

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

VOLUME – II B & III

**TECHNICAL SPECIFICATION
FOR COAL HANDLING PLANT
RUN-OFF WATER TREATMENT SYSTEM**

SPECIFICATION NO.: PE-TS-497-157-A001 REV 00



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA**



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X325 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-

SECTION-

REV. NO. 00

DATE:

CONTENTS
VOLUME – II B

SECTION	DESCRIPTION	PAGE
SECTION – A	INTENT OF SPECIFICATION	3 OF 325
SECTION – B	PROJECT INFORMATION	6 OF 325
SECTION – C	SPECIFIC TECHNICAL REQUIREMENTS	
SECTION – C1	SPECIFIC TECHNICAL REQUIREMENTS - MECHANICAL	22 OF 325
	ANNEXURES	
	• ANNEXURE I : QUALITY PLAN	35 OF 325
	• ANNEXURE II : SUB VENDORS LIST	48 OF 325
	• ANNEXURE III : FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES	68 OF 325
	• ANNEXURE IV : DRAWING/DOCUMENTS REQUIREMENT & DISTRIBUTION SCHEDULE	77 OF 325
	• ANNEXURE V : MANDATORY SPARES	87 OF 325
	• DRAWINGS	88 OF 325
	• DATASHEET - A	91 OF 325
SECTION – C2	SPECIFIC TECHNICAL REQUIREMENTS - ELECTRICAL	103 OF 325
SECTION – C3	SPECIFIC TECHNICAL REQUIREMENTS - C&I	136 OF 325
SECTION-D	GENERAL TECHNICAL REQUIREMENT OF LOW PRESSURE PIPING	248 OF 325
	GENERAL TECHNICAL REQUIREMENT OF PUMPS	273 OF 325
	GENERAL TECHNICAL REQUIREMENT OF ELEVATORS, CRANES AND HOISTS, WEIGH BRIDGE	284 OF 325
	GENERAL TECHNICAL REQUIREMENT OF SURFACE PREPARTION & PAINTING	294 OF 325
	SITE STORAGE & PRESERVATION GUIDELINES FOR MECHANICAL BOP's	303 OF 325
	SUPERVISION SERVICES (CHPWTP)	318 OF 325

VOLUME III

	LIST OF DOCUMENTS TO BE SUBMITTED ALONG WITH BID	321 OF 325
	COMPLIANCE CUM CONFIRMATION SCHEDULE	322 OF 325
	PRE BID CLARIFICATIONS SCHEDULE	323 OF 325
	SCHEDULE OF DECLARATION	324 OF 325
	SCHEDULE OF DEVIATIONS WITH COST OF WITHDRAWAL	325 OF 325



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-A

REV. NO. 00

DATE:

SECTION - A
INTENT OF SPECIFICATION



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-A

REV. NO. 00

DATE:

SCOPE OF INQUIRY/ INTENT OF SPECIFICATION:

- 1.1 This specification is intended to cover design (i.e. Preparation and submission of drawing/ documents including " As Built " drawings and O&M Manuals), engineering, manufacture, fabrication, assembly, inspection & testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), fill of lubricants & consumables(excluding chemicals), mandatory spares along with spares for erection ,start up and commissioning as required, forwarding, proper packing, shipment and delivery at site ,unloading , handling transportation and storage at site, in site transportation, assembly, erection and commissioning, final painting at site, trial run, site testing, civil analysis & design of all civil structural & architectural works, Supervision of Complete civil structural, architectural & construction works, carrying out performance guarantee tests at site, training of customer/ client O&M staff & final handing over to end customer in flawless condition of **COAL HANDLING PLANT RUN-OFF WATER TREATMENT SYSTEM** complete with all accessories as per the details in different sections / volumes of this specification for **TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW)**.
- The bidder's scope shall also include any other services, etc. if called for in the succeeding sections of the specification.
- 1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve them of the responsibility of providing such facilities to complete the supply, erection and commissioning of Pre Treatment Plant within quoted price.
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgment is not in full accordance herewith.
- 1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.
- 1.5 Items though not specifically mentioned but needed to make the system complete as stipulated under these specifications are also to be furnished unless otherwise specifically excluded.
- 1.6 The general terms and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification are subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.
- 1.7 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification as "PRE BID CLARIFICATION SCHEDULE". In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of BHEL/Customer shall prevail and shall be complied by the bidder without any commercial and delivery implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by BHEL/ Customer as and when brought to their notice either by the bidder or by BHEL/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.
- 1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-A

REV. NO. 00

DATE:

- 1.9 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder/vendor and Customer/Purchaser/Employer will mean BHEL and/or Customer (NTPC: National Thermal Power Corporation Limited as interpreted by BHEL in the relevant context. Please refer GCC/SCC for better clarity.
- 1.11 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and dispatch release issued by BHEL/Customer.
- 1.12 BHEL's/Customer's representative shall be given full access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.



TITLE:

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-B

REV. NO. 00

DATE:

SECTION – B
PROJECT INFORMATION

CLAUSE NO.	PROJECT INFORMATION			
	TALCHER TPP STAGE-III (2X660 MW)			
1.00.00	BACKGROUND Talcher Thermal Power Project is situated near Talcher town in Angul district of Orissa having capacity of 460 MW (4x60 MW + 2x110 MW). The project was implemented by Orissa State Electricity Board (OSEB). Subsequently TTPS was taken over by NTPC on 03.06.1995. The present proposal is for expansion of TTPS by adding 2 units of 660 MW.			
2.00.00	PROJECT HIGHLIGHTS			
2.01.00	Location The proposed site is located near Talcher town in Angul district of Orissa having latitude and longitude as 20°55' N and longitude 85°25' E respectively. The site is approachable from Banarpal–Talcher section of National Highway No. 23 at a distance of about 1 km from Anand Bazar. Nearest railway station is at Talcher on Talcher-Cuttack section of North Eastern Railway at about 4 Kms. The nearest commercial airport is Bhubaneswar at about 90 km. Vicinity Plan of the proposed project is placed at Annexure-I .			
3.00.00	BASIC INPUTS			
3.01.00	Land The plant facilities for this expansion stage would be accommodated within the land available in the existing power station and ash disposal shall be in mine voids.			
3.02.00	Water Make up water requirement for Talcher Thermal power project, Stage-III expansion (2x660 MW) would be about 40 Cusec with ash water recirculation system. Water requirement for the project will be met from upstream of the Samal barrage discharge on the River Brahmani and shall be pumped to the raw water reservoir located about 28 kms from intake well.			
3.03.00	FUEL			
3.03.01	Coal Requirement, Availability and Linkage The Coal Linkage for the project granted by SLC(LT) and CLOA has allocated 5.854 MMTPA coal from MCL. The primary fuel for the main steam generator shall be coal. The domestic coal quality parameters are indicated in Annexure-IV-2 and imported coal parameters are indicated in Annexure-IV-4 are to be considered for steam generator design.			
3.03.03	Coal Transportation The envisaged mode of coal transportation from the coal mines to the power plant is through Indian Railways network and will be unloaded in underground RCC Track Hoppers.			
3.03.03	Fuel Oil The fuel oil to be used for start-up, coal flame stabilization and low load operation of the steam generator shall be Light Diesel oil (LDO) having the characteristics given at Annexure-IV-1 and HSD Oil characteristics given at Annexure-IV-3 .			
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-IB PROJECT INFORMATION
PAGE 1 OF 15				

CLAUSE NO.	PROJECT INFORMATION 			
4.00.00	STEAM GENERATOR TECHNOLOGY The steam generators shall be super critical once through type, water tube, direct pulverized coal fired, top supported, balanced draft furnace, single reheat, radiant, dry bottom type, suitable for outdoor installation. The gas path arrangement shall be single pass (Tower type) or two pass type.			
5.00.00	FLUE GAS DESULPHURIZATION SYSTEM (FGD) & SCR ready system: The project is envisaged with Flue Gas Desulfurization (FGD) system and DeNOx ready system meeting Ministry of Environment, Forest & Climate Change notification dated 07.12.2015. Limestone to be used for design of FGD system shall be as per the characteristic given at Annexure-IV-5 .			
6.00.00	CAPACITY Talcher TPP, Stage-III : 2x660 MW - Present proposal			
7.00.00	BENEFICIARY STATES The project is being implemented as a regional project for meeting the power demand of Eastern Region Beneficiaries including Orissa – the home-state. The exact allocation of power shall be subject to the approval of Ministry of Power, Govt. of India.			
8.00.00	METEOROLOGICAL DATA The meteorological data from nearest observatory is placed at Annexure-II .			
9.00.00	Plant Water Scheme The Plant water scheme is included in Part-E of Technical Specification.			
9.01.00	Condenser Cooling (CW) Water System It is proposed to adopt a recirculating type cooling water system with cooling towers for the project. For the re-circulating type CW system it is proposed to supply clarified water as make up. Circulating water from CW pumps to TG area and from TG area to cooling tower will be carried through pipes/ducts. Cooled water from cooling tower will be led to CW pump house through the cold water channel by gravity.			
9.02.00	Equipment Cooling Water (ECW) System (Unit Auxiliaries) All plant auxiliaries shall be cooled by De-mineralized water (DM) in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system. It is proposed to provide independent primary cooling water circuit for TG & its auxiliaries and Steam Generator & auxiliaries (including station auxiliaries) on Unit basis.			
9.03.00	Other Miscellaneous Water Systems CW system blow down water shall be used for the FGD process requirement, ash slurry pumps sealing, sealing of Vacuum pumps (if applicable) of Ash Handling plant, make-up to fire water system. The service water shall be taken from clarified water tank of Pre-treatment plant. The service (wash water) water collected from various areas and coal handling plant shall be treated as per requirement and reused. The drinking water requirement shall be provided from water treatment plant.			
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-IB PROJECT INFORMATION	PAGE 2 OF 15

CLAUSE NO.	PROJECT INFORMATION			
	The quality of Raw water is given in this sub-section at Annexure-III			
10.00.00	POWER EVACUATION SYSTEM In view of above and considering the present capacity of the project (1320 MW), it is proposed to adopt the step-up/power evacuation voltage as 400kV. Accordingly provision for 4 Nos. of 400 kV line bays has been considered in the generation switchyard. Station supply shall be derived directly from 400kV voltage level through 400kV Class station transformers. The issue of power evacuation of the project shall be taken up with appropriate Transmission Utility as per regulatory provision, based on final power allocation received from Ministry of Power.			
11.00.00	Criteria for Earthquake Resistant Design of Structures and Equipment All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in Part-B of this section.			
12.00.00	Criteria for Wind Resistant Design of Structures and Equipment All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given as given in Part-B of this section.			
13.00.00	Vulnerability Atlas of India(VAI), prepared by Building Materials, Training and Promotion Council (BMTPC) under Ministry of Housing and Urban Affairs, is a comprehensive document which provides existing hazard scenario for the entire country and presents the digitized State/UT-wise hazard, maps with respect to earthquakes, winds and floods for district-wise identification of vulnerable areas. It also includes additional digitized maps for thunderstorms, cyclones and landslides. The main purpose of this Atlas is its use for disaster preparedness and mitigation at policy planning and project formulation and construction stage. The VAI provides necessary information for risk analysis and hazard assessment and is available at website www.bmtpc.org. As per Government's directive, it is mandatory for the bidders to refer VAI for multi-hazard risk assessment and include the relevant hazard proneness specific to project location while planning, designing and execution of the project in terms of following details: i) Seismic zone (II to V) for earthquakes ii) Wind velocity iii) Area liable to floods and Probable max. surge height iv) Thunderstorms history v) Number of cyclone storms/sever cyclone storms and max sustained wind specific to coastal region vi) Landslides incidences with Annual rainfall normal vii) District wise Probable Max. Precipitation Accordingly, bidder should refer VAI while planning, designing and execution of the project. However, for design of structures/facilities and equipment, the criteria for earthquake resistant design of structures and equipment, the criteria for Wind Resistant Design of Structures and Equipment and design parameters for drainage facilities, stipulated in the Technical Specification shall be followed. For other information like area liable to floods, probable max. surge height, landslide, thunderstorm, cyclone etc. agencies are required to refer the VAI.			
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-IB PROJECT INFORMATION	PAGE 3 OF 15

CLAUSE NO.	PROJECT INFORMATION		
	ANNEXURE-I		
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-IB PROJECT INFORMATION	PAGE 4 OF 15

CLAUSE NO.

PROJECT INFORMATION

एनटीपीसी

NTPC

ANNEXURE-II

STATION : अर्वाताल STATION : AQUL		अक्षांश LAT. 20°50'		देशांतर LONG. 65°16'		ऊँचाई HEIGHT ABOVE M.S.L. 139 METRES		आवृत्ति PERIOD OF OBSERVATIONS 1971-2000					
माह	MONTH	वायुमंडल का तापमान AIR TEMPERATURE				आर्द्रता HUMIDITY							
		औसत MEAN				अधिकतम EXTREMES							
		DRY BULB	WET BULB	DAILY MAX	DAILY MIN	HIGHEST	LOWEST	DATE	DATE				
		°C	°C	°C	°C	°C	°C	AND YEAR	AND YEAR				
		°F	°F	°F	°F	°F	°F						
जनवरी	JAN	1001.2	17.0	15.4	27.0	15.6	31.0	11.3	35.1				
फरवरी	FEB	1007.6	20.7	18.5					1994				
मार्च	MAR	1005.1	21.1	19.0	30.0	18.2	35.3	12.7	38.3				
अप्रैल	APR	1005.4	20.0	19.9					1967				
मई	MAY	1006.7	25.3	21.0	35.5	21.0	38.2	15.9	41.1				
जून	JUN	1002.6	33.5	22.1					1999				
जुलाई	JUL	1003.1	28.7	24.4	38.9	24.4	42.5	20.0	45.6				
अगस्त	AUG	1008.4	30.6	25.9	38.8	26.0	44.3	21.6	47.2				
सितम्बर	SEP	1005.7	29.7	25.0	36.2	25.9	42.5	21.7	47.2				
अक्टूबर	OCT	1002.5	32.8	26.3					1967				
नवम्बर	NOV	1005.1	27.9	25.4	32.1	24.4	36.2	22.4	41.1				
दिसम्बर	DEC	1008.5	27.5	25.3	31.4	23.9	34.5	21.3	37.7				
औसत	ANNUAL	1003.8	25.2	22.0	32.9	21.5	44.1	9.1	47.2				
कुल	TOTAL	1000.2	30.1	23.1					1921				
औसत	MEAN								12				
संख्या	NUMBER								89				
वर्ष	OF YEARS								89				

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-IB
PROJECT INFORMATION

PAGE
5 OF 15

CLAUSE NO.	PROJECT INFORMATION			एनटीपीसी NTPC
	ANNEXURE-III			
	<u>RAW WATER ANALYSIS</u>			
	SN	Constituent	As	mg/l (except pH & turbidity)
	1	Calcium	CaCO3	80
	2	Magnesium	CaCO3	35
	3	Sodium	CaCO3	20
	4	Potassium	CaCO3	5
	5	Total Cation	CaCO3	140
	6	HCO3	CaCO3	85
	7	p Alkalinity	CaCO3	0
	8	Chlorides	CaCO3	35
	9	Sulphate	CaCO3	20
	10	Total Anion	CaCO3	140
	11	Reactive Silica	SiO2	25
	12	Silica non-Reactive	SiO2	5
	13	Total Iron	Fe	0.5
	14	pH value	-	6.8-8.0
	15	Turbidity	NTU	2000
	16	TDS	ppm	190
	17	Temp	deg C	20-35
	18	KMnO4	ppm	2
19	TOC	ppm	5	
20	Total Suspended Solids	mg/l	2000	
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-IB PROJECT INFORMATION	PAGE 6 OF 15

CLAUSE NO.	PROJECT INFORMATION			एनडीपीसी NTPC
	ANNEXURE-IV-1			
	TABLE-1			
	LIGHT DIESEL OIL CHARACTERISTICS			
	AS PER IS 15770-2008			
	Characteristics	LDO		
	1. Pour Point (max)	21 °C & 12°C for Summer and Winter respectively		
	2. Kinematic viscosity in centistokes at 40 deg.C	2.5 to 15.0		
	3. Sediment percent by mass (max)	0.10		
	4. Total sulphur percent by mass (max)	1.5		
	5. Ash percentage by mass (max)	0.02		
	6. Carbon residue (Rams bottom) percent by pass (max.)	1.50		
	7. Acidity inorganic	Nil		
	8. Flash point (Min.) - Pensky Martens	66 deg.C		
	9. Copper strip corrosion for 3 hours at 100°C	Not worse than No. 2		
	10. Water content, % by volume (max)	0.25		
	11. GCV(kcal/kg)	10,000		
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-IB PROJECT INFORMATION	PAGE 7 OF 15

CLAUSE NO.	PROJECT INFORMATION					
	एनटीपीसी NTPC DOMESTIC COAL CHARACTERISTICS ANNEXURE-IV-2 TABLE-1 – A					
S No.	Characteristics (As received basis)	Range of 95% coal supplies			Range of 5% coal supplies	
		Column-1	Column-2	Column-3	Range of Adequacy coal	
1.0	PROXIMATE ANALYSIS	Design	Worst	Best	Worst	Best
1.1	Total Moisture (%)	14	16	12	17	11
1.2	Ash (%)	41	45	38	46	34
1.3	Volatile matter (%)	22	19	24	18	25
1.4	Fixed carbon (%)	23	20	26	19	30
	Total (%)	100	100	100	100	100
2.0	ULTIMATE ANALYSIS					
2.1	Carbon (%)	34.04	30.53	37.84	29.33	41.7
2.2	Hydrogen (%)	2.73	2.45	2.8	2.1	3.1
2.3	Sulphur (%)	0.55	0.45	0.65	0.45	0.8
2.4	Nitrogen (%)	0.83	0.63	1.2	0.55	1.3
2.5	Oxygen (%) (By difference)	6.85	4.94	7.51	4.57	8.1
2.6	Total Moisture (%)	14	16	12	17	11
2.7	Ash (%)	41	45	38	46	34
2.8	Total (%)	100	100	100	100	100
2.8	GCV (kcal/kg)	3400	3100	3700	3100	4000
2.9	Hard grove index	50	45	60	45	65
2.10	YGP (mg/kg)	75	80	70	85	65
3.0	ASH ANALYSIS					
3.1	Silica (%)	57.61	55.60	59.62	53.10	60.50
3.2	Alumina (%)	29.65	30.20	28.67	32.38	28.10
3.3	Iron Oxide (%)	6.96	7.75	6.03	8.28	5.51
3.4	Titania (%)	1.60	1.50	1.70	1.40	1.80
3.5	Phosphoric Anhydride (%)	0.53	0.58	0.46	0.60	0.40
3.6	Lime (%)	0.89	1.10	1.50	0.80	1.70
3.7	Magnesia (%)	0.35	0.40	0.30	0.50	0.25
3.8	Sulphuric Anhydride (%)	0.05	0.05	0.05	0.05	0.05
3.9	Sodium Oxide (%)	0.30	0.30	0.50	0.25	0.55
3.10	Balance Alkalies(By Difference) (%)	2.06	2.52	1.17	2.64	1.14
4.0	ASH FUSION RANGE (Under reducing atmosphere)					
4.1	Initial Deformation Temperature (degree Celsius)	1100	1100	1150	1100	1150
4.2	Hemispherical temperature (degree Celsius)	1300	1250	1350	1250	1350
4.3	Flow temperature (degree Celsius)	1400	1400	1400	1400	1400
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-IB PROJECT INFORMATION		PAGE 8 OF 15

