</p>		
	<ol style="list-style-type: none"> 1) Design of all pressure vessels shall conform to ASME Section VIII or acceptable equivalent standard. Design pressure shall be the maximum expected pressure to which the vessels may be subjected to plus 5% additional margin. Maximum expected pressure for vessels placed in the discharge line of pumps shall be based on the shut-off head of the pumps plus static head at pumps suction if any. For all other pressure vessels, design pressure shall be at least 8 Kg/cm² (g). 2) Design of all vertical cylindrical atmospheric storage tanks containing water, acid, alkali, and other chemicals shall conform to IS: 803. 3) Design of all horizontal cylindrical atmospheric storage tank containing water, acid, alkali, and other chemicals shall conform to BS: 2594. 4) Design temperature of all pressure vessels and storage tanks shall be 10 deg. C higher than the maximum temperature that any part of the vessel/tank is likely to attain during operation. In case, tank is subjected to vacuum, the same shall be taken care in designing the tank. 5) The design of DM water storage tanks (Vertical type) shall conform to IS: 803. Supporting frame where required shall be in accordance with IS: 800. The tank shall be "Non-pressure" fixed roof type with atmospheric vents. 6) All vessels/tanks without inside rubber lining shall have a corrosion allowance of minimum 2 mm and mill allowance (minimum 0.3 mm) for shell and dished ends. Thinning allowance of 2 mm (minimum) shall be considered for dished end. 7) All the atmospheric tanks shall have sufficient free board above the "Level High"/"Normal Level" as the case may be. The overflow level shall be kept at least 20 cm or 10% of vessel height above the "Level High"/"Normal Level" for all the tanks except for the DM tanks for which a minimum height of 300 mm shall be provided over the "High Level". Further, a minimum 100 mm free board shall be provided above the top of overflow level to the bottom of roof of the tank. Wall thickness of atmospheric tanks shall not be less than 6 mm. 8) Vessels coming under review of IBR shall be designed accordingly. 9) Material of Construction <ol style="list-style-type: none"> i) The pressure vessels shall be fabricated from carbon steel plates conforms to SA 515 Gr.70 or SA 516 Gr. 70 if the pressure vessels are designed as per ASME Section VIII. ii) If the pressure vessels are designed as per IS 2825 following criterion shall be followed: The pressure vessels shall be fabricated of steel as per IS: 2002 Gr. 3 (normalized condition) or SA: 515/516 Gr. 70 (normalized), in case the vessels are designed as per Class 1 or Class 2 of IS: 2825. If the pressure vessels are designed as per Class 3 of IS: 2825, the material of construction shall conform to IS: 2062 or IS: 2002 Gr. 3 (Normalized quality).or SA 515 /516 Gr. 70 iii) All atmospheric tanks shall be fabricated of steel conforming to IS: 2062. iv) The pipe flanges, manhole/manhole covers reinforcement pads etc. shall be fabricated out of the same material as that one used for the vessel/tank. 10) Fabrication <ol style="list-style-type: none"> a) The vessel ends for storage tanks of vertical type shall have flat bottom. However, the ends of horizontal storage tanks, and all the pressure vessels shall be dished design of Torispherical type designed and constructed by forging, pressing or spinning. The dished ends shall have a minimum straight flange length of 60 mm. Conical or flat (with or without reinforcement) ends shall not be accepted. 		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2</p>	<p>SUB-SECTION A - 14 WATER TREATMENT PLANT</p>	<p>PAGE 35 OF 36</p>

CLAUSE NO.	<div style="text-align: center;"> TECHNICAL REQUIREMENTS  </div>		
<p>26.00.00</p>	<p>b) The plates to be used for fabrication shall preferably have a minimum width of 1500 mm. All welding shall be performed by ASME qualified welders under Section-IX of ASME Boiler and Pressure Vessel code and welding electrodes shall be as per relevant Codes/Standards viz. AISC Section 1.17 etc.</p> <p>c) All pressure vessels and storage tanks except DM water storage tanks, UF, RO Permeate water tanks shall be fabricated complete and tested at manufacturer's works to ensure better workmanship.</p> <p>1) Appurtances, Connections, Lifting lugs</p> <p>a) Manholes/Hand Holes: All the pressure vessels and horizontal type storage tanks shall be provided with at least one manhole of 500 mm diameter. The vertical type storage tanks shall be provided with a manhole of 500 mm dia on the top cover, if the diameter of the tank is 1200 mm or more. For the vertical cylindrical atmospheric tanks, manholes shall be provided as per IS: 803.</p> <p>b) All the vessels and tanks shall be normally provided with a hand hole of 150 mm gasketed located near the bottom of the straight side.</p> <p>c) All lined vessels connections shall be conformed to required class/rating. Nozzle material shall be ASTM-106 Grade B, Schedule 80.</p> <p>d) All vessels of internal, diameter of 1200 mm or greater shall be provided with minimum four (4) lifting lugs for safe and effective handling during erection. Smaller vessels shall be provided with at least two (2) lifting lugs. Material of construction for these vessel supports, saddles, lugs shall conform to IS: 2062 of tested quality.</p> <p>Painting: Painting shall be conforming to the requirements specified elsewhere in technical specification.</p>		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO:CS-4540-001A-2</p>	<p>SUB-SECTION A - 14 WATER TREATMENT PLANT</p>	<p>PAGE 36 OF 36</p>

LOW PRESSURE PIPING

**TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CS-4540-001A-2**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.00.00	<u>LOW PRESSURE PIPING</u>			
1.01.00	<p>The Scope of Low Pressure (LP) piping systems for the following services shall be as defined in various tender drawings & the sub section pertaining to “Terminal points and exclusions” and shall include the following systems:</p> <ul style="list-style-type: none"> a) Circulating water piping b) DM water normal make-up piping (condenser makeup, ECW makeup for both Steam Generator and Turbo Generator Auxiliaries & CPU regeneration plant, etc.). DM for Aux Boiler filling, FGD area, etc. c) Condenser emergency make up and ECW tank emergency make-up for SG & TG / condensate storage and transfer system. d) Boiler (Steam Generator) and Deaerator fill piping. e) Equipment Cooling Water (ECW) piping including its chemical dosing for primary circuit for Steam generator and Turbo generator and their auxiliaries. f) Auxiliary cooling water piping. g) Complete service water piping, APH /ESP wash water piping, Drinking (potable) water piping (plant distribution, CHP area, for Colony, etc.), CW Blowdown piping (including FGD & CHP area), clarified water & HVAC piping, Raw water piping (PT plant, ash handling, Make up to Fire water Tank), R.O. reject to CHP piping, Sludge & Effluent transfer piping system. h) Compressed air (Instrument & service air) piping system. i) Sludge (PT Plant to Ash slurry sump) & Effluent (DM Plant to Ash slurry sump) transfer systems. j) CPU Regeneration waste to CW Channel, Condenser Pit Clear water to CW Channel, ADV discharge to CW Channel, etc. k) Drain & vent piping system for the piping\equipment etc. under the bidder’s scope. l) Tanks as described elsewhere in the specification for the above systems. (Including condensate storage tanks, etc.). m) Re-circulation pipes along with valves, breakdown orifices etc., wherever required/specified elsewhere in Technical Specification. n) Any other piping system required making the Low Pressure (LP) piping systems in the bidder’s scope complete. o) Other applicable piping systems as mentioned in Plant Water Scheme and elsewhere in Technical Specification. 			
1.02.00	<p>The scope covers the following for the complete LP piping mentioned above:</p> <ul style="list-style-type: none"> a) Design, engineering, manufacturing, supply, fabrication, testing packaging, transportation to site, storage, taking delivery of Employer supplied equipment from site stores, in plant transportation, erection, cleaning, testing and commissioning of all items i.e., pipes, fittings, supports/ hangers, valves, actuators, motors, specialties, 			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4540-001A-2	SUB SECTION- IIA-08 LOW PRESSURE PIPING	PAGE 1 OF 4	

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.03.00	<p>expansion joints, strainers, moisture traps, tanks, chemical dosing system for Equipment Cooling Water System (Primary circuit), instruments, drains, vent including drain/ vent valves ,air release valves etc.</p> <p>The items though not specifically mentioned or indicated here in but are needed to make the system / equipment complete shall also be furnished and treated as if included in the specification unless otherwise specifically excluded.</p> <p>Bidder's scope of supply & works shall include but not be limited to the following:</p> <p>a) Pipes, headers and manifolds, bends, elbows, returns, tees, laterals, crosses, reducers/ expanders, caps and closures, couplings, plugs, sleeves, and saddles, stubs and bosses, unions and other similar fittings, flanges, gaskets, fasteners and sealants, ring joints, backing rings, all types of valves including drain/ vent/ air release valves, 3-way valves(where applicable) with test connection for instruments/ manifolds etc. actuators, specialties, orifices, flow nozzles, etc. as per finalized single line flow diagrams and layout drawings/ isometric drawings.</p> <p>b) Complete assemblies of hangers, supports anchor, guides, restraints, etc. including welded attachments, clamps, devices tie-rods, turn-buckles, springs and spring cages, shoes, rollers, trapezes etc.</p> <p>c) Weather hoods for pipes crossing ceilings and walls.</p> <p>d) Instrument tapping and stub connections, root valves, 3-way valves (where applicable) with test connections, drains and vent valves & expanders / reducers as required and instruments as indicated else where for instruments supplied by the Contractor.</p> <p>e) Drain funnels, drip pans, moisture traps etc. wherever required shall be provided.</p> <p>f) Instrument tapping, stub connections, root valves and instrument tubing up to root valves for instruments supplied by the Employer for onward connections by the Employer.</p> <p>g) All supporting attachments like plates, saddles, stools, shoes, base plate, saddle plates, angles, channels, I-beams, trapeze, cantilevers, brackets, sways, braces, nuts, bolts, cleats, clamps, needed to complete the erection of piping system covered under this specification.</p> <p>Anchor bolts, bed & foundation plates, pipe sleeves and Nuts to be embedded in concrete for piping where ever indicated in the drawing. All grouting and chipping work (including supply of cement, sand and stone chips) for equipment foundations, pipe supporting etc.</p> <p>Reinforced concrete valve chambers wherever required for underground piping.</p> <p>h) Surface preparation, priming and painting of all non-insulated above ground piping and equipment except galvanized steel piping & surfaces, stainless steel piping & surfaces, and gun metal surfaces.</p> <p>Paints and varnishes, primers, thinners etc. as required for anti-corrosive protection of piping & equipment above ground.</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4540-001A-2</p>	<p>SUB SECTION- IIA-08 LOW PRESSURE PIPING</p>	<p>PAGE 2 OF 4</p>	

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	<p>i) Bidder shall provide anti-corrosive protection anticorrosive tape or coating wrapping on the external surfaces of pipes to all directly buried piping including galvanized carbon steel piping.</p> <p>j) On the internal surface of all pipes 1000 mm and above, a coat of primer followed by a hot coat of coal tar enamel paint or coal tar epoxy paint shall be applied.</p> <p>k) Excavation, preparation of bed, backfilling with compaction of soil and removal of extra-earth to designated places in case of pipes to be buried.</p> <p>l) Bidder shall also design, supply, fabricate, erect, set and commission all hangers, tie-rods, turn-buckles, supports, guides, restraints, anchors, etc. as required for the, piping system. This includes the provision of all associated steel work including brackets, cradle supports, duck feet, channels, angles, etc. It is Bidder's responsibility to estimate these requirements and include them in their offer price. Whenever, straight run of the yard pipes are more than 300 meters, flexibility analysis shall be conducted by the contractor to identify the requirement of loops, type of supports etc.</p> <p>m) In covered concrete trenches bidder shall supply necessary supporting materials such as stools, saddles, base plates, clamps, U-bolts, angles, clips etc.</p> <p>n) Bidder shall supply all necessary drains and vents with drain & vent valves including anti-flash funnels and moisture traps for compressed air system as required for the safe and effective draining-venting of the piping systems based on the approved flow scheme / single line diagram. It is bidder's responsibility to identify the requirements of drains, vents, and supply the necessary pipe work, fittings, hangers and supports etc. for the same.</p> <p>o) Bidder shall supply and install necessary matching pieces as may be needed for connection of piping systems with equipment terminals, valves and specialties.</p> <p>p) Bidder shall erect all instrument impulse piping and fittings from the tap-off point of the last root valve including the root valve and instruments.</p> <p>q) Bidder shall perform necessary internal machining of pipe for installing orifices, flow nozzles, straightening vanes etc.</p> <p>r) The Bidder shall prepare the flow diagrams, detailed dimensional piping layout/ Isometric/ fabrication/ as built drawings of all the systems along with Cross sectional drawings, showing all supports and equipment as required.</p> <p>s) In addition to submission of drawings as stipulated above bidder shall also furnish the data/ documents with respect to following:</p> <ol style="list-style-type: none"> 1) Thickness calculation of large diameter buried pipes as per AWWA-M-11. 2) System design calculation of Primary closed circuit ECW and secondary circuit ACW system for flow & pressure balancing. 3) Design calculations for condensate storage tank and Drinking water tank. 4) Static Analysis for Long (more than 300 meter straight run) above ground piping wherever required. 			
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4540-001A-2</p>	<p style="text-align: center;">SUB SECTION- IIA-08 LOW PRESSURE PIPING</p>	<p style="text-align: center;">PAGE 3 OF 4</p>	

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
1.04.00	<p>t) Bidder's scope of supply for fabrication, erection, cleaning, testing and commissioning of the piping systems installed by him shall include the following: -</p> <p>All welding consumables like welding electrodes, filler rods and wires; gases like oxygen, acetylenes, argon, carbon-dioxide, propane, backing rings etc.</p> <p>Films for radiographic examination of welds.</p> <p>X-ray and Gamma -ray equipment including isotopes, dye penetrants, and other required non-destructive testing materials and equipment (all to be taken back by the Bidder after completion of work).</p> <p>All heating and stress relieving equipment, thermocouples asbestos blankets, cables, temperature recorders, charts heat sensitive chalks and crayons etc. (All to be taken back by bidder after completion of work).</p> <p>All machinery, equipment tools and tackles as required for transportation handling, fabrication and erection (All to be taken back by Bidder after completion of work).</p> <p>All equipment/ materials as required for cleaning, flushing, blowing out and hydro testing of the piping systems; these shall include but not be limited to pumps and compressors with prime movers, instruments, pipe work with supports, valves, strainers and other specialties, blanks, plugs, spool pieces, dummy plates, electrical accessories, etc. (All to be taken back by Bidder after completion of work).</p> <p>All scaffolding materials and false work (To be taken back by Bidder after completion of work).</p> <p>The Bidder shall provide Services of erection superintendent and foremen, fitters and riggers, welders, transport and crane operators and other skilled and unskilled labour.</p> <p>The design engineering and providing all temporary pipe work as required for erection, cleaning, flushing, blowing out, testing and commissioning of the piping system is the responsibility of the Bidder.</p> <p>The Bidder's scope shall include design, supply of required structural steel (except those which are specifically excluded), their fabrication and erection where ever required.</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4540-001A-2	SUB SECTION- IIA-08 LOW PRESSURE PIPING	PAGE 4 OF 4

LOW PRESSURE PIPING (CONT.)

**TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-B
BID DOC. NO. CS-4540-001A-2**

CLAUSE NO.	<p style="text-align: center;">TECHNICAL REQUIREMENTS</p> 																																										
1.05.00	<p>Based on the inside diameter so established, minimum thickness calculation shall be made as per ANSI B 31.1 OD. Manufacturing allowance shall be added to minimum calculated thickness and next higher standard thickness of pipes shall than be selected as per ANSI B 36.10/IS-1239 Heavy grade/IS-3589/ASTM-A-53/API-5L/ANSI B36.19 as the case may be. Alternatively, manufacturers standard thickness can also be accepted subject to that such thickness shall be equal to or more than the minimum calculated thickness after considering manufacturing allowance. Selected thickness then shall be checked for vacuum loading criterion as per the guidelines given in AWWA-M-11.</p>																																										
1.06.00	<p>Corrosion allowance of 1.6 mm will be added to the calculated thickness being considered (except stainless steel piping).</p>																																										
1.07.00	<p>Bend thinning allowance/manufacturing allowance etc. shall be as per the requirement of the design code provision.</p>																																										
1.08.00	<p>Material of construction for pipes carrying various fluids shall be as specified elsewhere.</p>																																										
1.09.00	<p>Compressed air pipe work shall be adequately drained to prevent internal moisture accumulation and moisture traps shall be provided at strategic locations in the piping systems.</p>																																										
1.10.00	<p>Depending upon the size and system pressure, joints in compressed air pipe work shall be screwed or flanged. The flange shall be welded with the parent pipe at shop and shall be hot dip galvanized before dispatch to site. Alternatively, the flanges on GI pipes may be screwed-on flanges also.</p>																																										
1.11.00	<p>Threaded joints shall be provided with Teflon sealant tapes.</p>																																										
1.12.00	<p>Following types of valves shall be used for the system/service indicated.</p> <table border="1"> <thead> <tr> <th>SYSTEM</th> <th colspan="6">TYPES OF VALVES</th> </tr> <tr> <th></th> <th>Butterfly</th> <th>Gate</th> <th>Globe</th> <th>Check</th> <th>Ball</th> <th>Plug</th> </tr> </thead> <tbody> <tr> <td>Water</td> <td>x</td> <td>x</td> <td>x</td> <td>x</td> <td>x</td> <td></td> </tr> <tr> <td>Air</td> <td></td> <td>x</td> <td>x</td> <td>x</td> <td>x</td> <td></td> </tr> <tr> <td>Drains & vents</td> <td></td> <td>x</td> <td>x</td> <td>x</td> <td></td> <td></td> </tr> <tr> <td>Fuel oil (if any)</td> <td></td> <td>x</td> <td>x</td> <td>x</td> <td>x</td> <td>x</td> </tr> </tbody> </table>	SYSTEM	TYPES OF VALVES							Butterfly	Gate	Globe	Check	Ball	Plug	Water	x	x	x	x	x		Air		x	x	x	x		Drains & vents		x	x	x			Fuel oil (if any)		x	x	x	x	x
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1.13.00	<p>Recirculation pipes along with valves, breakdown orifices etc. shall be provided for important pumping systems as indicated in respective process and instrumentation diagrams (P&IDs). The recirculation pipe shall be sized for minimum 30% design flow of single pump operation or the recommended flow of the pump manufacturer whichever is higher.</p>																																										
2.00.00	<p>TECHNICAL SPECIFICATION</p>																																										
2.01.00	<p>GENERAL</p> <p>Specific technical requirements of low-pressure piping, fittings, supports, valves, specialties and tanks etc. have been covered under this Sub-section. It includes details pertaining to design and material of construction for piping, fittings, valves, equipment, etc. cleaning/surface preparation application of primer and painting on over ground piping. It also</p>																																										
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CLAUSE NO.	TECHNICAL REQUIREMENTS 				
2.02.00 2.02.01 2.02.02 2.02.03 2.02.04 2.02.05 2.02.06 2.02.07 2.02.08 2.02.09 2.02.10 2.02.11	<p>includes detailed technical requirement of laying underground/buried piping including water proofing/anti corrosive protection. It also covers design, engineering, manufacturing, fabrication, technical details of piping, valves, specialties, piping hangers / supports, tanks etc.</p> <p>Pipes and fittings</p> <p>All low pressure piping systems shall be capable of withstanding the maximum pressure in the corresponding lines at the relevant temperatures. However, the minimum thickness as specified in the following clauses and or respective codes for pipes and fittings shall be adhered to. The bidder shall furnish the pipe sizing/ thickness calculation as per the criteria mentioned above under LP piping equipment sizing criteria of this Technical Specification.</p> <p>Piping and fittings coming under the purview of IBR shall be designed satisfying the requirements of IBR as a minimum.</p> <p>Supporting arrangement of piping systems shall be properly designed for systems where hydraulic shocks and pressure surges may arise in the system during operation. Bidder should provide necessary protective arrangement like anchor blocks/anchor bolt etc. for the safeguard of the piping systems under above mentioned conditions. The requirement will be, however, worked out by the contractor and he will submit the detailed drawings for thrust/anchor block to the Employer. External, and internal, attachments to piping shall be designed so as not to cause flattening of pipes and excessive localized bending stresses.</p> <p>Bends, loops, off sets, expansion or flexible joints shall be used as required in order to prevent overstressing the piping system and to provide adequate flexibility. Flexibility analysis (using software packages such as Caesar-II etc.) shall be carried out for sufficiently long piping (straight run more than 300M).</p> <p>Wherever Bidder's piping coming under this specification, terminates at an equipments or terminal point not included in this specification, the reaction and the thermal movement imposed by bidder's piping on equipment terminal point shall be within limits to be approved by the Employer.</p> <p>The hot lines shall be supported with flexible connections to permit axial and lateral movements. Flexibility analysis shall be carried out for pipelines which have considerable straight run as indicated above and necessary loops/ expansion joint etc. shall be provided as may be necessary depending on layout.</p> <p>Piping and fittings shall be manufactured by an approved manufacturer of repute. They should be truly cylindrical of clear internal diameter, of uniform thickness, smooth and strong, free from dents, cracks and holes and other defects.</p> <p>For rubber lined ERW pipes, beads shall be removed for pipe size 80 NB and above.</p> <p>Inspection holes shall be provided at suitable locations for pipes 800 Nb and above as required for periodic observations and inspection purposes.</p> <p>At all intersection joints, it is Contractor's responsibility to design and provide suitable reinforcements as per the applicable codes and standards.</p> <p>For large size pipes/ducts, at high point and bends/change of direction of flow, air release valves shall be provided as dictated by the system requirement and operation philosophy & tripping conditions of pumping system. Sizing criteria for air release valves shall be generally on the basis of valve size to pipe diameter ratio of 1:8. Requirement shall be decided as per relevant code.</p> <p>Transient analysis /surge analysis where ever specified and required shall be conducted in order to determine the location, number and size of the Air-Release valve on certain long distance/high volume piping systems, if applicable within the scope of work of the package.</p>	TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2	SUB-SECTION- A-9 (LOW PRESSURE PIPING)	PAGE 3 OF 19

CLAUSE NO.	TECHNICAL REQUIREMENTS																					
2.03.00	Material																					
2.03.01	Alternate materials offered by Bidder against those specified. shall either be equal to or superior to those specified. The responsibility for establishing equality or superiority of the alternate materials offered rests entirely with the Bidder and any standard code required for establishing the same shall be in English language.																					
2.03.02	No extra credit would be given to offers containing materials superior to those specified. Likewise, no extra credit would be given to offers containing pipe thickness more than specified.																					
2.03.03	All materials shall be new and procured directly from the manufacturers. Materials procured from traders or stockists are not acceptable.																					
2.03.04	All materials shall be certified by proper material test certificates. All material test certificates shall carry proper heat number or other acceptable references to enable identification of the certificate that certifies the material.																					
2.03.05	<p>Material of construction for pipes carrying various fluids shall be as follows:</p> <table border="1"> <thead> <tr> <th>SI No</th> <th>Type of Fluid</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>i) Ordinary Water (Raw Water, Clarified Water, etc.) ii) Equipment cooling water including Both primary & secondary circuit (DMCW pH-corrected & ACW drain water)</td> <td>IS-2062 Gr.-E-250B/ASTM A-36/ASTM A-53 type 'E' Gr. B/IS-3589 Gr. 410 /IS-1239 Heavy.</td> </tr> <tr> <td>2.</td> <td>i) Demineralised water, ii)Alkaline solution (ECW system chemical dosing)</td> <td>Stainless Steel to ASTM A312, Gr. 304 welded for sizes 65 mm NB and above. Stainless steel to ASTM A312, Gr. 304 sch.40s seamless for sizes 50mm and below</td> </tr> <tr> <td>3.</td> <td>i) Drinking (potable) water ii)Compressed air (Instrument & service air)</td> <td>ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent.</td> </tr> <tr> <td>4.</td> <td>(Condensate) spill water</td> <td>ASTM A 106 Gr. B</td> </tr> <tr> <td>5.</td> <td>Effluents from Neutralization pit</td> <td>MSRL</td> </tr> </tbody> </table>			SI No	Type of Fluid	Material	1.	i) Ordinary Water (Raw Water, Clarified Water, etc.) ii) Equipment cooling water including Both primary & secondary circuit (DMCW pH-corrected & ACW drain water)	IS-2062 Gr.-E-250B/ASTM A-36/ASTM A-53 type 'E' Gr. B/IS-3589 Gr. 410 /IS-1239 Heavy.	2.	i) Demineralised water, ii)Alkaline solution (ECW system chemical dosing)	Stainless Steel to ASTM A312, Gr. 304 welded for sizes 65 mm NB and above. Stainless steel to ASTM A312, Gr. 304 sch.40s seamless for sizes 50mm and below	3.	i) Drinking (potable) water ii)Compressed air (Instrument & service air)	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent.	4.	(Condensate) spill water	ASTM A 106 Gr. B	5.	Effluents from Neutralization pit	MSRL	
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2.03.06	In water lines, pipes up to 150mm Nb shall conform to ANSI B36.10/ASTM-A-53, Type-E Gr. B /IS:1239 Gr. Heavy and minimum selected thickness shall not be less than IS:1239 Grade Heavy except for demineralised water, drinking water and condensate spill lines.																					
2.03.07	Pipes of above 150mm Nb shall be to AWWA-C200/ANSI B 36.10/ASTM A-53/IS 3589 Gr.410. Pipe to be fabricated by the bidder shall be rolled and butt welded from plates conforming to ASTM A-53 type 'E' Gr. B/IS 2062 Gr. E-250B/ASTM-A-36. However, larger pipes, i.e. 1000mm Nb and above shall be made from plates conforming to ASTM A 36/IS 2062 Gr. E-250B and shall meet the requirements of AWWA-M-11 (for deflection & buckling criteria considering water filled pipe as well as vacuum condition that may prevail during transient/surge conditions, truck-load, rail-load and weight density for compacted soil or any other load as the case may be).																					
2.03.08	In demineralised water service, the pipes up to 50 Nb shall be of stainless steel ASTM A 312, Gr. 304 sch. 40 Seamless. The size for these pipes shall be to ANSI B 36.19. These shall be socket welded. The material for pipe from 65mm NB up to and including 400 NB shall be to ASTM A 312, Gr. 304 (welded). In no case the thickness of fittings shall be less than parent pipe thickness.																					
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2	SUB-SECTION- A-9 (LOW PRESSURE PIPING)	PAGE 4 OF 19																			