CLAUSE NO.	PROJECT INFORMATION			
	TABLE-2 ANNEXURE-IV-3 HIGH SPEED DIESEL OIL CHARACTERISTICS [AS PER IS 1460-2005 (BS-II)]			
	S. No.	Particulars	Unit	Value
	1.	PHYSICAL PROPERTIES		
		a. Distillation volume recovery @ 350 ⁰ C	% vol. (min)	85
		b. Distillation volume recovery @ 370 ⁰ C	% vol. (min)	95
		c. Kinematic Viscosity @ 40 Degree C	cSt	2.0 – 5.0
		d. Density @ 15 Degree C	kg/m ³	820 – 860
		e. Pour Point		
		- Summer	Degree C (max)	15
		- Winter	Degree C (max)	03
		f. Cold Filter Plugging Point		
		- Summer	Degree C (max)	18
		- Winter	Degree C (max)	06
		g. Flash Point (Abal)	Degree C (max)	35
		h. Lubricity WSD 1.4 @ 60 Degree C	Microns (max)	460
	2.	HEATING VALUE		
		a. Higher Heating Value (HHV)	Kcal/Kg	11,000
		b. Lower Heating Value (LHV)	Kcal/Kg	10,300
	3.	ACIDITY		
		a. Inorganic	mg KOH/g	Nil
		b. Total	mg KOH/g	0.2 (max.)
	4.	Copper Strip Corrosion 3 hours @100 ⁰ C	No.	1 (max)
	5.	RCR on 10% residue	% wt.	0.3 (max)
	6.	CONTAMINANTS		
		a. Ash	ppm (wt.)	100 (max)
		b. Sediments	% wt	0.05 (max)
		c. Total Sulphur	% wt	0.05 (max)
		d. Water Content	% volume	0.05 (max)
		e. Trace Metals		
		- Na + K	ppm (wt)	0.30 (max)
		- Vanadium	ppm (wt)	0.50 (max)
		- Lead	ppm (wt)	0.50 (max)
		- Calcium	ppm (wt)	2.0
		- Ni + Zn	ppm (wt)	Nil
	7.	Nitrogen content (FBN)	% wt.	0.015
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-IB PROJECT INFORMATION	PAGE 9 OF 15

CLAUSE NO.	PROJECT INFORMATION			एनटीपीसी NTPC
	ANNEXURE-IV-4			
	TABLE – 4			
	TYPICAL IMPORTED COAL AND ASH CHARACTERISTICS			
	SI.No.	Characteristics (as received basis)	Imported Coal	
			Worst	Best
	1.0	Proximate Analysis		
	1.1	Total Moisture (%)	20	16
	1.2	Ash (%)	10	10
	1.3	Volatile Matter (%)	30	45
	1.4	Fixed Carbon (%)	40	29
	1.5	Total (%)	100	100
	2.0	Ultimate Analysis		
	2.1	Carbon (%)	56.4	62.4
	2.2	Hydrogen (%)	4.5	4.9
	2.3	Sulphur (%)	0.9	0.8
	2.4	Nitrogen (%)	0.9	0.5
	2.5	Oxygen (%) (By difference)	7.3	5.4
	2.6	Carbonates (%)	0	0
	2.7	Phosphorous (%)	0	0
	2.8	Total Moisture (%)	20	16
	2.9	Ash (%)	10	10
		Total	100	100
	2.10	GCV (Kcal/Kg)	5800	6500
	2.11	Hard Grove Index	45	60
	2.12	YGP (mg/kg)	100	70
	3.0	Ash Analysis		
	3.1	Silica (SiO2) (%)	32.74	34.94
	3.2	Alumina(Al2O3) (%)	30.5	28.43
	3.3	Iron Oxides(Fe2O3) (%)	18.2	15.2
	3.4	Titania (TiO2)	1.56	1.76
	3.5	Phosphoric Anhydride(P2O5) (%)	0.44	0.54
	3.6	Lime (CaO) (%)	6.12	7.62
	3.7	Magnesia (MgO) (%)	1.83	1.93
	3.8	Sulphuric Anhydride (%)	6.95	7.65
	3.9	Sodium Oxide (Na2O) (%)	0.3	0.4
	3.10	Balance alkalies (by difference)	1.36	1.56
		Total	100	100
	4.0	Ash Fusion Temperature reducing temperature		
	4.1	Initial deformation Temp (°C)	1100	1250
	4.2	Hemispherical Temp. (°C)	1300	1350
	4.3	Flow Temp. (°C)	1400	1400
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-IB PROJECT INFORMATION	PAGE 10 OF 15

CLAUSE NO.	PROJECT INFORMATION			एनटीपीसी NTPC																																																																				
	Annexure – IV-5																																																																							
	LIMESTONE CHARACTERISTICS																																																																							
	<table><tr><th colspan="4">Chemical Analysis(% by mass)</th></tr><tr><td>1.</td><td>CaO</td><td>%</td><td>47-51.0*</td></tr><tr><td>2.</td><td>MgO</td><td>%</td><td>0.9-3.8</td></tr><tr><td>3.</td><td>Fe₂O₃</td><td>%</td><td>0.45-1.0</td></tr><tr><td>4.</td><td>Al₂O₃</td><td>%</td><td>1.19-2.1</td></tr><tr><td>5.</td><td>Si₂O₃</td><td>%</td><td>2.1-4.5</td></tr><tr><td>6.</td><td>Mn₂O₃</td><td>%</td><td><0.12</td></tr><tr><td>7.</td><td>P₂O₅,</td><td>%</td><td>Traces</td></tr><tr><td>8.</td><td>Cl₂</td><td>%</td><td><0.015</td></tr><tr><td>9.</td><td>Na₂O</td><td>%</td><td><0.16</td></tr><tr><td>10.</td><td>K₂O</td><td>%</td><td><0.01</td></tr><tr><td>11.</td><td>TiO₂</td><td>%</td><td><0.02</td></tr><tr><td>12.</td><td>Total Sulphur</td><td>%</td><td><0.1</td></tr><tr><td>13.</td><td>LOI</td><td>%</td><td>39.0-41.3</td></tr><tr><td colspan="4">Physical properties</td></tr><tr><td>1</td><td>Bond Index</td><td>kWh/t</td><td>13</td></tr><tr><td>2</td><td>Granule size</td><td></td><td>Medium</td></tr></table>				Chemical Analysis(% by mass)				1.	CaO	%	47-51.0*	2.	MgO	%	0.9-3.8	3.	Fe ₂ O ₃	%	0.45-1.0	4.	Al ₂ O ₃	%	1.19-2.1	5.	Si ₂ O ₃	%	2.1-4.5	6.	Mn ₂ O ₃	%	<0.12	7.	P ₂ O ₅ ,	%	Traces	8.	Cl ₂	%	<0.015	9.	Na ₂ O	%	<0.16	10.	K ₂ O	%	<0.01	11.	TiO ₂	%	<0.02	12.	Total Sulphur	%	<0.1	13.	LOI	%	39.0-41.3	Physical properties				1	Bond Index	kWh/t	13	2	Granule size		Medium
Chemical Analysis(% by mass)																																																																								
1.	CaO	%	47-51.0*																																																																					
2.	MgO	%	0.9-3.8																																																																					
3.	Fe ₂ O ₃	%	0.45-1.0																																																																					
4.	Al ₂ O ₃	%	1.19-2.1																																																																					
5.	Si ₂ O ₃	%	2.1-4.5																																																																					
6.	Mn ₂ O ₃	%	<0.12																																																																					
7.	P ₂ O ₅ ,	%	Traces																																																																					
8.	Cl ₂	%	<0.015																																																																					
9.	Na ₂ O	%	<0.16																																																																					
10.	K ₂ O	%	<0.01																																																																					
11.	TiO ₂	%	<0.02																																																																					
12.	Total Sulphur	%	<0.1																																																																					
13.	LOI	%	39.0-41.3																																																																					
Physical properties																																																																								
1	Bond Index	kWh/t	13																																																																					
2	Granule size		Medium																																																																					
	Notes: 1. *Guaranteed parameters (guarantee on limestone consumption, auxiliary power consumption & gypsum purity) shall be based on available (reactive) CaCO₃ content of 89%. The design of Flue Gas Desulphurisation (FGD) system & auxiliaries shall be based on available (reactive) CaCO₃ content of 79%. 2. For the purpose of volumetric computations of limestone handling & storage system the bulk density of limestone shall be taken as 1400 kg/m³. However for torque, drive & structural load requirements the density of lime stone shall be taken as 1700 kg/m³. For gypsum, the bulk density shall be taken as 900 kg/m³ for volumetric computation and 1250 kg/m³ for torque, drive & structural load requirements. 3. For the purpose of sizing of equipments and guarantee, MgCO₃ shall be considered as unreactive dolomitic form.																																																																							
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-IB PROJECT INFORMATION	PAGE 11 OF 15																																																																				

CLAUSE NO.	PROJECT INFORMATION			एनटीपीसी NTPC
	Annexure-IV-6			
	METHANOL CHARACTERSTICS			
	SN	Fuel Property	Unit	Methanol
	1	Chemical Formula		CH3-OH
	2	Fuel Carbon	Wt%	38
	3	Fuel Oxygen	Wt%	12
	4	Density at 20 deg C	kg/m3	792
	5	LHV	Kcal/kg	4800
	6	Boiling Temp	°C at 1 bar	65
	7	Vapour Pressure	bar at 20°C	0.13
	8	Kinematic viscosity	cSt at 20°C	0.74
	11	Auto Ignition	°C	470
	12	Heat of Vapourization	kcal/kg	260
	15	Flammability limit	vol %	6-36
16	Flash Point	°C	12	

CLAUSE NO.	PROJECT INFORMATION		
	एनटीपीसी NTPC		
	Annexure-IV-7(A)		
S.N.	Technical Data	Unit	Specifications for Torrefied Pellet
1.	Base Material		Agro residue: Which means the leftover portion of the agriculture produce such as stubble/straw/stalk/husk of those agro residue which are surplus and not being used as animal fodder such as paddy, soya, arhar, gwar, cotton, gram, jawar, bajara, moong, mustard, seasam, til, maize, sunflower, jute, coffee etc., groundnut shell, coconut shell, castor seed shell etc., pine needle, elephant grass, sarkanda and horticulture waste such as dry leaves and trimmings generated during the maintenance and pruning of trees and plants. Wood obtained from tree cutting shall not be treated as agro residue and shall be not to be used as base material or mixing purpose whatsoever.
2.	Diameter	mm	In case of cylindrical shape: Diameter: Not more than 35 mm Length: Random For other shapes: No dimension should exceed 35 mm.
3.	Fines % (<3 mm) (ARB*)	Wt%	finest ≤ 5%
4.	Gross Calorific Value (GCVARB*)	Kcal/Kg	Refer below
5.	Moisture (ARB*)	Wt%	≤ 15% (not more than 15%)
6.	Bulk density	Kg ³	600
	*ARB – As Received Basis		
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-IB PROJECT INFORMATION PAGE 13 OF 15

CLAUSE NO.	PROJECT INFORMATION																																																										
	Annexure-IV-7(B) The sample was prepared by torrefying rice straw at 300 deg C with a holding time of one hour. Following analysis are carried out at NETRA using the powdered torrefied rice straw samples and the results of various testing for the specific sample is tabulated below: a. Proximate Analysis (wt %, Air Dried Basis) <table><tr><td>M</td><td>Ash</td><td>VM</td><td>FC</td></tr><tr><td>6.68</td><td>21.66</td><td>47.68</td><td>23.98</td></tr></table> b. Ultimate Analysis (wt %, Air Dried Basis) <table><tr><td>C</td><td>H</td><td>N</td><td>S</td><td>O</td></tr><tr><td>46.65</td><td>3.93</td><td>1.13</td><td>0.14</td><td>19.81</td></tr></table> c. GCV : 4201 kcal/kg d. Ash Fusion Temperature under reducing conditions: °C <table><tr><td>IDT</td><td>ST</td><td>HT</td><td>FT</td></tr><tr><td>1134</td><td>1357</td><td>1374</td><td>1422</td></tr></table> e. Ash Elemental Analysis (Elements expressed as Oxides in %w/w) <table><tr><td>Na2O</td><td>MgO</td><td>Al2O3</td><td>SiO2</td><td>P2O5</td><td>SO3</td><td>K2O</td><td>CaO</td><td>TiO2</td><td>MnO</td><td>Fe2O3</td></tr><tr><td>2.423</td><td>7.783</td><td>4.623</td><td>67.48</td><td>1.9</td><td>1.9</td><td>6.15</td><td>4.21</td><td>0.39</td><td>0.03</td><td>2.83</td></tr></table>											M	Ash	VM	FC	6.68	21.66	47.68	23.98	C	H	N	S	O	46.65	3.93	1.13	0.14	19.81	IDT	ST	HT	FT	1134	1357	1374	1422	Na2O	MgO	Al2O3	SiO2	P2O5	SO3	K2O	CaO	TiO2	MnO	Fe2O3	2.423	7.783	4.623	67.48	1.9	1.9	6.15	4.21	0.39	0.03	2.83
M	Ash	VM	FC																																																								
6.68	21.66	47.68	23.98																																																								
C	H	N	S	O																																																							
46.65	3.93	1.13	0.14	19.81																																																							
IDT	ST	HT	FT																																																								
1134	1357	1374	1422																																																								
Na2O	MgO	Al2O3	SiO2	P2O5	SO3	K2O	CaO	TiO2	MnO	Fe2O3																																																	
2.423	7.783	4.623	67.48	1.9	1.9	6.15	4.21	0.39	0.03	2.83																																																	
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-IB PROJECT INFORMATION			PAGE 14 OF 15																																																	

CLAUSE NO.	PROJECT INFORMATION		
	Annexure-IV-7(C) For the Torrefied Rice Straw Pellets (Prepared by torrefaction of rice straw at 300 deg C with holding time of 1 hr) tested at NETRA, the test results are as follows: A. For Anion (ISO 16994:2016 E-Solid Biofuels- Determination of total content of sulphur and chlorine)-reported as wt % dry basis a. Chlorine (Cl): 0.32% b. Fluorine (F) : 0.09% B. For Cation (ISO 16967:2015 E-Solid Biofuels- Determination of major elements ...)- Reported as wt % dry basis a. Sodium (Na): 0.31% b. Potassium (K): 2.04% Note: The above details as at Annexure-IV-7(A), IV-7(B & IV-7(C) are indicative only and shall vary based on the exact raw material and its subsequent processing.		
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-IB PROJECT INFORMATION	PAGE 15 OF 15



TITLE:

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

**SECTION-C1
(SPECIFIC TECHNICAL REQUIREMENT-MECHANICAL)**



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001
VOLUME-II-B
SECTION-C1
REV. NO. 00 **DATE:**

1.0 GENERAL

This specification is intended to cover design (i.e. Preparation and submission of drawing/ documents including " As Built " drawings and O&M Manuals), engineering, manufacture, fabrication, assembly, inspection & testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), fill of lubricants & consumables(excluding chemicals), mandatory spares along with spares for erection ,start up and commissioning as required, forwarding, proper packing, shipment and delivery at site ,unloading , handling transportation and storage at site, in site transportation, assembly, erection and commissioning, final painting at site, trial run, site testing,civil analysis & design of all civil structural & architectural works, Supervision of Complete civil structural, architectural & construction works, carrying out performance guarantee tests at site, training of customer/ client O&M staff & final handing over to end customer in flawless condition of **COAL HANDLING PLANT RUN-OFF WATER TREATMENT SYSTEM** complete with all accessories for **TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW)**.

2.0 REFERENCE DOCUMENTS

- A. PE-DG-497-157-A001A : P & ID For Coal Handling Plant Run-Off Water Treatment System.
- B. PE-DG-497-157-A001B : Layout For Coal Handling Plant Run-Off Water Treatment System.
- C. DATASHEET – A : FOR ABOVE SYSTEM
- D. PE-DG-497-100-M001 : PLOT PLAN

3.0 SCOPE OF SUPPLY (MECHANICAL)-

Bidder to note that Coal Handling Plant Run-Off Water Treatment System shall include associated Mechanical, Electrical, Control & instrumentation work. Broad scope of work of this package includes all equipment and accessories. Please also refer Mechanical data sheet, P&ID and the respective section of Electrical and C&I sections for respective scopes.

Following are in bidder's scope of supply:

- 1) One (1) number decanted water sump (in 2 sections) of RCC Construction (Civil in BHEL Scope) to receive decanted water from settling ponds.
- 2) Two (2) Nos Clarifier feed pumps (2x50%), along with motors, piping, valves, fittings, instrumentation etc.
- 3) Water Discharge piping from Clarifier feed pumps discharge to stilling chamber complete with fittings, valves and instruments.
- 4) One (1) number stilling chamber of RCC Construction (Civil in BHEL Scope) of required capacity for both clarifiers.
- 5) One (1) number of inlet channels of RCC Construction (Civil in BHEL Scope) along with isolation gates & flow measuring element (parshall flume) in channel.
- 6) One (1) number of inlet chamber of RCC Construction (Civil in BHEL Scope) of required capacity for clarifier.
- 7) One (1) no. Reactor Clarifiers (1x100%) with sampling points at different elevation along with concrete encased pipe from inlet channel/chamber to clarifier inlet shaft and sludge blow off pipes etc. The associated civil works shall be in BHEL's Scope.
- 8) Clarifier bridge assemblies, hand railings, required motors, valves, piping, insert plates, instrumentation etc.
- 9) Outlet channels of RCC Construction (Civil in BHEL Scope) from Clarifier up to the distribution chamber,
- 10) Sludge disposal system from clarifier, with piping, manholes, valves, instrumentation up to sludge collection pit as indicated in P & ID of CHP Run-Off Water Treatment System.
- 11) One (1) no. RCC Sludge Pit (Civil in BHEL Scope) with common sump of pumps.
- 12) Two (2) Air Blowers (2x100%) for air agitation system of the sludge pit with acoustic enclosure, motor, piping, valves, instrumentation etc.
- 13) Two (2) nos. Sludge Transfer Pumps (2x100%) with motor, piping, valves, fittings and instrumentation up to Filter Press.
- 14) Filter press (2 Nos.) of required capacity, along with associated Flushing/Cleaning pumps with motors (1W+1S), elevated platform in RCC construction, valves, piping, instrumentation etc.
- 15) One (1) No. Service Water Overhead Storage Tank (Civil in BHEL Scope). The associated float type valve, overflow & drain arrangement, valves, instrumentation etc shall be in bidder's scope.
- 16) One (1) no. RCC Distribution Chamber in twin section (Civil in BHEL Scope).



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

- 17) Two (02) Nos Supernatant Transfer Pumps (2x50%) for Plant along with motors, piping, valves, fittings, instrumentation etc.
- 18) One (1) no. Chemical storage cum Dosing shed to store chemicals, tanks, pumps, etc. Chemical storage shall be designed to meet 15 days requirement. The associated civil works shall be in BHEL's Scope.
- 19) Two (2) nos. Lime slaking tanks with motorized stirrer, flushing arrangement, instrumentation, valves, fittings and piping up to the Lime preparation tank. The associated civil works shall be in BHEL's Scope.
- 20) Two (2) nos. Lime slurry transfer Pumps (2x100%) with motor, Piping, valves & instrumentation etc.
- 21) Two (2) nos. Lime Solution dosing Tanks with motorized stirrer, flushing arrangement, instrumentation, valves, fittings and piping up to the Clarifiers. The associated civil works shall be in BHEL's Scope.
- 22) Two (2) nos. Lime dosing Pumps (2x100%) with motor, Piping, valves & instrumentation etc.
- 23) Two (2) nos. Alum Solution Preparation Tanks with motorized stirrer, flushing arrangement, instrumentation, valves, fittings and piping up to the Clarifiers. The associated civil works shall be in BHEL's Scope.
- 24) Two (2) nos. Alum Dosing Pumps (2x100%) with motor, Piping, valves & instrumentation etc.
- 25) Two (2) nos. Synthetic flocculent dosing Tanks with motorized stirrer, flushing arrangement, instrumentation, valves, fittings and piping up to the all Clarifiers.
- 26) Two (2) nos. Synthetic flocculent dosing Pumps (2x100%) with Motor, Piping, valves & instrumentation etc for all the clarifiers.
- 27) Two (2) nos. coagulant-aid dosing Tanks with motorized stirrer, flushing arrangement, instrumentation, valves, fittings and piping up to the all Filter Press.
- 28) Two (2) nos. coagulant-aid dosing Pumps (2x100%) with Motor, Piping, valves & instrumentation etc for all the Filter Press.
- 29) Two (2) nos. Weighing Scales, one (1) no. electrically operated monorail hoist with trailing cable in Chemical storage cum Dosing shed.
- 30) Mandatory spares. (Refer attached, Annexure-V/Section-C1). Bidder to consider all applicable spares, in case any spares is not applicable the relevant equivalent spares shall be provided by bidder within quoted price.
- 31) Start-up and commissioning spares as required.
- 32) All piping, valves, instruments as required for the system completion.
- 33) All motorized valves shall be provided with integral starter.
- 34) Instruments to be used for PG test shall be additionally supplied over and above the instruments shown in tender P&IDs. PG test equipment being supplied, installed and commissioned for each unit, shall be retained by employer (NTPC) after completion of PG test. All instruments, reagents, monitoring gadgets used for monitoring and carrying out, pre-commissioning, trial run, commissioning, Performance guarantee test shall be retained by end customer/BHEL.
- 35) Operating platforms shall be provided for all the equipment supplied as required/necessitated.
- 36) All pipes, puddle Pipes, fittings, structural steel etc. required for hand railing, platforms, and ladders for the equipment supplied, shall be in the scope of bidder. All insert plates, nuts and bolts, counter flanges wherever applicable shall be in the scope of bidder.
- 37) All sluice gates along with suitable protection shall be in the scope of bidder only.
- 38) All auxiliary steel structures (U-clamps, nuts, bolts, channels etc.) for fixing the pipe on the pedestal or trestles shall be in the scope of bidder.
- 39) First fill/charge of all lubricants, grease, etc.
- 40) Wherever terminal points between BHEL and bidder indicated, bidder shall provide pipes with counter flange.
- 41) One set of all special tools & tackles of reputed make necessary for proper maintenance or adjustment of the equipment being supplied by the bidder, packed in permanent box.
- 42) Sufficient numbers of portable type ladders with plate form to be supplied for ease of maintenance.
- 43) Necessary pipe, piping, fitting, valves, drains, vents, sampling etc. required for the complete Plant. Pipe racks shall be provided by BHEL wherever available. Wherever pipe racks are not available, pipe shall be laid on pedestal. All auxiliary steel structure (U-clamps, nuts, bolts, channels etc.) for fixing pipes on pedestal or racks for complete CHP Run-Off Water Treatment system shall be in bidder's scope.
- 44) Charging platform for all the chemical tanks along with required handrails, accessories etc. Permanent ladder (not rungs) for approaching the top of tanks, valves etc. All steel inserts plates with lugs, plates, bolts, nuts, sleeves, edge angles and all other embedding components etc as required to grout in civil works and to support/hold the equipment's for opening/maintenance purpose, shall be in bidder's scope.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

45) **Hand Railings and Ladders**-All handrails and ladders shall be galvanised at the rate of 610 Gms / Sq. as per IS : 4736.

46) All channels & brackets, mounting plates as required for mounting of motors, pumps, stirrers, tank etc.

47) All other things are also included in scope of supply as specified in other part of the specification.

4.0 PIPING

All the piping as listed below shall be in bidder's scope. The below indicated pipes shall be designed, supplied, erected, laid and tested by the bidder. Elbows, tees, puddle pipes, flanges Hangers and supports, embedment plates with lugs etc required for the below given piping shall also be provided by the bidder.

- a) All piping within the Coal Handling Plant Run-Off Water Treatment System.
- b) 600 NB of Minimum 70 meter Water Discharge piping from Clarifier feed pumps discharge to stilling chamber.
- c) Carbon Steel Pipe from inlet channel/chamber to clarifier inlet shaft, encased with concrete for buried portion and externally epoxy painted inside the clarifier.
- d) Sludge blow off pipe from clarifier to sludge sump.
- e) 600 NB of Minimum 1350 meter piping from Supernatant Transfer Pump to Cooling Tower basin (Cooling Tower area). (Refer Detail Of Piping Length For Treated Water Indicated in P&ID of Coal Handling Plant Run-Off Water Treatment System).
- f) 300 NB of Minimum 650 meter piping up to Waste Service Water Sump (ETP Area). (Refer Detail Of Piping Length For Treated Water Indicated in P&ID of Coal Handling Plant Run-Off Water Treatment System).
- g) 300 NB of Minimum 30 meter piping from Distribution chamber to nearest storm water drain. (Refer Detail of Piping Length for Treated Water Indicated in P&ID of Coal Handling Plant Run-Off Water Treatment System).
- h) Inlet and outlet pipes for each sump, pits, pumps, other equipment, etc. with pipe connections to the respective sumps, pits, equipment.
- i) Service water piping, instrument air piping, service air piping, potable water piping, etc. as applicable as per the Terminal Points.
- j) In addition, any additional piping and associated accessories required to complete the system shall be in bidder's scope.

5.0 DESIGN CRITERIA AND TECHNICAL DETAILS

The proposed schematic arrangement of the CHP Run-Off Water Treatment System is detailed out in this specification. The P & ID For Coal Handling Plant Run-Off Water Treatment System (Dwg. No.- PE-DG-497-157-A001A) is enclosed herein in this section for bidders compliance.

The material of construction specified in data Sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty which shall be subject to BHEL / Customer approval during detail engineering without any commercial & delivery implication to BHEL.

- 1) The top water level in the distribution chamber shall be 4.5 meter (Min) from finished ground level. However, the exact level shall be decided during detail engineering.
- 2) The hydraulic circuit of the complete plant shall be designed in such a way that water from Stilling Chamber shall flow by gravity up to the distribution chamber under various flow rates up to maximum flow.
- 3) The effluent water from the CHP Run Off Water Treatment plant shall meet the guaranteed parameters specified elsewhere.
- 4) Layout for plant shall be designed in such a way that all units (e.g.- stilling chamber, clarifier, inlet channel, distribution chamber, sludge pit, Filter Press Platform etc.) shall be interconnected by at least 1 M wide walkway at appropriate elevations with hand-railing on both sides and pathway at ground level. Minimum head room clearance to be maintained.
- 5) Space available for the complete plant is indicated in attached layout tilted as "Layout for CHP Run-Off Water Treatment System ". Bidder to accommodate all facilities in given area.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

- 6) All the chemicals to be used in the CHP Run- Off Water Treatment plant shall generally conform to the requirement of technical grade as per relevant IS.
- 7) All materials and components of valves, pumps, piping and other equipment and appurtenances shall be compatible with the respective fluid herein.
- 8) The pipelines routed in RCC trenches shall be provided with coating and wrapping. Road, Rail or pipe trench crossing be through trestle/RCC hume pipes of appropriate pressure class and the pipe lines shall be provided with coating and wrapping as per specification.
- 9) Capacity of monorail hoists, chain pulley block wherever indicated in Datasheet– A are minimum and capacity of such hoists, chain pulley block etc. shall be suitable for handling 125% of maximum weight to be **handled** during erection and maintenance of the equipments in the pump house, buildings etc. as the case may be.
- 10) All the metallic parts of equipments of Complete CHP run-Off Water Treatment system, which are embedded in concrete or in contact with water, shall be painted with bitumastic heavy duty paint over a coat of primer with total thickness of 400 microns. All the other parts of the plant shall be painted with one coat of primer and three coats of chlorinated rubber paint and total thickness shall be 200 microns.
- 11) 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 centre line shall be kept at least 200 mm from the Invert Level of the chemical tanks/ water retaining structures/ tanks/ sumps.
- 12) A minimum free board of 300 mm shall be provided in all the water retaining structures of CHP Run-Off Treatment Plant (such as Stilling chamber, all the channels, Clarifiers, Distribution chamber, Overhead filtered water tank, Sludge sump, Chemical tanks etc.) above the maximum water level/ overflow level as the case may be excluding the thickness of the slab / beam thickness if any.
- 13) Maximum operating speed of all the pumps shall be limited to 1500 RPM or less unless specified otherwise.
- 14) Wherever local instruments for measurement of Flow, Pressure, Level is indicated in the P&ID, Bidder to provide Diaphragm seal type instrument for Chemical (all type and concentration), corrosive, viscous fluids application.
- 15) For calculation of pump head, bidder to follow the technical specification requirement. Wherever pipes are running on pipe rack, Bidder will consider 12 m static head, in addition to the losses in straight length and bend in pipes and valves etc. 10% overall margin shall be considered ,while selection of pump head during detailed engineering.
- 16) The pumps shall be designed to operate under discharge valve open and close condition. Pump suction valves, re-circulation valves and discharge valves shall be provided with required limit switches for interlock & control.
- 17) The starting of pumps (wherever applicable) which are provided with forced water lubrication shall be interlocked with the availability of lube water by means of starting of lubrication water pumps, availability of adequate flow, pressure etc. The standby lubrication pump shall be started automatically during inadequate pressure or while tripping of working pump(s).
- 18) Vertical wet pit type pumps handling waste service water and decanted water shall be provided with forced water lubrication using a set of lubrication water pumps and an overhead tank filled from plant service water system.
- 19) Facilities for maintenance of the pumps by means of mobile cranes or jib crane or gantry cranes shall be provided based on pumps layout and as specified in Chapter titled 'Layout Requirements'. Hoist, mobile cranes shall be generally conforming to the requirements specified in Chapter titled 'Layout Requirements'.
- 20) Storage tanks shall be provided with vent, overflow, drain connections with required valves. Stair case, operating platform etc. shall be provided. Agitators shall be of SS-316 construction with motor driven reduction gear units.
- 21) Fasteners like bolts, nuts etc. shall be stainless steel for those coming in contact with water and for others high tensile carbon steel.
- 22) Base plate, sole plates for pumps, blowers etc. shall be carbon steel with epoxy coated.
- 23) Suitable permanent flushing connections shall be provided for all pipelines carrying sludge, acid and alkali.
- 24) Rotary type actuators for butterfly valves are also acceptable.
- 25) Max. support length in meters for MS pipe shall be as follows:-
 - a) PIPE DIAMETER (MM) 1200 1000 800
 - b) SPAN (METERS) 12 10 10For pipe sizes less than 800 NB, span shall be as per ANSI B31.1.
- 26) Design of all vertical cylindrical atmospheric storage tanks containing water, acid, alkali and other chemicals shall conform to IS: 803.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

- 27) 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.
- 28) 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.
- 29) 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.
- 30) All atmospheric tanks shall be fabricated of steel conforming to IS:2062. 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.

31) Fabrication

1. 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.

32) Appurtances, Connections, Lifting lugs

1. 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.
2. 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.
3. All lined vessels connections shall be conform to required class/rating. Nozzle material shall be ASTM-106 Grade B, Schedule 80.
4. 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.

33) OTHER DESIGN AND CONSTRUCTION FEATURES

16.1 STILLING CHAMBER

The stilling chamber shall be provided with a baffle wall so that water shall enter the chamber from the bottom and velocity of water rise through the stilling chamber shall be selected to avoid any turbulence of the incoming water and volume of stilling chamber shall have a retention time of 1 minute and velocity of water rise through the stilling chamber shall be 0.05 m/sec.. Draining arrangement with a valve shall be provided for the stilling chamber.

16.2 REACTOR CLARIFIER UNIT

- 1) The clarifier shall be solid contact reactor type with integral variable speed impeller/ turbine to internally recirculate water and sludge at adjustable rate to produce consistent water quality at varying hydraulic load and turbidity. The unit shall be designed with a minimum retention time of 90 minutes in the settling zone.
- 2) The overall area of the unit shall be based on an average flow velocity of 2.5 M3/M2/hr to 3 M3/M2/hr. Weir loading shall not exceed 300 M3/m/day. For uniform overflow over weirs, triangular notches (saw tooth weir) shall be provided as necessary.
- 3) Clear width of the bridge shall not be less than 1200 mm. All the Reactor Clarifiers shall be equipped with full bridge.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

- 4) Design of the sludge removal system should be such as to reduce loss of water during sludge blow off within 3% of rated flow.
- 5) The clarifier periphery (all around) shall have a walkway (minimum width 1000 mm) with handrail and access ladder (RCC) (at least from two locations) for good approach. All the Reactor clarifiers shall be equipped with full bridge of sufficient width. Permanent ladders shall also be provided (not rungs) for approaching the sludge pipeline valves for maintenance. However, the sludge valves shall be operatable from the top of the sludge chamber through head stock and extended spindle arrangement.
- 6) 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), reaction zone (slow mixing) and clarification zone in RCC construction. Clarifiers shall be provided with radial launders.
 - 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.

16.3 OVERHEAD WATER STORAGE TANK

The overhead tank in HDPE construction shall be provided on raised platform in the vicinity of chemical storage cum dosing shed. The water level in the tank shall be maintained by means of a float operated valve. The tank shall be provided with an overflow and drain connection with valve. The capacity of the overhead water tank shall 2 m³ (min.) to cater the water requirement such as chemical preparation, flushing etc.

16.4 CHEMICAL STORAGE CUM DOSING SHED

- 1) Chemical dosing equipment, pumps, tanks, piping etc. of CHP Run-Off Water Treatment System shall be located in shed. The Chemical Storage cum dosing shed shall store chemicals and other dosing equipment, pumps, tanks etc. Suitable acid/alkali resistance lining/tiling shall be provided by bidder as per detail indicated elsewhere in the specification.
- 2) Bidder to consider the minimum clear Height of 5.5 m (Min) from FGL for chemical storage cum dosing shed. However, Bidder to ensure minimum 2.5 m clear height above the equipment/tank for suitably handling of agitator, motor etc.
- 3) Preparation & dosing equipment of each type of chemical shall be isolated/segregated to avoid mixing of chemicals, facilitate safe operation, easy movement of personnel during plant operation and emergency condition like chemical leakage etc.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

- 4) Suitable platforms, ladders etc. to facilitate approach to various tanks, manholes/hand-holes, sight-glass, operation & maintenance of valves, instruments etc. shall be provided. Chemical storage cum dosing shed shall have sufficient unloading space, wide corridors for movement of chemicals.
- 5) Storage area (Alum, Lime, other chemicals etc.), Chemical preparation tanks area, Chemical drain trench & dyke wall shall be provided with corrosion resistant (AR) tiles/lining to protect the surface due to spillage/drains etc.
- 6) Drains from chemical storage & preparation facility/equipment shall be designed so that the same are not mixed with storm water drainage.
- 7) Chemical storage cum dosing shed shall be designed to store the chemicals for 15 days period considering working of all the clarifiers, filter press etc.
 - a) Alum as $Al_2(SO_4)_3$: 70 ppm on 100% basis
 - b) Lime as $Ca(OH)_2$: 30 ppm on 100% basis
 - c) Synthetic Flocculent : 1 ppm
 - d) Coagulant aid : 2 ppm
- 8) The overflow & drains from the various chemical tanks and floor wash drains of chemical storage cum dosing shed shall be led to CSSP.
- 9) Any other system/equipment required to meet the System requirement shall be provided.

16.5 CLARIFIER SLUDGE DISPOSAL SYSTEM

- 1) One (1) number RCC sludge pit in two (2) sections to collect sludge from all the clarifiers of CHP Run-Off Water Treatment system shall be provided. Sludge pit shall be able to store the sludge generated in clarifiers and any other drain/effluent connected to this sump. Each section of the pit shall be provided with agitation by recirculation (jetting nozzles) system and air agitation system.
- 2) Two (2) (1W + 1S) Air Blowers, common for Sludge Pit for air agitation system of the sludge pit to avoid settlement of solids, with piping, valves, instrumentation etc. with its internals (i.e.) casing, impeller, shaft etc. Blower speed shall be limited to 1500 rpm. Noise level of blowers should be limited to 85 dBA at 1 m from blowers. All the air blower shown in the P&IDs & referred in the technical specification, shall be provided in the acoustic enclosures.
- 3) Two (2) numbers of sludge feed pumps (2x100%) (1W+1S) (Vertical sump pumps) shall be provided to pump sludge to the Filter Press.

4) FILTER PRESS

- 1) The filter press (2 Nos) shall be used for dewatering the sludge coming out of preceding Sludge Sump. Each filter press shall be designed for the handling of total sludge generated while the other filter press will be under backwash/cleaning operation ensuring continuous desludging of the sludge generated.
- 2) The filter press shall be designed for continuous operation.
- 3) The feed shall be pumped into the filter press by the help of pumps. The filter press shall be located at an elevated platform. The solids from the filter press shall flow by gravity. The elevation of the filter press platform shall be at least 3.5 M above ground level so that clearance below the chute shall be suitable for truck/trolley movement. The centrate shall be sent back to clarifier by pumping.
- 4) For dewatering the fine suspended solids, suitable polyelectrolyte shall be dosed in the filter press. The solids cake discharge from filter press shall have minimum 20% to 25 % solids and shall be of tractable consistency.
- 5) The filter press shall be provided with washing lines which shall allow clearing of filter press.
- 6) The filter press shall be provided with anti-vibration arrangement for reducing the vibrations.
- 7) Polyelectrolyte dosing facility shall be provided. Necessary piping, pumps, valves, etc. shall be supplied by bidder for this purpose.
- 8) Suitable flushing connection with plug/tanks shall be provided for all pipe lines carrying sludge. Pressurized water supply for flushing shall be provided as shown in P&ID.
- 9) Suitable access rungs, ladder, platform, hand railing etc. shall be provided as per manufacturer's standard design.



16.6 CONTROL & OPERATION

- 1) Treatment plant shall be controlled from DDCMIS (BHEL Scope) located at water system control room. The control & operation of various systems described below is indicative only and the actual control & operation philosophy shall be finalized with during detailed engineering. However, for all the systems, following basic process related interlocks, alarms /pre-warning signals shall be implemented in the control system as per system requirement.

All the drives shall be started and stopped from DDCMIS (BHEL Scope).

The following pumps shall be started and stopped from DDCMIS (BHEL Scope).

- a) Alum dosing pumps.
- b) Lime dosing pumps.
- c) Flocculent dosing pumps.
- d) Sludge transfer pump.
- e) Blowers for sludge pit.
- f) Supernatant Transfer Pumps.

In addition to above Local Emergency Stop facility from individual pump shall be provided.

The following shall be monitored and controlled from DDCMIS (BHEL Scope).

- a) Agitators of chemical dosing tanks.
- 2) The motor operated inlet control valve to clarifiers shall be regulated with respect to the water level in the distribution chamber. A variable frequency drive (VFD) shall be provided for turbine/impeller drive of all the clarifiers to control the speed for varying the recirculation rate. The scrapper drives of clarifiers shall be interlocked with torque limit switches on the motors.
- 3) All the pumps shall be interlocked with the level at sump/reservoir/tank for pumps start permissive as well as pump protection. Annunciation prior to trip shall also be provided.
- 4) Agitator can be started only when the level in the corresponding dosing tank is adequate. The agitator shall trip when the level in the dosing tank comes below a pre-defined set point.
- 5) Capacity of the metering pump shall be controllable from 10-100% continuously by adjusting the stroke length manually by a micro meter dial calibrated for 0–100% of pump capacity integral with the pump.
- 6) Various annunciations related to low level of the chemical tanks shall be provided.
- 7) Each High Rate Solid Contact Clarifier (HRSCC) will have a local control panel, VFD and other part of panel accessories. The local control panel will be provided with a Remote/Local selector switch on panel. When the switch is in “Local” position, the flocculator operation will be from Local panel, however, when the selector switch is in “Remote” position, it will be controlled from DCS. This is related to flocculator operation only. However, the Rake drive will not have any local operation, it will be operated from DCS only.
- 8) A mimic with the status of drives including ON, OFF, TRIP indication of respective motors/pumps and control valve shall be provided on the DDCMIS.
- 9) Torque trip for all the clarifier shall be provided.
- 10) All the dosing pumps shall be capable of being adjusted manually to any out put with in the stated range.
- 11) All pumps shall trip at level low in respective tanks or Sumps.
- 12) Alarms pertaining to tank/sump- Very High (VH), High (H), Low (L), Very Low (VL) shall be indicated in Treatment Plant DDCMIS.
- 13) Among the equipment, it shall be possible to select a specific pump or tank or sump for working/standby/ maintenance etc. through control system.
- 14) **Permissive & Interlocks:**
 - 1) Starting & tripping of pumps with respect to liquid level in the respective sump/tanks or liquid pressure in the suction lines.