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p>Bidder/Contractor shall note that pipes offered as per a particular code shall conform to that code in all respects i.e. Dimension, tolerances, manufacturing methods, material, heat treatment, testing requirements, etc. unless otherwise mentioned elsewhere in the specification.</p>		
2.03.09	<p>Instrument air, Plant (service) air lines and Drinking water lines shall be to ASTM A 53 type E grade B/ANSI B 36. 10/IS 3589, Gr. 410 / IS: 1239 Heavy (in case thickness calculated is more than gr. Heavy, ANSI B 36.10 Schedule numbers shall be followed) and galvanized to IS 4736 or any equivalent internationally reputed standard. The material of the pipes shall be to ASTM A 53 type 'E' Gr. B / IS: 3589, Gr. 410 / IS: 1239 Gr. Heavy. The fittings shall be of either same as parent material or malleable iron to IS-1879 (galvanized).</p>		
2.03.10	<p>Spiral welded pipes as per API-5L/IS-3589 are also acceptable for pipe of size above 150 NB. However minimum thickness of the pipes shall be as elaborated in above clauses.</p>		
2.03.11	<p>Condensate lines shall be to ASTM A 106 Gr. B and dimension to ANSI B 36.10 schedule "standard" as minimum to be maintained.</p>		
2.03.12	<p>If carbon steel plates of thickness more than 12 mm are used for manufacture of pipes, fittings and other appurtenances, then the same shall be control-cooled or normalized as the case may be following the guidelines of the governing code.</p>		
2.04.00 2.04.01	<p>Field routed pipes: Pipe lines of NB 50 size and below are regarded as field run piping. It is Bidder's responsibility to plan suitable layouts for these system insitu. Bidder shall prepare drawings indicating the layout of field run pipe work. These drawings shall be approved by Project Manager to the installation of the field run pipe work. Based on these approved layouts the Bidder shall prepare the BOQ of field run-pipes and submit to Employer for approval.</p>		
2.05.00 2.05.01	<p>Slope/Drains and Vents Suitable slope shall be provided for all pipelines towards drain points. It is Bidder responsibility to identify the requirements of drains and vents, and supply the necessary pipe work, valves, fittings, hangers and supports etc. As per the system requirement low points in the pipelines shall be provided with suitable draining arrangement and high points shall be provided with vent connections where air or gas pockets may occur. Vent for use during hydrostatic test shall be plugged after the completion of the test. Vent shall not be less than 15mm size. Drains shall be provided at low points and at pockets in piping such that complete drainage of all systems is possible. Drain shall not be less than 15mm for line size up to 150mm, not less than 20mm up to 300mm and not less than 25mm for 350mm to 600mm pipes and not less than 50mm for 600mm and above pipes. Material for drain and vent lines shall be compatible with that of the parent pipe material.</p>		
2.05.02	<p>Air piping shall be sloped so that any part of the system can be drained through the shut-off drain valve or drain plugs.</p>		
2.06.00	<p>Pipe Joints In general all water lines 65mm NB and above, are to be joined generally by butt welding except the locations where valves/fittings are to be installed with flanged connections and 50mm and below by socket welding unless mentioned otherwise specifically. All air lines shall be of screwed connection and rubber lined pipes of flanged connections.</p>		
2.06.01	<p>Screwed Joints (a) Threading of pipes shall be carried out after bending, heat treatment etc. If not possible, threading may be done prior to these operations but proper care should be taken to protect them from damage. Threads shall be to ANSI B 2.1 (taper) NPT / ANSI B1.20.1 (taper) NPT / IS: 554 unless specified otherwise. (b) Galvanized pipe shall generally be joined by screwing into sockets. The exposed threaded portion on the outside of the pipes shall be given a zinc silicate coating.</p>		
<p align="center">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p align="center">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2</p>	<p align="center">SUB-SECTION- A-9 (LOW PRESSURE PIPING)</p>	<p align="center">PAGE 5 OF 19</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS 			
<p>2.06.02</p> <p>2.06.03</p>	<p>Galvanized pipes shall not be field joined by welding for protection of Galvanising Zinc layer. Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before jointing. For galvanized pipe sizes above 150 mm NB, screw & socket jointing as per ASTM-A-865 shall be employed for both pipe-to-pipe and pipe-to-fitting jointing. For pipe to fitting connection since no direct threading can be done on the fittings (supplied as per ASTM-A-234 Gr. WPB and ANSI B-16.9) necessary straight pipe lengths acting as match pieces shall be welded to the fitting at both ends and subsequently the free ends of the straight lengths shall be threaded as per ASTM A-865 for jointing with main pipe. Once welding of fittings with match pieces and threading of free ends of match pieces are over, the entire fabricated piece shall be galvanized, or in case match pipes and fittings are already galvanized before the above mentioned fabrication then suitable application of Zinc-Silicate paste adequately at the welded surface (both in side & outside) after welding, along with the nascent threaded metal portions at both free ends given the same application of Zinc Silicate paste. Alternatively, flanged jointing may be employed for pipe sizes 100 NB and above. However, the bidder shall ensure the galvanized pipe joints do not fail during hydro test.</p> <p>(c) Teflon tapes shall be used to seal out screwed joints and shall be applied to the male threads only. Threaded parts shall be wiped clean of oil or grease with appropriate solvent if necessary and allowing proper time for drying before applying the sealant. Pipe ends shall be reamed and all chips shall be removed. Screwed flanges shall be attached by screwing the pipe through the flange and the pipe and flange shall be refaced accurately.</p> <p>(d) For pipe sizes from 350 mm NB to 550 mm NB (including 350 NB & 550 NB) the GI pipes shall be of flanged connection. However, the pipes after welding of flanges shall be completely galvanized. All the welded surfaces whether inside or outside shall be coated with zinc-silicate paste. Seal welding of flanges will be permitted only when any flange is leak-prone during hydro testing.</p> <p>(e) For pipe sizes 600 mm NB and above, the GI pipes shall be of welded connection followed by application of zinc silicate coating at welded surfaces both inside and outside the pipe, except for the last blank/blind flange, or, equipment connection where application of zinc-silicate paste after welding cannot be done due to inaccessibility of the inside welded surface and where galvanic protection has been impaired due to welding of pipe-to-pipe joint. Thus the last erection joint shall be flanged joint.</p> <p>Welded Joints</p> <p>(a) For making up welded joints (butt weld or socket weld) the welding shall be performed by manual shielded metal arc process in accordance with the requirements specified elsewhere in the spec. Any welder employed for carrying butt welding shall be qualified as per ASME section IX for the type of joints he is going to weld. Jointing by butt weld, or socket weld shall depend upon the respective piping material specifications.</p> <p>Flanged Joints</p> <p>(a) Flanged connections for pipes are to be kept to the minimum and used only for connections to vessel, equipments, flanged valves and other fittings like strainer/traps/orifices etc. for ease of connection and maintenance etc. Rubber lined pipes shall be flange joined only.</p> <p>(b) All flanged valves intended for installation on steel piping system, shall have their flanges drilled to ANSI B 16.5 (or equivalent) and according to the pressure class stated in their respective piping material specification.</p> <p>(c) Drilling on flanges of flanged valves must correspond to the drilling of flanges on the piping system on which the valves are installed.</p>	<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2</p>	<p>SUB-SECTION- A-9 (LOW PRESSURE PIPING)</p> <p>PAGE 6 OF 19</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS		
2.07.00 2.07.01	<p>Bends / elbows / mitre bends / Tees / Reducers & other fittings For pipe fittings such as elbows (long radius), reducers, tees, etc. the material shall be to ASTM-A-234 Gr. WPB/ASTM-105 up to 300 NB. For pipe fittings above 300 NB, the fittings may be fabricated conforming to parent pipe material. Provision of compensation pads shall be kept as per ANSI B 31.1. The fitting shall conform to the dimensional standard of ANSI B-16.9/ 16.11. Further branching in pipes for sizes 65nb and above is also acceptable (ANSI B 31.1).</p> <p>However, for pipes up to 150 NB, pipe fittings may be supplied with material and dimension conforming to IS 1239 in case parent pipes also conform to IS 1239.</p>		
2.07.02	For pipe size 350Nb and above mitre bends may be used for all pipes except rubber lined pipes. However, mitre bends are also acceptable for rubber lined pipes above 1200 NB. The bend radius shall be 1½ times the nominal pipe diameter. 90 deg. bends (mitre) shall be in 4 pieces (3 cuts) and 45 deg. mitre bends shall be in 3 pieces 22½ deg. Fabrication of mitre bends shall be as detailed in BS 2633/BS534.		
2.07.03	For pipes, above 1200 NB, reducer and tees shall be to dimensional standard of AWWA-C-208.		
2.07.04	Stainless steel fittings shall conform to either ASTM-A-182 Gr. 304 or ASTM-A-403 Grade WP. 304 Class-S, for sizes up to and including 50 mm NB, i.e. the fittings shall be of seamless construction. However, for stainless fittings above 50 mm NB, the same shall conform to ASTM-A-403 Gr. WP 304 Class W i.e. the fittings shall be of welded construction strictly in accordance with ASTM-A-403.		
2.07.07	In no case, the thickness of fittings shall be less than the thickness of parent pipe, irrespective of material of construction.		
2.08.00	Flanges		
2.08.01	Flanges shall be slip on type or weld neck type. Welding of flanges in tension is not permitted.		
2.08.02	All flanges and-flanged drilling shall be to ANSI B 16.5/BS EN-1092 / AWWA C-207 of relevant pressure/temperature class. Flanges shall be fabricated from steel plates conforming to ASTM A 105/IS 2062 Gr. E-250B. However stainless steel flanges shall be fabricated from SS plates to ASTM-A-240, Gr. 304 or equivalent.		
2.09.00	<p>Specific technical requirement of laying buried pipe with anti-corrosive treatment</p> <p>The pipe in general shall be laid with the top of the pipe minimum 1.0 (one) meter below finished general ground level.</p>		
2.09.01	<p>Trenching</p> <p>(a) The trench shall be cut true to the line and level and shall follow the gradient of the pipeline. The width of the trench shall be sufficient to give free working space on each side of the pipe. Trenches shall conform to IS 5822 or any international standard.</p>		
2.09.02	<p>Preparation and cleaning of piping</p> <p>(a) The pipeline shall be thoroughly cleaned of all rust, grease, dirt, weld scales and weld burrs etc. moisture or other foreign matter by power cleaning method such as sand or grit blasting, power tool cleaning, etc. Grease or heavy oil shall be removed by washing with a volatile solvent such as gasoline. Certain inaccessible portions of the pipeline (which otherwise not possible to be cleaned by power cleaning methods) may be scrubbed manually with a stiff wire brush and scrapped where necessary with specific permission of the Project Manager.</p>		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2</p>	<p>SUB-SECTION- A-9 (LOW PRESSURE PIPING)</p>	<p>PAGE 7 OF 19</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
2.09.03	<p>(b) On the internal surface for pipes 1000 Nb and above, a coat of primer followed by a hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.</p> <p>Coating and wrapping/ Anti corrosive Protection Coal tar tape</p> <p>a. Buried piping shall be coated and wrapped, as per specification, after completion of welded and/or flanged connections, and after completion and approval of Hydro testing. Materials to be used for coating and wrapping of underground pipelines are:</p> <ol style="list-style-type: none"> (1) Coating primer (coal tar primer) (2) Coating enamel (coal tar enamel) (3) Wrapping materials. <p>All primer/coating/wrapping materials and methods of application shall conform to IS: 10221 except asphalt/bitumen material. Materials (primer/coating/wrapping) as per AWWA-C-203 are also acceptable.</p> <p>Protective coating shall consist of coal tar primer, coal tar enamel coating, glass fiber, tissue inner wrap followed by glass fiber or coal tar impregnated Kraft outer wrap or finish coat.</p> <p>Number of coats and wraps, minimum thickness for each layer of application shall be as per IS-10221. Number of. Coats and wraps shall be decided based on soil corrosivity / resistivity as indicated in IS-10221. Soil data-for this purpose shall be made available.</p> <p>Total thickness of completed coating and wrapping shall not be less than 4.0 mm.</p> <p>b. Alternatively, the anti-corrosive protection for buried pipes can consist of anti-corrosive protection Coal-tar tapes. Material and application of tapes shall conform to IS 15337 or equivalent. These-tapes shall be applied hot over the cold coal tar primer in steps of 2mm thickness so as to cover the spiral edges of the first tape by the application of second tape. The total nominal thickness of the finished protective coating shall be 4.0 mm.</p>		
2.09.04	<p>Trench bed preparation and back filling</p> <p>Prior to lowering and laying pipe in any excavated trench, the bottom of the trench may require to be back filled and compacted (or as the case may be) to provide an acceptable bed for placing the pipe. Bed preparation in general shall be as per IS: 5822.</p>		
2.09.05	<p>laying of galvanized steel (GI) pipes</p> <p>All the joints shall be screwed with socket or flanged. Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before jointing Threaded portion on either side of the socket joint shall be applied with Zinc silicate paste.</p> <p>All the provisions for trenching' bed preparation' laying the pipe application of primer' coating' wrapping with tapes and back filling etc. as indicated for "laying of buried piping" and " anti-corrosive protection for buried piping" are applicable for buried galvanized steel (GI) pipes also.</p>		
2.10.00	<p>Cleaning and flushing</p>		
2.10.01	<p>All piping shall be cleaned by the Bidder before and after erection to remove grease, dirt, dust, scale and welding slag.</p>		
2.10.02	<p>Before erection all pipe work, assemblies, sub-assemblies, fittings, and components, etc. shall be thoroughly cleaned internally and externally by blast cleaning or by power driven wire brushes and followed by air-blowing. However, for pipe sizes below 100nb the pipes</p>		
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CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p>may be cleaned internally by compressed air blowing as an alternative to internal blast cleaning. The brushes shall be of the same or similar material as the metal being cleaned. Cleaning of Galvanized pipes shall be done by air blowing only.</p>		
2.10.03	<p>After erection, all water lines shall be mass flushed with water. The cleaning velocities in water lines shall be 1.2-1.5 times the operating velocities in the pipelines.</p>		
2.10.04	<p>All compressed air pipe work shall be cleaned by blowing compressed air.</p>		
2.11.00	<p>Specification for hangers and supports</p>		
2.11.01	<p>All supports and parts shall conform to the requirement of power piping code ANSI B 31.1 or approved equivalent.</p>		
2.11.02	<p>The maximum spans of the supports of straight length shall not exceed the recommended values indicated in ANSI B 31.1.</p>		
2.11.03	<p>At all sliding surfaces of supports suitable arrangement is to be provided to minimize sliding friction.</p>		
2.12.00	<p>Design/Construction/Material Particulars of Gate/ Globe /Check /Butterfly / Ball / Air release /Float valves / Moisture Traps.</p>		
2.12.01	<p>GENERAL</p> <p>(a) All valves shall have indicators or direction clearly marked on the hand-wheel so that the valves opening/closing can be readily determined.</p> <p>(b) Special attention shall be given to operating mechanism for large size valves with a view to obtaining quick and easy operation ensuring that a minimum of maintenance is required.</p> <p>(c) The valves coming in vacuum lines shall be of extended gland type and/or water sealed.</p> <p>(d) The actuator-operated valves shall be designed on the basis of the following:</p> <ol style="list-style-type: none"> (1) The internal parts shall be suitable to support the pressure caused by the actuators; (2) The valve-actuator unit shall be suitably stiff so as not to cause vibrations, misalignments, etc. (3) All actuator-operated valves shall be provided with hand operated gearing mechanism also. (4) All actuators operated valves shall open/ close fully within time required by the process. <p>(e) Valves coming under the purview of IBR shall meet IBR requirements.</p> <p>(f) All valves shall be provided with embossed name plate giving details such as tag number, type, size etc.</p> <p>(g) Wherever required valves shall be provided with chain operator, extension spindles and floor stands or any other arrangement approved by employer so that they can be operated with ease from the nearest operating floor. Wherever necessary for safety</p>		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2</p>	<p>SUB-SECTION- A-9 (LOW PRESSURE PIPING)</p>	<p>PAGE 9 OF 19</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS 																												
2.12.02	<p>purpose locking device shall be provided. Further, necessary small platforms for facilitating easy valve operation shall be provided by the contractor wherever necessary in consultation with project manager within the bid price at no extra cost to employer</p> <p>VALVE BODY MATERIAL</p> <p>Valve body material for various services shall be as follows:</p> <p>Valve body material for water application like Secondary circuit auxiliary cooling water of ECW system, Raw water, Ash water make-up, service water, clarified water, DM cooling water (pH corrected) , drinking water etc. shall be cast iron for sizes 65NB and above; gun-metal for sizes 50 Nb and below.</p> <p>For compressed air application, valve body material shall be cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.</p> <p>DM water: SS body and disc along with SS internals. However for butterfly valves, Cast Iron /Ductile Iron/SG iron/carbon steel body and disc with elastomer lining are also acceptable.</p> <p>Condensate: Cast Carbon Steel / Forged Carbon Steel.</p>																												
2.12.03	<p>The design, material, construction, manufacture, inspection, testing and performance of valves shall comply with all currently applicable statutes, regulations and safety codes in the locality where the valves will be installed. The valves shall conform to the latest editions of applicable codes and standards as mentioned elsewhere. Nothing in this specification shall be construed to relieve the Bidder of his responsibility. Valves in general shall conform to the requirements of the following standards.</p> <p>Standards and Codes</p> <table border="0"> <tr> <td>AWWA-C-504</td> <td>Rubber seated butterfly valves.</td> </tr> <tr> <td>BS-5155/EN-593</td> <td>Cast iron and steel body butterfly valves for general purpose.</td> </tr> <tr> <td>IS-778</td> <td>Gun-metal gate, globe and check valves for general purpose.</td> </tr> <tr> <td>BS-5154</td> <td>Copper alloy globe/globe stop and check and gate valves for general purpose.</td> </tr> <tr> <td>IS-780</td> <td>Sluice valves for water works purpose (50-300 mm size)</td> </tr> <tr> <td>IS-2906</td> <td>Sluice valves for water works purpose (350-1200 mm size)</td> </tr> <tr> <td>IS-5150</td> <td>Cast iron wedge and double disc gate for general purpose.</td> </tr> <tr> <td>BS-5152</td> <td>Specification for cast iron globe valves.</td> </tr> <tr> <td>BS-5153</td> <td>Cast iron check valves for general purpose.</td> </tr> <tr> <td>IS-5312</td> <td>Swing check type reflux (non-return) valves.</td> </tr> <tr> <td>ANSI B 16.34</td> <td>Standard for valves.</td> </tr> <tr> <td>API-594</td> <td>Standard for Dual-check valves.</td> </tr> <tr> <td>API-600</td> <td>Steel gate valves.</td> </tr> </table>			AWWA-C-504	Rubber seated butterfly valves.	BS-5155/EN-593	Cast iron and steel body butterfly valves for general purpose.	IS-778	Gun-metal gate, globe and check valves for general purpose.	BS-5154	Copper alloy globe/globe stop and check and gate valves for general purpose.	IS-780	Sluice valves for water works purpose (50-300 mm size)	IS-2906	Sluice valves for water works purpose (350-1200 mm size)	IS-5150	Cast iron wedge and double disc gate for general purpose.	BS-5152	Specification for cast iron globe valves.	BS-5153	Cast iron check valves for general purpose.	IS-5312	Swing check type reflux (non-return) valves.	ANSI B 16.34	Standard for valves.	API-594	Standard for Dual-check valves.	API-600	Steel gate valves.
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.12.04	ANSI-B-16.10 API-598	Valves face to face and other relevant dimension. Valves inspection test.	<p>End Connections</p> <p>The end connections, shall comply with the following:</p> <p>Socket welding (SW) - ANSI B 16.11</p> <p>Butt Welding (BW) - ANSI B 16.25.</p> <p>Threaded (SC) - ANSI B 2.1</p> <p>Flanged (FL) - ANSI B 16.5& AWWA-C-207 (steel flanges), ANSI B 16.1 (Cast Iron flanges).</p>	
2.13.00	<p>Gate/Globe/Check Valves</p> <p>(a) All cast iron body valves (gate, globe and non-return) shall have flanged end connections; (screwed ends for Ductile D.2NI body valves are not acceptable).</p> <p>(b) All steel and stainless steel body valves of sizes 65 mm and above shall have flanged or butt welding ends. Valves of sizes below 65mm shall have flanged or socket welded ends. Compatibility of welding between valve body material and connecting pipe material is a pre-requisite in case of butt-welded joints.</p> <p>(c) All gun metal body valves shall have screwed ends.</p> <p>(d) All flanged end valves / specialties shall be furnished along with matching counter flanges, fasteners, gaskets etc. as required to complete the joints.</p> <p>(e) Gate/slucie valves shall be used for isolation of flow. All gate valves shall be of the full-way type, and when in the full open position, the bore of the valve shall not be constricted by any part of the gate.</p> <p>Gate valves shall be of the solid/elastic or articulated wedge disc. Gate valves shall be provided with the following accessories in addition to other standard items:</p> <p>(1) Hand wheel</p> <p>(2) Position indicator (for above 50 mm NB valve size)</p> <p>(3) Draining arrangement wherever required.</p> <p>(f) Globe valves shall be used for regulation purposes. They shall be provided with hand wheel, position indicator, draining arrangement (wherever required) and arrow indicating flow direction. Preferably, the valves shall be of the vertical stem type. Globe valves shall preferably have reduced or spherical seating and discs shall be free to revolve on the spindle.</p> <p>The pressure shall preferably be under the disc of the valve. However, globe valves, with pressure over the disc shall also be accepted provided (i) no possibility exists that flow from above the disc can remove either the disc from stem or component from disc (ii) manual globe valves can easily be operated by hand. If the fluid load on the top of the disc is higher than 40-60 KN, bypass valve shall be provided which permits the downstream system to be pressurized before the globe valve is opened.</p>			
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CLAUSE NO.	<p style="text-align: center;">TECHNICAL REQUIREMENTS</p> 																		
2.13.01	<p>(g) Check valves shall be used for non-return service. They shall be swing check type or double door (Dual plate) check type with a permanent arrow inscription on the valve body indicating the fluid flow direction. In long distance pipes lines with possibility of surge-occurrence, dual plate check valves are preferable for its spring controlled opening /closing of flaps/doors against flow reversals. However, dual plate check valves shall not be used for sizes more than 600mm NB.</p> <p>(h) For bore greater than 2" the valves must be swing check type or dual plate check type suitable for installation in all positions (vertical and horizontal);</p> <p>(i) For bore smaller than or equal to 2" the valves must be of the piston type to be installed, in horizontal position.</p> <p>(j) All gate and globe valves shall be provided with back seating arrangement to enable on line changing of gland packing. The valves shall be preferably outside screw & yoke type.</p> <p>(k) All gate and globe valves shall be rising stem type and shall have limit switches for full OPEN and full CLOSED indication wherever required. This will include motor-operated valves also wherever required. In such cases the limit switches shall form an integral part of the valve. Stop-gap arrangement in this respect is not acceptable.</p> <p>(l) All valves except those with rising stems shall be provided with continuous mechanical position indicators; rising stem valves shall have only visual indication through plastic/metallic stem cover for sizes above 50 mm nominal bore.</p> <p>(m) For CI gate, globe and check valves wherever thickness of body/bonnet is not mentioned in the valves standards, thickness mentioned in IS- 1538 for fitting shall be applicable.</p> <p>MATERIAL OF CONSTRUCTION (GATE/GLOBE/CHECK VALVE)</p> <p>(a) The materials shall generally comply with the following:</p> <p>(1) Cast Steel Valves</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 40px;">Body & bonnet</td> <td style="padding-left: 100px;">ASTM A 216 Gr. WCB/ ASTM A 105</td> </tr> <tr> <td style="padding-left: 40px;">Disc for non-return Valves</td> <td style="padding-left: 100px;">ASTM A 216 Gr. WCB/ ASTM A 105</td> </tr> <tr> <td style="padding-left: 40px;">Trim.</td> <td style="padding-left: 100px;">ASTM A 182 Gr. F6 or Equivalent</td> </tr> </table> <p>(2) Stainless steel valves</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 40px;">Body & Bonnet</td> <td style="padding-left: 100px;">SS 304</td> </tr> <tr> <td style="padding-left: 40px;">Disc</td> <td style="padding-left: 100px;">-do-</td> </tr> <tr> <td style="padding-left: 40px;">Trim.</td> <td style="padding-left: 100px;">SS 316</td> </tr> </table> <p>(3) Cast iron valves</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 40px;">Body & bonnet</td> <td style="padding-left: 100px;">BS 1452 Gr. 14/ IS-210 Gr. FG 260</td> </tr> <tr> <td style="padding-left: 40px;">Seating surfaces and rings</td> <td style="padding-left: 100px;">13% chromium steel/ 13% Chrome overlay</td> </tr> <tr> <td style="padding-left: 40px;">Disc for non-return valves</td> <td style="padding-left: 100px;">BS 1452 Gr. 14/IS-210 Gr FG 260</td> </tr> </table>	Body & bonnet	ASTM A 216 Gr. WCB/ ASTM A 105	Disc for non-return Valves	ASTM A 216 Gr. WCB/ ASTM A 105	Trim.	ASTM A 182 Gr. F6 or Equivalent	Body & Bonnet	SS 304	Disc	-do-	Trim.	SS 316	Body & bonnet	BS 1452 Gr. 14/ IS-210 Gr. FG 260	Seating surfaces and rings	13% chromium steel/ 13% Chrome overlay	Disc for non-return valves	BS 1452 Gr. 14/IS-210 Gr FG 260
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.14.00	<p>Hinge pin for non-return valves AISI 316</p> <p>Stem for gate globe valves 13% chromium steel or Equivalent</p> <p>Back seat 13 % chromium steel / 13% Chrome overlay</p> <p>(4) Gun Metal valves</p> <p>Body and bonnet IS 318 Gr. 2/ Equivalent Standard</p> <p>Trim. -do-</p> <p>(b) Cast iron body valves shall have high alloy steel stem and seat.</p> <p>(c) Material for counter flanges shall be the same as for the piping.</p> <p>(d) Forged carbon steel & Forged stainless steel valves are also acceptable in place of Gun metal valves.</p> <p>Air Release Valve</p> <p>(a) The air release valves shall be of automatic double air valve with two orifices and two floats. The float shall not close the valve at higher air velocities. The orifice contact joint with the float shall be leak tight joint.</p> <p>(b) The valve shall efficiently discharge the displaced air automatically from ducts/pipes while filling them and admit air automatically into the ducts/pipes while they are being emptied. The valve shall also automatically release trapped air from ducts/pipes during operation at the normal working pressure.</p> <p>(c) Body material of automatic air release valves shall comply generally with BS 1452 Gr. 14/IS: 210 Gr. FG 260. and spindle shall conform to high tensile brass.</p> <p>(d) Air release valves shall not have any integral isolation device within them. Each Air release valve shall be mounted, preceded by a separate isolation gate/ butterfly valve.</p>			
2.15.00	<p>Butterfly valves</p>			
2.15.01	<p>Design/Construction</p> <p>(a) The valves shall be designed for the design pressure/temperature of the system on which it is installed and in accordance with AWWA-C-504, EN-593 or any other approved equivalent standard latest edition. Fabricated steel (IS: 2062 GR. E-250B) butterfly valves instead of cast iron body valves are also acceptable for size above 300 mm Nb diameter.</p> <p>(b) The valves shall be suitable for installation in any position (horizontal/vertical etc.) and shall be generally of double-flanged construction. However, for sizes 600 NB and below the valves of Wafer construction are also acceptable</p> <p>(c) Valves-350Nb and above shall have pressure equalizing bypass valves, wherever system parameters warrant the same.</p> <p>(d) Valves-200Nb and above shall also be provided with gear operator arrangement as a standard practice suitable for manual operation. Manual operation of valve shall be</p>			
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2</p>	<p>SUB-SECTION- A-9 (LOW PRESSURE PIPING)</p>	<p>PAGE 13 OF 19</p>	

CLAUSE NO.	TECHNICAL REQUIREMENTS 																										
2.15.02	<p>through gear arrangement having totally enclosed gearing with hand wheel diameter and gear ratio designed to meet the required operating torque It shall be designed to hold the valve disc in intermediate position between full open and full closed position without creeping or fluttering. Adjustable stops shall be provided to prevent over travel in either direction.</p> <p>Limit and torque switches (if applicable) shall be enclosed in water tight enclosures along with suitable space heaters for motor actuated valves, which may be either for On-Off operation or inching operation with position transmitter.</p> <p>Material of Construction (Butterfly Valves)</p> <p>Materials and other design details shall be as indicated below:</p> <p>(a) Cast Iron Butterfly Valves</p> <table border="0"> <tr> <td>Body & Disc</td> <td>ASTM A48, Gr. 40 with 2% Ni / IS: 210. Gr. FG-260, with 2% Ni / SG iron BSEN 1563, Gr EN GJS-400-15 with 2%Ni and epoxy coated</td> </tr> <tr> <td>Shaft</td> <td>BS 970 431 S: 291 / EN 57, or AISI-410 or AWWA-permitted shaft material equivalent to EN-57/AISI-410 or better.</td> </tr> <tr> <td>Seat ring</td> <td>18-8 Stainless steel</td> </tr> <tr> <td>SEAL</td> <td>NITRILE RUBBER</td> </tr> </table> <p>(b) Stainless Steel Butterfly Valves</p> <table border="0"> <tr> <td>Body & Disc</td> <td>SS 304</td> </tr> <tr> <td>Shaft</td> <td>SS 316</td> </tr> <tr> <td>Seat Rings</td> <td>EPT/BUNA-N/Neoprene</td> </tr> </table> <p>(c) Carbon steel Butterfly Valves</p> <table border="0"> <tr> <td>Body & Disc</td> <td>ASTM A 216, Gr. WCB</td> </tr> <tr> <td>Shaft</td> <td>SS 304</td> </tr> <tr> <td>Disc & Seat Rings</td> <td>EPT/BUNA-N/Neoprene</td> </tr> </table> <p>(d) Elastomer lined Butterfly Valves</p> <table border="0"> <tr> <td>Body & Disc</td> <td>ASTM A48, Gr. 40 / IS: 210. Gr. FG-260 / SG Iron (ductile iron) IS 1865 Gr 400-15 or BSEN 1563, Gr EN GJS-400-15 / ASTM A 216, Gr. WCB with elastomer lining.</td> </tr> <tr> <td>Shaft</td> <td>SS 316</td> </tr> </table>			Body & Disc	ASTM A48, Gr. 40 with 2% Ni / IS: 210. Gr. FG-260, with 2% Ni / SG iron BSEN 1563, Gr EN GJS-400-15 with 2%Ni and epoxy coated	Shaft	BS 970 431 S: 291 / EN 57, or AISI-410 or AWWA-permitted shaft material equivalent to EN-57/AISI-410 or better.	Seat ring	18-8 Stainless steel	SEAL	NITRILE RUBBER	Body & Disc	SS 304	Shaft	SS 316	Seat Rings	EPT/BUNA-N/Neoprene	Body & Disc	ASTM A 216, Gr. WCB	Shaft	SS 304	Disc & Seat Rings	EPT/BUNA-N/Neoprene	Body & Disc	ASTM A48, Gr. 40 / IS: 210. Gr. FG-260 / SG Iron (ductile iron) IS 1865 Gr 400-15 or BSEN 1563, Gr EN GJS-400-15 / ASTM A 216, Gr. WCB with elastomer lining.	Shaft	SS 316
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2.15.03	<p>Proof of Design Test (Type Test) for Butterfly Valves</p> <p>Proof of Design (P.O.D.) test certificates shall be furnished by the bidder for all applicable size-ranges and classes of Butterfly valves supplied by him, in the absence of which actual P.O.D. test shall be conducted by the bidder.</p>																										
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2	SUB-SECTION- A-9 (LOW PRESSURE PIPING)	PAGE 14 OF 19																								

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
2.16.00	<p>All valves that are designed and manufactured as per AWWA-C-504 / AWWA-C-516 shall be governed by the relevant clauses of P.O.D test in AWWA-C-504/AWWA-C-516. For Butterfly valves, designed and manufactured to EN-593 or equivalent, the P.O.D. test methods and procedures shall generally follow the guidelines of AWWA-C-504 in all respect except that Body & seat hydro test and disc-strength test shall be conducted at the pressures specified in EN-593 or the applicable code. Actuators shall also meet requirements of P.O.D. test of AWWA-C-504/AWWA-C-516.</p> <p>Float operated valves</p> <p>(a) Valve shall automatically control the rate of filling and will shut off when a predetermined level is reached and close to prevent over flow on pre-set maximum water level. Valve shall also open and close in direct proportion to rise or fall of water level.</p> <p>(b) DESIGN AND CONSTRUCTION FEATURES The following design and construction feature of the valve shall be the minimum acceptable.</p> <p>(c) Valves shall be right-angled or globe pattern.</p> <p>(d) Valves shall be balance piston type with float ball.</p> <p>(e) Leather liner shall not be provided.</p> <p>(f) The body and cover material shall be cast iron conforming to ASTM-A 126 Grade 'B' or IS: 210 Grade 200 or equivalent, and Float shall be of copper with epoxy painting of two (2) coats.</p> <p>(g) Valves shall be suitable for flow velocities of 2 to 2.5m/sec.</p> <p>(h) The valves shall have flanged connections.</p>		
2.17.00 2.17.01	<p>Tanks and Accessories</p> <p>The designer and manufacturer of storage tanks shall comply with and obtain approval of all currently applicable statutory regulations and safety codes in the locality where the equipment will be installed. The tanks shall conform to IS 803/IS804/IS 805/ IS 2825/ API 650/ IS 4049/ IS 4682 (part-I) and IS 4864 to 4870/ ASME B & PV code Sec.-VIII as the case may be.</p>		
2.17.02	<p>DESIGN AND CONSTRUCTION</p> <p>(a) Design of all vertical atmospheric storage tanks containing water, acid, alkali and other chemical shall conform to IS:803 & API 650.</p> <p>(b) Design of all horizontal atmospheric storage tanks containing water, acid, alkali and other chemicals shall generally conform to IS:2825 as regards to fabrication and general construction taking care of combined bending, shear & hoop stresses developed due to supporting arrangement.</p> <p>(c) Tank shall be made from mild steel plates to BS 4360/IS-2062 Gr.E-250B (or equivalent) for ordinary wafer application when it is not corrosive in nature.</p> <p>(f) Tank shall be provided with suitable supporting joints. All vessels shall be provided with lifting lugs, eye bolts etc. for effective handling during erection.</p> <p>(j) Tanks shall be provided with float operated level indicators / level gauges / level transmitters and level switches, as required, with complete assembly. Suitable flanged pads for level switches mounting shall also be provided. The level indicator can be top or side mounted as the case may be.</p> <p>(k) In addition to inlet and outlet nozzles, the tanks shall be provided with vents, overflow, drain nozzles complete for various connections on tanks. Overflow lines from storage tanks is to be routed to the nearest surface drains. For tanks containing DM water, alkaline water or power cycle water the vent to atmosphere shall be</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2	SUB-SECTION- A-9 (LOW PRESSURE PIPING)	PAGE 15 OF 19

CLAUSE NO.	TECHNICAL REQUIREMENTS																																							
2.17.03	<p>through carbon-di-oxide absorber vessel suitably mounted on the tank. CO2 absorber vessel shall be provided with the initial fill of chemicals.</p> <p>(l) Tanks shall have suitable stairs/ladders on inside and outside of the tanks, manholes / inspection cover as required and also platform suitably located.</p> <p>(m) Tank supporting arrangement as approved by Employer shall be provided with all plates/angles/joints/flats and supporting attachment including lugs, saddles, legs etc.</p> <p>(o) Tank fabrication drawing and design calculations shall be approved by the Project Manager.</p> <p>Corrosion protection</p> <p>(a) A corrosion allowance, applicable to surface in contact with corrosive media, when required after thorough cleaning by blast cleaning preceded by wire brushing shall be taken into consideration.</p> <p>(b) Manholes shall be provided for easy access into the vessels. The size shall be minimum 500 mm and will be with cover plate, nuts bolts, etc. to ensure leak tightness at the test pressure.</p> <p>(c) Each tank shall be provided with drilled cleats welded to the tank for electrical grounding. Material of cleats shall be same as that of the shell.</p> <hr/> <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Description</th> <th>Tech. Particulars</th> </tr> </thead> <tbody> <tr> <td>1.00</td> <td>CONDENSATE STORAGE TANKS</td> <td></td> </tr> <tr> <td>1.01</td> <td>Number required</td> <td>one for each unit</td> </tr> <tr> <td>1.02</td> <td>Capacity of each tank (Effective)</td> <td>350 Cu. m (for 660MW units)</td> </tr> <tr> <td>1.03</td> <td>Size (Dia. & Height)/Plate Thickness</td> <td>8.6mX7.2m minimum, Shell & Roof plate Thickness 8mm and Base plate thickness 10mm</td> </tr> <tr> <td>1.04</td> <td>Type and pressure class</td> <td>Vertical, cylindrical, atmospheric</td> </tr> <tr> <td>1.05</td> <td>Material of construction</td> <td>MS- (IS-2062 Gr. B or equivalent) as per specified code, 8mm thickness (minimum)</td> </tr> <tr> <td>1.06</td> <td>Location</td> <td>Outdoor</td> </tr> <tr> <td>1.07</td> <td>Overflow, drain, vent and Sample connection (piping &valve)</td> <td>required</td> </tr> <tr> <td>1.08</td> <td>Level Indicator</td> <td></td> </tr> <tr> <td></td> <td>a) Number</td> <td>One for each tank</td> </tr> <tr> <td></td> <td>b) Type</td> <td>Mechanical float type with dial</td> </tr> </tbody> </table>			Sl. No.	Description	Tech. Particulars	1.00	CONDENSATE STORAGE TANKS		1.01	Number required	one for each unit	1.02	Capacity of each tank (Effective)	350 Cu. m (for 660MW units)	1.03	Size (Dia. & Height)/Plate Thickness	8.6mX7.2m minimum, Shell & Roof plate Thickness 8mm and Base plate thickness 10mm	1.04	Type and pressure class	Vertical, cylindrical, atmospheric	1.05	Material of construction	MS- (IS-2062 Gr. B or equivalent) as per specified code, 8mm thickness (minimum)	1.06	Location	Outdoor	1.07	Overflow, drain, vent and Sample connection (piping &valve)	required	1.08	Level Indicator			a) Number	One for each tank		b) Type	Mechanical float type with dial	
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TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2	SUB-SECTION- A-9 (LOW PRESSURE PIPING)	PAGE 16 OF 19																																					

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p>1.09 Manhole (minimum 500mm size)</p> <p>1.10 Special Fittings</p> <p>a) Hydraulic Seal of Overflow/Drain</p> <p>b) Additional nozzle Connection</p> <p>c) Nozzle connection for Instrument/spare</p> <p>d) CO2 Absorber for vent (not to be kept on roof of tank, but to be kept on ground level)</p> <p>e) Outside stair case (spiral)</p> <p>f) Inside Ladder</p> <p>g) Draw off sump</p> <p>h) Root valve for level Transmitter</p> <p>-----</p> <p>2.18.00 RUBBER EXPANSION JOINTS</p> <p>2.18.01 All parts of expansion joints shall be suitably designed for all stresses that may occur during continuous operation and for any additional stresses that may occur during installation and also during transient condition.</p> <p>2.18.02 The expansion joints shall be single bellow rubber expansion joints. The arches of the expansion joints shall be filled with soft rubber.</p> <p>2.18.03 The tube (i.e. inner cover) and the cover (outer) shall be made of natural or synthetic rubber of adequate hardness. The shore hardness shall not be less than 60 deg. A for outer and 50 deg. A for inner cover.</p> <p>2.18.04 The carcass between the tube and the cover shall be made of high quality cotton duck, preferably, square woven to provide equal strength in both directions of the weave. The fabric plies shall be impregnated with age resistant rubber or synthetic compound and laminated into a unit.</p> <p>2.18.05 Reinforcement, consisting of solid metal rings embedded in carcass shall be provided.</p>	<p>type indicator (Guide wire, Float and Housing of Stainless steel - 316 Gr. construction)</p> <p>Two (2)-one on shell and the other on roof</p> <p>Required</p> <p>number and size to be indicated to successful Bidder</p> <p>Three (3) nos. for each tank</p> <p>required</p> <p>required</p> <p>Required</p> <p>required</p> <p>Root valves for two (2) nos. level transmitter for each tank Required</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2	SUB-SECTION- A-9 (LOW PRESSURE PIPING)	PAGE 17 OF 19

CLAUSE NO.	TECHNICAL REQUIREMENTS				
2.19.02	(b) Strainer Element		Stainless steel (AISI 316)		
	(c) End connection		Screwed up to 50 mm Nb, and Flanged above 50 mm Nb		
	Duplex type				
	(a)	The strainers shall be basket type and of duplex construction. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least four (4) times the internal area of the connecting pipe. The mesh of strainer element shall be commensurate with the actual service required. Pressure drop across the strainer in new condition shall not exceed 4.0 MWC at full flow.			
	(b)	Wire mesh (if applicable) of the strainers shall be suitably reinforced. The material of construction of various parts shall be as follows.			
	Body		IS: 318, Gr. 2 up to 50 mm Nb, and IS:210, Gr. FG 260 or ASTM-A-515 Gr. 75/IS-2062 Gr. E-250B and internally epoxy-painted above 50 mm NB.		
	Strainer element		Stainless steel (AISI 316)		
	End connection		Screwed up to 50mm Nb, and Flanged above 50 mm Nb. Gasket shall be of full face type		
	(c)	The strainer will have a permanent stainless steel tag fixed on the strainer body indicating the strainer tag number and service and other salient data.			
	(d)	The size of the strainer and the flow direction will be indicated on the strainer body casting.			
	(e)	Thickness of the strainer element should be designed to withstand the pressure developed within the strainer due to 100% clogged condition exerting shut-off pressure on the element.			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2	SUB-SECTION- A-9 (LOW PRESSURE PIPING)	PAGE 19 OF 19		



TITLE:
**TECHNICAL SPECIFICATION FOR
PRE TREATMENT PLANT (PT PLANT)
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-158A-A001

VOLUME II-B

SECTION-D

REV. NO. 00

DATE:

GENERAL TECHNICAL REQUIREMENT OF PUMPS

CLAUSE NO.	TECHNICAL REQUIREMENTS			
				Annexure-1
	HORIZONTAL CENTRIFUGAL PUMPS			
1.00.00	SCOPE			
	General requirements in respect of design, material, constructional features, manufacture, inspection, testing the performance at the Vendor's/ Sub-Vendor's works and delivery to site erection, field testing and commissioning of Horizontal Centrifugal Pumps. The minimum technical requirements and equipment shall include, but not be limited to the following:			
2.00.00	CODES AND STANDARDS			
2.01.00	Design, material, construction manufacture inspection and performance testing of Horizontal Centrifugal Pumps shall comply with all currently applicable statutes, regulations, and safety codes in the locality where the equipment will be installed. The equipment supplied shall comply with the latest applicable Indian standards listed below. Other National Standards are acceptable, if they are established to be equal or superior to the Indian Standards.			
2.02.00	List of Applicable Standards			
	i)	IS : 1520	-	Horizontal Centrifugal Pumps for clear cold fresh water.
	ii)	IS : 5120	-	Technical requirements of roto-dynamic special purpose pumps
	iii)	API - 610	-	Centrifugal pumps for general refinery service.
	iv)	IS : 5639	-	Pumps Handling Chemicals & corrosion liquids.
	v)	IS : 5659	-	Pumps for process water
	vi)	HIS	-	Hydraulic Institute Standards; USA
	vii)	ASTM-I-165-65	-	Standards Methods for Liquid Penetration Inspection.
3.00.00	DESIGN REQUIREMENTS			
3.01.00	The maximum efficiency of pumps shall be preferably within + 10% of the rated design flow indicated in data sheets.			
3.02.00	Total head capacity curve shall be continuously rising from the operating point towards shut - off without any zone of instability and with a minimum shut off head of 15% more than design head.			
3.03.00	Pumps of a particular category shall be identical and shall be suitable for parallel operation with equal load division. The head Vs capacity and BHP Vs capacity characteristics should match to ensure even load sharing and trouble-free operation throughout the range. Components of identical pumps shall be interchangeable.			
3.04.00	Pumps shall run smoothly without undue noise and vibration. Peak to peak vibration limits shall be restricted to the following values during operation.			
	Speed	Antifriction bearing	Sleeve bearing	
	1500 rpm and below	75.0-micron	75.0 micron	
	3000 rpm	50.0-micron	65.0 micron	
	The noise level shall not exceed 85 dBA. Overall sound pressure level reference 0.0002 microbar (the standard pressure reference for air sound measurement) at a distance of 1M from the equipment surface.			
4.00.00	DESIGN CONSTRUCTION			
4.02.00	Pump casing shall have radially/axially split type construction. The casing shall be designed to withstand the maximum shut - off pressure developed by the pump at the pumping temperature. The pumps shall be capable of starting with discharge valve fully open and close condition.			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2	SUB SECTION A-15 CW SYSTEM	PAGE 22 OF 31

CLAUSE NO.	<p style="text-align: center;">TECHNICAL REQUIREMENTS</p> 		
4.03.00	<p>Pump casing shall be provided with a vent connection and piping with fittings & valves Casing drain as required shall be provided complete with drain valves, piping and plugs. It shall be provided with a connection for suction and discharge pr. Gauge as standard feature.</p>		
4.04.00	<p>Impeller</p> <p>Impeller shall be closed or semi-closed as specified elsewhere and designed in conformance with the detailed analysis of the liquid being handled</p>		
4.05.00	<p>Impeller/ Casing Wearing Rings</p> <p>Replaceable type wearing rings shall be provided at suitable locations pumps.</p>		
4.06.00	<p>Shaft</p> <p>The critical speed shall be well away from the operating speed and in no case less than 130% of the rated speed.</p>		
4.07.00	<p>Shaft Sleeves</p> <p>Shaft sleeves shall be fastened to the shaft to prevent any leakage or loosening</p>		
4.08.00	<p>Bearings</p> <p>The bearings offered shall be capable of taking both the radial and axial thrust. Anti-friction bearings of standard type, if provided, shall be selected for a minimum life 16,000 hours of continuous operation at maximum axial and a radial loads and rated speed.</p> <p>Bearings shall be easily accessible without disturbing the pump assembly.</p>		
4.09.00	<p>Stuffing Boxes / Mechanical Seals</p> <p>Stuffing boxes of packed ring construction type or mechanical seals shall be provided wherever specified. Packed ring stuffing boxes shall be properly lubricated and sealed as per service requirements. If external gland sealing is required, it shall be done from the pump discharge. The Mech sealing face should be low frictional co-efficient & resistance to corrosion against the liquid being pumped.</p>		
4.11.00	<p>Pump Shaft Motor Shaft Coupling</p> <p>The Pump and motor shaft shall be connected with a adequately sized flexible coupling of proven design with a spacer</p>		
4.12.00	<p>Base Plate</p> <p>A common base plate mounting both for the pump and motor shall be furnished. The base plate shall be of fabricated steel and of rigid construction, suitable ribbed and reinforced.</p>		
4.13.00	<p>Assembly and Dismantling</p> <p>Assembly and dismantling of each pump with drive motor shall be possible without disturbing the grouting base plate or alignment.</p>		
4.14.00	<p>Drive Motor (Prime Mover)</p> <p>The KW rating of the drive shall be based on continuously driving the connected equipment for the conditions specified. In case, where parallel operation of the pumps is specified, the actual motor rating is to be selected considering overloading of the pump in the event of tripping of operating pumps. Continuous motor rating (at 50 deg. Cent, ambient) for pump shall be at least 10% above the maximum load demand of the driven equipment in the complete range.</p>		
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>		<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2</p>	<p style="text-align: center;">SUB SECTION A-15 CW SYSTEM</p> <p style="text-align: right;">PAGE 23 OF 31</p>



5.00.00

Technical Data sheet of Pumps

No	Designation\Application	Clarified/Raw/ Treated water	DM water
1)	Operating Speed	1500 rpm (nominal)	
2)	Pumps and drives to be designed for	Outdoor duty & Continuous Operation	
3)	Type of lubrication	Grease	
4)	Suction condition	Flooded Suction	
5)	Type of Shaft Sealing	Gland packing	Mechanical Seal
6)	Type of coupling (motor & pump)	Flexible	
11)	Material of Construction		
i)	Casing, Stuffing Box, Gland	2.5% Ni IS210 Gr 260	CI FG ASTM A CF8M
ii)	Impeller	ASTM A351 CF8M	
	Wearing rings (if applicable)	SS – 316	
iii)	Shaft, Shaft Sleeves	SS-410	
iv)	Bolts & nuts	SS 316 for those encountering water and for others, material shall be high tension carbon steel.	
v)	Base plate (min 12 mm thick)	Carbon Steel (Epoxy Painted)	
7)	Accessories	a. Required Instrumentation b. Companion flanges with nuts, bolts and gaskets, Anchor bolts, nuts, sleeves and inserts. c. Internal piping with valves, filters & Instruments for sealing/ cooling/ lubrication system up to and including isolating valve etc. d. Positioning dowels, Eye bolts, lifting etc. e. Ladders, Platforms & Other accessories	

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Annexure-2			
	VERTICAL PUMPS			
1.00.00	SCOPE			
1.01.00	This specification covers general requirements in respect of design, construction features, manufacture, inspection, and performance at Vendor's / sub-vendor's works delivery to site, erection field testing and commissioning of Makeup Water & Raw Water Pumps. The minimum technical requirements and equipment shall include, but not be limited to the following:			
2.00.00	CODES AND STANDARDS			
2.01.00	The design, material, construction, manufacture, inspection, testing and performance of Vertical Pumps shall comply with all currently applicable statutes, regulations, and safety codes in the locality where the equipment will be installed. The equipment supplied shall comply with the latest applicable Standards listed below. Other national standards are acceptable, if they are established to be equal or superior to the listed standards.			
2.02.00	List of Applicable Standards			
	IS: 1710	:	Vertical Turbine Pumps for clear cold fresh water.	
	IS: 5120	:	Technical requirement of rotor dynamic special purpose pumps.	
	HIS	:	Hydraulic Institute Standards U.S.A.	
	PTC 82:		Centrifugal pumps-power test code	
	API 610:		Centrifugal pumps for general refinery purposes.	
3.00.00	DESIGN AND PERFORMANCE REQUIREMENTS			
3.01.00	The maximum efficiency point of the pumps shall preferably lie within 10% of the rated design flow.			
3.02.00	Pumps of a particular category shall be identical, suitable for parallel operation and provided with interchangeable components. Head vs. capacity and BHP vs. Capacity characteristic should match to ensure even load sharing and trouble-free operation throughout the range.			
3.03.00	The pumps shall have stable Head vs. Capacity characteristic continuously rising towards shut-off with the highest at shut-off and with an approximate shut-off head of 15% or more than the design head for radial flow pumps and 50% more than the design head for mixed flow/ turbine type pumps.			
3.04.00	The operating range of operation of pumps shall generally be 40% to 120% of rated flow for sustained period of operation.			
3.05.00	The power requirement of the pump shall be non-over loading type for mixed flow/ turbine type pumps.			
3.06.00	The critical speed of the pump shall be less than 80% of the rated speed or more than 130% of the rated speed. Also, the critical speed of the pump-motor assembly shall be more than the maximum reverse run-away speed.			
3.07.00	Pump shall run smoothly without undue noise and vibration. The vibration limit measured at motor end shall not exceed the limit specified in Hydraulic Institute Standards. The noise level shall not exceed 85 dBA overall sound pressure level reference 0.0002 microbar (the standard pressure reference for air sound measurement) at a distance of 1M from the equipment surface.			
3.08.00	The base plate, foundation bolts, motor stool and other components shall be designed to take the full force coming on the discharge elbow under shut-off condition.			
3.09.00	Water for motor cooling and thrust bearing cooling, if required, shall be tapped from the discharge of the pumps and/or fed from an over-head tank. All piping, valves, strainer,			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2	SUB SECTION A-15 CW SYSTEM	PAGE 25 OF 31