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

- 2) Starting & tripping of agitators with respect to liquid level in the respective sump/tanks.
- 3) Starting & tripping of pumps (which are provided with forced water lubrication) with respect to lubricating water flow (through low pressure/low flow signal as the case may be).
- 4) Tripping of pumps when the discharge pressure is very high to avoid operation of the pump under shutoff head.
- 5) Stopping/ tripping of equipment due to abnormal parameters related to safety of equipment like high vibration, very high bearing lubrication water (and /or oil) temperature to the drive/pumps, very high bearing temperature of the of pump/drive etc as applicable based on the recommendations of Equipment Supplier.
- 6) Automatic opening of the re-circulation valve to pre-set percentage, in case of failure of opening of pump(s) discharge valve to ensure minimum flow through the pump, as per the recommendation of manufacturer.
- 7) Automatic starting of standby pumps upon failure of starting of selected pump or tripping of running pump as the case may be.

15) Alarms /Signals:

- 1) Abnormal parameters such as low & high level in tanks/sumps, high pressure at pump discharge, low header pressure, low lubrication water flow to pumps (provided with forced water lubrication system) etc.
- 2) Failure of starting of equipment such as pumps, blowers etc. upon start command.
- 3) Tripping of equipment due to protection logic.

In addition, the control system shall facilitate the operator to know the status of various equipment (Whether equipment is running or stopped or tripped etc, whether the equipment is selected for operation/ standby duty /maintenance mode etc as the case may be).

6.0 SCOPE OF SUPPLY (ELECTRICAL)

Complete electrical as per specification and details indicated in Section C2 (Specific Technical requirement-Electrical).

7.0 SCOPE OF SUPPLY (C&I)

Complete C&I as per specification and details indicated in Section C3 (Specific Technical requirement -C&I).

8.0 SCOPE OF SERVICES

The bidder's scope also includes following services for scope under this specification:

- 1) Erection and commissioning, unloading, storage and handling at site of the complete system including the erection & commissioning all the pipe under the scope of bidder.
- 2) Complete civil analysis & design of all civil structural & architectural works of complete CHP Run off water treatment system area including Chemical storage cum Dosing shed & Filter Press Platform.
- 3) Supervision of Complete civil structural & architectural works of complete CHP Run off water treatment system area including Chemical storage cum Dosing shed & Filter Press Platform.
- 4) Arrangement of all instruments, reagents, monitoring gadgets for monitoring, & lab facilities to carry out, pre-commissioning, trial run, commissioning, Performance guarantee test & till handover.
- 5) Monitoring gadgets, instruments and equipment required for maintenance.
- 6) Complete grouting for equipment, fixing and any concreting inside the vessels and lining.
- 7) All personnel required during maintenance, Commissioning and Performance guarantee test.
- 8) Trial run for requisite period.
- 9) Performance guarantee test.
- 10) Painting shall be as specified in "Surface Preparation & Painting" Sec-D1 of this technical specification. Bidder to note that paint shed shall be finalized during detailed engineering as per customer & BHEL requirement and any variation in the painting schedule as finally approved by customer shall be taken care by bidder without any commercial and delivery implication.
- 11) Final touch up paint at site.
- 12) Bidder shall perform the guarantee parameters as per specification requirement to the satisfaction of owner. The exact modalities of verifying guarantee for the parameters indicated in the specification shall be finally as agreed with the owner during detailed engineering & mutually agreed.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

9.0 TERMINAL POINTS

- 1) CHP Run-off Water Treatment System -As per P&I diagram of CHP Run-Off Water Treatment System.
- 2) Supernatant Transfer to CT basin – At the Cooling Tower Basin (Refer P&I diagram of CHP Run-Off Water Treatment System).
- 3) Supernatant Transfer to WSWS – At the Waste Service Water Sump Inlet (Refer P&I diagram of CHP Run-Off Water Treatment System).
- 4) Supernatant Transfer to Storm Water Drain – At the Nearest Storm Water Drain (Refer P&I diagram of CHP Run-Off Water Treatment System).
- 5) 25 NB Instrument air supply at 5 to 7 kg/cm² (g) – At 5-meter distance from CHPWT Plant Chemical storage cum Dosing shed. However, distribution and piping inside CHPWT Plant area shall be in bidder's scope.
- 6) 25 NB Service air supply at 5 to 7 kg/cm² (g) - At 5 meter distance from CHPWT Plant Chemical storage cum Dosing shed. However distribution and piping inside CHPWT Plant area shall be in bidder's scope. If service air required is more than provided by BHEL, bidder to provide necessary compressors/blowers and associated valves, piping, fittings, flanges, instruments etc. to meet the system requirement.
- 7) Service water connection (50 NB connections) at 5 meter distance from CHPWT Plant Chemical storage cum Dosing shed. Piping inside CHPWT Plant area for mentioned services will be in bidder's scope.
- 8) Drinking water (or potable water) of 25 NB connections to CHPWT Plant - At 5 meter distance from CHPWT Plant Chemical storage cum Dosing shed. However distribution and piping inside CHPWT Plant area shall be in bidder's scope.

10.0 EXCLUSIONS

- 1) Complete civil structural, architectural & construction works of complete CHP Run off water treatment system area.
- 2) Dismantling or rerouting of any underground pipeline/ buried utilities.
- 3) All chemicals.
- 4) Air conditioning, ventilation & firefighting facilities. However, heat dissipation data for all motors & panels as applicable shall be finished by the bidder during detail engineering for sizing of HVAC equipment.
- 5) Other exclusions are mentioned in the electrical & C&I parts of this specification.

11.0 QP AND SUB VENDOR APPROVAL

- 1) The quality assurance plan is enclosed as Annexure-I/section-C1. However requirement of detailed QP, inspection checklist, certificate of conformance etc. for each equipment and sub-vendor shall be finalized during detailed engineering stage; decision of BHEL/customer shall be binding on vendor in this regard. Any changes/additional tests insisted upon by Owner during approval of QAP's shall be accepted by bidder without any commercial and delivery implication to BHEL/Customer. Bidder shall submit the quality plans in BHEL format during detailed engineering stage. Bidder to note further that during detailed engineering all the QAP's/check lists etc. shall be submitted to Customer/BHEL for approval. All inspection & testing etc. shall be carried out accordingly.
- 2) The sub vendor list enclosed as Annexure-II/section-C1 is indicative only and is subject to approval / acceptance by customer (NTPC). Bidder to propose his sub vendor list with back up documents (experience list, end user certificate as applicable) etc. The same shall subject to BHEL and Customer approval during detailed engineering stage without any technical, commercial & delivery implication to BHEL.

12.0 PERFORMANCE GUARANTEE TEST

The Performance guarantee test shall be as per Annexure-III/Section-C1.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

13.0 DESIGN CRITERIA AND TECHNICAL DETAILS

In addition to the requirements of Section C & D the following shall also be complied under scope of this specification.

The P&ID for CHP Run-Off Water Treatment System (**Dwg.No.- PE-DG-497-157-A001A**) is enclosed herein in this section for bidder's compliance. The material of construction specified in data Sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty which shall be subject to BHEL /Customer approval during detail engineering without any commercial & delivery implication to BHEL. The other technical requirement shall be as per Technical Requirement of water treatment system. Please refer Section-D1 of this specification.

14.0 DRAWING/DOCUMENTS REQUIREMENT

For the Drawings/Documents Requirement & Distribution submission schedule, please refer **Annexure-IV/Section-C1**.

The bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and customer comments or observations. Without compliance sheet the submission of the drawings/documents will not be considered and the delay on this account will be solely on bidder's side only. Bidder to comply with the observations of the BHEL and CUSTOMER without price & delivery implication.

15.0 ADDITIONAL REQUIREMENT

- 1) Engineering for this project is to be carried out in Integrated Intelligent Engineering environment at BHEL end. For Details Refer Drawings/Documents Requirement & Distribution submission schedule.
- 2) Initial charge of all lubricants & grease.
- 3) All special tools necessary for proper maintenance or adjustment of the equipment packaged in permanent box.
- 4) Finish paints for touch-up painting of equipment after erection at site in sealed container.
- 5) Wherever pipe racks are not available, pipes shall run on pedestals or below ground. All fixing items such as U clamps, nuts, bolts etc. required to lay the pipes on pedestals shall be in bidder's scope of work. Coating, wrapping and protection required for buried pipes shall be in bidder's scope of work.
- 6) All the first fill and one Year's topping requirements or 10 % of first fill quantity, whichever is more of consumable such as greases, oil, lubricants, servo fluids/control fluids, gases and 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 furnished by the bidder. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum.
- 7) Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
- 8) In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.
- 9) Final Electrical Load list will be submitted by the successful bidder as per agreed drawing/ doc submission schedule. Thereafter any change in the electrical load list shall be entertained only subject to its feasibility, and BHEL reserves the right to debit the vendor cost of any changes necessitated in the switch gear /MCC on account of changed loads.
- 10) The complete system shall be proven and necessary design documentation in support of proveness shall be submitted by the successful bidder in support of the systems, if asked by the customer without any price and delivery implication to BHEL and customer.
- 11) System to be designed to meet all the statutory requirements. Preparation of all necessary drawings/data/ documents for obtaining necessary Approval of statutory authorities like CCOE , IBR , Weight & Measures



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

Department and any other agency/ competent authority ,on behalf of the customer, related to installation of CHP Run-off Water Treatment System (if required) is included in bidder's scope. All expenses required to obtain the approval shall also be borne by the successful bidder. Successful bidder shall inform customer well in advance requirement of authority letter along with format for the same. After issuance of authority letter by customer, it will be vendor's responsibility to regularly follow up with the concerned authorities to obtain timely approval from these authorities. Any delay on account of the same, unless any specific information related to above approval to be furnished by customer is delayed by customer, shall be to vendor's account and shall not be used as a reason for extension in contract completion.

- 12) Vendor to attend regular engineering meeting with BHEL and customer fortnightly in BHEL or customer office as decided during detail engineering. Vendor will depute all his concerned engineering representative along with the project manager for discussion and approval. Meeting can be held at site also.
- 13) Space available for CHP Run-off Water Treatment System is attached, elsewhere in this specification. Bidder to accommodate their equipment within the space provided. Further during detail engineering some arrangement of facilities may have variation. Bidder to accommodate the same without any commercial & delivery implication.
- 14) Bidder to submit BBU during detailed engineering after approval of Basic documents. Incomplete BBU shall not be reviewed by BHEL.
- 15) Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance.
- 16) Any statutory requirement / clearance required for the packages from government / local body shall be in bidder's scope. Any change arising out of any new government norms, statutory requirements during the course of execution of the project shall also be complied by the bidder without any commercial implication.
- 17) Instrument, valves, & piping shown in the flow diagram/ P&IDs are bare minimum requirement. Any additional instrument, valves, and piping required as per system requirement, shall be in the bidders scope.
- 18) Wherever gravity flow is not possible the bidder shall provide suitable storage & pumping system (2x100%) along with Piping, valves & instrumentation etc to meet the system & process requirement.
- 19) Service water shall be available near to CHP Run-off Water Treatment System / system building/ area at approximately 1.5 to 2.0 Kg/Cm². Hence, bidder to take care for cooling/ lubrication of the pumps being supplied by the bidder under this technical specification. If service water pressure requirement is more than available pressure, bidder to consider two (2) nos. cooling pump/lubrication pump for CHP Run-off Water Treatment System.
- 20) Capacity of monorail hoists, chain pulley block wherever indicated in Datasheet– A are minimum and capacity of such hoists, chain pulley block etc. shall be suitable for handling 125% of maximum weight to be handled during erection and maintenance of the equipments in the pump house, buildings etc. as the case may be.
- 21) Wherever local instruments for measurement of Flow, Pressure, Level is indicated in the P&ID, Bidder to provide Diaphragm seal type instrument for Chemical (all type and concentration), corrosive, viscous fluids application.
- 22) Slings & Lifting lugs shall be provided in all equipment.
- 23) In case of any conflict and repetition of clauses in the specification, the more stringent requirements among them are to be complied with.
- 24) Latest version of all codes and standards to be followed.
- 25) All civil drawings will have bill of quantity (BOQ) in every revision/submission.

16.0 SITE VISIT BEFORE SUBMISSION OF OFFER.

Bidders shall make Site visit in order to familiarize themselves with existing condition of site before submitting the bid in order to make their offer complete. During detail engineering also, the successful bidder shall be responsible for the correctness of details w.r.t existing facility at site. Customer approval on any drawing having details of existing facility shall not be cited by the successful bidder a valid reason for any shortcoming in the work by them. BHEL shall also not entertain any cost implication for any lack of input data with regard to site during detail engineering.



TITLE:
**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001	
VOLUME II-B	
SECTION-C1	
REV. NO. 00	DATE:

ANNEXURE-I

QAP FOR CHP-RUN-OFF WATER TREATMENT SYSTEM



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-CI

REV. NO. 00

DATE:

QUALITY ASSURANCE												
CLAUSE NO	QUALITY ASSURANCE											
	Test/Check	Material Test	WPS/PQR/Welder	DPT/MPI	Assembly Fit up	Dimension	RT	Hydraulic test / Pneumatic test	Performance Test	Test as per relevant Std / Appd. Data Sheets	Other Tests	Remarks



COMMON ITEMS:

1. Horizontal Centrifugal Pumps					Y	Y			Y ¹	Y		LEGENDS: Applicable tests are identified by 'Y'. Y ^a : One per Heat / Heat Treatment batch / Lot. Y ^b : On machined surfaces only. Also 100% on Butt Welds & 10% on Fillet Welds. Y ^c : UT shall be done for shafts with Dia 50 mm or above & Plates of Thickness 25 mm or above. Y ^d : Dynamic Balancing per IS: 21940, Grade 6.3 minimum shall be conducted for rotating assy. Y ¹ : As per Pump governing standard. Tolerances as per HIS, USA. Y ² : Random 10% RT to be conducted on butt welds for Thk ≥10 mm. Y ³ : Seat Leakage Test for actuator operated valves shall be done by operating the valve with job actuator. Y ⁴ : Tests on Rubber Diaphragms shall be conducted per batch of Rubber mix for Tensile, Elongation, Hardness, Thickness, Bleed Resistance. In addition, Type Test for 50,000 cycles for each type of diaphragm shall also be conducted.
1.1. Casing	Y ^a		Y ^b			Y		Y				
1.2. Impeller	Y ^a		Y ^b			Y					Y ^d	
1.3. Shaft	Y ^a		Y			Y			Y ¹	Y	Y ^c	
2. Vertical Pumps					Y	Y						
2.1. Casing	Y ^a		Y ^b			Y		Y			Y ^d	
2.2. Impeller	Y ^a		Y ^b			Y					Y ^c	
2.3. Shaft	Y ^a		Y			Y						
2.4. Fabricated Parts	Y ^a	Y	Y ^b			Y	Y ²	Y				
3. Dosing/ Metering Pumps	Y ^a					Y		Y	Y ¹	Y		
4. Gate/ Globe/ Check Valves	Y ^a		Y ^b			Y		Y	Y	Y	Y ³ , Y ⁶	
5. Dual Plate Check Valves	Y ^a		Y ^b			Y		Y	Y	Y	Y ⁶ , Y ¹²	
6. Diaphragm Valves	Y ^a					Y		Y		Y	Y ⁴ , Y ³	
7. Butterfly Valves (Low Pr.)					Y	Y		Y	Y	Y	Y ³	
7.1 Body & Disc (Cast	Y ^a		Y ^b			Y						
7.2 Body and Disc (Fabricated)	Y ^a	Y	Y ^b			Y				Y	Y ²	
7.3 Shaft	Y ^a		Y ^b			Y					Y ^c	
8. Plug/ Ball Valves (Low Pr.)	Y ^a		Y ^b		Y	Y		Y	Y	Y	Y ³	Y ⁶ : Blue Matching, Wear Travel for Gate Valves and reduced pressure test



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-CI

REV. NO. 00

DATE:

QUALITY ASSURANCE												
CLAUSE NO												
Test/Check	Material Test	WPS/PQR/Welder	DPT/MPI	Assembly Fit up	Dimension	RT	Hydraulic test / Pneumatic test	Performance Test	Test as per relevant Std / Appd. Data Sheets	Other Tests	Remarks	
Items / Components												
9. Blowers/ Compressors	Y ^a		Y ^b	Y	Y			Y	Y	Y ^c , Y ^d	for check valves shall be conducted as per relevant standards.	
10. Tanks/ Pressure Vessels	Y ^a	Y	Y ^b	Y	Y	Y ⁸	Y		Y	Y ⁷	Y ⁷ : Heat Treatment of the Tank/Vessel shall be done per fabrication code requirement. Welded dished ends shall be stress relieved. Dished ends manufactured by cold working shall also be stress relieved as per the requirement of code.	
11. Rubber Lining	Y ^a				Y				Y	Y ⁹	Y ⁸ : RT as per fabrication code requirements. However, dished ends welds, if manufactured by using welded plates shall be subjected to 100% RT.	
12. Strainers	Y ^a	Y	Y ^b	Y	Y		Y		Y		Y ⁹ : Rubber Lining Mix shall be subjected to Bleed Resistance Test on mould sample. Adhesion Test, Spark Test and Hardness Test for the Rubber lined jobs shall also be conducted.	
13. Pipe & Pipe Fittings	Y ^a	Y	Y	Y	Y	Y ⁸	Y	Y		Y ¹⁰	Y ¹⁰ : Gear Boxes shall be checked for smooth No Load Operation at shop to verify noise and vibration levels. Gear Ratio and Kerosene Leak Test shall also be conducted.	
14. Agitators /Flash Mixer/ Flocculator	Y ^a	Y	Y ^b	Y	Y			Y ¹ ₁	Y	Y ^c , Y ^d	Y ¹¹ : One Fan of each type & size shall be routine performance tested as per corresponding code for air flow, static pressure, total pressure, speed, efficiency, power consumption, noise & temperature rise. Also all Fans shall be subjected to run test of 4 hours during which noise, vibration, temperature rise and current drawn shall be measured.	
15. Ventilation/Exhaust Fan	Y ^a		Y ^b	Y	Y						Y ¹² : Dry cycle test on valve spring for 1, 00,000 cycles shall be carried out as	
16. Hoists & Cranes	Y ^a	Y	Y ^b	Y	Y	Y ⁸		Y	Y			
17. Wrapping & Coating Material	Y				Y				Y			
18. Package/ Split AC	Y							Y	Y	Y ¹⁴		
PT & LET PLANT:												
1. Clariflocculator / Reactor Clarifier / Plate or Tube Settler	Y ^a	Y	Y ^b	Y	Y				Y	Y ¹⁰		



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

CLAUSE NO

QUALITY ASSURANCE



Test/Check Items / Components	Material Test	WPS/PQR/Welder	DPT/MPI	Assembly Fit up	Dimension	RT	Hydraulic test / Pneumatic test	Performance Test	Test as per relevant Std / Appd. Data Sheets	Other Tests	Remarks
2. Pressure / Vacuum Relief valve / Pressure Regulating Valve	Y ^a			Y	Y		Y	Y	Y		type test, if not carried out earlier, for the similar MOC, size and type of spring. Y ¹³ : Test as per approved supplier practice. Y ¹⁴ : Electronic leak test for condenser & evaporator unit.
DM PLANT											
1. Resins / Activated Carbon									Y		
2. Filter Membrane					Y				Y		Note: 1.The complete Piping system along with valves & fittings shall be hydraulically tested at 1.5 times design pressure or 2 times working pressure whichever is higher after erection at site.
3. RO Pressure tube	Y ^a				Y		Y		Y		2. In case of items other than those identified above, the quality requirements shall be decided based on system design requirements.



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-CI

REV. NO. 00

DATE:

Tests/Check	Material Test	DPT/MPI	Ultrasonic test	RT	Balancing	Hydraulic / Water Fill test	Pneumatic Test	Assembly/ fit up	Dimensions	Functional/operational Test	Performance Test	Other Test	All Test as per relevant Std/ Approved Data Sheets	Remarks
Items / Components														
A. CW PUMPS, VT PUMPS & CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL), SUMP PUMPS, SUBMERSIBLE PUMPS, DRAINAGE PUMP											Y ²			
1 Shaft	Y ^a	Y ^b	Y ^c	Y ³	Y				Y			Y ^d		
2 Impeller	Y ^a	Y ^b			Y							Y ^e		
3 Suction Bell / Bowl Castings/ Inserts	Y ^a	Y ^b				Y			Y					
4 Discharge Head / Column Pipes / Distance Piece/Base Plate	Y ^a	Y ^b	Y ^c	Y ⁴		Y		Y						
5 Companion Flanges	Y ^a	Y ^b	Y ^c	Y ⁵				Y						
5 Thrust Bearing (Tilting Pad type)	Y ^a	Y	Y					Y	Y				Y	
B. BUTTERFLY VALVES						Y ⁷		Y	Y	Y		Y ⁸	Y	
1 Body & Disc (Cast)	Y ^a	Y ^b												
2 Body & Disc (fabricated)	Y ^a	Y ^b	Y ^c									Y ⁹		
3 Shaft	Y ^a	Y ^b	Y ^c											
4 EH Actuators	Y ^a	Y				Y	Y	Y		Y				
C. RE JOINTS	Y ^a					Y ¹⁰		Y	Y			Y ¹¹		
D. R & W PIPES	Y ^a													
E. CRANES & HOISTS	Y ^a	REFER NOTE 13												
		REFER RESPECTIVE QA CHAPTER FOR CHECKS ON EOT CRANES AND HOISTS												



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-CI

REV. NO. 00

DATE:

F.	VENTILATION FANS																			
1)	Hub/Blades/Casing /Impeller	Y	Y																	Y
2)	Shaft																			
3)	Pre/Fine Filters	Y ^a	Y	Y ^c																Y ¹⁴
H.	GATE, GLOBE, CHECK VALVES, PIPINGS, & SPECIALITIES	Y ^a	Y ^b	Y ^c									Y ¹⁵		Y	Y	Y	Y	Y ¹⁵	Y

Notes:

a	One per Heat/ Heat Treatment Batch/ Lot.
b	On machined surfaces only for Castings / Forgings and on Welds of Fabricated Components.
c	For Shaft diameter. ≥ 50 mm and for plate thickness ≥ 25 mm
d	Inter Granular Corrosion (IGC) Test shall be carried out on SS Castings.
1	Trial assembly of all Vertical Turbine Pump components with Column Pipes, Discharge Head, and Motor Stool shall be carried at shop.
2	Performance testing of Pumps shall be carried out at shop, as per HIS standard to determine Head & Flow Characteristics.
3	In case of CW pump impellers, Radiographic Examination shall be conducted as per ASTM E186/446 with Severity Level 2 for Gas porosity, Level 3 for Sand, Slag and Shrinkage. Cracks, Inserts and Mottling are not acceptable. Radiographic Examination should cover Vanes, Vane Junctions, Full Radial depth of Hub & other accessible areas of the rest of the Impeller.
4	Random 10% RT to be conducted on butt welds for $\text{Thk} \geq 10$ mm & ≤ 25 mm and 100% RT to be conducted on butt welds for $\text{Thk} > 25$ mm (RT may be replaced by Ultrasonic Test due to constraint if any.) Stress relieving shall be carried out as per norms of ASME Section VIII.
5	Segmental Flanges exceeding 37.5 mm thickness shall be stress relieved after welding. All butt weld joints in segmental flange shall be examined by Radiographic Test. (RT may be replaced by Ultrasonic Test due to constraint if any.) Maximum number of segments shall be 4 only.
6	No repair welding is permitted on Cast Iron / Alloy Cast Iron Castings.
7	Hydraulic Test of Body, Seat and Disc strength shall be carried out in accordance with latest edition of AWWA C-504. Actuator operated Valves shall be checked for Seat Leakage by closing the Valve with Job Actuator. Seat Leakage test shall be carried out in both directions.
8	For Proof of Design Test refer respective chapters of engineering portion in the technical specification.
9	For Butterfly Valves of Fabricated construction (Sizes 600mm and above), butt Welds of thickness 20mm & above shall be subjected to 100% Radiography and Components shall undergo stress relieving.



TITLE:

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-CI

REV. NO. 00

DATE:

10	During Hydraulic & Vacuum test at 30 mm Hg absolute in 3 different positions, the change in Circumference of the Arch should not be more than 1.5%. Permanent Set, after 24 hours of the test, should not exceed 0.5% of Arch.														
11	Tests on Rubber for Tensile, Elongation, Hardness, Hydraulic Stability as per ASTM D-471, Ozone Resistance test as per IS:3400 Part 20, Aging test, Adhesion strength of Rubber to Fabric and Rubber to Metal shall be carried out.														
12	Smooth operation and Leakage test shall be carried out at site.														
13	Followings are the testing requirements for fabrication of pipes at site														
	<table> <tr> <th>Tests</th><th>Quantum of Check</th></tr> <tr> <td>WPS, PQR, Welder Qualification Test</td><td>100%</td></tr> <tr> <td>DPT on root run</td><td>100% for pipes up to 1200 mm diameter</td></tr> <tr> <td>DPT after back gauging</td><td>100% for pipes above 1200 mm diameter</td></tr> <tr> <td>RT/ UT by TOFD Technique/PAUT</td><td>5%</td></tr> <tr> <td>DPT on finished butt weld joints</td><td>10%</td></tr> <tr> <td>Hydraulic Test</td><td>100%, 1.5 times the design pressure or 2 times the working pressure whichever is higher.</td></tr> </table>	Tests	Quantum of Check	WPS, PQR, Welder Qualification Test	100%	DPT on root run	100% for pipes up to 1200 mm diameter	DPT after back gauging	100% for pipes above 1200 mm diameter	RT/ UT by TOFD Technique/PAUT	5%	DPT on finished butt weld joints	10%	Hydraulic Test	100%, 1.5 times the design pressure or 2 times the working pressure whichever is higher.
Tests	Quantum of Check														
WPS, PQR, Welder Qualification Test	100%														
DPT on root run	100% for pipes up to 1200 mm diameter														
DPT after back gauging	100% for pipes above 1200 mm diameter														
RT/ UT by TOFD Technique/PAUT	5%														
DPT on finished butt weld joints	10%														
Hydraulic Test	100%, 1.5 times the design pressure or 2 times the working pressure whichever is higher.														
	Note:- After erection, the complete piping system shall be tested at 1.5 times, the design pressure or two times the maximum working pressure whichever greater. No leakage/seepage is acceptable. Butt weld joints which would not be hydro-tested shall be subjected to 100% RT test/ 100% UT by TOFD /PAUT Technique.														
14	Type / Routine tests as per requirements of BS-6540/ ASHRAE-52-76 for Dust arrestance shall be carried out.														
15	- All pipes and fittings shall be tested as per applicable code. - All strainers shall be subjected to Hydraulic pressure test for leakage. - All valves shall be hydraulically tested for body, seat and back-seat (if applicable) as per relevant standard. Check valves shall also be tested for leak tightness test at 25% of the specified seat test pressure. - Valves shall be offered for hydro test in unpainted condition. - Functional checks of the valves for smooth opening and closing shall also be done. - Anti-corrosive protection shall be tested as per applicable code.														

1) The above mentioned requirement are bare minimum. However any additional comments provided by BHEL / Customer shall be adhered by successful bidder without any commercial and delivery implication to BHEL/Customer.



TITLE:
**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001	
VOLUME II-B	
SECTION-C1	
REV. NO. 00	DATE:

QAP FOR LOW PRESSURE PIPING (LP PIPING)



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

**PIPES, FITTINGS, BENDS, VALVES, COATING-WRAPPING, STRAINERS EXPANSION,
JOINTS, TANKS, FASTENERS, LINING ETC.**

	Tests/Check Items / Components	Material Test	DPT/MPI / RT	Ultrasonic Test	WPS/ WQS/PQR	Hydraulic / Water Fill Test	Pneumatic Test	Assembly Fit up	Dimensions	Functional/operation al Test	Other Tests	All Tests as per relevant Std	REMARKS
1	Pipes & Pipe Fittings	Y ^a	Y ^b			Y ¹			Y			Y	
2	Diaphragm Valves	Y ^a				Y ⁵			Y		Y ⁶		
3A	Cast Butterfly Valves (Low Pressure)					Y		Y	Y	Y	Y ⁷		
	Body	Y ^a	Y ^b										
	Disc	Y ^a	Y ^b										
	Shaft	Y ^a	Y	Y ^c									
3B	Fabricated Butterfly Valves	REFER NOTE 14											
4	Gate/ Globe/Swing Check / Ball Valves	Y ^a	Y ^b	Y ^c		Y ⁵	Y	Y	Y	Y	Y ⁸		
5	Dual Plate Check Valves	Y ^a	Y ^b	Y ^c		Y	Y	Y	Y	Y	Y ⁴		
6	Rolled & Welded Pipes and Mitre Bends	Y ^a	Y ³		Y	Y ³			Y		Y ^{3&15}	Y	
7	Coating & Wrapping of Pipes	Y ²									Y ²		
8	Tanks & Vessels	Y ^a	Y ^b		Y	Y			Y		Y ¹⁵		
9	Strainers	Y ^a	Y ^b		Y #	Y					Y ¹¹		#For Fabricated Strainer
10	Rubber Expansion Joints	Y ^a				Y ¹²		Y	Y		Y ¹³		
11	Internal Lining of Pipes	Y ^a							Y		Y ⁹		
12	Site Welding		Y ¹⁰		Y	Y							
NOTES (MEANING OF SUPERSSCRIPTS)													
a	One per heat/heat treatment batch/lot.												
b	On machined surfaces only for castings and on butt welds.												
c	For shaft/spindles > or = 40 mm												
1	100% Hydraulic test shall be carried out. Weld joints not subjected to hydraulic test due to some unavoidable reasons, shall be subjected to 100% RT/PAUT.												
2	Spark Test, Adhesion Test and Material Test for primer and enameled & Coal Tar Tapes as per AWWA-C-203-91/ IS-10221 & IS 15337 as applicable.												
3	Followings are the testing requirements for fabrication of pipes at site												
	TESTS					QUANTUM OF CHECKS							
	WPS, PQR, Welder Qualification Test					100% Welders and WPS shall be qualified as per ASME- section IX							
	DPT on root run					100% for pipes up to 1200 mm diameter							
	DPT after back gauging					100% for pipes above 1200 mm diameter							
	RT / UT by (TOFD/PAUT) Technique					5% (100% of T Joints)							
	DPT on finished butt weld joints					10%							



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

	Hydraulic Test	100%, 1.5 times the design pressure or 2 times the working-pressure whichever is higher.
4	Dry Cycle Test on Dual Plate Check valve spring for one lakh Cycles shall be carried out as a type test. If Dry Cycle test carried out earlier for same material & diameter, Test report shall be reviewed.	
5	Seat Leakage Test for Actuator Operated Valves, shall be done with by closing the valves with actuator.	
6	Tests on rubber parts shall be conducted per batch of rubber mix for tensile, Elongation, hardness, adhesion, spark test, bleed resistance test. In addition, type test for 50,000 cycles of each type of diaphragm shall also be conducted.	
7	Hydraulic Test of Body, Seat and disc-strength shall be carried out in accordance with governing design standard in presence of owner / owner's representatives. Actuator operated valves shall be checked for Seat Leakage by closing the valves with actuator. For Proof of Design Test refer respective chapters of engineering portion in the technical specification.	
8	Blue matching, wear travel for gates, valves, pneumatic seat leakage, and reduced pressure test for check valves shall be done as per relevant standard. Maximum allowable vacuum loss is 0.5 mm of Hg abs. for valves to be tested for vacuum operation for internal pressure 25 mm of Hg abs. for a period of 15 minutes. Fire safe test for ball valve shall be done wherever specified. In case of already carried out, the test report shall be submitted for review and acceptance by owner / owner's representatives. Valves shall be offered for hydro test in unpainted condition.	
9	Tensile, Elongation, Hardness, Specific Gravity, Lining Thickness, Humidity Check, Pipe temperature check, Adhesion Test and Holiday Detection Test etc as per applicable standard shall be done for all lining material and application.	
10	10% of welds (Root and finished welds) shall be subjected to DPT. (100% DPT for compressed air line and boiler & deaerator fill line.).	
11	Pressure drop across the strainer for each type and size as a special test shall be carried out. In case of already carried out, the test report shall be submitted for review and acceptance by owner / owner's representatives.	
12	During hydraulic and vacuum tests at 25mm Hg abs in 3 positions, the change in the circumference of arch should not be more than 1.5%. 24 hrs after the test permanent set in dimension should not exceed 0.5%.	
13	Tests on rubber for tensile, elongation, hardness, hydraulic stability check as per ASTM D 471, ozone resistance test as per ASTM D 1149/IS 3400 Part 20 aging test and adhesion strength of rubber to fabric, rubber to metal adhesion shall be carried out.	
14	In addition of all tests as indicated for Cast Butterfly valve being applicable for fabricated butterfly valves, following test shall be done for Fabricated Butterfly Valve: a. UT as per ASTM A-435/IS 11630 & IS 4225 on plate material for body and disc shall be carried out for plate thickness 25mm and above. b. 100% RT and DPT as per ASTM, Section-VIII, Division-I, on butt joints of body and disc. 10% DPT on other welds shall be done. c. Post weld heat treatment as per ASME, Section-VIII, Division-I on butt joints of body and disc. d. Welders and WPS shall be qualified as per ASME- section IX	
15	Maximum number of segments in segmental flanges shall be four (04) only. All butt weld joints in the segmental flanges shall be examined by RT/UT. Segmental flanges exceeding 37.5 mm thickness shall be stress relieved as per norms of ASME Section VIII after welding.	
16	For pressure vessel welds RT shall be done as per design code requirements.	

All Valves shall be offered for inspection in unpainted condition.

No repair welding is permitted on Cast Iron / Alloy Cast Iron Castings.



TITLE:
**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001	
VOLUME II-B	
SECTION-C1	
REV. NO. 00	DATE:

QAP FOR EOT CRANES AND HOISTS



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

Shop Test for T.G.Hall EOT Cranes, Other Cranes & Hoist

1.0 HOOKS

- 1.01 ALL TESTS INCLUDING PROOF LOAD TEST AS PER RELEVANT IS/BS/DIN SHALL BE CARRIED OUT.
- 1.02 MPI/DPT SHALL BE CARRIED OUT AFTER PROOF LOAD TEST.

2.0 STEEL CASTING

- 2.01 DPT ON MACHINED SURFACE SHALL BE CARRIED OUT.

3.0 GIRDERS, END CARRIAGE, CRAB, GEAR BOX AND ROPE DRUM

- 3.01 THE PLATES OF THICKNESS 25MM AND ABOVE SHALL BE ULTRASONICALLY TESTED.
- 3.02 NDT REQUIREMENTS ON WELDMENTS SHALL BE AS FOLLOWS:
- a) BUTT WELDS IN TENSION:- 100% RT AND 100% DPT
 - b) BUTT WELDS IN COMPRESSION:- 10% RT AND 100% DPT
 - c) BUTT WELDS IN ROPE DRUM:- 100% RT AND 100% DPT
 - d) FILLET WELDS:- RANDOM 10% DPT

4.0 FORGING (WHEEL, GEARS, PINIONS, AXLE, HOOKS & HOOK TRUNION)

- 4.01 ALL FORGINGS GREATER THAN OR EQUAL TO 50 MM DIAMETER OR THICKNESS SHALL BE SUBJECTED TO ULTRASONIC TESTING.
- 4.02 DPT/MPI SHALL BE DONE AFTER HARDFACING AND MACHINING.

5.0 WIRE ROPE SHALL BE TESTED AS PER RELEVANT STANDARD.

6.0 REDUCTION GEARS SHALL BE TESTED FOR REDUCTION RATIO, BACKLASH & CONTACT PATTERN. GEAR BOX SHALL BE SUBJECTED TO NO-LOAD RUN TEST TO CHECK FOR OIL LEAKAGE, TEMPERATURE RISE, NOISE AND VIBRATION.

7.0 THE CRANES SHALL BE COMPLETELY ASSEMBLED AT SHOP FOR FINAL TESTING. ALL TESTS FOR DIMENSION, DEFLECTION, LOAD, OVERLOAD, HOISTING MOTION, CROSS TRAVEL ETC. AS PER IS-3177 SHALL BE CARRIED OUT AT SHOP.

8.0 ALL ELECTRIC HOISTS SHALL BE TESTED AS PER IS-3938 AND CHAIN PULLEY BLOCKS SHALL BE TESTED AS PER IS-3832.

9.0 LIFTING BEAM:

- 9.01 THE PLATES OF THICKNESS 25MM AND ABOVE SHALL BE ULTRASONICALLY TESTED.



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

9.02

NDT REQUIREMENTS ON WELDMENTS SHALL BE AS FOLLOWS:

- e) BUTT WELDS IN TENSION:- 100% RT AND 100% DPT
- f) BUTT WELDS IN COMPRESSION:- 10% RT AND 100% DPT
- g) FILLET WELDS:- RANDOM 10% DPT

9.03

ALL FORGINGS GREATER THAN OR EQUAL TO 50 MM DIAMETER OR
THICKNESS SHALL BE SUBJECTED TO ULTRASONIC TESTING.

9.04

DPT/MPI SHALL BE DONE AFTER MACHINING.

9.05

Lifting Beam will be subjected to overload testing at @1.25 X
SWL of Lifting Beam at manufacturer works.



TITLE:
**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001	
VOLUME II-B	
SECTION-C1	
REV. NO. 00	DATE:

ANNEXURE-II

SUB-VENDOR LIST (INDICATIVE)

PROJECT: PATRATO 3 X 600MW

PACKAGE: WATER TREATMENT PLANT (DM PLANT, PT PLANT, ST PLANT, CW TREATMENT & CHLORINE DIOXIDE PLANT)

MAIN CONTRACTOR: BHEL

CONTRACT NO: 9585-001

LIST OF ITEMS REQUIRING
QUALITY PLAN AND
SUB CONTRACTOR APPROVAL

DOC. NO.

Revision No.