CLAUSE NO.	<p style="text-align: center;">TECHNICAL REQUIREMENTS</p> 			
<p>3.12.00</p> <p>3.13.00</p> <p>4.00.00</p> <p>4.01.00</p> <p>4.02.00</p> <p>4.03.00</p> <p>4.04.00</p> <p>4.05.00</p> <p>4.06.00</p> <p>4.07.00</p> <p>4.07.01</p> <p>4.07.02</p>	<p>instruments etc. required for this purpose and line shaft bearing lubrication (if required) shall be provided by the Contractor.</p> <p>Reverse Rotation</p> <p>a) The pump shall be provided with an approved mechanical device to protect reverse rotation on loss of drive motor power and failure of discharge valve to close.</p> <p>b) a reverse rotation detection switch shall be provided to prevent starting of motor while rotating in reverse direction.</p> <p>Motor Rating</p> <p>The pumps shall be capable of starting with discharge valve fully closed as well as fully open conditions. Motors shall be selected to suit to the above requirements. Continuous motor rating (at 50°C ambient) for all pumps shall be at least ten per cent (10%) above the maximum load demand of the driven equipment in the complete operating range (including run out condition) to take care of the system frequency/voltage variation.</p> <p>Drive motors shall be connected directly to the line shaft of the pump.</p> <p>DESIGN AND CONSTRUCTION</p> <p>Pump Type</p> <p>Pumps shall be of vertical shaft, single stage/multi-stage, submerged suction, complete with bowl, column & head assembly, and drive assembly. The pump design shall be of pullout/non-pull-out type as specified</p> <p>Discharge head</p> <p>The pump discharge shall be of above-floor type/sub-floor type. In certain cases of pump installation where expansion joint is located immediately at the pump discharge, the pump assembly will be subjected to the unbalanced hydraulic thrust. A thrust pad will be built in with the discharge head for transmitting the hydraulic thrust to external structures such that this hydraulic thrust is not transmitted to the foundation bolts for which they may not be designed.</p> <p>Column Pipe</p> <p>Column pipes shall be flanged and bolted and shall be complete with gaskets, nuts, and bolts.</p> <p>Impeller</p> <p>The impeller shall be closed, or semi-open or open as specified elsewhere.</p> <p>Wearing Rings</p> <p>Replaceable type wearing rings shall be provided for both casing and the impeller. For open impellers replaceable casing liners shall also be provided. The difference in hardness of the casing & impeller wearing rings shall be minimum 50 BHN.</p> <p>Impeller & Line Shaft</p> <p>Shaft size selected based on maximum combined shear stress must take into consideration the critical speed as per API - 610.</p> <p>Pump & Shaft Bearings - lubrication</p> <p>Adequate number of properly designed bearings shall be furnished. The type of lubrication i.e., self-water lubrication or forced water lubrication shall be provided.</p> <p>Self water Lubrication System</p> <p>The line shaft bearings shall be lubricated by the water being pumped. The main pump and line shaft bearings which are above minimum water level shall be of 'Thordon' type/</p>	<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2</p>	<p style="text-align: center;">SUB SECTION A-15 CW SYSTEM</p> <p style="text-align: center;">PAGE 26 OF 31</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS																													
4.07.03	<p>equivalent. For other line shaft bearings located below minimum water level, cutless rubber bearings can be used.</p> <p>Forced water lubrication system</p> <p>The line shaft shall be provided with shaft enclosing tube to exclude pumped water from shaft and bearings.</p> <p>Lubricating water pumps shall be provided to supply lubricating water for bearings. These lubricating water pumps shall get supply from the overhead water storage tank.</p>																													
4.08.00	<p>Thrust Bearings</p> <p>Single thrust bearing at motor top or separate thrust bearings at pump and motor shall be provided to take care of hydraulic thrust and weight of the rotating assembly. Thrust bearing shall be spherical roller type or superior, capable of absorbing axial thrust in both directions of rotation. Water required for cooling of thrust bearing shall be taken from pump discharge, wherever applicable.</p> <p>The thrust bearing shall be rated for continuous operation with thrust as developed in shut-off condition with clearance between the wearing rings in worn out condition to be at least four (4) times the clearance between the wearing rings in new condition.</p>																													
4.09.00	<p>Pump Motor Supports, Base plate etc.</p> <p>The pump and motor shall have a common support. The necessary supporting frame, base plates, mounting plates etc. as required shall be supplied under this specification.</p>																													
4.10.00	<p>Stuffing Box</p> <p>Gland packing shall be provided at the top-of-the-line shaft. Shaft sleeves shall be provided at the stuffing box.</p>																													
4.11.00	<p>Assembly and Dismantling</p> <p>Assembly and dismantling of each pump with drive motor shall be possible without disturbing the grouted base/sole plate or alignment.</p>																													
9.00.00	<p>Technical Data Sheet (if not mentioned specifically elsewhere in the CW System technical specifications) of Pumps</p> <table border="1"> <thead> <tr> <th>SN</th> <th>Description</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Designation</td> <td>As applicable</td> </tr> <tr> <td>2</td> <td>Total No. of Pumps</td> <td>As applicable</td> </tr> <tr> <td>3</td> <td>No. of Working Pumps</td> <td rowspan="2">As applicable</td> </tr> <tr> <td>4</td> <td>No. of Standby Pumps</td> </tr> <tr> <td>5</td> <td>Guaranteed Flow & Total Head (Guaranteed)</td> <td></td> </tr> <tr> <td>6</td> <td>Operating Speed (Max.)</td> <td>1500 rpm</td> </tr> <tr> <td>7</td> <td>Pumps and drives to be designed for</td> <td>Outdoor duty & Continuous Operation</td> </tr> <tr> <td>10</td> <td>Type of Pump</td> <td>Vertical Wet Pit & Non-Pull out type</td> </tr> </tbody> </table>			SN	Description	Parameters	1	Designation	As applicable	2	Total No. of Pumps	As applicable	3	No. of Working Pumps	As applicable	4	No. of Standby Pumps	5	Guaranteed Flow & Total Head (Guaranteed)		6	Operating Speed (Max.)	1500 rpm	7	Pumps and drives to be designed for	Outdoor duty & Continuous Operation	10	Type of Pump	Vertical Wet Pit & Non-Pull out type	
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<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>		<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2</p>	<p>SUB SECTION A-15 CW SYSTEM</p>	<p>PAGE 27 OF 31</p>																										

CLAUSE NO.

TECHNICAL REQUIREMENTS



13	Type of Discharge	Above Floor
14	Type of Impeller	Closed / Semi-open
16	Type of Lubrication	Forced water/ Self lubrication (as specified)
18	Minimum Water Level in sump	Min submergence level of pump plus 0.5.m
19	Maximum Water Level in sump	As per system requirement (Min 0.2 m below FGL)
21	Sump Invert Level	As per HIS
22	Operating Floor Level	Min. 0.5 M above FGL
23	Other dimensions of sump, Fore-bay etc	As per HIS & system requirement
25	Accessories to be provided with each pump	<p>a. Required Instrumentation</p> <p>b. Companion flanges with nuts, bolts and gaskets, Anchor bolts, nuts, sleeves and inserts.</p> <p>c. Internal piping with valves, filters & Instruments for sealing/ cooling/ lubrication system up to and including isolating valve etc.</p> <p>d. Positioning dowels, Eye bolts, lifting etc.</p> <p>e. Ladders, Platforms & Other accessories</p>
26	MOC	
i	Suction Bell, Casing / Bowl	2.5% Nickel Cast Iron, IS: 210 Grade FG 260; S-0.1% max. P-0.15% max.
ii	Casing Liner	Stainless steel (SS)
iii	Impeller	Austenitic SS ASTM A743/ CF8M Grade
iv	Wearing rings	SS-316
v	Impeller Shaft, Pump & line shaft, Pump & Shaft Coupling, Pump & Shaft Sleeves	SS - ASTM A 276 Gr. 410.
vi	Shaft bearings	Cutless rubber with bronze retainer for below minimum water level and Thordon type for above minimum water level.

TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE

TECHNICAL SPECIFICATION
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vii	Column pipe	Fabricated steel as per IS: 2062 (minimum thickness - 10 mm) with 2 coats of epoxy coating inside & outside.
viii	Shaft Enclosing Tubes	Fabricated steel as per IS: 2062 (minimum thickness - 6 mm) with 2 coats of epoxy coating inside & outside.
ix	Discharge Head	Fabricated steel as per IS: 2062 (minimum thickness - 10 mm) with 2 coats of epoxy coating inside & outside.
x	Distance Piece (if applicable)	Fabricated steel as per IS: 2062 (min thickness 10 mm) with 2 coats of epoxy coating inside.
xii	Stuffing Box, Gland	2.5 % NI-CI to IS-210 FG-260
xiii	Gland Packing	Impregnated Teflon
xiv	Gaskets	Wire reinforced rubber gasket / Neoprene Rubber / Compressed Asbestos Fibre
xv	Ladders, Platforms & Other Accessories	Fabricated steel as per IS: 2062
xvi	Bolts & Nuts	Stainless Still AISI Type 316 for those coming in contact with water and for others material shall be High Tension Carbon Steel
xvii	Baseplate & Soleplate (min 12 mm thick), Matching flange	Fabricated steel as per IS: 2062

TALCHER THERMAL POWER PROJECT
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CLAUSE NO.	<p style="text-align: center;">TECHNICAL REQUIREMENTS</p> 		
	<p style="text-align: right;">Annexure-3</p> <p style="text-align: center;">SUBMERSIBLE PUMPS</p> <p>1.00.00 SCOPE</p> <p>1.01.00 This specification covers general requirements in respect of design, material, manufacture, construction, testing & inspection at Vendor's / sub-vendor's delivery to site, of submersible pumps. The minimum technical requirements and equipment shall include, but not be limited to the following:</p> <p>2.00.00 CODES AND STANDARD</p> <p>The design manufacture and performance of submersible pumps shall be complied with all currently applicable statues, regulation, and safely codes in the locality where the Equipment will be installed. The Equipment shall also conform to the latest applicable Indian standards listed below/equivalent standards.</p> <p>2.01.00 List of Applicable Indian Standards</p> <p>IS: 8034 - Submersible pumps for clear cold fresh water</p> <p>IS: 5120 - Technical requirement of Rotodynamic Special Purpose pumps.</p> <p>3.00.00 DESIGN AND PERFORMANCE REQUIREMENTS</p> <p>a) The pump shall be of single stage mono - block type with non-clog design.</p> <p>b) Components of Identical pumps shall be interchangeable.</p> <p>c) Pumps shall have continuously rising head characteristics.</p> <p>4.00.00 MOTOR RATING</p> <p>Continuous motor rating (at 50 deg. C ambient) for pumps shall be at least ten percent (10%) above the maximum load demand of the driven equipment in the complete operating range to take care of the system frequency variations.</p> <p>5.00.00 FEATURES OF CONSTRUCTION</p> <p>a) Pumps shall be of Submersible, wet pit type.</p> <p>b) Pumps shall be able to pass through solids up to 100 mm and capable of handling wastewater which may contain, sludge, plastic solids etc.</p> <p>c) Coupling device shall ensure leak proof joint between the pump and discharge elbow. This shall also enable pump to be removed from the sumps without the necessity of dismantling any nuts, bolts etc.</p> <p>d) Pumps shall be portable type and capable of using in any sump as and when required. Pump shall be provided with required stool, flexible, hose chain connection etc. for easy installation, removal, and maintenance. Adequate length of chain required for lowering the pump into the sump and flexible type discharge pipe shall be provided.</p> <p>e) Impeller</p> <p>Enclosed impellers shall be equipped with seal rings on their hubs. In case of open impeller, the pump shall be designed to take care of the additional thrust produced.</p>		
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2</p>	<p style="text-align: center;">SUB SECTION A-15 CW SYSTEM</p>	<p style="text-align: center;">PAGE 30 OF 31</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS						
<p>1.00.0</p> <p>2.00.00</p> <p>2.01.00</p>	<p style="text-align: right;">Annexure-4</p> <p>Control philosophy for CW System, MuW, ECW and Auxiliary Water Pumps etc.</p> <ol style="list-style-type: none"> 1) The Pumps shall be controlled from the Control Room. The start/stop commands of these pumps, all associated auxiliaries/drives including all the motor operated discharge valves, shall be routed through control system where all interlocks & permissive shall be implemented and start/stop signals shall be issued to MCC/Switchgear. The operation of interconnecting valve and any other common drive shall be possible from pump house as well as DDCMIS. The exact details of the same shall be finalised during detailed engineering. 2) A local push button switch shall be used for emergency tripping of the motor. The pump can be started either with pump discharge valve partially open or in closed position depending upon contractor's standard practice. 3) Applicable for CW Pumps- The CW Pumps shall be controlled as specified in relevant chapters of Control & Instrumentation. Pump can be started only when either at least one of the flow circuits through the respective condenser to the discharge duct and cooling tower is established or re-circulation line to pump sump is open. 4) As applicable, an interlock shall prevent the starting of pump unless bearing lubricating water flow and motor bearing cooling water flow has been established over a period. Low flow of either pump or motor bearing cooling water when the pump is running will give alarm(s) and trip the pump with alarm in case of sustained low value over a preset time. 5) Low flow of either pump or motor bearing cooling water when the pump is running will give alarm(s) and trip the pump with alarm in case of sustained low value over a preset time. 6) In case of high pressure at pump discharge due to accidental closure of any of the butterfly valves, an alarm shall be generated. 7) In case of normal stopping, when a pump control switch is turned 'OFF', the butterfly valve at its discharge shall first close (25-30) % before the respective pump motor is de-energized. On tripping of motor due to any reason, the butterfly valve at the discharge shall close fully automatically. 8) If water level in pump sump is low, an alarm shall be initiated. Pump shall be tripped in case of very low level of water in the intake sumps and very high discharge header pressure. 9) Regulating the CW system makeup valve shall control the water level in the sump/fore bay. 10) Pump shall be tripped from very high winding temperature of motor and very high metal temperature of thrust bearings. Alarm shall be provided for high motor winding temperature and high motor/ pump bearing temperature. 11) The operation philosophy as detailed above is suggestive only and shall be finalized with the successful bidder after award of contract and shall be subject to Employer's approval. <p>Instrumentation for CW System, MuW, ECW and Auxiliary Water Pumps.</p> <p>Vibration monitoring system, if necessary, shall be provided. The alarm and trip signals from vibration system shall be connected to the Control system. Bidder shall provide Duplex temperature elements for bearing & winding temperature monitoring points if specified. The excessive bearing/winding temperature shall be used for alarm and tripping of pumps/ motors. Further, Bidder shall provide required level & pressure sensing instruments as specified elsewhere in relevant Subsections of Control & Instrumentation and/or tender drawings.</p>			<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2</p>	<p style="text-align: center;">SUB SECTION A-15 CW SYSTEM</p>	<p style="text-align: center;">PAGE 31 OF 31</p>

GENERAL TECHNICAL REQUIREMENT OF ELEVATORS, CRANES AND HOISTS, WEIGH BRIDGE

**TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CS-4540-001A-2**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
ELEVATORS, CRANES AND HOISTS				
1.00.00	ELEVATOR			
1.01.00	Passenger Elevators for TG Building, Service Building and Administration Building			
	<p>The Passenger elevators for TG Building, Service Building and Administration Building shall be as under.</p>			
	<ul style="list-style-type: none"> (i) One (1) no. conventional type elevator having capacity of 13 persons for TG Building for each unit. (ii) Two (2) nos. conventional type elevator having capacity of 13 persons for Service Building. (iii) Two (2) nos. panoramic type elevator with five glass panels on rear side having capacity of 13 persons (884 kg.), for Administration building. 			
1.01.01	<p>The scope shall include all items / accessories, service along with all electrical equipment etc. required to meet all design, installation, operation, safety, protection and other requirements of IS: 14665 (latest edition) (all parts), 'Lift' and service lifts'. This scope shall include all items / devices needed to comply with the requirements indicated elsewhere in the specification. The scope shall include but not limited to the following:</p> <ul style="list-style-type: none"> (a) 1 No. fireman's switch for each elevator. (b) Machinery supporting Beam. 			
1.01.02	The location of Elevators shall be as per tender drawings enclosed with the specification.			
1.01.03	Complete erection, testing and commissioning including all testing and commissioning materials, consumables and other tools and tackles required for erection.			
1.01.04	To obtain necessary local administration permits / approvals and make arrangements for inspection and tests required thereby.			
2.00.00	CRANE & HOIST			
2.01.00	<p>Suitable EOT Crane/HOT crane/monorail beams with hoists/chain pulley blocks of adequate capacity, to meet the erection and maintenance requirements are to be provided by the vendors for the various equipment/areas. Some of the areas/equipment not covered by TG hall EOT crane are indicated below. For balance areas/equipment, not listed herein, the requirements of Technical Specification shall be followed.</p>			
TALCHER THERMAL POWER STATION STAGE-III (2X660MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI, Part-A BID DOC NO: CS-4540-001A-2	SUB SECTION- IIA-19 ELEVATORS, CRANES AND HOIST	PAGE 1 OF 2	

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	<p>(a) Feed water heaters & deaerator.</p> <p>(b) Various pumps & Heat Exchangers.</p> <p>(c) Fans, motors, gear boxes etc., of Main Condenser, vacuum pumps, control fluid room etc.</p> <p>(d) Auxiliary cooling water pumps and DM cooling water pumps of ECW systems and Plate heat exchangers.</p> <p>(e) Central lube oil system room.</p> <p>(f) Any other equipment.</p> <p>The above requirement is indicative only; the requirement given in the respective chapter is to be adhered to.</p>			
<p>TALCHER THERMAL POWER STATION STAGE-III (2X660MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION-VI, Part-A BID DOC NO: CS-4540-001A-2</p>	<p>SUB SECTION- IIA-19 ELEVATORS, CRANES AND HOIST</p>	<p>PAGE 2 OF 2</p>	

**GENERAL TECHNICAL REQUIREMENT OF
ELEVATORS, CRANES AND HOISTS,
WEIGH BRIDGE (CONT.)**

**TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-B
BID DOC. NO. CS-4540-001A-2**

CLAUSE NO.	TECHNICAL REQUIREMENTS																																							
<p>1.00.00</p> <p>1.01.00</p> <p>1.01.01</p> <p>1.01.02</p> <p>1.01.03</p> <p>1.02.00</p>	<p>SERVICE ELEVATORS, CRANE, HOIST & MONORAIL</p> <p>SERVICE ELEVATORS</p> <p>DESIGN CRITERIA AND OPERATIONAL SPECIFICATION</p> <p>Design</p> <p>Elevator shall be of conventional type for Service Building and TG building and of panoramic type with five glass panels on rear side for Administration Building. The elevator shall meet the quality of international standard. The quality of glass panel on rear should be of highest grade from safety point of view and should meet the best standard.</p> <p>No. of floors to be served shall be as per the specification and tender drawing of the Employer. Bidders shall quote variation in price for addition/deletion of one landing level in the relevant schedule of Forms and Procedures. However, bidder shall quote for above indicated landing levels in his base offer. No of floors and landing elevations are tentative only. The final landing elevations for all buildings shall be subject to approval by the Employer after award.</p> <p>Elevators shall be designed based on following criteria:</p> <table border="1"> <tr> <td>i)</td> <td>Design/construction/installation codes.</td> <td>:</td> <td>Latest edition of IS: 14665 (all parts)</td> </tr> <tr> <td>ii)</td> <td>Load carrying capacity</td> <td>:</td> <td>884 kgs. (equivalent to 13 persons) for passenger elevator for service building , TG building and Administration Building.</td> </tr> <tr> <td>iii)</td> <td>Rated speed</td> <td>:</td> <td>1.0 m/sec.</td> </tr> <tr> <td>iv)</td> <td>Position of machine room</td> <td>:</td> <td>Directly above the elevator shaft.</td> </tr> <tr> <td>v)</td> <td>Machine room</td> <td>:</td> <td>Window air conditioner of minimum 2T capacity per elevator shall be provided by bidder.</td> </tr> </table> <p>CONSTRUCTION</p> <p>Construction of the elevators shall specifically meet all requirements of the codes indicated and shall have following additional features:</p> <table border="1"> <tr> <td>i)</td> <td>Flooring of Cabin</td> <td>:</td> <td>Vitrified ceramic tiles of mat finish.</td> </tr> <tr> <td>ii)</td> <td>Car enclosure & car panels</td> <td>:</td> <td>Stainless Steel</td> </tr> <tr> <td>iii)</td> <td>Handrails on 3 sides</td> <td>:</td> <td>Mirror Stainless Steel</td> </tr> <tr> <td>iv)</td> <td>False ceiling</td> <td>:</td> <td>Powder painted</td> </tr> </table>			i)	Design/construction/installation codes.	:	Latest edition of IS: 14665 (all parts)	ii)	Load carrying capacity	:	884 kgs. (equivalent to 13 persons) for passenger elevator for service building , TG building and Administration Building.	iii)	Rated speed	:	1.0 m/sec.	iv)	Position of machine room	:	Directly above the elevator shaft.	v)	Machine room	:	Window air conditioner of minimum 2T capacity per elevator shall be provided by bidder.	i)	Flooring of Cabin	:	Vitrified ceramic tiles of mat finish.	ii)	Car enclosure & car panels	:	Stainless Steel	iii)	Handrails on 3 sides	:	Mirror Stainless Steel	iv)	False ceiling	:	Powder painted	
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<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2</p>	<p>SUB-SECTION-A-24 SERVICE ELEVATORS CRANE, HOIST & MONORAIL</p>	<p>PAGE 1 OF 6</p>																																					

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	v)	:	Car opening & Hoist way opening Protected by central opening sliding Stainless Steel door	
	vi)	:	CABIN ACCESSORIES The following accessories shall be provided : a) Recessed fluorescent light/LED fittings on car ceiling. b) Car control station c) Emergency stop switch. d) 5/15A, 3 pin plug socket with switch on top of lift car. e) Switches with Braille characters.	
	<p>1. AUTOMATIC RESCUE DEVICE (ARD) - (BATTERY DRIVE):</p> <p>Bidder to provide a modern Advanced electronic drive system of “RESCUING Passenger Trapped in a ELEVATOR”.</p> <p>2. EMERGENCY SAFETY DEVICES :</p> <p>The lift shall be provided with safety Device attached to the lift car frame and placed beneath the car. The safety device shall be capable of stopping and sustaining the lift car up at governor tripping speed with full rated load in car.</p> <p>3. Elevator shall have Floor announcement system & Braille switches</p> <p>1.02.01 All steel embedment for fixing landing doors/indicators etc. to the Elevator well shaft and fascia plate shall be supplied by the Bidder.</p> <p>1.02.02 Guide rails complete with supporting brackets for the car and counter weights. Bidder to take care of granite tiles (approx 80 kg) to be provided for cabin flooring in selecting counter weights.</p> <p>1.02.03 Elevator drive machines complete with electric motor, reduction gear unit, suspension ropes, buffers for the cars and the counter weights and other drive and control mechanism. All foundation anchor bolts, sleeves, anchoring steel and any item required to complete the job satisfactorily shall be provided by the bidder. The bidder shall also provide for the grouting of anchor bolts, sleeves, anchoring steel, etc. and other anchorages</p> <p>1.02.04 Any other steel works as well as all other accessories/components not specified in the specification but necessary for making the Elevator complete.</p> <p>1.02.05 All building work including the supply of steel items, associated with installation of equipment in the machine room hoist way, hoist way door, frames and Elevator pit, shall form part of bidders scope of service, Bidder shall also provide the Elevator-well complete with foundation</p>			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-A-24 SERVICE ELEVATORS CRANE, HOIST & MONORAIL	PAGE 2 OF 6	

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
<p>1.03.00</p> <p>1.03.01</p> <p>1.04.00</p> <p>1.04.01</p>	<p>and brick walls around the lit-well together with overhead machine room. The machine room will be provided with R.C.C. floor slab with necessary pockets for anchor bolts and slots.</p> <p>OPERATION</p> <p>Elevator shall have provisions to meet following operational requirements :</p> <ol style="list-style-type: none"> a) Selective Duplex collective, automatic operation with or without attendant through illuminated push button station located inside the lift car. b) Door operating shall be automatic door operation and electronic door protection system for opening/closing of car and landing doors. c) Bidder shall provide car operating panel with luminous buttons, car position indication in car (both visual and audio) combined with direction arrows, overload warning indicator, battery operated alarm bell and emergency light and fan & hands free speaker telephone set with suitable battery, charger & controls. d) Bidder shall provide emergency indicator to indicate the location of elevator in case of elevator being stuck up between the floors through automatic flashers (both audio & visual) e) Bidder shall provide electronic door detector (Infra red curtain type). f) Two push buttons, one for upward movement and the other for downward movement at each intermediate landing and one push button at each terminal landing shall be provided in order to call the car. Digital hall position indicator at all floors, tell lights at all floors shall also be provided by the bidder. g) For facilitating the movement of visually & hearing impaired persons, hall lantern and car arrival chimes shall be provided. h) All fixtures shall be in stainless steel face plates. i) Push buttons shall be fixed in the car for holding the doors open for any length of the time required. j) All other safety/protection/operation interlocks as required by IS:14665 (latest edition). <p>Elevator Electricals:</p> <p>Electric motor:</p> <p>The driving motors shall conform to I.S 325 and suitable for the Variable Voltage Variable Frequency (VVVF) application. All motors shall be squirrel cage induction type, suitable for operation at 415V (+/- 10% variation) , 3 phase, 3 wire, 50HZ (+3% to -5% variation) supply. Motors shall be provided with thermal class 130 (B) or better insulation</p>			एनटीपीसी NTPC
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-A-24 SERVICE ELEVATORS CRANE, HOIST & MONORAIL	PAGE 3 OF 6	