Date

PAGE

Place

0

9

10

11/07/19

1 of 10

11

12

Remark

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

62

63

64

65

66

67

68

69

70

71

72

73

74

75

76

77

78

79

80

81

82

83

84

85

86

87

88

89

90

91

92

93

94

95

96

97

98

99

100

101

102

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

137

138

139

140

141

142

143

144

145

146

147

148

149

150

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167

168

169

170

171

172

173

174

175

176

177

178

179

180

181

182

183

184

185

186

187

188

189

190

191

192

193

194

195

196

197

198

199

200

201

202

203

204

205

206

207

208

209

210

211

212

213

214

215

216

217

218

219

220

221

222

223

224

225

226

227

228

229

230

231

232

233

234

235

236

237

238

239

240

241

242

243

244

245

246

247

248

249

250

251

252

253

254

255

256

257

258

259

260

261

262

263

264

265

266

267

268

269

270

271

272

273

274

275

276

277

278

279

280

281

282

283

284

285

286

287

288

289

290

291

292

293

294

295

296

297

298

299

300

301

302

303

304

305

306

307

308

309

310

</

PROJECT PATRATI 3 & BODMW						LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL						DOC NO.		Revision No		0	
PACKAGE WATER TREATMENT PLANT (DM PLANT PT PLANT ET PLANT ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)						MAIN CONTRACTOR : BHFL						Date		11/02/19			
CONTRACT NO. 9585-001						PAGE						2 of 10					
Sr. No.	Item	QTY / INSP CAT	QP NO		PROPOSED SUB SUPPLIER	Place	SUB SUPPLIED APPL Status	Remark									
1	2				5/0 MOTOR	7	6	5	4	3	2	1	10	11	12		
					M/S FLOWMORE LTD		A	HORIZONTAL UP TO 500MM/HRL & VERTICAL CENTRIFUGAL PUMPS UP TO 1000MM ONLY. RUBBER LINED PUMPS ALSO.									
					M/S FLOWMORE LTD		A										
					KHILKAR BHUS LTD		A										
					WPH LTD		A										
					WPH LTD		A										
					INOTI LTD		A										
					XYLEM WATER SOLUTIONS INDIA PVT LTD		A										
					FLOERVEVE INDIA CONTROLS PVT LTD		A										
					SWITCH PRECISION		A										
					WILD MATHIE R PLATT PUMPS (PVT) LIMITED		A										
					BHFL APPROVED SOURCES ACCEPTABLE												
					ASIR		A										
					KHILKAR BHUS LTD		A										
					AQUAMACHINERY		A										
					WPH LTD		A										
					WPH LTD		A										
					MBH		DH										
					BHFL APPROVED SOURCES ACCEPTABLE												
					ADVANCE VALVE PVT LTD		A										
					LEAGER		A										
					R & G MULTIPLE		A										
					BHFL APPROVED SOURCES ACCEPTABLE												
					WEIR BOW		A										
					MICO FINISH VALVES PVT LTD		A										
					FLOW CHEM INDUSTRIES		A										
					LACT VALVES (MATED)		A										

PROJECT: PATRATU 3 X 1600MW				DOC. NO.			
PACKAGE: WATER TREATMENT PLANT (DM PLANT, PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)				Revision No. 0			
MAIN CONTRACTOR: BHEL				Date 11/07/13			
CONTRACT NO: 9585-001				PAGE 4 of 10			
Sr. No.	Item	QP / INSP CAT	QP NO	PROPOSED SUB SUPPLIER	SUB SUPPLIER APPL. Status	Place	Remark
1	2	3	4	5	6	7	11
14	VALVE CONVENTIONAL GATE / GLOBE / CHECK - 600NB ON CLASS - 300	II					12
				LADEB	A	JALANDHAR	CS GATE 600MM CLASS 400 NB, CS GLOBE 600MM CLASS 400 NB, CS CHECK 600MM AND CLASS 400 NB
				HAWA ENGINEERS	A	AHMEDABAD	FCS / FCS 50 NB CLASS 600
				FOURESS	A	THANE	400NB CLASS 600 AND 50NB CLASS 600
				BHEL INP	A	GONDWAL	GATE UP TO 300 NB CLASS 600, GLOBE 250 NB CLASS 400, CHECK 150NB CLASS 600
				HITECH ENGG PVT LTD	A	AHMEDABAD	50 NB CLASS 600
				QCS PUMPS LTD	A	CHIMBATURE	300NB CLASS 2500
				NOTON VALVES INDIA PVT LTD	A	NAVI MUMBAI / AHMEDABAD	CS GATE 400 NB CLASS 600, CHECK 300 NB CLASS 600
				LAT VALVES LIMITED	A	CHIMBATURE	650 MM CLASS 600, 50 NB CLASS 600
				WOLBEN	A	HUBLI	Conventional CS Gate / Globe / Check Valves up to 100MM and Class # 1500, CS Gate / Globe / Check Valves up to 200MM and Class # 600, FCS Gate / Globe / Check Valves up to 50MM and Class # 2500
15	SLURGE GATE/ ISOLATION GATE	II		BHEL APPROVED SOURCES ACCEPTABLE			
				CRANE PROCESS FLOW	A	SATARA	UPTO 300NB PM10
				WELBEN	A	HUBLI	UPTO 250 NB - PN 10, 310MM PN6
16	DIAPHRAGM VALVES	I		PRECISION ENGINEERS	A	MUMBAI	UPTO 200 NB - PN 10, CS Diaphragm Valves up to 200NB & Rating PN10/ CLASS 150
				NCMA INDUSTRIES	DR	NAVI MUMBAI	
				A/V VALVES	DR	AGRA	
				MAJESTIC VALVES (LAB LINE)	DR	MP	
17	RUBBER LINING OF TANKS/ VESSELS/ PIPES/ VALVES & FITTINGS	II		BHEL APPROVED SOURCES ACCEPTABLE			
18	PP & PTFE/ TEFLOX LINING	III		BHEL APPROVED SOURCES ACCEPTABLE			
19	MS PIPES (BLACK/ GR) IS:1229 & IS:3599 UPTO 1000 NB	II		BHEL APPROVED SOURCES ACCEPTABLE			
				SAI	A	BHUBHALLA	CO-RELATED MTC SHALL BE REVIEWED.
				WELSPIN	A	ANAR	ANR UPTO 2400 NB

9/5/13

6/10/13

11/07/13

PIPES FROM ALREADY IDENTIFIED SUB-VENDORS
BHEL MARKED MANUFACTURED WITH VALID REGISTRATION

PROJECT: PATRATU 3 X 800MW				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL				DOC. NO.		Revision No.		Date		PAGE		SUB SUPPLIER APPL Status		Place		Remark	
PACKAGE: WATER TREATMENT PLANT (DW PLANT), PT PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)				MAIN CONTRACTOR: BHEL				Revision No.		11/07/19		5 of 10		9		10		11		12	
CONTRACT NO: 9565-001																					
Sr No	Item	QTY / INSP CAT	QIP NO	PROPOSED SUB SUPPLIER	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1
20	MS PIPES (BLACK/ GI) IS: 1219 & IS: 3589 > 1000 NB			WELSPUN																	
				MAN INDUSTRIES																	
				SAMSHI PIPE INDUSTRIES LTD																	
				MUKAT TANKS & VESSELS																	
				MUKAT PIPES																	
				LALIT PIPES AND PIPES LTD																	
				RATNAMANI																	
				RATNAMANI																	
				PSL HOLDINGS LIMITED																	
				PSL INTERNATIONAL LTD																	
				PSL LIMITED																	
				PSL LIMITED																	
				ICD PIPES																	
				M/s Surya Rods Limited																	
				CAPACITE STRUCTURES PVT LTD (EARLIER PRATHIBA PIPES & STRUCTURES PVT LTD)																	
				BHEL APPROVED SOURCES ACCEPTABLE																	
				REM																	
				RATNAMANI																	
				RATNAMANI																	
21	VALVE-PR / VACUUM RELIEF /SAFETY RELIEF /AIRV / FLOAT VALVE																				

PROJECT: PATRATU 3 X 600MW				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL				DOC. NO.		0	
PACKAGE: WATER TREATMENT PLANT (DM PLANT, PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)								Revision No.			
MAIN CONTRACTOR: BHEL								Date		11/03/19	
CONTRACT NO: 4585-001								PAGE		6 of 10	
Sr. No	Item	QTY / INSP CAT	QTY NO	PROPOSED SUB SUPPLIER	SUB SUPPLIER APPL Status	Place	Remark				
22	SS PIPE ASTM A 312	II (III FOR FOREIGN VENDORS)	4	6	5	II	12				
				SUMITOMO	A	JAPAN					
				SUSTA	A	GERMANY					
				OUTO KOMPU	A	SWEDEN					
				PRANASH STEELAGE	A	VALSAD	ONLY FOR SEAMLESS (UPTO 3000 AND ERW UP TO 4000)				
				BHANDARI TUBES & TUBES LIMITED	A	DEWAI	ERW UP TO 3000				
				APEX	A	REHROHE	ERW UPTO 400 NI SEAMLESS (UPTO 50 NI)				
				SWAM PNEUMATIC	A	NOIDA					
				EVEREST BLOWERS PVT LTD	A	BAHADURGARH	UP TO 40 HP (APPROX 1400 CUM/HR)				
				KAY INTERNATIONAL	A	SONEPAT	UP TO 500 CUM/HR				
				KULKARNI POWER TOOLS	A	SHIBOL	UP TO 2500CUM/HR				
				USHA COMPRESSOR	A	AHMEDABAD	UP TO 60 HP (APPROX 2000CUM/HR)				
				BHEL APPROVED SOURCES ACCEPTABLE							
				BHEL APPROVED SOURCES ACCEPTABLE							
				BHEL APPROVED SOURCES ACCEPTABLE							
				TRACTEL TIRFOR	A	PALWAL	UPTO 20 TON				
				LIFTING EQUIPMENT	A	DELHI	UPTO 12 TON				
				ARMSEL	A	BANGALORE	UPTO 5 TON				
				HERCULES HOIST	A	RAIGAD	UPTO 15 TON				
				BEVA INDUSTRIES	A	FARIDABAD	UP TO 25T				
				EDDY CRANE	A	PUNE	UPTO 10 TON				
				CONSOLIDATED HOIST	A	*NATARA /PUNE *	*PUNE FOR ELECTRIC HOIST UPTO 15 TONS				
				ELECTROTECHNAPHY	A	ROSHRA	UPTO 15 TON FOR ELECTRIC HOIST ONLY				
				TEJIBO ERECTION	A	KOLKATA	UPTO 5 TON FOR ELECTRIC HOIST				
				PRATAP ENGG (PBL)	A	2 V NAGAR	UPTO 10 TON FOR ELECTRIC HOIST ONLY				
23	AIR BLOWERS (LOBE TYPE) <= 5 KW	I									
24	AIR BLOWERS (LOBE TYPE) < 5 KW	II									
25	PUMP - METERING / DOSING	II									
26	ELECTRIC HOIST/EOT CRANE / CHAIN PULLEY BLOCK UPTO 5 TONS	III									
27	ELECTRIC HOIST/EOT CRANE / CHAIN PULLEY BLOCK > 5 UPTO 10 TONS	III									

PROJECT: PATRATO 3 & BROMW				DOC. NO.			
PACKAGE: WATER TREATMENT PLANT (DM PLANT, PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)				Revision No. 0			
MAIN CONTRACTOR: BHEL				Date 11/07/19			
CONTRACT NO: 9585-001				PAGE 8 of 10			
Sr. No	Item	Q.P / INSP CAT	Q.P NO	PROPOSED SUB SUPPLIER	Place	SUB SUPPLIER APPL. Status	Remark
30	PRESSURE REDUCING VALVE, VESSEL INTERNALS, RASCHING RINGS, VALVES FOR INSTRUMENT ISOLATION, HANDRAILS & PLATFORMS, STRUCTURAL STEEL (ANGLES, CHANNELS, PLATES, BOUNDS, GRATINGS FOR SUPPORT AND PLATFORMS), LADDERS, PUDDLE PIPES (MS), INSERT / EMBEDMENT PLATES, MEDIA FOR MBBR TANK, SLUDGE TROLLEY, FASTENER, GASKET, OIL & GREASE, PAINTS, PP FILTER NOZZLE, EYE POUTING, FITTINGS, DAMPNER, CALIBRATION POT, SELF CLEANING STRAINER, OIL DRIEM, DEGASSED TOWER, U CLAMP, NEEDLE VALVE, NAME PLATE/FASTENERS, SIGHT GLASS, RUPTURE DISC, FOUNDATION BOLTS, CATION COLUMN, SAMPLE COOLER, SITE FLOW INDICATOR.	(H)	4	6	7	9	11
39	MISCELLANEOUS ITEMS - OVERFLOW SEAL POT, HOSES, FILTER MEDIA (SAND/GRAVEL), FMB MEDIA, FUME ABSORBER, MOISTURE ABSORBER, CO2 ABSORBER, BREATHING FRV TANKS, RESIN TRAP, OPEN TRAP, DIFFUSERS, STATIC MIXER, PALL RINGS, DISSOLVING BASKET, MEDIA TRAPS, MIXING TEE, PP STAINER, PP BALLS, BAR SCREEN, FLECTORS, VENTURI MIXERS, RO SKID / UF SKID & OTHER SKIDS FABRICATION, SAFETY SHOWER, SAFETY EQUIPMENTS, CENTRIFUGE, FOOT/FLOAT VALVE, OIL WATER SEPARATOR & OIL SEPARATOR, WEIGHING SCALE, ACTIVATED CARBON, ANTHRACITE, RO SAMPLING PANEL & SNAP ACTION VALVE.	(H)	4	6	7	9	11
80	PIPING FABRICATION - HIGH PRESSURE - >300 PSI	(H)					
91	PIPING FABRICATION - LOW PRESSURE UPTO 300 PSI	(H)					
92	PIPE CS SEAMLESS ASTM A 106	(H)					

PROJECT: PATRATHI 3 X 600MW				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL				DOC. NO.	
PACKAGE: WATER TREATMENT PLANT (DM PLANT, PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)								Revision No.	
MAIN CONTRACTOR: BHEL								Date	
CONTRACT NO: 9585-02A								PAGE	
								Place	
								SUB SUPPLIER APPL Status	
								7	
								8	
								9	
								10	
								11	
								12	

PROJECT : PATRATU 3 X 800MW				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL				DOC NO.	
PACKAGE : WATER TREATMENT PLANT (DM PLANT, PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)				Revision No.				0	
MAIN CONTRACTOR : BHEL				Date				11/07/19	
CONTRACT NO : 9585-001				PAGE				10 of 10	
Sr. No	Item	QTY / INSP CAT	QTY NO	PROPOSED SUB SUPPLIER	Place	SUB SUPPLIER APPL. Stamp	10	11	12
59	LABORATORY GLASSWARES AND EQUIPMENTS	III		BHEL APPROVED SOURCES ACCEPTABLE					
60	ATMOSPHERIC TANKS - SITE FABRICATED	SHALL BE COVERED IN PQP		BHEL APPROVED SOURCES ACCEPTABLE					
61	CHLORINE DI OXIDE GENERATOR	I		GREENHOLD WATER TECHNOLOGIES LIMITED	VANDODARA/ MUMBAI	OR			

NOTE: For Mandatory Spares, Use Tests/ Checks shall be same as applicable in the approved QP of the Main Equipment for the respective spare item. Spares, not covered in the QP of the Main Equipment, shall be treated as Inspection Category-(I). For all Spares, BHEL shall submit the Interchangeability Certificate & CDC for the purpose of Dispatch Clearance by NTPC/PVUN.

A - FOR THESE ITEMS PROPOSED VENDOR IS ACCEPTABLE TO NTPC/PVUN OR FOR THESE ITEMS DETAILS ARE REQUIRED FOR NTPC/PVUN REVIEW

2. QP / INSPECTION CATEGORY

CAT I: For these items the quality plans are approved by NTPC/PVUN, and the final acceptance will be on physical inspection witness by NTPC/PVUN.

CAT II: For these items the quality plans are approved by NTPC/PVUN. However no physical inspection shall be done by NTPC/PVUN. The final acceptance by NTPC/PVUN shall be on the basis of review of documents as per approved QP.

CAT III: For these items Quality control to be exercised as per Main contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of Conformance (COC) by Main Contractor.

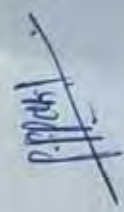
UNITS / WORKS: Place of Manufacturing, Place of Main Supplier of Main units/works.

Digit 11/07/19
VISHNESH KUMAR
VSHNL

Digit 11/07/19
Kamlesh Singh
PVUNL

Project : Patratu STPP 3X800 MW Package : Water Treatment Plant Package (DM, PT, ETP, STP, CWT, Clo2 Plant) Main Contractor : BHEL Sub Contractor : Contract No. : 9585-001-136		Sub-Vendor List Control & Instrumentation and Electrical Items		Doc No	QA-C&I and Elect -WTP-00	
				Rev No	1	
				Date	10.07.2019	
Sl No.	Item	QP/ Insp. Cat.	Acceptable Supplier As Per Database	Place of Manufacturing	Approval Status	Remarks
		III	ABB(K-Tech)	USA	A	Liquid like Oil & Water
		III	Endress & Houser	Germany	A	
		III	Saab Rosemount	Sweden	A	Now Emerson
		III	Emerson Process Management	Singapore	A	ROSEMOUNT 3300 GUIDED WAVE RADAR 3400 AND 5600 NON CONTACTING RADAR
		III	Endress & Houser	Germany	A	
Following C&I items to be supplied as per main contractor approved sources meeting the NTPC Specification requirement						
1	Conduits / Pipe (Gi)	III	Main Contractor approved sources		A	
2	Flow Gauge / Indicator	III	Main Contractor approved sources		A	
3	Flow Switch	III	Main Contractor approved sources		A	
4	FRP Junction Box	III	Main Contractor approved sources		A	
5	Hand Held Calibrator	III	Main Contractor approved sources		A	
6	Instrument Tube / Pipe Fittings (Air)	III	Main Contractor approved sources		A	
7	Instrument Valve	III	Main Contractor approved sources		A	
8	Level Gauge (Transparent & Reflex, Tubular Type)	III	Main Contractor approved sources		A	
9	Level Indicator (Float & Board Type)	III	Main Contractor approved sources		A	
10	Level Switch - Float/Displacer Type/Paddle	III	Main Contractor approved sources		A	
11	Limit Switch	III	Main Contractor approved sources		A	
12	Pr./ Vacuum/ Dp Gauges	III	Main Contractor approved sources		A	
13	Press, Dp, Vacuum Switch	III	Main Contractor approved sources		A	
14	Solenoid Valve with SV Box	III	Main Contractor approved sources		A	
15	Temperature Gauge(With Thermowell if applicable)	III	Main Contractor approved sources		A	
16	Temperature Switch	III	Main Contractor approved sources		A	

D. Jyoti Singh Kumar
 10/07/2019
 BHEL


 10/07/2019

Project : Patratu STPP 3X800 MW		Sub-Vendor List			Doc No	
Package : Water Treatment Plant		Control & Instrumentation and Electrical Items			Rev No	
Package (DM, PT, ETP, STP, CWT, Clo2 Plant)					Date	
Main Contractor : BHEL					10.07.2019	
Sub Contractor :						
Contract No. : 9585-001-136						
Sl No.	Item	Qp/ Insp. Cat.	Acceptable Supplier As Per Database	Place of Manufacturing	Approval Status	Remarks
2		1	Yaskawa	Japan	DR	VFD from Rockwell (Allen Bradley)- USA, (Upto 415 V, 600 KW), VVVF Drive RA / AB-USA, Authorised System integrator: M/s Saitech, Vadodara
			Rockwell Automation	Sahibabad	A	Up to 415 V -750 KW, VVVF Drive from ABB Finland / ABB Bangalore (Up to 2.2 KW). Authorised system integrator M/s Switching Circuit Kolkata.
			ABB	Bangalore	A	Up to 415 V-132 KW, VVVF Drive from Siemens Germany. Proposed System integrator Cot mac Pune- DR category
			Siemens	Nasik	A	Upto 50 HP (37KW)
			CG Power & Industrial Solutions	Mandideep	A	VFD (NXP model) from VACON Finland, upto 400KW, 415V and upto 900KW, 690V
			Vacon	Bangalore	A	
			NICCO	Sharnagar, Kolkata	A	
			Torrent Cable Ltd	Nadiad	A	
			Incab	Pune	A	
			Polycab Wires Pvt Ltd	Daman	A	
			Hindustan Vidyut Product Ltd	Faridabad	A	
			KEI Industries	Bhiwadi	A	
			Deltan	Faridabad	A	
			Paramount Cable	Khushkhara	A	
			Gemisch Industries	Bhiwadi	A	
			Radiant	Hyderabad	A	
			Universal Cables	Satna	A	
			Cords Cable	Bhiwadi	A	
			Elkay Teletelink	Faridabad	A	
			Havells India Ltd	Alwar	A	
			R.F. kabel	Silvassa	A	
			Ravin Cables	Pune	A	
			Gupta Power Cable	Khurda	A	
			Thermocables	Hyderabad	A	
			Finolex	Pune	A	
			Sbee Cable	Bangalore	A	
			Suyog Cable	Vadodara	A	
			MTI Engg.	Okhla/ Bhiwadi	A	

Project : Patrauli STPP 3X800 MW Package : Water Treatment Plant Package (DM, PT, ETP, STP, CWT, Clo2 Plant) Main Contractor : BHEL Sub Contractor : Contract No. : 9585-001-136			Sub-Vendor List Control & Instrumentation and Electrical Items		Doc No	QA/C&I and Elect (WTP-00)
Sl No.	Item	QP/ Insp. Cat.	Acceptable Supplier As Per Database	Place of Manufacturing	Approval Status	Remarks
4	Galvanized Cable Tray	Refer Note 5 II	Steelite Engg.	Mumbai	A	Galvanizing at B.G. Shirke - Pune
			Amtech	Pune	A	GALVANISATION AT VISHAKHA STEELS ALLIED-ANKAPALLI
			Inar Profile	Enkapalli	A	
			Indiana Gratings	Pune	A	Galvanization at TM Radhakrishna Chetty & Co-Chennai
			TRG	Chennai	A	
			Industrial Perforation	Kolkata	A	
5	Cable Tray Flexible Support Structure (C1)	II	Kannade Anand Udg	Mumbai	A	Fabrication at their units: Plot No. 42, Morivali, MIDC, District Thane & Plot No.: D-35, Anand Nagar MIDC, Addl. Ambarnath, Dist. Thane Galvanization and offer the galvanized cable trays for inspection at D-34 Anand Nagar MIDC, Addl. Ambarnath, Dist. Thane
			Unitech Fabricators	Howrah/Hoogly	A	Galvanisation at Gurpreet Galvaniser, Hyderabad
			Patny Systems	Hyderabad	A	
			India Electric Syndicate	Kolkata	A	Galvanization at BMW Industries/ B.P. Projects- Howrah
			Premier Power Products	Howrah	A	Galvanizing at Neha Galvanizer - Howrah
			VATCO	Mumbai	A	Galvanising at Sigma Mumbai
			Rukmani	Raipur	A	Ladder type cable trays only
			Rukmani	Hoogly	DR	
			Ratan Projects AND ENGG. PVT LTD.	Howrah	A	
			Steelite Engg.	Mumbai	A	
			Valco	Mumbai	A	Galvanizing at M/s. Sigma- Mumbai
			Premier Power Products	Howrah	A	Galvanizing at Neha Galvanizer - Howrah
6	Cable Lugs/ Ferrules	III	Ratan Projects	Howrah	A	Galvanisation at NITPC approved sources.
			Amtech Engg. Services	Pune	A	Galvanizing at M/s. B.G. Shirke-Pune
			Inar Profiles	Enkapalli	A	
			Indiana Gratings	Pune	A	
			Industrial Perforation	Kolkata	A	Galvanising from Poona Galvaniser
			Dowell	Mumbai	A	
			3D	Umbergaon	A	Refer Note 6
			Chetna	Nasik	A	