CLAUSE NO.	TECHNICAL REQUIREMENTS			
<p>1.04.02</p> <p>1.04.03</p> <p>1.04.04</p>	<p>Controls:</p> <p>The controls shall be Variable Voltage and Variable frequency type and shall provide smooth and constant acceleration and retardation under all conditions of operation. Suitable control panel shall be provided in the machine room.</p> <p>Cables and wiring:</p> <p>All the cables except trailing cables shall be as per IS:1554-1 or IS-7098-I. the PVC outer sheath of these cables shall be flame retardant, low smoke (FRLS) type with the following FRLS properties.</p> <ul style="list-style-type: none"> a) Oxygen index of min. 29 (as per IS:10810 Part-58) b) Acid gas emission of max. 20% (as per IEC-754-I). c) Smoke density rating shall not be more than 60% (as per ASTM-D-2843). <p>The circular trailing cables shall be either in accordance with IS 4289 Part-I (Elastomer insulated) or IS-4289 Part-II (PVC insulated). The flat type trailing cables if offered shall be in accordance with IEC-60227-6.</p> <p>All wiring / cabling between the equipments in the lift machine room and that between the machine room and equipments in the lift well and at the landings shall be wired in HDP conduits/ galvanized steel conduits to be supplied by the contractor. Alternatively armored cables may be used.</p> <p>Earthing:</p> <p>The elevator structures and all Electrical equipment, including metal conduits shall be effectively earthed with the earth conductors provided in the machine room as per IS: 3043.</p>			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-A-24 SERVICE ELEVATORS CRANE, HOIST & MONORAIL	PAGE 4 OF 6	

CLAUSE NO.	TECHNICAL REQUIREMENTS			
DATA SHEET				
	i) Type of services ii) Load carrying capacity iv) Rated speed v) Total Travel vi) No. of floor to be served vii) Method of control viii) Position of M/c room ix) Size of platform x) Size of lift well xiii) Specification code xiv) Design seismic efficient	: Passenger : As per specification One (1) m/s : TG hall- As per layout Service Building- As per layout Administrative Building- As per layout : TG hall, Service Building & administrative building: - To be decided during detailed engineering. : Variable voltage variable frequency (VVVF) : Directly above lift shaft : As per IS14665 & manufacturer's standard latest. : -do- : As per IS:14665 (5 parts) (Latest Edition). : According to the IS 1893-1977		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-A-24 SERVICE ELEVATORS CRANE, HOIST & MONORAIL	PAGE 5 OF 6	

CLAUSE NO.	TECHNICAL REQUIREMENTS		
<p>2.00.00</p> <p>2.01.00</p> <p>2.02.00</p> <p>2.03.00</p> <p>2.04.00</p> <p>2.05.00</p>	<div style="text-align: right; border: 1px solid black; padding: 2px; width: fit-content; margin-bottom: 10px;"> एनटीपीसी NTPC </div> <p>CRANE, HOIST & MONORAIL</p> <p>Suitable EOT Crane/HOT Crane/Monorail beams with hoists/Chain Pulley Blocks of adequate capacity, to meet the erection and maintenance requirements are to be provided by the vendor for the various areas/equipment. Some of the areas/equipment not covered by TG hall EOT cranes are indicated below. For balance areas/equipment, not listed hereinafter, the requirements of Specification shall be followed.</p> <p>(a) Feed water heaters & deaerator (Applicable Hoists/Chain pully block for maintenance purpose shall be provided).</p> <p>(b) Various pumps & Heat Exchangers.</p> <p>(c) Condenser Water Boxes (front & rear), (Applicable If hinged type water box not envisaged)</p> <p>(d) CW Butterfly Valves</p> <p>(e) Vacuum Pumps</p> <p>(f) Control Fluid Room</p> <p>(g) Auxiliary cooling water (clarified) pumps and DM cooling water pumps of ECW systems.</p> <p>(h) Central Lube Oil System room.</p> <p>(i) Any other equipment.</p> <p>The above requirement is indicative only, the requirement given in the respective chapter is to be adhered to.</p> <p>The EOT cranes shall be designed as per IS-3177 (Latest edition) class -2 duty and the monorail hoists (hand operated) shall be designed to duty class 2 to IS 3832. Electrical wire rope hoist shall be designed as per IS:3938 (latest).</p> <p>The design, manufacture inspection and testing of the crane shall comply with the requirement of latest version of IS:3177</p> <p>The stipulations of all statutory codes like Indian Electricity Act, Indian Electricity Rules, Factory Acts, Local Municipality Act etc. shall however prevail over the specification requirements, in case any conflict arises between this specification and the statutory codes.</p> <p>For the hoists with more than 2.0 ton lifting capacity or more than 10.0 M lift, motor operated hoist block for both long travel and lift shall be provided. Other hoist blocks shall be of hand operated type for both travel and lift. However, all monorails coming out of the building shall be provided with electric hoist block, irrespective of load and lift.</p> <p>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.</p> <p>The operator shall be able to control the movement of the monorail hoist with the help of floor operated pendant. The creep speed for vertical movement shall also be provided as per the system requirement.</p>		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2</p>	<p>SUB-SECTION-A-24 SERVICE ELEVATORS CRANE, HOIST & MONORAIL</p>	<p>PAGE 6 OF 6</p>

SURFACE PREPARATION & PAINTING

**TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-B
BID DOC. NO. CS-4540-001A-2**

CLAUSE NO.	<div style="text-align: right;"></div> TECHNICAL REQUIREMENTS																
1.00.00	Specification of surface preparation & painting																
1.01.00	Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.																
1.02.00	All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labelled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.																
1.03.00	Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.																
1.04.00	All pipelines shall be Colour coded for identification as per the NTPC Colour-coding scheme, which will be furnished to the contractor during detailed engineering.																
1.05.00	SURFACE PREPARATION																
1.05.01	All surfaces to be painted shall be thoroughly cleaned of oil. Grease and other foreign material. Surfaces shall be free of moisture and contamination from chemicals and solvents.																
1.05.02	<p>The following surface preparation schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer.</p> <table border="0"> <tr> <td style="padding-left: 20px;">SP1</td> <td>Solvent cleaning</td> </tr> <tr> <td style="padding-left: 20px;">SP2</td> <td>Application of rust converter (Ruskil or equivalent grade)</td> </tr> <tr> <td style="padding-left: 20px;">SP3</td> <td>Power tool cleaning</td> </tr> <tr> <td style="padding-left: 20px;">SP4</td> <td>Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer)</td> </tr> <tr> <td style="padding-left: 20px;">SP4*</td> <td>Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns</td> </tr> <tr> <td style="padding-left: 20px;">SP5</td> <td>Shot blasting/ abrasive blasting.</td> </tr> <tr> <td style="padding-left: 20px;">SP6</td> <td>Emery sheet cleaning/Manual wire brush cleaning.</td> </tr> </table>			SP1	Solvent cleaning	SP2	Application of rust converter (Ruskil or equivalent grade)	SP3	Power tool cleaning	SP4	Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer)	SP4*	Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns	SP5	Shot blasting/ abrasive blasting.	SP6	Emery sheet cleaning/Manual wire brush cleaning.
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SP6	Emery sheet cleaning/Manual wire brush cleaning.																
1.06.00	APPLICATION OF PRIMER/PAINT																
1.06.01	The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.																
1.06.02	Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.																
1.06.03	Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.																
1.06.04	Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.																
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION VI, PART-B BID DOC. NO. CS-4540-001A-2	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 1 of 8														

CLAUSE NO.	<div style="text-align: right;"></div> TECHNICAL REQUIREMENTS		
1.06.05	<p>Following are the Primer/painting schemes envisaged herein:</p> <p>PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104.</p> <p>PS3* - Zinc Chrome primer (Alkyd base) by dip coat.</p> <p>PS4 - Synthetic Enamel (long oil alkyd) to IS2932.</p> <p>PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744</p> <p>PS9 - Aluminum paint to IS 2339.</p> <p>PS9* - Heat resistant Aluminum paint to IS-13183 Gr.-I (for temperature 400 degC – 600 degC), IS-13183 Gr.-II (for temperature 200 degC- 400 degC and IS-13183 Gr.-III (for temperature upto 200 degC)</p> <p>PS13 - Rust preventive fluid by spray, dip or brush.</p> <p>PS14 - Weldable primer-Deoxaluminat or equivalent.</p> <p>PS16 - High Build Epoxy CDC mastic `15'.</p> <p>PS17 - Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.)</p> <p>PS18 - Epoxy based TiO2 pigmented coat</p> <p>PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=35.0(min.)</p> <p>PS-20 - Epoxy based finish paint</p>		
1.06.06	<p>All weld edge preparation for site welding shall be applied with one coat of weldable primer.</p>		
1.06.07	<p>For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.</p>		
1.06.08	<p>SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.</p>		
1.06.09	<p>a) All un-insulated equipments, pipes, valves etc covered in sub-section A-08 (Steam Turbine & Auxiliary system) shall be painted with paint not inferior to Epoxy resin based paints with minimum DFT of 150 micron.</p> <p>The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner:</p> <ul style="list-style-type: none"> ▪ Primer coat – Epoxy based zinc phosphate ▪ Intermediate - Epoxy based TiO2 pigmented coat ▪ Finish coat - Epoxy based finish coat/Two pack polyurethane coat <p>b) Equipment, pipes etc. with high temperature shall be painted with heat resistant aluminum paint (to be selected based on the service condition of component as per IS-13183). Two coats of paint shall be applied with total DFT 40 micron.</p> <p>c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard</p>		
1.06.10 A)	<p>Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows:</p> <p>Primer : One coat of unmodified epoxy resin along with polyimide hardener.</p> <p>Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct</p>		
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION VI, PART-B BID DOC. NO. CS-4540-001A-2</p>	<p>SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING</p>	<p>Page 2 of 8</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p>hardener.</p> <p>Total thickness of primer and paint should not be less than 400 microns.</p> <p>B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows:</p> <p>i) For Indoor vessel, tanks, piping, valves & other equipments:</p> <ul style="list-style-type: none"> (a) Surface preparation shall be done either manually or by any other approved method. (b) Primer coat shall consist of one coat of chlorinated rubber based zinc phosphate primer having minimum DFT of 50 microns. (c) Intermediate coat (or under coat) shall consist of one coat of chlorinated rubber based paint pigmented with Titanium dioxide with minimum DFT of 50 microns. (d) Top coat shall consist of one coat of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 50 microns. <p>Total DFT of paint system shall not be less than 150 microns.</p> <p>ii) For Outdoor vessel, tanks, piping, valves & other equipments:</p> <ul style="list-style-type: none"> (a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard. (b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns. (c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns. (d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided. <p>The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied.</p> <p>Total DFT shall not be less than 300 microns.</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION VI, PART-B BID DOC. NO. CS-4540-001A-2	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 3 of 8



1.06.11 Primer/Painting Schedule

Sl. No	Description	Surface Preparation	Primer Coat			Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade
			Type of Primer	No. of Coats	Min. DFT / coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)		
A) Power Cycle Piping													
1.	All insulated Piping, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	As per NTPC Colour shade/ coding scheme
2.	All un-insulated Piping, fittings/ components, Pipe clamps, Vessels/Tanks, Equipment etc.	Design temperature < or equal to 60°C	SP3/SP4	PS 5	2	25	-	-	PS 4	3	35	155	
		Design temperature above 60°C- 200°C	SP3/SP4	PS 9*	1	20	-	-	PS9*	1	20	40	
		Design temperature > 200°C	SP3/SP4	PS9*	1	20	-	-	PS9*	1	20	40	
3	Constant Load Hanger (CLH) and Variable Load Hanger (VLH)	SP4*	PS19	1	40	-	-	-	PS17	1	30	70	
4	Piping hangers / supports (other than (3) above. (un-insulated)	SP3/SP5	PS5	2	25	-	-	-	PS4	2	25	100	

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Valves													
5.	Cast/Forged	Design temperature < or equal to 60 degC #	SP3/SP5	PS5	2	35	-	-	-	PS4	2	25	120
		Design temperature above 60 degC	SP3/SP5	PS9*	1	20	-	-	-	PS9*	1	20	40
6.	All auxiliary Structural Steel components for pipe supports	Outside building and in SG envelope TG	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a) Epoxy coat b) Final coat of paint PS17	2 1	35 30	250
		Within building TG	SP4*	-do-	1	35	PS18	1	35	a) Epoxy coat b) Final coat of paint PS17	2 1	25 30	150
7.	Weld Edges		SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	25

TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	BID DOC. NO. CS-4540-001A-2	TECHNICAL SPECIFICATION SECTION VI, PART-B	SUB-SECTION -A-12 SURFACE PREPARATION & PAINTING	Page 5 of 8
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1. \$ - The first 2 finished coats (total min.DFT of 70 microns) shall be done at shop and the 3rd finish coat (min.DFT 35 Microns) shall be applied at site.
2. For valves below 65NB and temperature upto and including 540 DegC, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint.
3. For corrosion protection of threaded hanger rods and variable spring cages, electro galvanizing in full compliance to minimum Corrosion category C3 as per EN ISO12944 is also acceptable.
4. For spring cages, 2 coats of 30 µm (min) zinc-rich epoxy resin primer with zinc content > 80 weight% in dry film followed by 2 coats of 30 µm (min) top coat of Acrylic resin Co-polymerisate with a total combined minimum DFT of 120µm is also acceptable in lieu of above specified paint scheme.
5. For corrosion protection, all inner parts of the hangers (CLH/VLH) shall be at least in full compliance to Corrosion category C3 as per EN ISO12944.
6. # - For Cast/forged valves upto & including design temperature 60Deg.C, Aluminium painting as per IS-13183 Gr-3 or better with total DFT 40Micron is also acceptable.

B) Steam Generator & Auxiliaries:

1	All surfaces with temperature 95°C or less and which are insulated	SP3/SP4	PS 5	2	30	-	-	-	PS 4	2	20	100
2	All surfaces with temperature above 95°C and which are insulated	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40

Note: 1) SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.

2) Painting specification for all other exposed steel surfaces not covered above shall be same as that given in Civil Sub-section, Part-B, Section VI for corrosion protection of steel structures.

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C) LOW PRESSURE PIPING													
1	All Piping, fittings / components, valves, Equipments etc.	SP3/SP5	PS3/PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per NTPC Color shade/coding scheme.
2	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting											
3	On the internal surface for pipes 1000 Nb and above	A coat of primer followed by hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.											

D) Fire Detection & Protection System, Compressed air system and Air-conditioning & Ventilation System

For Fire Detection & Protection System, Surface preparation and painting of Fire Water Storage Tanks, all Steel Surfaces (external) exposed to atmosphere (outdoor & indoor installation), Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc. should be as per the Part-B, Sub Section-A-18, Fire Detection & Protection System

For Air Conditioning System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Air Conditioning System.

For Ventilation System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Ventilation System.

For compressed air system, Surface preparation and painting of all the steel surfaces should be as per the Part-B, Sub Section--A-16 compressed air system.

E) ESP

1	All surfaces with surface temperature 95°C or less (with or without insulation)	SP3/SP4	PS3/PS3*	1	25	-	-	-	PS 4	1	30	55
2	All surfaces with surface temperature above 95°C (with or without insulation)	SP3/SP4	PS5	2	30	-	-	-	-	-	-	60

TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	BID DOC. NO. CS-4540-001A-2	TECHNICAL SPECIFICATION SECTION VI, PART-B	SUB-SECTION -A-12 SURFACE PREPARATION & PAINTING	Page 7 of 8
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General Notes (Applicable for all above points A to E)

- i) Painting specification for all surfaces with surface temperature 95°C or less (un-insulated) that are not covered above shall be same as that given in Civil Sub-section, Part-B, Section-VI for corrosion protection of steel structures.
- ii) Painting specification for inside surfaces (such as inner surfaces of ducts/ tanks/ mills/ dampers/ ESP etc.) that are not covered specifically in above clauses, shall be provided with 2 coats of suitable primer i.e. PS5/ PS9 (Total DFT 60/40 micron) based on the temperature.

F) FGD System

- (i) Surface preparation shall be blast cleaned conforming to Sa 2-1/2 Swiss Standard.
- (ii) Primer coat shall consist of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.
- (iii) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.
- (iv) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided.

TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	BID DOC. NO. CS-4540-001A-2	TECHNICAL SPECIFICATION SECTION VI, PART-B	SUB-SECTION -A-12 SURFACE PREPARATION & PAINTING	Page 8 of 8
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MANDATORY SPARES

**TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CS-4540-001A-2**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
<p>1.00.00</p> <p>1.01.00</p> <p>1.02.00</p>	<p>SPARES</p> <p>The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares and recommended spares and indicate these in the relevant schedules of the Bid Form and Price Schedules. The general requirements pertaining to the supply of these spares is given below:-</p> <p>MANDATORY SPARES</p> <p>(a) The list of mandatory spares considered essential by the Employer is indicated in this chapter. The bidder shall indicate the prices for each and every item in the 'Schedule of mandatory Spares' whether or not he considers it necessary for the Employer to have such spares. If the bidder fails to comply with the above or fails to quote the price of any spare item, the cost of such spares shall be deemed to be included in the contract price. The bidder shall furnish the population per unit of each item in the Bid Forms and Price Schedules. Whenever the quantity is mentioned in "sets" the bidder has to give the item details and prices of each item.</p> <p>(b) The Employer reserves the right to buy any or all the mandatory spares parts.</p> <p>(c) The prices of mandatory spares indicated by the Bidder in the Bid Proposal sheets shall be used for bid evaluation purposes.</p> <p>(d) All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the first unit. However, spares shall not be dispatched before dispatch of corresponding main equipments.</p> <p>(e) Wherever quantity is specified both as a percentage and a value, the Bidder has to supply the higher quantity until and unless specified otherwise.</p> <p>RECOMMENDED SPARES</p> <p>(a) In addition to the spare parts mentioned above, the contractor shall also provide a list of recommended spares for 3 years of normal operation of the plant and indicate the list and total prices in relevant schedule of the Bid Form and Price Schedules. This list shall take into consideration the mandatory spares specified in this Section-VI, Part-A and should be independent of the list of the mandatory spares. The Employer reserves the right to buy any or all of the recommended spares. The recommended spares shall be delivered at project site at least two months before the scheduled date of initial operation of first unit. However, the spares shall not be dispatched before the dispatch of the main equipment.</p> <p>(b) Price of recommended spars will not be used for evaluation of the bids. The price of these spares will remain valid upto 6 months after placement of Notification of Award for the main equipment. However, the Contractor shall be liable to provide necessary justification for the quoted prices for these spares as desired by the Employer.</p>			
<p>TALCHER THERMAL POWER STATION STAGE-III (2X660MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-4540-001A-2</p>	<p>SUB SECTION-VI MANDATORY SPARES</p>	<p>Page 1 of 3</p>	

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.03.00	<p>START-UP & COMMISSIONING SPARES</p> <p>Start-up and commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system. All spares used till the plant is handed over to the employer shall come under this category. The Contractor shall provide for an adequate stock of such start up and commissioning spares to be brought by him to the site for the plant erection and commissioning. They must be available at site before the equipments are energized. The unused spares, if any, should be removed from there only after the issue of Taking Over certificate. All start up spares which remain unused at the time shall remain the property of the Contractor.</p>			
1.04.00	<p>The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares and recommended spares and indicate these in the relevant schedules of the Bid Form and Price Schedules. The general requirements pertaining to the supply of these spars is given below.</p>			
2.00.00	<p>The Contractor shall indicate the service expectancy period for the spares parts (both mandatory and recommended) under normal operating conditions before replacement is necessary.</p>			
3.00.00	<p>All spares supplied under this contract shall be strictly inter changeable with the parts for which they are intended for replacements. 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 with desecrator packs as necessary.</p>			
4.00.00	<p>All the spares (both recommended and mandatory) shall be manufactured alongwith the main equipment components as a continuous operation as per same specification and quality plan.</p>			
5.00.00	<p>The contractor will provide Employer with cross-sectional drawings, catalogues, assembly drawings and other relevant documents so as to enable the Employer to identify and finalise order for recommended spares.</p>			
6.00.00	<p>Each spares part shall be clearly marked or labelled on the outside of the packing with its description. When more than one spares part is packed in a single case, a general description of the content shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purposes of identification.</p>			
7.00.00	<p>All cases, containers or other packages are to be opened for such examination as may be considered necessary by the Employer.</p>			
8.00.00	<p>The contractor will provide the Employer with all the addresses and particulars of his sub suppliers while placing the order on vendors for items/components/equipments covered under the contract and will further ensure with his vendors that the Employer, if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.</p>			
<p>TALCHER THERMAL POWER STATION STAGE-III (2X660MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-4540-001A-2</p>	<p>SUB SECTION-VI MANDATORY SPARES</p>	<p>Page 2 of 3</p>	

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
9.00.00	<p>The Contractor shall warrant that all spares supplied will be new and in accordance with the contract Documents and will be free from defects in design, material and workmanship.</p>			
10.00.00	<p>In addition to the recommended spares listed by the contractor, if the employer further identifies certain particular items of spares, the contractor shall submit the prices and delivery quotation for such spares within 30 days of receipt of such request with a validity period of 6 months for consideration by the Employer and placement of order for additional spares if the Employer so desires.</p>			
11.00.00	<p>The Contractor shall guarantee the long term availability of spares to the Employer for the full life of the equipment covered under the contract. The Contractor shall guarantee that before going out of production of spares parts of the equipment covered under the Contract, he shall give the Employer atleast 2 years advance notice so that the latter may order his bulk requirement of spares, if he so desires. The same provision will also be applicable to sub-contractors. Further, in case of discontinuance of manufacture of any spares by the Contractor and/or his sub contractors, Contractor will provide the Employers, two years in advance, with full manufacturing drawings, material specifications and technical information including information on alternative equivalent makes required by the Employer for the purpose of manufacture/ procurement of such items.</p>			
12.00.00	<p>Material Codification</p> <p>The bidder to provide datasheets/ assembly drawings of the manufacturer/ any other relevant document showing Bill of Material(s), Make, Model Number, Part Number etc. through which mandatory spares to be supplied can be uniquely identified. This would facilitate the Employer to assign a unique code to each of the mandatory spare as brought out in GCC. The bidder shall extend all necessary assistance in this regard.</p>			
<p>TALCHER THERMAL POWER STATION STAGE-III (2X660MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-4540-001A-2</p>	<p>SUB SECTION-VI MANDATORY SPARES</p>	<p>Page 3 of 3</p>	

PRE-COMMISSIONING & COMMISSIONING

**TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-B
BID DOC. NO. CS-4540-001A-2**

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p align="center">PRE-COMMISSIONING ACTIVITIES, COMMISSIONING OF FACILITIES AND INITIAL OPERATIONS</p> <p>1.00.00 GENERAL</p> <p>1.01.00 The pre-commissioning and commissioning activities including Guarantee tests, checks and initial operations of the equipment furnished and installed by the Contractor shall be the responsibility of the Contractor as detailed in relevant clauses in Technical Specification. The Contractor shall provide, in addition, test instruments, calibrating devices, etc. and labour required for successful performance of these operations. If it is anticipated that the above test may prolong for a long time, the Contractor's workmen required for the above test shall always be present at Site during such operations.</p> <p>1.02.00 It shall be the responsibility of the Contractor to provide all necessary temporary instrumentation and other measuring devices required during start-up and initial operation of the equipment systems which are installed by him. The Contractor shall also be responsible for flushing & initial filling of all oils & lubricants required for the equipment furnished and installed by him so as to make such equipment ready for operation. The Contractor shall be responsible for supplying such flushing oil and other lubricants unless otherwise specified elsewhere in these specifications & documents.</p> <p>1.03.00 The Contractor upon completion of installation of equipments and systems, shall conduct pre-commissioning and commissioning activities, to make the facilities ready for sustained safe, reliable and efficient operation. All pre-commissioning/commissioning activities considered essential for such readiness of the facilities including those mutually agreed and included in the Contractors quality assurance program as well as those indicated in clauses elsewhere in the technical specifications shall be performed by the Contractor.</p> <p>2.00.00 TESTING / COMMISSIONING PROCEDURES</p> <p>The contractor shall submit his testing / commissioning check lists and procedures for various equipments / systems covered under the contract at least 18 months before the actual commissioning of the equipments / systems for review and approval of employer.</p> <p>The testing / commissioning procedures are to be of a standard format in order to maintain consistency of presentation, content and reporting. The list of commissioning check lists and procedures to be submitted and their content details shall be agreed upon during preaward discussions.</p> <p>An indicative list of Testing / Commissioning procedures/schedules and Standard Checklists and the details regarding the contents of testing/commissioning are enclosed as annexure at the end of this sub-section of section-VI, Part B. The actual list of such equipments / systems shall depend on the equipments / systems being supplied by the contractor.</p> <p>i) Annexure-I : Standard Checklist of items</p> <p>ii) Annexure-II : Testing / Commissioning Procedure/schedules</p> <p>iii) Annexure-III : Commissioning procedures requiring approval of Employer.</p> <p>iv) Annexure – IV : Demonstration/Acceptance test procedures during Commissioning/Initial operation</p> <p>v) Annexure – V : Brief write up on Contents of Testing / Commissioning Procedures</p> <p>Procedure/schedules shall be approved by the employer.</p>		
<p align="center">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p align="center">TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2</p>	<p align="center">SUB-SECTION- G-06 PRE-COMMISSIONING & COMMISSIONING ACTIVITIES</p>	<p align="center">PAGE 1 OF 14</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
3.00.00	PRECOMMISSIONING & COMMISSIONING ACTIVITIES		
3.01.00	General		
	<p>The pre-commissioning activities including some of the important checks & tests for certain major equipment/ systems (as a minimum) are described below, although it is the Contractor's responsibility to draw up a detailed sequential & systematic list of checks / tests and various activities / procedures connected with pre-commissioning of the complete facilities with all systems, sub-systems and equipment supplied and installed by him and get the same approved by the Employer.</p>		
3.02.00	PRE-COMMISSIONING ACTIVITIES/TESTS:		
	Steam Generator		
3.02.01	Hydraulic Testing of Pressure Parts		
	<p>On completion of installation of the Steam Generator pressure parts and high pressure boiler external piping & non boiler external piping a hydraulic test in accordance with the requirements of the Indian Boiler Regulations, shall be performed by the Contractor. However, making use of valves/control valves supplied by others and installed on the contractor's piping system during hydraulic testing shall be subjected to the acceptance of respective valve supplier otherwise hydraulic cap/blanking arrangement as required shall be used. The procedure adopted for hydraulic test and preservation shall have the prior approval of the Employer. The detailed schemes and procedure for carrying out hydraulic testing shall be prepared and furnished by the contractor and it shall be discussed and finalized during detailed engineering stage. The water for hydraulic test shall be made alkaline by addition of suitable chemicals. After the test, the Steam Generator and high pressure external piping shall be suitably drained and preserved.</p> <p>All blank flanges, removable plugs, temporary valves, pipes & fittings, spools, other accessories and services required for carrying out hydraulic testing of boiler external pipings & non boiler external pipings and boiler & its pressure parts shall be furnished by the Contractor. The pressurization equipment including water piping and any chemicals for preservation, needed for the above test shall also be furnished by the Contractor. Any defect noticed during the testing shall be rectified and the unit shall be retested by the Contractor.</p> <p>In the case of branch connections/ tap-off piping (in others scope) from contractor's scope of piping are not ready or not erected at the time of hydrostatic testing of piping in contractor's scope, then the contractor to supply/use necessary blanking arrangement as required at these tap-off /branch connections. The hydraulic test shall be considered successful only on certification to that effect by the concerned inspecting authority as per the provision of the IBR and the Project Manager.</p>		
3.02.02	Air & Gas Tightness Test		
	<p>After completion of installation of furnace tubes and/or inner skin casing wherever applicable ducts and air heaters, and before commencement of application of thermal insulation a test shall be performed on the Steam Generator by the contractor to prove or to establish the tightness of the erected equipments from the outlet of FD fan through Steam Generator to the stack. Such test shall be done, as far as possible, with all mountings like soot blowers etc. installed in position. The procedure adopted for such tests shall have the prior approval of the Employer. Normally physical leak detection method by pressurizing the section under test by running FD Fan / PA Fan / Temporary blower, as the case may be, is adopted. The contractor may adopt any other better method of testing.</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2	SUB-SECTION- G-06 PRE-COMMISSIONING & COMMISSIONING ACTIVITIES	PAGE 2 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
3.02.03	<p>All equipments including any temporary blanking, if required, for the above test shall be provided by the Contractor.</p> <p>The Contractor's air and gas tightness test procedure shall be such that it shall enable conductance of air/gas tightness test on the ducts in segmented manner (as and when these duct segments are ready), so that these duct segments can be immediately released for application of insulation after their air/gas tightness tests. Contractor shall made all necessary arrangement for conducting tests in this manner. Any blanking etc. on the duct side required for testing of duct segments shall be provided by Contractor. Contractor shall bring fan / blower (s) of adequate size / capacity and other necessary instruments so that these tests can be conducted without necessity of FD / PA fans. The above equipment shall be brought to site by the Contractor on temporary basis and shall be taken back after successful completion of air / gas tightness test.</p> <p>Chemical Cleaning of Pressure Parts</p> <p>The Contractor shall perform thorough and efficient cleaning operations of all the internal parts of the boiler, like economiser, water wall / evaporator, separator, feed water line, piping, start-up recirculation lines and associated piping and all other pressure parts and associated high pressure piping covered under these specifications (except those portions which are to be steam blown).</p> <p>The cleaning operation shall consist of De-mineralised (DM) water flushing, the chemical cleaning using acids like hydrofluoric acid or as recommended by the manufacturer, DM water rinsing, DM water flushing, nitrogen capping etc. Complete chemical cleaning procedure, the scheme and layout including parameters of the pumps, size of tanks, materials of construction, the rate of consumption and total requirements of steam and water for such cleaning process shall have the approval of the Employer.</p> <p>The Contractor shall furnish all labour, materials such as the required chemicals and other consumables, all equipment such as acid/chemical transfer and acid/chemical circulating pumps complete with drive motors, acid storage and acid/chemical mixing tanks, all temporary piping, valves and specialities and local instruments for pressure, temperature and flow measurements and any other items needed to carry out the process. All equipment required for chemical cleaning of Steam Generator shall be supplied by the contractor.</p> <p>The Contractor shall take care to dispose off the used chemicals and the effluents from the cleaning operations, after neutralisation, meeting all the statutory regulations and in a manner acceptable to the Project Manager and which would comply with the norms of the State Pollution Control Board. This includes construction of suitable neutralization pit, channels, disposal equipments etc.</p> <p>The Contractor shall specifically make all necessary arrangements for prevention of any fire accidents, explosions etc. during the performance of the chemical cleaning operations. The Contractor shall ensure that during the cleaning process the procedure adopted shall be such as to consume minimum demineralized water.</p> <p>The cleaning procedure shall include final flushing and draining of the boiler under a nitrogen gas cap and/or filling the boiler with inhibited water or any other proven procedure recommended by the manufacturer for the preservation of the boiler which is acceptable to the Employer. The Contractor shall furnish a detailed procedure for boiler preservation during detailed engineering for Employer's approval.</p> <p>All equipment needed for such preservation including the nitrogen cylinders, interconnecting piping and any regulating equipment for N2 cap and other preservatives shall be provided by the Contractor for the Steam Generator and the same shall also become the property of the Employer after completion of the chemical cleaning.</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2	SUB-SECTION- G-06 PRE-COMMISSIONING & COMMISSIONING ACTIVITIES	PAGE 3 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
3.02.04	<p>The Contractor shall provide adequate safety and protective equipment for all his employees and ensure that they are worn at all times of danger. Specialized treatment equipment (such as required for first aid when using hydrofluoric acid/chemical) must be provided at the place of handling acid/chemical. An acid/chemical cleaning report and log of each cleaning must be provided by the Contractor to the Employer, immediately after the cleaning operation.</p> <p>Dry Preservation of non-drainable portion during shutdown to be provided.</p> <p>Steam Blowing</p> <p>Steam blowing of complete Superheaters, Reheaters and various boiler external piping and non boiler external piping shall be carried out by the Contractor as per requirements/scope of work (indicated in Part-A & Part-B, Section-VI) of this specification. Temporary materials as required for steam blowing of these piping systems shall be supplied by the contractor.</p> <p>Steam blowing of contractor's scope of piping systems shall be performed without valves/control valves supplied in steam blowing circuit otherwise valve supplier's acceptance to include these valves for steam blowing operation is to be submitted by the contractor. Based on the above the Contractor shall give recommended procedures, method of blowing and scheme for steam blowing indicating clearly additional system, if any, to be cleaned by steam blowing and furnish data/ write-up/ layouts/ drawings to that effect to the Employer for approval.</p> <p>The Contractor shall furnish his recommendations regarding use of various test equipments and instruments and termination/acceptance criteria for steam blowing, which in any case shall meet the steam turbine-generator requirements.</p> <p>The systems which should be ready and operational before steam blowing shall be made ready/operational by the Contractor by the scheduled date for starting of steam blowing.</p> <p>For equipments/components installed on high pressure external piping, such as various thermo-wells, flow meter, control valves, HP/LP Bypass valves etc., the Contractor shall comply with guidelines to be followed during steam blowing, with respect to removal / blanking / replacement of such items their internals etc. by spool pieces as given by the respective manufacturer/sub-contractor.</p> <p>Supply of all such spools (as above) and/or blanks, temporary piping and supports etc. as required, cutting / welding / edge preparation and rewelding required for blanking, temporary piping connection and/or for replacements by spool pieces shall be the responsibility of the Contractor. After steam blowing removal of spool pieces & temporary piping and reinstallation of various components, shall also be the responsibility of the Contractor.</p> <p>In the case of branch connections/ tap-off piping are not ready or not erected at the time of steam blowing operation then the contractor to supply/use necessary blanking arrangement as required at these tap-off / branch connections.</p> <p>It will be the responsibility of the Contractor to operate the Steam Generator and its accessories equipment to generate adequate steam at the parameter and quality in line with the requirements of steam blowing procedure. The Contractor shall make adequate provisions for temporary enhancement of fuel oil firing capacity of the steam generators by changing oil gun tips etc. as may be required so as to be able to conduct complete steam blowing operation by oil firing alone. All necessary precautions to avoid fires and cold end corrosion of Air preheater, during such oil firing at enhanced SG loads, shall be taken by the Contractor.</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2	SUB-SECTION- G-06 PRE-COMMISSIONING & COMMISSIONING ACTIVITIES	PAGE 4 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p>The Contractor shall ensure successful and timely completion of steam blowing of all systems and will render all help/services as required including:</p> <ul style="list-style-type: none"> (i) Services of test/operating personnel/supervisors. (ii) Extending all cooperation during erection, pre-commissioning of plant and equipment to be made ready and operational before starting steam blowing. (iii) Extending all cooperation for interface engineering of equipments/components of temporary system required for steam blowing operation. (iv) Contractor's engineers shall be available for all coordination meetings arranged by the Employer for finalizing the details of temporary system for steam blowing. <p>For the steam blowing operation, steam conditions like pressure, temperature etc. at the Steam Generator outlet shall be so selected that a minimum cleaning ratio/ disturbance factor of more than 1.4 is achieved. A cycle of heating, cooling and blowing/ purging, is to be repeated to ensure thorough cleaning of the interior of the pipes/ tubes etc. The final indication of cleanliness shall be demonstrated by purging through target plates positioned at the discharge point.</p> <p>3.02.05 SCR SYSTEM</p> <p>Complete pre-commissioning work including tests of facilities such as pressure drop test of SCR system and all other tests as mutually agreed in the Contractor's quality assurance program as well as those identified in the specification.</p> <p>3.02.06 ESP</p> <p>Complete pre-commissioning work including tests of facilities such as air and gas tightness tests of ESP, pressure drop test of ESP, gas distribution test of ESPs etc. and all other tests as mutually agreed in the Contractor's quality assurance program as well as those identified in the specification.</p> <p>3.02.07 FGD System</p> <p>3.02.07.01 Air and Gas Tightness Test</p> <p>After completion of installation of Booster fans (if required), ducts & absorber, and before commencement of application of thermal insulation a test shall be performed on the FGD system by the contractor to prove or to establish the tightness of the erected equipments. The procedure adopted for such tests shall have the prior approval of the Employer. Normally physical leak detection method by pressurizing the section under test by running Temporary blower is adopted. The contractor may adopt any other better method of testing.</p> <p>All equipments including any temporary blanking, if required, for the above test shall be provided by the Contractor.</p> <p>The Contractor's air and gas tightness test procedure shall be such that it shall enable conductance of air/gas tightness test on the ducts in segmented manner (as and when these duct segments are ready), so that these duct segments can be immediately released for application of insulation after their gas tightness tests. Contractor shall made all necessary arrangement for conducting tests in this manner. Any blanking etc. on the duct side required for testing of duct segments shall be provided by Contractor. Contractor shall bring fan / blower (s) of adequate size / capacity and other necessary instruments so that these tests can be conducted. The above equipment shall be brought to site by the Contractor on</p>		
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
<p>3.02.07.02</p> <p>3.02.08</p> <p>3.03.00</p> <p>3.03.01</p> <p>3.03.02</p> <p>3.03.03</p>	<div style="text-align: right; border: 1px solid black; padding: 2px; width: fit-content; margin-bottom: 10px;">  </div> <p>temporary basis and shall be taken back after successful completion of air / gas tightness test.</p> <p>All pre-commissioning tests & activities as indicated in Annexure-I, II & III and elsewhere in the technical specification shall be performed by the Contractor.</p> <p>Any other pre-commissioning activity such as floating of safety valves etc. as considered essential for readiness of facilities for commencement of commissioning activities shall also be undertaken by the Contractor.</p> <p>Demonstration/Acceptance tests during Commissioning/Initial Operation</p> <p>The following tests shall be demonstrated during commissioning for which the bidder has to furnish the procedure and get the approval of the employer:</p> <p>Unit Load Ramp rate capability test: Demonstration of $\pm 3\%$ per minute ramp rate for 50% to 100% load range and minimum $\pm 1\%$ per minute below 50% load to minimum boiler once through load, maintaining the parameters within prescribed limits as defined in closed loop control system requirements (Refer Functional Guarantee Chapter).</p> <p>Start-up, Loading, Unloading and Shutdown Capabilities (For Turbine Generator)</p> <p>(i) Unit Start Up</p> <p>Start-up time (upto full load), and loading capabilities for the Turbine Generator together for cold start conditions (greater than 36 hours shutdown), warm start conditions (between 8 and 36 hours shutdown) and hot start conditions (less than 8 hours shutdown) as indicated by the Contractor in the offer and accepted by the EMPLOYER shall be demonstrated, ensuring that the various turbine operational parameters like vibration, absolute and differential expansion, eccentricity and steam-metal temperature mismatch etc. are within design limits.</p> <p>(ii) Sudden Total Loss of External Load</p> <p>On occasions, the steam turbine generator unit may experience sudden total loss of all external load. Under these conditions, the steam turbine generator unit shall not trip but shall continue to be in operation under the control of its speed governor to supply power for the plant auxiliary load with HP-LP bypass in operation while staying within the agreed limits of steam to metal temperature mismatch, exhaust hood temperature, absolute and differential expansion, vibration and eccentricity. The same shall be demonstrated. Further, the provisions of Part-B, Section-VI, shall also be complied with.</p> <p>(iii) Steam Metal Temperature Mismatch Limitation</p> <p>The steam-metal temperature differential for cold, warm and hot start up, loading / unloading and shutdown conditions shall be within the permissible limits indicated by the Bidder in the offer and accepted by the Employer.</p> <p>Turbine Generator Set Capability</p> <p>The steam turbine generator unit shall be capable of delivering at generator terminals the output as indicated by the BIDDER in the heat balances submitted along with his bid, under the following condition.</p> <p>(a) Maximum continuous output at generator terminals corresponding to both strings of HP heaters out of service, under rated steam conditions, at condenser pressure of</p>	<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2</p>	<p>SUB-SECTION- G-06 PRE-COMMISSIONING & COMMISSIONING ACTIVITIES</p> <p>PAGE 6 OF 14</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
3.03.04	<p>89 mmHg(Abs) and 3% make-up & Aux. Steam requirement tapped from CRH, generating not less than the rated output OR output corresponding to design BMCR heat duty, whichever is less without overstressing turbine components.</p> <p>NOTE: While conducting the tests of (a) above the condenser pressure measurement shall be done at 300mm above the top row of condenser tubes .</p> <p>Turbine Auxiliaries</p> <p>(i) H.P./L.P. Bypass Capabilities</p> <p>The HP & LP Bypass system should satisfy the following functional requirements under automatic interlock action. It should come into operation automatically under the following conditions:</p> <ul style="list-style-type: none"> (a) Generator circuit breaker opening. (b) HP - IP stop valves closing due to turbine tripping. (c) Sudden reduction in demand to house load. <p>Under all these conditions, while passing the required steam flows as per the relevant heat balances, the condenser should be able to swallow the entire steam without increasing the exhaust hood temperature and condenser pressure beyond the maximum permissible value indicated by the BIDDER in his offer and accepted by the EMPLOYER. The same shall be demonstrated.</p> <p>(ii) Steam Condensing Plant for main turbine</p> <ul style="list-style-type: none"> (a) Temperature of condensate, at outlet of condenser, shall not be less than saturation temperature corresponding to the condenser pressure at all loads. (b) Oxygen content in condensate, at condensate collection tank outlet, shall not exceed 0.015 CC per litre over the entire load range and shall be determined according to calorimetric Indigo - Carmine method. (c) Air leakage in the condenser under full load condition shall not exceed more than 50% of design value taken for sizing the condenser air evacuation system. (d) When one half of the condenser is isolated, condenser shall be capable of taking at least 60% T.G. load under EMCR conditions. (e) The capacity of each vacuum pump in free dry air under standard conditions at a condenser pressure of 25.4 mm Hg (abs) and sub cooled to 4.17 deg.C below the temperature corresponding to absolute suction pressure shall not be less than specified elsewhere. Correction curves for establishing the capacity at site conditions shall also be furnished. (f) The air and vapour mixture from air cooling zone of condenser shall be 4.17 deg.C below the saturation temperature corresponding to 25.4 mm Hg (abs) suction pressure. Correction curves for establishing the same at site conditions shall also be furnished. 		
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CLAUSE NO.	<div style="text-align: center;">TECHNICAL REQUIREMENTS</div> <div style="text-align: right;"></div>		
3.03.05	<p>(iii) Feed water heaters & Deaerator</p> <p>(a) TTD's and DCA's of feed water heaters in line with 660 MW TMCR heat balance shall be demonstrated.</p> <p>(b) Dissolved O₂ content in Deaerator effluent at deaerator outlet without chemical dosing at all loads, not to exceed 0.005 CC/ litre determined as per ASTM-D-5543-09 or Indigo Carmine method.</p> <p>(c) Difference between saturation temperature of steam entering the deaerator and temperature of feed water leaving deaerator.</p> <p>(iv) Condensate Extraction Pumps</p> <p>The vibration, noise level and parallel operation of any two of the three pumps shall be demonstrated.</p> <p>(v) Drip Pumps (if envisaged)</p> <p>The vibration and noise level shall be demonstrated.</p> <p>(vi) Boiler feed pumps</p> <p>(a) The vibration, noise level and parallel operation of any two of the three pumps shall be demonstrated as per specification requirements.</p> <p>(b) Cold start up / hot start up of the unit using TDBFP with motive steam from auxiliary steam header.</p> <p>(vii) Turbine hall and other EOT Crane:</p> <p>Over load test, travel & hoist speed checks etc., shall be demonstrated as per IS: 3177 (latest edition).</p> <p>Balance Pumps, Blowers, Fans, Compressors and rotating equipment.</p> <p>a) The vibration, noise level and parallel operation, wherever applicable, of the pumps, blowers, fans, compressors and rotating equipment shall be demonstrated.</p> <p>b) Pumps, blowers, fans, compressors and rotating equipment shall be capable of delivering flow and head corresponding to design point as specified.</p>		
3.03.06	<p>Balancing of Coal/Primary air flow</p> <p>Contractor shall balance the primary air as well as coal flows in the pulverised fuel pipes such that the minimum PF and PA flow imbalance in the PF pipes from each coal pulveriser does not exceed 5% of average flows.</p> <p>The above balancing shall be checked by the Contractor by carrying out both clean air test and dirty air test (using dirty pitot tubes).</p>		
3.03.07	<p>Demonstration of boiler operation, rate of change of load and sudden load change withstand capability</p> <p>Refer Sub section-A-02 and A-03 ,Part-B (Mechanical), Section VI of Technical Specification.</p>		
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2</p>	<p style="text-align: center;">SUB-SECTION- G-06 PRE-COMMISSIONING & COMMISSIONING ACTIVITIES</p>	<p style="text-align: center;">PAGE 8 OF 14</p>

CLAUSE NO.	<div style="text-align: center;">TECHNICAL REQUIREMENTS</div> 		
3.03.08	<p>Steam Temperature Imbalance</p> <p>The Contractor shall demonstrate that at SH and RH outlets (in case of more than one outlet) the temperature imbalance between the outlets does not exceed 10 deg C under all loads including transients.</p>		
3.03.09	<p>No fuel oil support shall be required above 40% BMCR</p> <p>Contractor shall demonstrate that oil support for flame stabilization shall not be required beyond 40% of BMCR load when firing the coals from the range identified. The Contractor shall demonstrate that with any combination of mills/ adjacent mills in service (to Employer's choice) the Steam Generator does not require any oil firing for stable and efficient boiler operation at and above 40% BMCR loads.</p>		
3.03.10	<p>Capabilities of all drives</p> <p>After completion of installation of drives, contractor shall demonstrate the capability of all drives as specified elsewhere in Section VI Part B of Technical Specifications.</p>		
3.03.11	<p>Margin on Fans</p> <p>After completion of installation of fan drives, Fans, inlet and outlet ducting, measuring equipments etc. contractor shall demonstrate the margin on seal air fans, primary fans, Forced draft fans and induced draft fans as specified elsewhere in Section VI Part B of Technical Specifications.</p>		
3.03.12	<p>Cold Air Velocity Test (CAVT)</p> <p>A CAVT shall be conducted on each Steam Generator during commissioning before its initial operation to establish the average cold air velocity and the velocity distribution at minimum three predetermined sections (Employer's Choice) of steam generator. The data obtained from the CAVT will be used to compute the actual flue gas velocities as well as their distribution at the test sections during actual operation by correlating the CAVT data with the test/computed data from Thermal Performance Test as per Clauses 1.03.04 (iii) sub section-IV, Section-VI- Part-A. Should the CAVT results after this correlation with TPT data indicate actual localized high flue gas velocity zones/ mal-distribution of gas flow and/or flue gas laning, suitably designed stainless steel screens at required SG cross sections shall be provided by the Contractor to bring the deviation of the localized gas velocity within $\pm 20\%$ of average gas velocity specified. Through this test the Contractor shall also demonstrate the compliance with the specification requirements regarding the maximum allowable flue gas velocities at various sections of the Steam Generator, refer sub-section-A-03, Part-B of Technical Specifications.</p> <p>The detailed CAVT procedure shall be to Employer's approved. The Contractor shall submit a detailed CAVT report and the computations of actual velocities after correlating CAVT data with TPT data to the Employer for approval.</p>		
3.03.13	<p>Capabilities of firing of 30% imported coal</p> <p>Contractor shall demonstrate the capability of Steam generator and its auxiliaries to operate at rated parameters safely and on sustained basis at TMCR load while firing range of Indian coal(s) as specified in Table-1(A), Annexure-IV-2 ,sub section-IB ,Part-A of Section-VI blended with imported coal up o 30% by weight specified in Table-4, Annexure-IV-4, sub section-IB ,Part-A, Section-VI. Such demonstration shall be for 72 hours of continuous operation</p>		
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2</p>	<p style="text-align: center;">SUB-SECTION- G-06 PRE-COMMISSIONING & COMMISSIONING ACTIVITIES</p>	<p style="text-align: center;">PAGE 9 OF 14</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS			
3.03.13 a)	Performance characteristic of fans (PA/FD/ID fan capacity, head developed, etc.)			
3.03.14	Passenger & good elevators for steam generator – overload tests, travel and hoist speed checks.			
3.03.15	ESP Air in Leakage Contractor shall demonstrate that ESP air in leakage shall be limited to 1% of the total gas flow under guarantee point condition.			
3.03.16	Pressure Drop Across ESP Contractor shall demonstrate that the maximum flue gas pressure drop across the ESP under specified guarantee point condition shall not exceed 20 mmwc.			
3.03.17	FGD System (i) Performance characteristics of fans (capacity, head developed, etc.) and margins on fans in case Booster Fan, as specified in Part-B of technical specification, is provided by the Contractor. (ii) Capabilities of all drives (Refer Part B of Technical Specifications) (iii) Passenger cum Goods Elevator for FGD absorber & Limestone Grinding Building: Over load tests, travel and hoist speed checks.			
3.03.18	Unit startup/shutdown demonstration as per combined startup curves for cold, warm and hot conditions.			
3.03.19	Fire Detection and Protection System a) Following shall be demonstrated at Site: i) Vibration & Noise level of fire water pumps. ii) Performance test of each of systems such as Hydrant, HVW Spray, MVW Spray, Foam Injection system, Inert gas extinguishing system, fire detection and alarm system, Fire extinguishers and Fire monitors as per the design parameters/standards/TAC. iii) Parallel Operation, vibration & noise level of the fire water pumps and diesel engines. b) All tests as required by the TAC.			
3.04.00	Pre-commissioning & Commissioning activities requiring approval of the employer: (a) Hydraulic Test for STG integral piping, heat exchangers, condenser tubes & condenser, equipment cooling water system pipes and associated equipment etc. shall be done. The hydraulic test of other piping system as per statutory requirement and specified elsewhere shall also be carried out. All equipment needed for the tests shall be furnished by the Contractor. (b) Oil flushing of lube oil system, control & jacking oil system, etc. for turbines shall be done. Entire flushing oil requirement & refilling with fresh oil and other consumables along with flushing equipment shall be met by the Contractor.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p>(c) High Pressure/Low Pressure (HP/LP) bypass tests, vacuum tightness test as per approved procedures shall be done by the Contractor after arranging & lining up of all the necessary equipment by him.</p> <p>(d) Steam blowing & chemical cleaning, as applicable of integral piping of the turbo-generator, Low pressure piping, Power cycle piping & other piping in the scope of the Contractor shall be done by the Contractor.</p> <p>(e) Steam blowing & chemical cleaning, as applicable of integral piping of CEP sets & other piping in the scope of the Contractor shall be done by the Contractor.</p> <p>(f) All tests and activities pertaining to the CEP and its drive as per manufacturer's recommendations and as given in the chapter and covered in the specification.</p> <p>(g) Steam blowing & chemical cleaning, as applicable of integral piping of Drip Pump sets & other piping (if applicable) shall be done by the Contractor.</p> <p>(h) All tests and activities pertaining to the Drip Pump and its drive (if applicable) as per manufacturer's recommendations and as given in the chapter and covered in the specification.</p> <p>(i) Steam blowing & chemical cleaning, as applicable of integral piping of the Heaters & other components shall be done by the Contractor.</p> <p>(j) All tests and activities pertaining to the Heater as per manufacturer's recommendations and as given in the chapter and covered in the specification.</p> <p>(k) Oil flushing of lube oil system, control & jacking oil system, for BFP sets shall be done. Entire flushing oil requirement & refilling with fresh oil and other consumables along with flushing equipment shall be met by the Contractor.</p> <p>(l) Steam blowing & chemical cleaning, as applicable of integral piping of BFP sets & other piping shall be done by the Contractor.</p> <p>(m) All tests and activities pertaining to the BFP and its drive as per manufacturer's recommendations and as given in the chapter and covered in the specification.</p> <p>(n) Hydraulic Test for all low and high pressure piping, equipment cooling water system pipes and associated equipment etc. shall be done as per statutory requirement and specified elsewhere shall be carried out. All equipment needed for the tests shall be furnished by the Contractor.</p> <p>(o) All tests and activities pertaining to the Generator and Excitation as per manufacturer's recommendations and covered in the specification.</p> <p>(p) All tests and activities pertaining to the Generator Auxiliaries viz Primary water system, Seal oil system, Gas system etc., as per manufacturer's recommendations and covered in the specification.</p> <p>(q) Any other pre-commissioning checks/ tests and activities as described below and also those mutually agreed between the Contractor & the Employer shall be undertaken.</p>		
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CLAUSE NO.	TECHNICAL REQUIREMENTS				
3.05.00	<p>COMMISSIONING OF FACILITIES General</p> <p>Upon completion of pre-commissioning activities/test the Contractor shall initiate commissioning of facilities. During commissioning the Contractor shall carryout system checking and reliability trials on various parts of the facilities.</p> <p>Contractor shall carry out these checks/tests at site to prove to the Employer that each equipment of the supply complies with requirements stipulated and is installed in accordance with requirements specified. Before the plant is put into initial operation the Contractor shall be required to conduct test to demonstrate to the Employer that each item of the plant is capable of correctly performing the functions for which it was specified and its performance, parameters etc. are as per the specified/approved values. These tests may be conducted concurrently with those required under commissioning sequence.</p> <p>The Contractor shall finalize the protocol of check lists, after erection of the system and equipment, as per International Codes/Standard with the Employer.</p> <p>The Contractor shall furnish requisite no. of copies of procedures and list of start up, pre-commissioning, commissioning and initial operation tests for Employer's approval.</p> <p>The Contractor shall also demonstrate the performance of all C&I equipment, the tests on main equipment or prior to that as the case may be.</p> <p>Other tests shall be conducted, if required by the Employer, to establish that the plant equipments are in accordance with requirements of the specifications.</p>				
3.05.01	<p>The Commissioning tests/checks shall specifically include but will not be limited to following:</p> <ul style="list-style-type: none"> (a) Checks on the operation of all controls of isolating gas and air dampers. (b) Checks on operation of all fans and all rotating equipment to ascertain level of noise and vibration. (c) Test running of all pumps. (d) Checks on operation of all air heaters and adjustment of seals, if necessary when each heater is upto its working temperature. (e) Checks on operation of all soot blowers and retraction gear and the sequences control. (f) Check run on the Pulverised Fuel (P.F.) Mills including clean air flow test. (g) Standard commissioning tests and procedures as per Contractor's practice for Steam Generator, SCR System, FGD System and other equipment / auxiliaries. (h) Checks on operation of all individual control loops in the Steam Generator control loops in the Steam Generator control system including SCR & FGD System. (i) Checks on inter-relation between each control loop in the Steam Generator control system including SCR & FGD system. Checks on inter-relation between each control loop in the turbine generator control system. (j) Checks on correct functioning of the Burner Management System (BMS). 				
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
3.05.02	<p>(k) Calibration tests of orifice, flow nozzles, instruments and control equipment to the extent included in these specifications.</p> <p>(l) Tests on Control & Instrumentation (C&I) Equipments:</p> <p>LIST OF TEST / ACTIVITIES TO BE PERFORMED ON TG & AUXILIARY (but not limited to following)</p> <p>A) COMMISSIONING TESTS/CHECKS</p> <ol style="list-style-type: none"> 1. Test running of all pumps 2. Condenser vacuum test, feed water heater operational tests for establishing correct cascaded flow, heater water levels etc. & checking of all parameters as per approved heat balance diagrams. 3. Test for HP/LP bypass valves operation & their control system. 4. Test for operation of governing control system for turbines. 5. Standard commissioning tests and procedures as per Contractor's practice for steam turbine generator and other equipment / auxiliaries within the Contractor's scope of work. 6. Checks on operation of all individual control loops in the turbine generator control system. 7. Checks on correct functioning of the Turbine Protection System (TPS), Turbine Supervisory Control System (TSCS) for main turbine, Automatic Turbine Run-up System (ATRS), Automatic Testing of Turbine (ATT). 8. Standard commissioning tests and procedures as per Contractor's practice for CEP and other equipment / auxiliaries within the Contractor's scope of work. 9. Checks on operation of all individual control loops in the CEP control system. 10. Standard commissioning tests and procedures as per Contractor's practice for Drip Pump (if applicable) and other equipment / auxiliaries within the Contractor's scope of work. 11. Checks on operation of all individual control loops in the Drip Pump control (if applicable) system. 12. Feed water heater operational test for establishing correct cascaded flow, heater water levels and checking of all parameters as per approved heat balance diagram. 13. standard commissioning tests and procedures as per contractor's practice for heaters and de-aerator and other equipment/auxiliaries within the contractor's scope of work. 14. Checks on operation of all individual control loops in the heater and deaerator control system. 15. Test for operation of governing control system for BFP turbines. 16. Standard commissioning tests and procedures as per Contractor's practice for BFP and other equipment / auxiliaries within the Contractor's scope of work. 17. Checks on operation of all individual control loops in the BFP control system. 18. Checks on correct functioning of the BFP Turbine for Turbine Protection System (TPS), Turbine Supervisory Control System (TSCS) for main turbine, Automatic Turbine Run-up System (ATRS), Automatic Testing of Turbine (ATT). 19. Calibration tests of orifice, flow nozzles, instruments and control equipment to the extent included in these specifications. 20. Checks on operation of all rotating equipments to ascertain level of noise and vibration 			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2	SUB-SECTION- G-06 PRE-COMMISSIONING & COMMISSIONING ACTIVITIES	PAGE 13 OF 14	