Disapproved
11.07.19
V. SURESH KUMAR
(SHEC)

[Signature]

Project : Patratu STPP 3X800 MW Package : Water Treatment Plant Package (DM, PF, ETP, STP, CWT, Clo2 Plant) Main Contractor : BHEL Sub Contractor : Contract No. : 9585-001-136		Sub-Vendor List Control & Instrumentation and Electrical Items		Doc No Rev No Date	QA-C&I and Elect-WTP-00 1 10.07.2019 8 of 9	
SI No.	Item	QP/ Insp. Cat.	Acceptable Supplier As Per Database	Place of Manufacturing	Approval Status	Remarks
7	DCDR, ACDR, MLDR, WRDR, WDR AFCL, UTSDR, DCFB, LIGHTING PANEL, LOCAL PANEL, CONTROL PANEL (NON PLC), SCHEMATIC BOARD, PUSH BUTTON, NON MCSAIG TYPE, LOCAL MOTOR STARTER, POWER JB, LOCAL CONTROL STATIONS, REMOTE PANEL, OIL FILTRATION PANEL, HT JUNCTION BOX ETC	I (All wall mounted fixed type indoor/ outdoor or LT switchgear shall be treated as inspection CAT-III)	Switching Circuits	Kolkata	A	
			Jakson	Greater Noida	A	
			Pyrotech	Udaipur	A	
			Positronics	Vadodara	A	
			Control Devices	Kolkata	A	
			Jolly Engineering	Kolkata	DR	
Following Electrical items to be supplied as per main contractor approved sources meeting the NTPC Specification requirement						
1	Cable Glands	III	Main contractor approved sources		A	Refer Note 6
2	PVC conduit/Hume pipe/Lighting wire/GI pipes/HDFE pipe/GI steel rigid conduit/ Epoxy conduit	III	Main Contractor Approved Sources/ BIS Approved Sources		A	1-Refer Note 6 2 Galvanising wherever applicable to be done at NTPC approved sources or from Note 7
3	Galvanized JB, Switch Box, Link Boxes, Adaptor Boxes, Industrial Receptacles, M.S. Rod, G.S. Flat G.I. Wire, Earth Wire & Lightning Protection, Trifoil Cable Clamps, Ferrules	III	Main Contractor Approved Sources		A	Galvanising wherever applicable to be done at NTPC approved sources or from Note 7
4	Electrical Heaters	III	Main Contractor Approved Sources		A	
LEGENDS :						
1.0 SYSTEM SUPPLIER / SUB SUPPLIER APPROVAL STATUS CATEGORY						
A - For those items proposed vendor is acceptable to Customer. To be indicated with letter "A" in the list alongwith the condition of approval, if any.						
DR - For those items "Detailed Required" for Customer review. To be identified with letter "DR" in the list. For these items, vendor shall be proposed for owner acceptance with-in the agreed contract schedule of the package						
2.0 QP INSPECTION CATEGORY :						
CAT - I : For those items the Quality Plans are approved by Customer and final acceptance will be on physical inspection witness by Customer						
CAT - II : For those items the Quality Plans are approved by Customer. However no physical inspection shall be done by Customer. The final acceptance by Customer shall be on the basis of review of documents.						

Dr. J. K. Singh
Sr. Engineer

P. H. Chakraborty

FORMAT No. Q5-Q1-QA/P-2/1/3-RO

Project : Patratu STPP 3X800 MW Package : Water Treatment Plant Package (DM, PT, ETP, STP, CWT, Clo2 Plant)		Sub-Vendor List Control & Instrumentation and Electrical Items		Doc No Rev No 1 Date 10/07/2019	(A-C&I) and Elec. (WTP&O)
Main Contractor : BHEL Sub Contractor :		Acceptable Supplier As Per Database		Place of Manufacturing	Remarks
Contract No.: 9585-001-136		QP/ Insp. Cat.		Approval Status	
Sl No.	Item				
CAT - III: For those items Main supplier approves Quality Plans. The final acceptance by Customer shall be on the basis of Certificate of Conformance by main supplier.					
UNIT/WORKS : Place of manufacturing. Place of main supplier of multi units/works.					
* - Inspection category will be decided during vendor evaluation.					
NOTES: As applicable (if required)					
Note 1:	For Instrument cable up to 1 KM inspection category CAT - III. For 1 KM to 2.5 KM inspection category CAT - II.				
Note 2:	For the C & I instruments mounted on the skid of the main item or supplied as a integral part of the main item. Instrument to be supplied as per proven practice of the manufacturer meeting the Customer technical specification requirement.				
Note 3:	For C and I items, mandatory Spares to be treated as NTPC inspection category CAT - III.				
Note 4:	For LT Motors: a) Up to 50 KW (CAT-III): Acceptance is based on COC of the manufacturer & the contractor confirming as follows: It is hereby confirmed that the above mentioned motor / motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out b) for 50 KW to 75 KW (CAT-III) for manufacturers who have already supplied this range of motors to NTPC, which have been commissioned and no adverse feedback has been reported from RIG/Project-site it is hereby confirmed that the above mentioned motor / motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out c) Above 75 KW (CAT-I): as per NTPC approved Quality Plan.				
Note 5:	Category of inspection for LT Cables and Cable Trays: For Total Contract Quantity per Size Less ≤ 2.5 KM For cable total quantity above 2.5 km & up to 10 km per size For cable total quantity above 10 km per size/type For cable total quantity above 10 km per size/type				
Note 6:	VDE / CE / UL / CSA Marking Certification preferably from Third Party Agency or BIS Approval Letter shall be submitted for NTPC's Verification / Information				
Note 7:	List of Galvanizers 1. M/s M J Engg, Delhi 2. M/s Kukruwa Fab & Gal- Howrah 3. M/s A V Engg, Kolkata 4. M/s Inar Profiles, Vishakhapatnam 5. M/s Anand Udyog, Mumbai 6. M/s Techno Engg, Chandigarh 7. M/s Steelite Engg, Mumbai				
Note 8:	List of sub-vendors is to be submitted along with QP for all the items identified as inspection category-I & II by the equipment Sub-Supplier.				
Note 9:	For the items not appearing in the precaward list and falls in the scope of supply of the bidder, bidder and Customer will mutually discussed in future.				

11.07.19
 VIKASH KUMAR
 K. H. R.

11.07.19
 PRASTANT P. S. RAO
 ADAM

FORMAT NO: OS-Q1-QA/P-3/FE-80

ENG DIV. / QA



TITLE:
**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001	
VOLUME II-B	
SECTION-C1	
REV. NO. 00	DATE:

ANNEXURE-III

FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES FOR SHORTFALL IN PERFORMANCE AND GUARANTEE TESTS

The term "Performance Guarantees" wherever appears in this Sub-Section shall have the same meaning and shall be synonymous to "Functional Guarantees". Similarly the term "Performance Tests" wherever appears in this Sub-Section shall have the same meaning and shall be synonymous to "Guarantee Test(s)".

The term "BMCR" (Boiler Maximum Continuous Rating) appearing in the Technical Specification shall mean the maximum continuous steam output of Steam Generator (as defined Cl. No. 1.02.00 Sub-section A-01, Part-B) at super heater outlet at rated parameters.

The term "TMCR" (Turbine maximum continuous rating) appearing in the technical specification shall mean 660 MW electrical power output at generator terminals (power at generator terminals as per clause indicated in this sub-section) under rated steam parameters, 0% cycle make-up and 77 mmHg (abs) condenser pressure unless used in conjunction with a different cycle make-up and/or a different condenser pressure and /or a different throttle steam pressure.

1.00.00

PERFORMANCE GUARANTEES

1.00.01

General Requirements

- a) The Contractor shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment covered in these specifications.
- b) The guaranteed performance parameters indicated in furnished by the bidder in his offer, shall be without any tolerance values whatsoever and all margins required for instrument inaccuracies and other uncertainties shall be deemed to have been included in the guaranteed figures.
- c) The Contractor shall conduct performance test and demonstrate all the guarantees covered herein, during performance guarantee/acceptance test. The various tests which are to be carried out during performance guarantee/acceptance test are listed in this Sub-section. The guarantee tests shall be conducted by the Contractor at site in presence of Employer on each unit individually.
- d) All costs associated with the tests including cost associated with the supply, calibration shall be included in the bid price.
- e) It is the responsibility of the contractor to perform the Performance Guarantee/ Acceptance test as specified in this subsection. At all times during the Performance Tests the emissions and effluents from the Plant shall not exceed the Guaranteed Emission and Effluent Limits.
- f) The Contractor shall make the plant ready for the performance guarantee tests before start of Initial Operation.
 All CAT-1 Performance Guarantee tests shall be conducted along with initial operation except following
 - a) Coal Pulverisor Wear Parts Warranty
 - b) Particulate Emission/ESP Efficiency, FGD.
 - c) Auxiliary power consumption for Station Auxiliaries (PG Test for Station Auxiliary Power Consumption to be done along with unit#2 initial operation)
 - d) "PG test of Cooling Tower (NDCT) shall be carried out by the contractor within one year of successful completion of trial operation of the cooling tower and at a time when the atmospheric conditions are within limits of deviation from the design conditions as specified, preferably in the period from May to September. If Unit trial operation falls in these months then PG test of NDCT can be clubbed with Unit trial operation.



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

- e) PG test of A/C System (for aux. power consumption under station auxiliaries) shall be carried out by the contractor within one year of successful completion of trial operation of the respective A/C system during summer in the months of May-August. If unit#2 trial operation falls in these months then PG test of A/C system can be clubbed with unit#2 trial operation.
- g) PG test shall be performed by using process instruments envisaged for normal operation and control of unit. Any additional instrument/ item required for PG test shall also be supplied by the contractor. Instruments to be used for PG test shall be indicated in the respective P&IDs.
- Control system loop tuning required to limit the variation of parameters during performance guarantee testing shall be completed prior to PG Test / initial operation. Test result for PG test is envisaged to be computed in DDCMIS.
- h) Tools and tackles, instruments/devices including flow devices, matching flanges, impulse piping & valves etc. and any special equipment, required for the successful completion of the tests, shall be provided by the contractor free of cost.
- i) The Performance / Acceptance test shall be carried out as per the standard procedure included in the specification. For some of the PG tests, standard PG test procedures have not been included in the specification. PG test procedure for such PG tests shall be submitted, as per latest International codes / standard meeting the specification requirements along with sample calculations & detailed activity plan of preparation (including test instrumentation), conductance and evaluation of Guarantees, within 90 days of the date of Notification of Award and finalization of the PG test procedure shall be done within 180 days from the date of Notification of Award.
1. For Cat-I Performance / Acceptance tests to be conducted along with the initial operation: After the conductance of Performance test, the test results shall be calculated in Contractor's PG test program/ software. The correction curves shall be fed/inbuilt in the PG test program/ software. Provision of manual entry of offline data which cannot be captured online (such as Relative humidity, atmospheric pressure, Coal analysis, Unburnt carbon in fly ash and bottom ash, Bottom ash / fly ash collection at various hoppers, Flue gas analysis (grid result) etc.) and necessary for calculation of PG Test result shall also be provided. The contractor shall submit the detailed test evaluation report of Performance test results to Employer promptly but not later than 7 days from the date of conductance of Performance test.
 2. For Performance / Acceptance tests other than those identified at 1 above: After the conductance of Performance test, the contractor shall submit the test evaluation report of Performance test results to Employer promptly but not later than 7 (seven) days from the date of conductance of Performance test. However, preliminary test reports shall be submitted to the Employer after completing each test run.
- j) The contractor shall submit for Employer's approval the detailed Performance Test procedure (except for the guarantee tests for which the standard PG test procedure is identified in technical specification) containing the following:
- i. Object of the test.
 - ii. Various guaranteed parameters & tests as per contract.
 - iii. Method of conductance of test and test code.
 - iv. Duration of test, frequency of readings & number of test runs.
 - v. Method of calculation.
 - vi. Correction curves and respective equations for graphs to be fed for the online computation.
 - vii. Instrument list consisting of range, accuracy, least count, and location of



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

- instruments along with reference approved P&IDs.
- viii. Scheme showing measurement points.
 - ix. Sample calculation.
 - x. Acceptance criteria.
 - xi. Any other information required for conducting the test.
- k) In case during performance guarantee tests it is found that the equipment/system has failed to meet the guarantees, the Contractor shall carry out all necessary modifications and/or replacements to make the equipment/system comply with the guaranteed requirements at no extra cost to the Employer and re-conduct the performance guarantee test(s) with Employer's consent. However, if the specified performance guarantee(s) are still not met even after the above modifications/replacements within ninety (90) days or a reasonable period allowed by the Employer, after the tests have been completed Employer will have the right to the following:
- i) **For Category-I Guarantees**
Accept the equipment/system/plant after levying Liquidated Damages as specified hereunder. The liquidated damages, for shortfall in performance indicated in clause 1.01.02 for this sub-section are on per unit basis and shall be levied separately for each unit, except for the rate indicated for auxiliary power consumption for station auxiliaries which is on station basis. The liquidated damages shall be prorated for the fractional parts of the deficiencies. The performance guarantees coming under this category shall be called 'Category - I' Guarantees.
 - ii) **For Category-II Guarantees**
In case the performance guarantee(s) are not met by the Contractor during demonstration test, the Contractor shall carry out all necessary modifications and/or replacements to comply with the guaranteed requirements at no extra cost to the Employer and re-conduct the performance guarantee test(s) with Employer's consent.

If, however, the demonstrated guarantee(s) are not met even after the above modifications / replacements within ninety (90) days, it will be concluded that, the equipment has failed to meet the guarantee(s).

In such a case, Employer shall Reject the equipment/plant/system and recover from the Contractor the payments already made. The performance guarantees under this category shall be called 'Category - II' Guarantees. Conformance to the performance requirements under Category -II is mandatory.
 - iii) **For Category-III Guarantees**
Accept the equipment/system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by the EMPLOYER. Such damages shall, however be limited to the cost of replacement of the equipment(s) / system(s) replacement of which shall remove the deficiency so as to achieve the guarantee performance. These parameters/capacities shall be termed as category - III, guarantees.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

1.01.00 GUARANTEES UNDER CATEGORY I

NIL

1.02.00 GUARANTEE UNDER CATEGORY –II

Noise

All the plant, equipment and systems covered under this specification shall perform continuously without exceeding the noise level over the entire range of output and operating frequency specified in General Technical Requirement, Part-C Section-VI of the technical specifications.

Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 61672-1 & 2 (latest edition) Sound pressure shall be measured all around the equipment at a distance of 1.0 m horizontally from the nearest surface of any equipment/ machine and at a height of 1.5 m above the floor level in elevation.

A minimum of 6 points around each equipment shall be covered for measurement. Additional measurement points shall be considered based on the applicable standards and the size of the equipment. The measurement shall be done with slow response on the A - weighting scale. The average of A-weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 micro bar shall not exceed the guaranteed value. Corrections for background noise shall be considered in line with the applicable standards. All the necessary data for determining these corrections, in line with the applicable standards, shall be collected during the tests.

1.03.00 GUARANTEE UNDER CATEGORY –III

Coal Handling Plant Run-Off Water Treatment System:-

1. The System shall be designed for the inlet total suspended solids (TSS) of 100 ppm & turbidity 100 NTU.
2. Each clarifier unit shall be guaranteed for design effluent capacity meeting the effluent quality as mentioned below.
 - a. Total suspended solids (TSS) less than and equal to 10 ppm.
 - b. Turbidity Less than and equal to 10 NTU.

1. CRANE, MONORAIL,HOIST ETC:-

The parameters/capabilities to be demonstrated for following systems/ equipment's shall be:

- (i) **EOT Cranes:** Over load tests, travel and hoist speed checks as per relevant Indian standards IS (latest edition).
- (ii) **HOT Cranes, Monorails etc.:** Over load test, Travel and speed checks, functional and performance tests as per relevant Indian standards IS (latest edition).
- (iii) **Butterfly valves:** - The functioning of various Butterfly valves, opening and closing operation as per control logic, accumulator capacity of hydraulic operated valves etc. shall be demonstrated as per the approved design document.

2. Pumps (CHP Run Off Water Treatment System)

- a) Capacity, head, and power consumption of all the pumps at the rated duty point (to be demonstrated and proved at shop with the respective job motors) and to operate in accordance with the approved pump characteristic curves. During the shop test no negative tolerance in the guaranteed capacity, head and efficiency of the pump shall be allowed.
- b) Current, Voltage, Motor input Power, Frequency, Speed, Bearing/ Motor winding Temperature, Vibration and noise level of pumps and drives and parallel operation (as applicable) without hunting & abnormal noise and with load sharing within 10% of each other at the rated duty point of pumps shall be demonstrated at site as a part of Performance & Guarantee test.



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

PREREQUISITES TO GUARANTEE TESTS TO BE ENSURED BY CONTRACTOR

1. Deputation of team to site to associate with the Guarantee tests,
2. Calibration of belt weigher scales and accuracy of same to be demonstrated to NTPC.
3. Arrangement of wattmeters / energymeters calibrated and sealed from approved Govt. test house or NTPC site laboratory. Arrangement of any other instrument/ accessory for the test.
4. Proper adjustment of skirt boards and belt cleaners prior to the start of tests.
5. Arrangement of calibrated equipments for measurement of vibration & noise levels.
6. Protection Relays of LT/HT switchgears and all motor feeders shall be checked.
7. Belt protection switches, local push buttons, hooters, brakes/rail clamps to be in working order.
8. Free rotation of idlers and pulleys.
9. Protection relays of LT/HT switchgears and all motors/transformer feeders to be checked.
10. Sufficient illumination.



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

FORMAT FOR SUBMISSION OF GUARANTEE TEST PROCEDURE

Clause No. as per LOA/ Tech. Specs.	Provision of LOA / Tech. Specs.	Name and Methodology of Test proposed by Vendor	NTPC comments on the tests proposed by vendor



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

GUARANTEE TEST PROFORMA

POWER MEASUREMENT

Project:

Package :

Date :

1. Equipment/Stream Composition :
2. Motor Description :
3. Sr. No. of meters used :
4. Date of Calibration of instrument and name of test house :
5. Multiplying factor (M.F.) of the wattmeter :
6. Wattmeter Readings (to be taken at 1 minute intervals) :

Sl. No.	Measureme nt Terminal Location	Time	Voltage (Volts)	Current (amps)	kw Reading		Total (W1+W2) MF kw	Remarks
					W1	W2		



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

GUARANTEE TEST PROFORMA

NOISE LEVEL MEASUREMENT

Project:

Package :

Date :

Details of Sound Level Meter

1. Make
2. Model
3. Date of calibration with name of Test House

Sl.No	Equipment with location	Equipment load/capacity	Measurement* point no.	Sound level dBA.	Remarks

NTPC

Contractor

* For each equipment location, a Projected Plan Diagram shall be made and the location of measurement points shall be identified.