CLAUSE NO.	TECHNICAL REQUIREMENTS 			
<p>3.06.00</p> <p>4.00.00</p> <p>5.00.00</p> <p>6.00.00</p> <p>7.00.00</p> <p>8.00.00</p> <p>8.01.00</p> <p>8.02.00</p>	<p>21. Checks on operation of all static equipments to ascertain level of noise and vibration</p> <p>22. Standard commissioning tests and procedures as per manufacturer's practice for Generator, Excitation and its auxiliaries within the Contractor's scope of work.</p> <p>Balance of Plant equipment & systems</p> <p>All pre-commissioning tests & activities as required for successful running of the equipment or as mentioned in the technical specification elsewhere shall be performed by the contractor.</p> <p>INITIAL OPERATION</p> <p>Upon completion of system checking/tests and as a part of commissioning of facilities, complete plant/facilities shall be put on initial operation for a period of thirty (30) days or 720 hours as stipulated in General Technical Requirements.</p> <p>The Contractor shall conduct all the commissioning tests and undertake commissioning activities pertaining to all other auxiliaries and equipments including all Electrical & C&I equipment/systems not specifically brought out above but are within the scope of work and facilities being supplied & installed by the Contractor and follow the guidelines indicated above or elsewhere in these technical specifications (Section-VI).</p> <p>The Contractor shall conduct the comprehensive guarantee tests on the Steam Generator in co-ordination with the Steam Generator to establish the functional guarantee values at stipulated conditions as per Sub-section-IV, Part-A, Section-VI.</p> <p>The Contractor shall conduct all the commissioning tests and undertake commissioning activities pertaining to all other auxiliaries and equipments including all Electrical & C&I equipment/systems not specifically brought out above but are within the scope of work and facilities being supplied & installed by the Contractor and follow the guidelines indicated above or elsewhere in these technical specifications (Section-VI).</p> <p>COMMISSIONING SPARES</p> <p>It will be the responsibility of the Contractor to provide all commissioning spares including consumable spares required for initial operation till the Completion of Facilities. The Contractor shall furnish a list of all commissioning spares within 60 days from the date of Notification of Award and such list shall be reviewed by the Employer and mutually agreed to. However, such review and agreement will not absolve the Contractor of his responsibilities to supply all commissioning spares so that initial operation do not suffer for want of commissioning spares. All commissioning spares shall be deemed to be included in the scope of the Contract at no extra cost to the Employer.</p> <p>These spare will be received and stored by the Contractor at least 3 months prior to the schedule date of commencement of initial operation of the respective equipment and utilized as and when required. The unutilized spares and replaced parts, if any, at the end of successful completion of guarantee tests shall be the property of the Contractor and he will be allowed to take these parts back at his own cost with the permission of Employer.</p>	<p>TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2</p>	<p>SUB-SECTION- G-06 PRE-COMMISSIONING & COMMISSIONING ACTIVITIES</p>	<p>PAGE 14 OF 14</p>
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>		<p>TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2</p>	<p>SUB-SECTION- G-06 PRE-COMMISSIONING & COMMISSIONING ACTIVITIES</p>	<p>PAGE 14 OF 14</p>

CLAUSE NO.	<div style="text-align: right;">  </div> TECHNICAL REQUIREMENTS		
	<p style="text-align: right;">ANNEXURE-I</p> <p style="text-align: center;"><u>STANDARD CHECKLIST</u></p> <p>This is an indicative list of items. The actual list shall depend on the Equipment / System being supplied by the contractor.</p> <p style="text-align: center;"><u>MECHANICAL</u></p> <p><u>VALVES</u></p> <ol style="list-style-type: none"> 1. Manually Operated Valve 2. Electrically Operated Valve 3. Pneumatically Actuated Valve 4. Hydraulically Actuated Valve 5. Safety Valve 6. Electromatic Relief Valve 7. Steam Trap 8. Non Return Valve (including Hydraulic/ Pneumatic QCNRVS) 9. Control Valve 10. Relief Valve 11. Differential Pressure Regulating Valve 12. One spare EOTV for steam blowing <p><u>TANKS & PRESSURE VESSELS</u></p> <ol style="list-style-type: none"> 1. Tanks (metal) up to 20 M³ 2. Tanks (Large Storage) 3. Pressure Vessel (Below 17 bars) 4. Air Receiver 5. Pressure Vessel – Access Door <p><u>PUMPS</u></p> <ol style="list-style-type: none"> 1. Pump-Low Pressure Centrifugal (Motor driven) 2. Pump-Up to 350HP 3. Pump-Sump installation 4. Gear Pump/Screw pump <p><u>PIPE WORK SYSTEM</u></p> <ol style="list-style-type: none"> 1. Steam services 2. Water services 3. Oil / Fire Resistant fluid system 4. Air services (Compressor) 5. High pressure services 6. Constant load support 		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2	SUB-SECTION-G-06 PRE-COMMISSIONING AND COMMISSIONING ACTIVITIES-ANNEXURE-I	PAGE 1 OF 4

CLAUSE NO.	<div style="text-align: right;"></div> TECHNICAL REQUIREMENTS		
	<p>7. Spring supports</p> <p>8. PF Coal</p> <p>9. Hangers and other Supports</p> <p><u>STRAINER AND FILTER</u></p> <p>1. Strainer / Filter Basket Type</p> <p>2. Strainer Rotary (Low Pressure)</p> <p>3. Filter & Strainers Centrifugal Separators</p> <p>4. Filter & Strainer Y-Type</p> <p>5. Filter & Strainer (Plate Type)</p> <p>6. Purifier</p> <p>7. Filter – Compressed Air Line</p> <p><u>HEAT EXCHANGER</u></p> <p>1. Heat Exchanger (General)</p> <p>2. Heat Exchanger – Oil / Water</p> <p>3. Rotary Air Heater</p> <p><u>FANS & COMPRESSORS</u></p> <p>1. Fans –Non-Pressure Lubricated</p> <p>2. Fans – Axial Flow pressure Lubricated</p> <p>3. Compressors-General</p> <p><u>DAMPERS & GATES</u></p> <p>1. Manually Operated Damper</p> <p>2. Pneumatically Operated Damper</p> <p>3. Electrically Operated Damper</p> <p>4. Manually Operated Gates</p> <p>5. Pneumatically Operated Gate</p> <p>6. Electrically Operated Gate</p> <p><u>DUCT WORK</u></p> <p>1. Boiler Flue Ducting</p> <p>2. Expansion Joints</p> <p>3. Observation & Access Door</p> <p><u>CRANES AND ELEVATORS</u></p> <p>1. Auxiliary Overhead Crane</p> <p>2. Travel Support Structure for Crane</p> <p>3. Long Travel & Cross Traverse Motion of Crane</p> <p>4. Main Aux. Hoist Motion (Crane)</p> <p>5. Crane Electric Hoist</p>		
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2</p>	<p style="text-align: center;">SUB-SECTION-G-06 PRE-COMMISSIONING AND COMMISSIONING ACTIVITIES-ANNEXURE-I</p>	<p style="text-align: center;">PAGE 2 OF 4</p>

CLAUSE NO.	<div style="text-align: right;"></div> TECHNICAL REQUIREMENTS		
	<p><u>POWER TRNAMISSION</u></p> <ol style="list-style-type: none"> 1. Power Transmission Gear Box 2. Bearings 3. Fluid Couplings <p><u>BOILER & AUX.SYSTEM</u></p> <ol style="list-style-type: none"> 1. Soot Blower Long Retractable 2. Wall Deslagger/Soot Blower 3. Bottom Ash Hopper 4. Fly Ash Hopper 5. Lubricator –Compressed Air Lines 6. Wind Box Assembly 7. Mixer / Stirrer 8. Compressed Air Breathing Apparatus 9. Oil Burner 10. Ignitors 11. Scanner 12. Manual Lubricators 13. Air Motor 14. Driers-Non Regenerative /Regenerative 15. Coal Bunker <p><u>ELELCTRICAL</u></p> <ol style="list-style-type: none"> 1. D.C. Motor 2. HV Squirrel Cage Induction Motor 3. 415 V Squirrel Cage Induction Motor 4. Motor Operated Actuators 5. Soot Blower (Deslagger) 6. Soot Blower (Long Retractable) 7. Soot Blower (Air Heater) 8. Aux. Control and Relay Panel Desk <p><u>CONTROL & INSTRUMENTATION</u></p> <ol style="list-style-type: none"> 1. Conductivity Measuring Equipment Including Test Procedures 2. pH Analyser Including Test procedure 3. Level Switch (Float Actuated) 4. Level Switch (Displacer Actuated) 5. Transmitter (Float Operated Pneumatic Output including Testing procedures) 6. Level indicator (Float/Pulley Type) 		
<p style="text-align: center;">TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2</p>	<p style="text-align: center;">SUB-SECTION-G-06 PRE-COMMISSIONING AND COMMISSIONING ACTIVITIES-ANNEXURE-I</p>	<p style="text-align: center;">PAGE 3 OF 4</p>

CLAUSE NO.	<div style="text-align: right;"></div> TECHNICAL REQUIREMENTS		
	<ol style="list-style-type: none"> 7. Local Temperature Indicator Including Test Procedure 8. Resistance Thermometer Element Including Test procedure 9. Thermocouple Element and Connecting Cable 10. Thermocouple and Resistance Thermometer Convertor/Transmitter Including Test Procedures 11. Temperature Switch Including Test Procedure 12. Cold Junction Boxes 13. O₂Analyser 14. O₂ in Hydrogen including Test procedures 15. Pressure and Vacuum Switch Including Test procedures 16. Differential Pressure Transmitter including Test Procedures 17. Differential pressure switch including Test procedures 18. Flow indicator (Variable Area) 19. Orifice plate 20. Flow Switch 21. Nozzle 22. Flow indicator (Float Operated) Including Test Procedure 23. Venturi (Fluid) 24. Flow Switch (Magnetic Type) 25. Limit Switches 26. Position Measurement & Indication Including Test procedures 27. Vibration Measurement 28. Digital Indicator 29. Moving Coil Indicator Including Test Procedures 30. Recorder Including Test procedure 31. Flame Scanner 32. Electrical Auto Manual Control Station 33. Push Button Module 34. Test Procedure for Electronic Modules of DDCMIS 35. Thermo Control Valve 36. Test procedure for Adjustment of Modulating Controller-PID Term 37. Test Procedure Indicating Controller-Electrical Input & Pneumatic Output 		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-001A-2	SUB-SECTION-G-06 PRE-COMMISSIONING AND COMMISSIONING ACTIVITIES-ANNEXURE-I	PAGE 4 OF 4

CLAUSE NO.

TECHNICAL REQUIREMENTS



ANNEXURE-II

COMMISSIONING PROCEDURES

Following is an indicative list of equipments / systems for which Testing / Commissioning procedures are to be submitted. The actual list will depend on the equipment / system being supplied by the Contractor.

S. No	DESCRIPTION
1.	ID Fan
2.	FD Fan
3.	PA Fan
4.	Air Heater
5.	Scanner Air Fans
6.	Fuel Firing System
7.	Milling System
8.	Soot Blower System
9.	Aux. Steam System
10.	Mill Reject Handling System
11.	HP Bypass System
12.	S.A.D.C. and its control
13.	Boiler Chemical Analysis Equipment
14.	SH / RH Spray system
15.	Chemical Dosing System
16.	Boiler Air and Gas System -Interlock Operation

TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)
EPC PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI, PART-B
BID DOC NO.: CS-4540-001A-2

SUB-SECTION-G-06
PRE-COMMISSIONING
AND COMMISSIONING
ACTIVITIES-ANNEXURE-II

PAGE 1 OF 1

CLAUSE NO.	<div style="text-align: right;"></div> TECHNICAL REQUIREMENTS																						
	<p style="text-align: right;">ANNEXURE-III</p> <p style="text-align: center;">COMMISSIONING PROCEDURES REQUIRING APPROVAL OF EMPLOYER</p> <table border="1"> <thead> <tr> <th>S.NO.</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Boiler Hydraulic Test and Preservation</td> </tr> <tr> <td>2.</td> <td>Boiler Chemical Cleaning</td> </tr> <tr> <td>3.</td> <td>Air and Gas Tightness Test of Furnace, Ducts etc.</td> </tr> <tr> <td>4.</td> <td>Steam Blowing of Boiler including Interconnecting Pipe Lines of Boiler, Turbine, Aux. Steam Header and Steam Supply lines.</td> </tr> <tr> <td>5.</td> <td>Steam Blowing and Oil Flushing of Fuel Oil System</td> </tr> <tr> <td>6.</td> <td>Clean Air Flow Test of Coal Pipes</td> </tr> <tr> <td>7.</td> <td>Oil Flushing of Lub Oil System of Rotary Equipments</td> </tr> <tr> <td>8.</td> <td>Cold Air Velocity Test</td> </tr> <tr> <td>9.</td> <td>Flushing of HP Bypass system oil lines</td> </tr> </tbody> </table>			S.NO.	DESCRIPTION	1.	Boiler Hydraulic Test and Preservation	2.	Boiler Chemical Cleaning	3.	Air and Gas Tightness Test of Furnace, Ducts etc.	4.	Steam Blowing of Boiler including Interconnecting Pipe Lines of Boiler, Turbine, Aux. Steam Header and Steam Supply lines.	5.	Steam Blowing and Oil Flushing of Fuel Oil System	6.	Clean Air Flow Test of Coal Pipes	7.	Oil Flushing of Lub Oil System of Rotary Equipments	8.	Cold Air Velocity Test	9.	Flushing of HP Bypass system oil lines
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CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p style="text-align: right;">ANNEXURE-IV</p> <p>Demonstration/Acceptance tests during Commissioning/Initial Operation</p> <p>The following tests shall be demonstrated during commissioning for which the bidder has to furnish the procedure and get the approval of the employer:</p> <ol style="list-style-type: none"> 1. Balance Pumps, Blowers, Fans, Compressors and rotating equipment. 2. Balancing of Coal/Primary air flow 3. Demonstration of boiler operation, rate of change of load and sudden load change withstand capability 4. Steam Temperature Imbalance 5. No fuel oil support shall be required above 40% BMCR 6. Capability of all drives 7. Margin on Fans 8. Cold Air Velocity Test (CAVT) 		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: CS-4540-001A-2	ANNEXURE-IV SUB-SECTION- G-06 PRE-COMM. & COMM. ACTIVITIES	PAGE 1 OF 1

CLAUSE NO.	<div style="text-align: right;"></div> TECHNICAL REQUIREMENTS		
	<p style="text-align: right;">-ANNEXURE-V</p> <p>BRIEF WRITE UP ON THE CONTENTS OF TESTING / COMMISSIONING PROCEDURE</p> <p>Testing / Commissioning Procedure is required to be of a standard format in order to maintain consistency of presentation, content and reporting. These should contain the following sections to make the document a self contained one.</p> <ol style="list-style-type: none"> 1. Plant Details / Design data 2. Objective 3. Proposal 4. Services Required 5. Safety Precautions 6. Emergency Procedures 7. State of the Plant (Status in respect of erection completion of Mech, Elect and C&I items) 8. Method 9. Completion / Acceptance Criteria 10. Appendix <ul style="list-style-type: none"> • Result • Log sheet • Drawing etc. 		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: CS-4540-101A-2	SUB-SECTION-G-06 PRE-COMMISSIONING AND COMMISSIONING ACTIVITIES-ANNEXURE-V	PAGE 1 OF 1

e-Learning Package For Pre Treatment Plant

e-Learning Package:

e-learning packages shall be supplied for the equipment / system for the complete Pre Treatment Plant along with associated electrical and C&I system.

These packages shall be installed on the Learning Management Server (LMS) of Power Management Institute (PMI) , NTPC located at Noida . The Engineer- In-Charge (EIC) for the e-learning modules shall be from PMI.

1. The objective of the e-Learning package consisting of courses for erection, commissioning, operation and maintenance of equipment / system as specified above is to facilitate the employees to have first hand information / requirement with respect to above activities for the supplied equipment / system .
2. The bidder shall submit e-learning courses each for erection, commissioning, operation and maintenance of each of the equipment / system supplied as above.
 - a. The erection course(s) should include instructions on pre-checks, prerequisites, erection strategy, erection procedure etc.
 - b. The commissioning course(s) should include instructions on pre-commissioning, commissioning, initial operation etc.
 - c. The operation course(s) should include instructions on the permissive, interlocks, physical check ups, start up, shutdown and protections etc.
 - d. The maintenance course(s) should include instructions on predictive, preventive, breakdown and overhauling.

Depth of coverage of above courses shall be as specified for “**Instruction Manuals**” in General Technical Requirement Part-C, Section-VI of technical specification. A literature on caution / safety while handling equipment / system for the above modules shall follow the description of the said equipment /system.

3. The e-Learning packages on equipment / system shall be installed by the vendor and shall be successfully test run in the presence of EIC or representative before acceptance by NTPC. The vendor will also give the master copy in form of Flash Drive/CD/DVD. The respective module for erection & commissioning shall be delivered and successfully test run at least three months before the scheduled start of the corresponding activity at site. The respective module for operation & maintenance shall be delivered and successfully test run at least three months before scheduled first synchronization of first unit.

4. e-Learning course broad requirements:

- a.** The courses shall be web based and mobile based Application type. It shall run on all possible versions of web browser like Internet Explorer, Google Chrome, Firefox etc. on Laptop/Desktop and shall be Smartphone/Tablet/Mobile responsive. The Mobile responsive courses shall run on Android, Windows Mobile, Blackberry, iOS etc.
- b.** The courses shall support liquid/fluid page layout so that the entire screen gets adjusted to PC, Laptop, Smartphone/Mobile, Tablet and any other display devices.
- c.** Course content text shall be in English language and be associated with a voiceover in English language with Indian accent.
- d.** Courses shall be SCORM (Sharable Content Object Reference Model) compliant, version 1.2 which is compatible with LMS at PMI.
- e.** Each course shall have every physical and functional detail of the equipment / system supplied.
- f.** Each of the e-Learning course shall be based on multiple web pages and mobile pages with multiple modules.
- g.** There shall be option for self-assessment test after every course. In case the user doesn't opt for self assessment test the user shall be able to go to the next course. There shall be no restriction in no. of times for repeating the assessments. All correct answers along with the answers marked by the users shall be displayed at the end of test/quiz.
- h.** If Java and Flash, as applicable are not available in the system to run the package, then there shall be a prompt message for updation of the same.
- i.** Each course shall have a self-running interactive content with navigation buttons containing forward, backward, pause, bookmark and menu options in the course window.
- j.** The course shall contain chapter titled 'Introduction/overview' that explains the purpose of the course.
- k.** The course content shall contain descriptive text shall be factual, specific, terse, clearly worded, and simply illustrative, so that the user can understand it.

- l. The system shall provide the user with the ability to select the information with a Cursor.
- m. The course menu should contain table of content linked to concerned pages. The user shall be given the capability to access all of the functions available on the system through a menu system. This shall consist of active buttons, which shall control a hierarchy of pull down/pop up menus. Menu shall appear quickly and exist only while a selection is being made. The user shall be given the capability to position the cursor or pointer on the menu item and use pointer device such as mouse to activate the function.
- n. Every course shall contain the 3D design/drawing/exploded view/360^o turn around view of the equipment/system, textual description of the equipment/system and its functionality with video (as applicable), animation and audio.
- o. The users shall be able to control audio sound level associated with the courses.
- p. Drawings / text in the courses shall be scalable (Zoom In/ Out).
- q. The user shall have the capability to record a **bookmark** to mark displayed information for later recall, whenever he accesses the same course next time.

Notes:

1. e-learning Package of an equipment / system shall include e-learning courses for each of erection, commissioning, operation and maintenance of that equipment / system.
2. e-learning courses on erection, commissioning, operation and maintenance of an equipment / system shall include e-learning lessons/chapters/modules (as required) for erection, commissioning, operation and maintenance respectively of that equipment / system.
3. The vendor shall get the approval of one sample course from EIC before proceeding for further courses.



**2x660MW TALCHER STAGE III STPP
3D MODEL SPECIFICATION AND
DRAWING REQUIREMENT**

SPECIFICATION No: PE-TS-497-158A-A001

SECTION: xx

Sub Section: xx

REV. 00

3D MODEL SPECIFICATION

- 1. BIDDER SHALL SUBMIT 3D PARAMETRIC MODEL OF THE SAID AREA COMPATIBLE WITH SP3D LIBRARY.**
- 2. BIDDER TO PREFERABLY USE DEFAULT LIBRARY OF SP3D FOR CREATION TO PRIMITIVES/MODEL/LAYOUT SO THAT IT CAN BE INTEGRATED WITH 3D MODEL OF THE MAIN PLANT**

FOLLOWING REQUIREMENTS TO BE MET BY BIDDER

All the layouts shall be made using computerized 3D modelling system (SP3D). The Employer reserves the right to review the 3D model at different stages during the progress of engineering. The layout drawings submitted for Employer's review shall be fully dimensioned and extracted from 3D model after interference check.

Contractor shall prepare 3D design review model (network ready, which shall include visual interference check, walk-through animation, video simulation for major equipment placement and removal, visual effect, photo realism etc), which is extracted from intelligent 3D model, for employer's review as & when desired by the employer. All piping layouts, equipment layouts, floor plans, ducting layout (Air/flue gas, A/C, Ventilation (if applicable etc.) and structural arrangement drawings shall necessarily be extracted from the aforesaid 3D model and submitted for employer's review along with the 3D Review model to enable employer to review and approve these drawings.

The complete editable 3D model (complete 3D data) along with complete component catalogues for all the size range, configuration files, customization files, templates and all referenced databases pertaining to 3D model of the package along with as built GADs, layout, isometrics, reports etc. with any other document generated from 3D model and naming conventions with as-built updates shall be handed over to the employer after completion of Engineering.

The corresponding complete 3D review model shall also be handed over to the employer for reference after the completion of engineering of respective package.

Handover Plan: There shall be continuous handover of documents and data at various stages of the project including rules and trigger points for handover of data to employer shall be at 30%, 60% and 90 % of 3D model stage.



TITLE:

TECHNICAL SPECIFICATION FOR
PRE TREATMENT PLANT (PT PLANT)
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-158A-A001

VOLUME II-B

SECTION-D

REV. NO. 00

DATE:

FORMAT FOR OPERATION AND MAINTENANCE MANUAL



TITLE:
**TECHNICAL SPECIFICATION FOR
 PRE TREATMENT PLANT (PT PLANT)
 TALCHER THERMAL POWER PROJECT
 STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-158A-A001
 VOLUME II-B
 SECTION-D
 REV. NO. 00 DATE:

FORMAT FOR OPERATION AND MAINTENANCE MANUAL

Project name :
 Project number :
 Package Name :
 PO reference :
 Document number :
 Revision number :

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	<u>Cover page</u>				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	<u>Index</u>				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	<u>Description of Plant/System</u>				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				
4.0	<u>Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)</u>				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	<u>Operation Guidelines for plant personal/user/operator</u>				
5.1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				



TITLE:
**TECHNICAL SPECIFICATION FOR
 PRE TREATMENT PLANT (PT PLANT)
 TALCHER THERMAL POWER PROJECT
 STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-158A-A001
VOLUME II-B
SECTION-D
REV. NO. 00 **DATE:**

5.2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5.3	Do's & Don't of the equipments.				
5.4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5.5	Parameters to be monitored with normal values and limiting values				
5.6	Trouble shooting with causes and remedial measures				
5.7	Routine operational checks, recommended logs & records				
5.8	Changeover schedule if more than one auxiliary for the same purpose is given				
5.9	Painting requirement and schedule				
5.10	Inspection, repair, Testing and calibration procedures				
6.0	<u>Maintenance guidelines for plant personal</u>				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				
6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres, Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	Statutory and other specific requirements considerations.				
8.0	List of reference documents				
9.0	Binding as per requirement				

SITE STORAGE AND PRESERVATION GUIDELINES

FOR

MECHNANICAL BOPs

(Doc No: PE-DC-SSG-A001 REV.00)



PROJECT ENGINEERING MANAGEMENT, POWER SECTOR
BHARAT HEAVY ELECTRICALS LIMITED-NOIDA

CONTENT

- 1 SCOPE OF THE DOCUMENT
- 2 PURPOSE OF STORAGE & PRESERVATION
- 3 MEASURES TO BE TAKEN FOR STORAGE AND PRESERVATION
 - a) GENERAL STORAGE REQUIREMENTS
 - b) GENERAL PRESERVATION REQUIREMENTS
 - c) GENERAL INSPECTION REQUIREMENTS
- 4 TYPE OF STORAGE FOR VARIOUS EQUIPMENT
5. CONCLUSION
6. STACKING ARRANGEMENT FOR PLATES AND STRUCTURAL STEEL

1. SCOPE OF THE DOCUMENT

This guideline is prepared in intent to provide proper site storage and preservation of the Mechanical, Electrical and C & I items / equipment supplied under various bought out packages/items. This storage procedure shall be followed at different power plant sites by concerned agency for storage and preservation from the date of equipment received at site until the same are erected and handed over to the customer.

2. PURPOSE OF STORAGE & PRESERVATION

Many of the items may be required to be kept in stores for long period. It shall therefore be essential that proper methods of storage and preservation be applied so that items do not deteriorate, loose some of their properties and become unusable due to atmospheric conditions and biological elements.

3. MEASURES TO BE TAKEN FOR STORAGE, HANDLING & PRESERVATION

a) GENERAL STORAGE REQUIREMENTS

1. To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2. The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3. The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. 'No smoking' signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4. Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5. Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
7. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks,

preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

6. At no time shall any materials be stored directly on ground. All materials shall be stored minimum 200 mm above the ground preferably on wooden sleepers

b) GENERAL PRESERVATION REQUIREMENTS

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.
2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.
3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.
4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings
5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.
6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.
7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.
8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.
9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.
11. Following preservatives/preservation methods can be used depending upon type of equipment
 - a. Rust preventive fluid (RPF)
 - b. Rust protective paints
 - c. Tarpaulin covers, in case of outdoor storage
 - d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –
 - Ingress of moisture and corrosion damages.
 - Damage to protective coating.
 - Open ends in pipes, vessels and equipment -
 - In case any open ends are noticed, same shall be capped.
2. Any damages to equipment / materials.
 - In case of any damages, these shall be promptly notified and in all cases, the repairs / rectification shall be carried out.
 - Any items found damaged or not suitable as per project requirements shall be removed from site. If required to store temporarily, they shall be clearly marked and stored separately to prevent any inadvertent use.

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

The types of storage are broadly classified under the following heads:

i **Closed storage with dry and dust free atmosphere. (C)**

The closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated asbestos sheets / galvanised iron sheets for roofing. Brick walls / asbestos sheets can be used to cover all the sides. The floor of the shed can be finished with plain cement concrete suitably glazed. The shed shall be provided with proper ventilation and illumination.



ii **Semi-closed storage. (S)**

The semi closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated / asbestos sheets for roofing. The floor shall be brick paved. If required a small portion of sides can be covered to protect components from rainwater splashing onto the components.





iii Open storage (O)

The open yard shall be levelled, well consolidated to achieve raised ground with the provision of feeder roads for crane approach along with access roads running all sides. One part of the open yard shall be stone pitched, levelled and consolidated with raised ground suitable for storing / stacking heavier and critical components with due space to handle them by cranes etc . Adequate number of sleepers, concrete block etc. to be provided to make raised platforms to stack critical materials.

A separate yard to be identified as “scrap yard” slightly away from main open yard to store wooden/steel scraps, which are to be disposed off. This is required to avoid mix up with regular components as well as to avoid fire hazard.

Some of the components, which are having both machined & un-machined surfaces and are bulky, shall be stored in open storage area on a raised ground and suitably covered with water proof / fire retardant tarpaulin.



The equipment listed below shall be stored and inspected as per requirement mentioned in the table below.

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
Raw material /mechanical items like pipes, plates, structure sections etc.)				
1.	Steel pipes (lined/unlined)	S	Damage , paint, corrosion, rubber lining peeling	Provide end cap
2.	MS Plates	S	Damage, paint, corrosion	
3.	SS Plates	S	Damage	
4.	Non-metallic pipes	S	Damage, cracks	Provide end cap
5.	Stainless steel pipes	S	Damage ,	Provide end cap
6.	MS sections, beams	S	Damage, paint, corrosion	
7.	Cable trays	S	Damage, condition of preservations	
8.	Insulation sheets	S	Damage	
9.	Insulation	C	Damage, packing	
10.	Hangers Rods	S	Damage, paint, packing	
11.	Tubes	S	Damage, paint , packing	Provide end cap
12.	Hume pipes	O	Damage	
13.	Castings	O	Damage, paint, corrosion	
Fabricated mechanical items (pressure vessels, tanks etc.)				
14.	Pressure vessels (unlined)	O	Damage, paint, corrosion,	Covered nozzles
15.	Atmospheric storage tanks (unlined)	O	Damage, paint, corrosion	Covered nozzles

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
16.	Pressure vessels (lined)	S	Damage, paint, corrosion, rubber lining	
17.	Atmospheric storage tanks(lined)	S	Damage, paint, corrosion, rubber lining	
18.	Support structures	O	Damage , paint, corrosion	
19.	Flanges	C	Damage , paint, corrosion	
20.	Fabricated pipes	S	Damage , paint, corrosion	Provide end cap
21.	Vessels internals	C	Damage , paint, corrosion ,packing	
22.	Grills	S	Damage , paint, corrosion	
23.	Angles	S	Damage , paint, corrosion	
24.	Bridge mechanism/clarifier mechanism	O	Damage , paint, corrosion	
25.	Cranes, rails	S	Damage , paint, corrosion	
26.	Stair cases	O	Damage , paint, corrosion	
27.	Ladders/handrails	O	Damage , paint, corrosion	
28.	Fabricated ducts	S	Damage , paint, corrosion	
29.	Isolation Gates	O	Damage , paint, corrosion	
30.	Fabricated boxes/panels	S	Damage , paint, corrosion	
Mechanical components like valves, fittings, cables glands, spares etc.)				
31.	Valves	S	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
32.	Fittings	S	Damage , packing	Provide end cap
33.	Cable glands	C	Damage , packing	
34.	Tools & tackles	C	Damage , packing	
35.	Nut , bolts, washers,	C	Damage , packing	
36.	Gasket & Packings	C	Damage , packing	
37.	Copper tubes	C	Damage , packing, corrosion	Provide end cap
38.	SS tubing	C	Damage , packing	Provide end cap
Rotating assemblies (pumps, blowers, stirrers, fans, compressors etc.)				
39.	Pumps	S	Damage , packing, corrosion	Shaft rotation
40.	Blowers/Compressors	S	Damage , packing, corrosion	Shaft rotation
41.	Agitators/stirrers/radial launders	C	Damage , packing, corrosion	Shaft rotation
42.	Rollers for chlorine tonner mounting	C	Damage , packing, corrosion	
43.	Centrifuge	S	Damage , packing,	
44.	Gear box	C	Damage , packing, corrosion	
45.	Bearings	C	Damage , packing, corrosion	
46.	Fans	S	Damage , packing, corrosion	
47.	Dosing skids	S	Damage , packing, corrosion	
48.	Pump assemblies	S	Damage , packing, corrosion	
49.	Air washers(INTERNALS)	S	Damage , packing	
50.	Air conditioners (split)	C	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
51.	Elevators(CONTAINERIZED)	O	Damage , packing, corrosion	
52.	Chillers/VA machines	S	Damage , packing	
53.	Air handling Unit/Package unit	S	Damage , packing	
54.	Chlorinators & Evaporators	C	Damage , packing	
55.	Ejectors	C	Damage , packing	
56.	Electrolyser	C	Damage , packing	
Miscellaneous items like chain pulley blocks, hoists etc.				
57.	Chain pulley blocks	S	Damage, Packing	
58.	Electric hoists	S	Damage, Packing	
59.	Fire extinguishers	C	Damage, expiry date	
60.	Fork Lift Truck	S	Damage, Packing	
61.	Hydraulic Mobile Crane	O	Damage, Packing	
62.	Mobile Pick Up & Carry Crane	O	Damage, Packing	
63.	Motor boats	O	Damage, Packing	
64.	Safety showers	S	Damage, Packing	
65.	Diffusers/dampers	S	Damage, Packing	
Chemicals and consumables (acid, alkali, paints, oils, reagents and special chemicals)				
66.	Hydro Chloric Acid (HCl)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical
67.	Sulphuric acid (H ₂ SO ₄)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
68.	Sodium hydroxide (NaOH)	Store in canes/ storage tank in dyke area	Date of production/ leakage/ fumes/ breather	hazardous chemical ,breather to be checked for air ingress
69.	Sodium hypo chlorite	To be stored under shed	Date of production/ leakage/ fumes	hazardous chemical ,self-life normally 15-30 days after which strength of chemical decays
70.	Ammonia	S	Date of production/ leakage/ fumes	Store in closed storage tanks, hazardous chemical
71.	CW treatment chemicals	S	Date of production , Self-life	Store in closed canes
72.	RO/UF cleaning chemicals	S	Date of production , Self-life	Store in closed canes
73.	Lime	C	Damage to packing , seepage	Prevent moisture, rain
74.	Alum bricks	C	Damage to packing	Prevent moisture, rain
75.	Poly electrolyte	S		Store in closed storage tanks
76.	Laboratory chemicals(powder)	C	Damage, Packing self- life	
77.	Laboratory chemicals(liquid)	C	Damage, Packing self- life	
78.	Lubrication oils	C	Leakage	
79.	Paints	S	Leakage ,air tightness	
80.	Sand	O	Damage of packing	No hooks
81.	Salt (NaCl)	C	Damage of packing, water ingress	Prevent moisture, rain
82.	Anthracite	S	Damage of packing	
83.	Activated carbon	S	Damage of packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
84.	Thermal insulation	S	Damage of packing	
85.	Cement	C	Damage of packing	Prevent moisture, rain
86.	Gravels	O	Damage of packing	
87.	ION exchange resins	C	Damage , packing	Refer manufacturer guidelines
88.	RO membranes	C	Damage , packing	Refer manufacturer guidelines
89.	UF membranes	C	Damage , packing	Refer manufacturer guidelines
90.	Cleaning chemicals	C	Damage , packing	Refer manufacturer guidelines
91.	Chemicals for analysers/calibration	C	Damage , packing	Refer manufacturer guidelines
Electrical and C & I items (motors, cables etc.)				
92.	Motors	C	Damage , packing	
93.	Cable drums	O	Damage	
94.	Control Panel /control desk, UPS ,JB	S	Damage, Packing	
95.	Instruments(gauges/analysers)	C	Damage	
Special items		As per Manufacturer's item, like Hydrogen cylinders, Ozonator, Analyser, Chlorine dioxide generators etc.		

5. CONCLUSION

Concerned storage agency at site should make sure that loss in equipment performance and wear & tear are minimised through proper storage and preservation. The above are broad guidelines and cover major equipment / materials. However specific storage practices shall be followed as per manufacturer recommendation. All the necessary measures even in addition to the ones mentioned above, if found necessary, should be taken to achieve the objective.

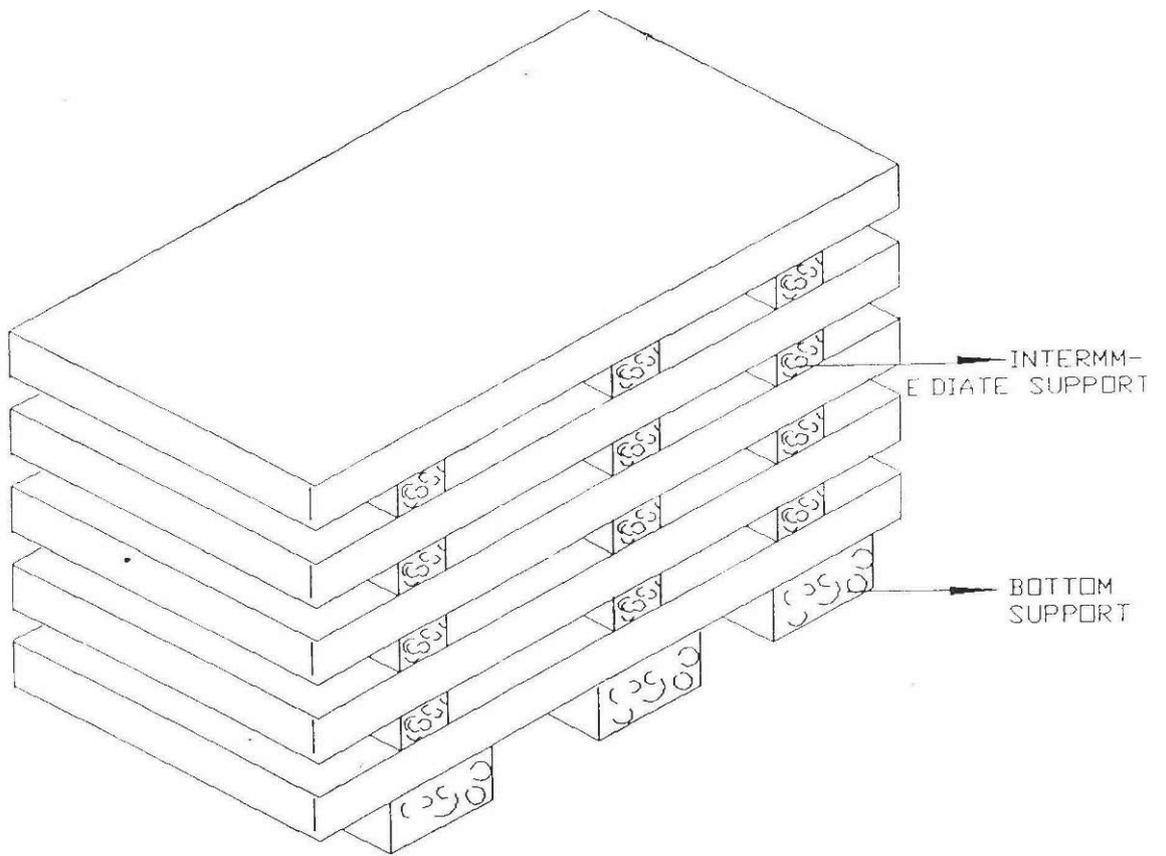


Figure – 1 – PLATE STACKING ARRANGEMENT

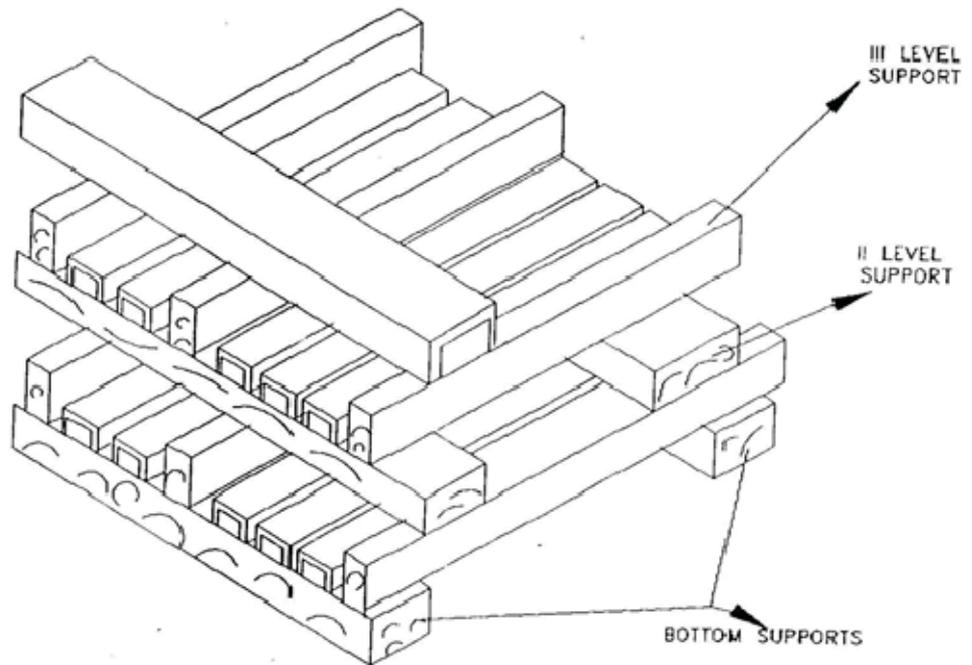


Figure – 2 – STRUCTURAL STEEL STACKING ARRANGEMENT



TITLE:
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STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-158A-A001

VOLUME II-B

SECTION-D

REV. NO. 00

DATE:

**SUPERVISION SERVICES
(PRE TREATMENT PLANT)**



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REV. NO. 00 **DATE:**

1.0 SCOPE

Supervision of Complete civil structural, architectural & construction works of complete Pre Treatment Plant is in bidder's Scope of work. The duration of supervision shall be One Hundred Eighty (180) man-days in multiple visits. The One Hundred Eighty (180) man-days are to be considered as One Hundred Eighty (180) working days at site excluding the travel time. The supervision charges shall be inclusive of charges of Air-Fair/Rail-Fair, Boarding/Lodging, Local conveyance, medical, insurance etc.

The scope includes supervision of complete civil work, construction works, structural & architectural works of complete pretreatment plant area including but not limited to supervision of excavation, backfilling, encasing of pipes, foundation work of equipment, brick work, plastering, PCC work, painting work of civil structures, shuttering work, Pipe & cable pedestal construction work, associated walkways, pathways, interconnecting platforms, handrails, staircases, plinth protections, peripheral drains, acid & alkali resistance tiling/bricks work, grouting work of equipment foundations, fixing and supervision of any other civil works as specified elsewhere in the specification.

Bidder to consider supervision of the following major items of Pre Treatment Plant including but not limited to:

- PT (CW & Potable System)-Aerator, Stilling Chamber, parshall flumes, Interconnecting channels, Bypass Channels, Inlet chambers, telescopic chambers etc.
- PT (DM System)-Aerator, Stilling Chamber, parshall flume, Interconnecting channels, Bypass Channel, Inlet chamber, telescopic chambers etc.
- PT (CW & Potable System)-Clarifiers, outlet channels up to clarified water storage tank & Gravity Filer-Potable water etc.
- PT (DM System)-Clarifier, outlet channel up to Gravity Filer-DM, etc.
- Gravity Filer House (PT-Potable & PT DM), including piping gallery house, filter water reservoirs, Filtered water pump house etc.
- Chemical House (PT-Potable & PT DM), including overhead water tanks, Chemical tanks, chemical storage area etc.
- Common Sludge Pit for PT- CW & DM system Clarifiers including inlet & outlet chambers etc.
- Filter backwash waste collection pit including inlet & outlet chambers.
- Foundation of PAC storage tanks, Unloading Pumps, Dyke area along with acid alkali resistance tiling/Lining.
- Foundation of equipment, Pipe & cable pedestals, associated walkways, pathways, interconnecting platforms, RCC staircases, plinth protections, peripheral drains, filling and finishing works of openings in walls, floors, cladding, roof and cable trenches construction etc for the complete pretreatment plant as per technical specifications.

Complete civil analysis & design of all civil structural & architectural works of Pre Treatment Plant is in bidder's Scope of work. The corresponding electro-mechanical, civil structural, architectural & construction drawings shall be prepared by successful bidder during contract stage. Based on the drawings the civil structural, architectural & construction works shall be carried out by BHEL at the site under the supervision of successful bidder. In case any modification is required in the civil work already carried out based on final drawings, BHEL reserves the right to debit cost of such rework to successful bidder/vendor. Bidder to ensure that the civil structural, architectural & construction works meets the technical specification requirement which are necessary to meet the performance of complete Pre Treatment Plant.



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LIST OF DOCUMENTS TO BE SUBMITTED ALONG WITH BID

1.0 Bidder to furnish following documents/information along with the bid (For Electrical And C&I Please Refer The Respective Section Of The Specification).

- Deviation if any strictly in the enclosed Schedule of deviation with cost of withdrawal only with mention of specification clause for which deviation is being asked. (Stamped & Signed). In case of No Technical Deviation, bidder to furnish the same format stating "No Deviation" duly Stamped & Signed.
- Compliance certificate.(Stamped & Signed)
- Schedule of Declaration. (Stamped & Signed)
- Un Price Schedule duly filled in. (Stamped & Signed)
- List of Start-up & commissioning spares if any. (Stamped & Signed)

Any other documents submitted by bidder except as asked in the bid's specification shall not be evaluated & considered as null & void.

NOTES:

- 1) Any item/work either supply of equipment or erection material which have not been specifically mentioned 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 without any extra charge shall provide the same.
- 2) All drawings/documents shall be approved by BHEL/Customer during detailed engineering stage. Successful Bidder shall comply with the comment of the customer/BHEL without any price & delivery implication.



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COMPLIANCE CUM CONFIRMATION CERTIFICATE

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.
3. 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.
4. 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.
5. There are no other deviations with respect to specification other than those furnished in the 'Schedule of Deviations'.
6. 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.
7. 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 and Customer).
8. All sub vendors shall be subject to BHEL/CUSTOMER approval.
9. Any special tools & tackles, if required, shall be in bidder's scope.
10. Performance guarantee test parameters shall stand valid till the satisfactory completion of Performance guarantee test and its acceptance by BHEL and Customer.



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PRE BID CLARIFICATION SCHEDULE

All clarification from the Technical Specification shall be filled in by the BIDDER clause by clause in this format only.

VOLUME	SECTION	CLAUSE NO.	PAGE NO.	SPECIFICATION REQUIREMENT	CLARIFICATION	REASONS FOR CLARIFICATION

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



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SCHEDULE OF DECLARATION

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.



SCHEDULE OF DEVIATIONS WITH COST OF WITHDRAWAL

**PROJECT:- TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

PRE TREATMENT PLANT (PT PLANT)

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF withdrawal OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF withdrawal OF DEVIATION IS APPLICABLE	NATURE OF COST OF withdrawal OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
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TECHNICAL DEVIATIONS

COMMERCIAL DEVIATIONS

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATIONS	SIGN & DATE

NOTES:

- For self manufactured items of bidder, cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
- For directly dispatchable items, cost of withdrawal of deviation will be applicable on the basic price including taxes, duties & freight.
- All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
- Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
- Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
- Bidder shall furnish price copy of above format along with price bid.
- The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
- Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
- For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.
- Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
- All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
- Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
- In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
- In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.