TITLE:
**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

ANNEXURE IV

DRAWING/ DOCUMENTS REQUIREMENT & DISTRIBUTION SCHEDULE

**TITLE:**

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

After award of LOI, The drawing documents listed in MDL are minimum drawing/documents, which shall be submitted by the bidder for BHEL and Customer approval. However any additional drawing/document if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial & delivery implication to BHEL.

The bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and customer comments or observations. Without compliance sheet the submission of the drawings/documents will not be considered and the delay on this account will be solely on bidder's side only. Bidder to comply with the observations of the BHEL and CUSTOMER without price & delivery implication.

Every revised submission incorporating BHEL/Customer comments shall be resubmitted within 7 day by bidder.

Bidder to further note that the submitted drawings/revised drawing, should be complete in all respects. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. For any clarification/discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL's / Customer's office for across the table discussions/ finalizations/ submissions of drawings.

- (a) List and schedule of drawings/documents to be submitted after award of contract shall be as per MDL.
- Bidder to note that drawings/documents submission shall be through web based Document Management System. Bidder would be provided access to the DMS for drawings/documents approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.
 - Internet explorer version – Minimum Internet Explorer 7
 - Internet speed – 2 mbps (Minimum preferred)
 - Pop ups from our external DMS IP (124.124.36.198) should not be blocked
 - Vendor's internal proxy setting should not block DMS application's link
 - (<http://124.124.36.198/wrenchwebaccess/login.aspx>)
 - DMS user manuals to be used by BHEL PEM vendors for uploading, viewing, revising, commenting and tracking documents on PEM's DMS have been uploaded on PEM internet website (www.bhelpem.com) under the Vendor session.
 - For quick access bidder may refer the link <http://bhelpem.com/DMSManuals/DMSManuals.html>
- Bidder shall submit soft copy/hard copy/CD ROMs of all the finally approved drawings and O&M Manuals as required by Customer/Customer consultant/BHEL-site/BHEL-PEM. The exact number of hard copies/CD ROMs of these documents to be submitted shall be notified to the bidder at the time of detailed engineering and bidder shall submit the same without any commercial/delivery implications to BHEL/Customer.
- All the drawing documents along with the O&M manual (of all the revisions) are necessarily to be submitted in soft copies in addition to hard copies.
- Bidder to submit soft copies of all the drawing and document along with quality plans for BHEL review and approval.
- Editable copy of all the drawings and documents shall be provided.
- The date of submission of drawing documents shall be considered as the date of submission of hard and soft copies whichever is later.
- All the drawings shall be prepared on computer auto cad and other documents (like datasheet etc.) on MS office software. Bidder not complying to the requirement shall not be considered. For the execution of the contract regular meeting (generally once in 15 days or as per project requirement) is required.
- Vendor to come for meeting with the concerned dealing persons as per BHEL or customer requirement in a short notice.
- Bidder to submit instrument schedule, cable schedule and valve schedule in MS- Excel format during detailed engineering.



TITLE:

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

- Bidder to also furnish the auto cad copy/MS-Excel/MS-word (as applicable) of the following documents after award of contract. However any other auto cad copy/MS-Excel/MS-word of any other document as per the insistence of BHEL and customer will also be submitted by the bidder without any delivery and commercial implication to BHEL and customer.
 - P&IDs.
 - Equipment layout of CHP-RUN-OFF WATER TREATMENT SYSTEM.
 - Equipment Cable tray layout of CHP-RUN-OFF WATER TREATMENT SYSTEM.
 - Civil assignment drawings & Civil Construction drawings.
 - Piping lay out drawing of CHP-RUN-OFF WATER TREATMENT SYSTEM.

Other requirements

- Engineering for this project is to be carried out in Integrated Intelligent Engineering environment at BHEL end. The engineering platform on which BHEL is doing the project is based on Smart Plant Suite. This is being done to have automated interface checking and thereby minimising rework at site. The engineering for packages placed in TG Hall will essentially be done using Intelligent P&ID, Intelligent Electrical, Intelligent Instrumentation and 3D modelling. For other BOPs i.e. those outside TG hall, though the same level of integration is preferable but 3D modelling is necessarily to be done and review model in compatible format is to be provided to BHEL on stages to be agreed.

Hence in line with above, bidder is required to prepare PIDs, Electrical drawings and all layout drawings using intelligent software with capability for transfer of data to and from corresponding Software being used by PEM.

- The data of models of facilities will be made available to BHEL as per the BHEL schedule for importing into BHEL model for interface checking and raising of integrated plant model. Layout and PID/electrical drawings will be extracted from the model.
- Standard write up on format compatibility of the BHEL's engineering platform for this project is attached as File formats supported by SPPID, SPI, SPEL & SP3D (Refer Section-D1).

- **e-Learning Package/Module:**

e-learning packages shall be supplied for the equipment / system for the complete pre-treatment plant along with associated electrical and C&I system. Bidder to refer Section-D1 for detail.

- Data/Reports other than listed drawings/documents will also be made available to BHEL as and when required for import into BHEL model.
- Successful bidder shall furnish detailed erection manual for each of the equipment as well as complete system supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.
- Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
- In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion. However, in case changes are necessitated due to any constraints at customer end, delay in review/ approval of such revised drawing beyond one month will be to customer's account.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

MASTER DRAWING LIST

S.NO.	NTPC Drawing No	Drawing Title	No. Of Weeks for Document Submission After Placing LOI/LOA
1	PE-V0-497-157-A001*	P & I DIAGRAM FOR CHP RUN-OFF WATER TREATMENT PLANT.	4
2	PE-V0-497-157-A002*	PROCESS SIZING & HYDRAULIC CALCULATION FOR CHP RUN-OFF WATER TREATMENT PLANT.	4
3	PE-V0-497-157-A003*	COMPOSITE PLANT LAYOUT FOR CHP RUN-OFF WATER TREATMENT PLANT	4
4	PE-V0-497-157-A004*	SYSTEM DESCRIPTION & CONTROL WRITE UP FOR CHP RUN-OFF WATER TREATMENT PLANT.	4
5	PE-V0-497-157-A005*	BASIC CIVIL DESIGN CRITERIA FOR CHP RUN-OFF WATER TREATMENT PLANT.	4
6	PE-V0-497-157-A006*	G.A OF INLET CHAMBER (PARSHALL FLUME, STILLING CHAMBER & INLET WELL.) FOR CHP RUN-OFF WATER TREATMENT PLANT.	10
7	PE-V0-497-157-A007*	CIVIL GA, FOUNDATION, SUPER STRUCTURE AND RCC DETAILS OF STILLING CHAMBER, PARSHALL FLUME & INLET WELL FOR CHP RUN-OFF WATER TREATMENT PLANT.	12
8	PE-V0-497-157-A008*	CIVIL DESIGN CALCULATION OF STILLING CHAMBER, PARSHALL FLUME & INLET WELL. FOR CHP RUN-OFF WATER TREATMENT PLANT.	12
9	PE-V0-497-157-A009*	G.A AND DATASHEET OF REACTOR CLARIFIERS FOR CHP RUN-OFF WATER TREATMENT PLANT	10
10	PE-V0-497-157-A010*	CIVIL GA OF REACTOR CLARIFIER FOR CHP RUN-OFF WATER TREATMENT PLANT.	12
11	PE-V0-497-157-A011*	RCC DETAILS OF REACTOR CLARIFIER FOR CHP RUN-OFF WATER TREATMENT PLANT.	12
12	PE-V0-497-157-A012*	CIVIL DESIGN CALCULATION OF REACTOR CLARIFIER FOR CHP RUN-OFF WATER TREATMENT PLANT.	12
13	PE-V0-497-157-A013*	G.A OF SLUDGE SUMP FOR CHP RUN-OFF WATER TREATMENT PLANT.	10
14	PE-V0-497-157-A014*	CIVIL GA OF SLUDGE SUMP FOR CHP RUN-OFF WATER TREATMENT PLANT.	12
15	PE-V0-497-157-A015*	RCC DETAIL OF SLUDGE SUMP FOR CHP RUN-OFF WATER TREATMENT PLANT.	12
16	PE-V0-497-157-A016*	CIVIL DESIGN CALCULATION OF SLUDGE SUMP FOR CHP RUN-OFF WATER TREATMENT PLANT.	12
17	PE-V0-497-157-A017*	G.A OF CHEMICAL STORAGE SHED INCLUDING OVERHEAD TANK FOR CHP RUN-OFF WATER TREATMENT PLANT	10
18	PE-V0-497-157-A018*	CIVIL GA & R/F DETAILS OF FOUNDATION, COLUMNS AND PLINTH BEAMS OF CHEMICAL SHED FOR CHP RUN-OFF WATER TREATMENT PLANT	12
19	PE-V0-497-157-A019*	ARCHITECTURAL DETAILS, GROUND FLOOR PLAN, SECTION & ELEVATION, TERRACE PLAN ETC. OF CHEMICAL SHED FOR CHP RUN-OFF WATER TREATMENT PLANT	12
20	PE-V0-497-157-A020*	CIVIL DESIGN CALCULATION OF CHEMICAL SHED FOR CHP RUN-OFF WATER TREATMENT PLANT	12
21	PE-V0-497-157-A021	DRIVE LIST (DRIVES CONTROLLED FROM DDCMIS) FOR CHP RUN-OFF WATER TREATMENT PLANT	10
22	PE-V0-497-157-A022	I/O LIST FOR CHP RUN-OFF WATER TREATMENT PLANT	10
23	PE-V0-497-157-A023	INSTRUMENT SCHEDULE FOR CHP RUN-OFF WATER TREATMENT PLANT	12
24	PE-V0-497-157-A024	PAINTING SCHEDULE FOR CHP RUN-OFF WATER TREATMENT PLANT.	12
25	PE-V0-497-157-A025	PIPE SCHEDULE FOR CHP RUN-OFF WATER TREATMENT PLANT.	10
26	PE-V0-497-157-A026	GENERAL ARRANGEMENT & CIVIL BLOCK OUT DETAILS OF SLUICE GATE (CHP RUN-OFF WATER TREATMENT PLANT)	10
27	PE-V0-497-157-A027	DATASHEET FOR PLATFORM TYPE WEIGHING SCALE. (CHP RUN-OFF WATER TREATMENT PLANT)	10
28	PE-V0-497-157-A028	DATASHEET AND G.A OF AIR BLOWER (CHP RUN-OFF WATER TREATMENT PLANT)	10
29	PE-V0-497-157-A029	DATASHEET & WIRING DIAGRAM OF ELECTRICAL ACTUATOR (CHP RUN-OFF WATER TREATMENT PLANT)	10
30	PE-V0-497-157-A030	INSTRUMENTS HOOK UP DRAWINGS FOR CHP RUN-OFF	10



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

		WATER TREATMENT PLANT	
31	PE-V0-497-157-A031	G.A AND DATASHEET OF TANK AGITATOR ASSEMBLY (CHP RUN-OFF WATER TREATMENT PLANT)	10
32	PE-V0-497-157-A032	GA AND DATASHEET OF HORIZONTAL CENTRIFUGAL PUMPS WITH MOTOR (CHP RUN-OFF WATER TREATMENT PLANT)	10
33	PE-V0-497-157-A033	DATASHEET FOR SAFETY SHOWER AND EMERGENCY KIT B (CHP RUN-OFF WATER TREATMENT PLANT)	10
34	PE-V0-497-157-A034	LCP OF REACTOR CLARIFIERS FOR CHP RUN-OFF WATER TREATMENT PLANT.	10
35	PE-V0-497-157-A035	INTERCONNECTION DIAGRAM AND CABLE SCHEDULE FOR CHP RUN-OFF WATER TREATMENT PLANT AREA	10
36	PE-V0-497-157-A036	GA DRAWING & CALCULATION OF ELECTRICAL HOIST (CHP RUN-OFF WATER TREATMENT PLANT)	10
37	PE-V0-497-157-A037	PIPING LAYOUT OF CHP RUN OFF WATER TREATMENT PLANT	10
38	PE-V0-497-157-A038	OPERATION & MAINTENANCE MANUAL(CHP RUN OFF WATER SYSTEM)	10
39	PE-V0-497-157-A039	DATA SHEET FOR LOCAL GAUGES (CHP RUN-OFF WATER TREATMENT PLANT)	10
40	PE-V0-497-157-A040	DATA SHEET FOR FLOW ELEMENT ALONG WITH ORIFICE CALC. (CHP RUN-OFF WATER TREATMENT PLANT)	10
41	PE-V0-497-157-A041	TECHNICAL DATA SHEET FOR FLOW TRANSMITTER (CHP RUN-OFF WATER TREATMENT PLANT)	10
42	PE-V0-497-157-A042	DATA SHEET FOR JUNCTION BOX (CHP RUN-OFF WATER TREATMENT PLANT)	10
43	PE-V0-497-157-A043	DATA SHEET FOR PRESSURE TRANSMITTER (CHP RUN-OFF WATER TREATMENT PLANT)	10
44	PE-V0-497-157-A044	DATA SHEET FOR LEVEL TRANSMITTER (CHP RUN-OFF WATER TREATMENT PLANT)	10
45	PE-V0-497-157-A045	CABLE TRAY LAYOUT OF CHP RUN-OFF WATER TREATMENT PLANT	10
46	PE-V0-497-157-A046	PG TEST PROCEDURE FOR CHP RUN-OFF WATER TREATMENT PLANT	20
47	PE-V0-497-157-A047	CONTROL LOGIC SCHEMES OF CHP RUN-OFF WATER TREATMENT PLANT	12
48	PE-V0-497-157-A048	GA AND DATASHEET OF VERTICAL CENTRIFUGAL PUMPS WITH MOTOR (CHP RUN-OFF WATER TREATMENT PLANT)	10
49	PE-V0-497-157-A049	GA AND DATASHEET OF SCREW PUMPS WITH MOTOR (CHP RUN-OFF WATER TREATMENT PLANT)	10
50	PE-V0-497-157-A050	GA, CROSS SECTION, PERFORMANCE CURVE AND DATASHEET OF DOSING PUMPS WITH MOTOR FOR CHP RUN-OFF WATER TREATMENT PLANT	10
51	PE-V0-497-157-A051	VALVE SCHEDULE OF CHP RUN-OFF WATER TREATMENT PLANT	12
52	PE-V0-497-157-A052	DATASHEET AND GA DRAWING OF DIAPHRAGM VALVES FOR CHP RUN-OFF WATER TREATMENT PLANT	10
53	PE-V0-497-157-A053	DATASHEET AND GA DRAWING OF BUTTERFLY VALVES FOR CHP RUN-OFF WATER TREATMENT PLANT	10
54	PE-V0-497-157-A054	DATASHEET AND GA DRAWING OF NRV/CHECK VALVES FOR CHP RUN-OFF WATER TREATMENT PLANT	10
55	PE-V0-497-157-A055	DATASHEET AND GA DRAWING OF GATE VALVES FOR CHP RUN-OFF WATER TREATMENT PLANT	10
56	PE-V0-497-157-A056	DATASHEET AND GA DRAWING OF PLUG VALVES FOR CHP RUN-OFF WATER TREATMENT PLANT	10
57	PE-V0-497-157-A057	CABLE SCHEDULE OF CHP RUN-OFF WATER TREATMENT PLANT	10
58	PE-V0-497-157-A058*	GA & DATA SHEET OF FILTER PRESS (CHP RUN-OFF WATER TREATMENT PLANT)	10
59	PE-V0-497-157-A059*	G.A OF FILTER PRESS PLATFORM FOR CHP RUN-OFF WATER TREATMENT PLANT.	10
60	PE-V0-497-157-A060*	CIVIL GA, FOUNDATION, SUPER STRUCTURE AND RCC DETAILS OF FILTER PRESS PLATFORM FOR CHP RUN-OFF WATER TREATMENT PLANT	12
61	PE-V0-497-157-A061*	CIVIL DESIGN CALCULATION OF FILTER PRESS PLATFORM FOR CHP RUN-OFF WATER TREATMENT PLANT	12
62	PE-V0-497-157-A062	MQP FOR SLUICE GATE	10
63	PE-V0-497-157-A063	MQP FOR BUTTERFLY VALVES	10
64	PE-V0-497-157-A064	MQP FOR DIAPHRAGM VALVE	10
65	PE-V0-497-157-A065	MQP FOR AIR BLOWER (LOBE TYPE)	10
66	PE-V0-497-157-A066	MQP FOR MS PIPES	10
67	PE-V0-497-157-A067	MQP FOR METERING PUMP (DIAPHRAGM TYPE)	10
68	PE-V0-497-157-A068	MQP FOR ELECTRICAL ACTUATOR	10



TITLE:

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

69	PE-V0-497-157-A069	MQP FOR CENTRIFUGAL PUMPS (HORIZONTAL & VERTICAL)	10
70	PE-V0-497-157-A070	MQP FOR VERTICAL WET PIT TURBINE PUMP	10
71	PE-V0-497-157-A071	MQP FOR REATOR CLARIFIER	10
72	PE-V0-497-157-A072	TYPE TEST REPORT OF FLOW ELEMENT (CALIBRATION)	10
73	PE-V0-497-157-A073	LIST OF ALARM	10
74	PE-V0-497-157-A074	MQP FOR GATE/ GLOBE/ CHECK VALVES	10
75	PE-V0-497-157-A075	MQP FOR NRV FLAP TYPE	10
76	PE-V0-497-157-A076	MQP FOR CI/ DI PIPES & FITTINGS	10
77	PE-V0-497-157-A077	MQP FOR PRESSURE VESSEL/ ATMOSPHERIC STORAGE TANKS	10
78	PE-V0-497-157-A078	ELECTRICAL LOAD LIST	10
79	PE-V0-497-157-A079	TYPE TEST REPORT OF ELECTRONIC TRANSMITTER	10
80	PE-V0-497-157-A080	TYPE TEST REPORT OF JUNCTION BOX (DEGREE OF PROTECTION)	10
83	PE-V0-497-157-A083	INSPECTION CHECK LIST / MANUFACTURING QUALITY PLAN OF FILTER PRESS	10
86	PE-V0-497-157-A086*	G.A OF DISTRIBUTION CHAMBER & PUMP HOUSE	10
87	PE-V0-497-157-A087*	CIVIL GA OF DISTRIBUTION CHAMBER & PUMP HOUSE	12
88	PE-V0-497-157-A088*	RCC DETAIL OF DISTRIBUTION CHAMBER & PUMP HOUSE	12
89	PE-V0-497-157-A089*	CIVIL DESIGN CALCULATION OF DISTRIBUTION CHAMBER & PUMP HOUSE.	12

Note- The drawing/ document marked as (*) shall be considered as basic drawings/ documents. In addition to above bidder to refer other Sections for documents related to Electrical & Control & instrumentation respectively.



TITLE:
**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001	
VOLUME II-B	
SECTION-C1	
REV. NO. 00	DATE:

DRAWING/DOCUMENTS DISTRIBUTION SCHEDULE



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

S.No	Description of Drgs/Docs	No of Prints	No of ROMs/DVDs/Portable Hard Disk	CD
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	Operation & Maintenance manual	1 set	--	
	i) First Submission			
	ii) Final Submission (Directly to site)	4 sets	2	
4	Plant Hand Book			
	i) First Submission	1	1	
5	Commissioning and Performance Test Procedure manual	1 set	--	
	i) First Submission			
	ii) Final Submission (Directly to site)	4 sets	2	



TITLE:

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

S.No	Description of Drgs/Docs	No of Prints	No of ROMs/DVDs/Portable Hard Disk	CD
6	Performance and Functional Guarantee Test Report i) First Submission	2 sets	--	
	ii) Approved Copies (Direct to Site)	4 sets	2	
7	Project Completion Report (Directly to site)	6 sets	2	
8	QA programme including Organisation for implementation and QA system manual(with revisions)	1	--	
9	Vendor details in respect of proposed vendors including contractor's evaluation report.	2	--	
10	Manufacturing QPs, Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc i) For review/comment	1	--	
	ii) Approved final copies of Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc (Direct to Site)	4	2	
11	Welding Manual, Heat Treatment Manuals, Storage & preservation manuals i) For review/comment	1 set	--	
	ii) Approved copies (Direct to Site)	4 sets	2	
12	QA Documentation Package for items / equipment manufactured and despatched to site	2 sets	2	
13	QA Documentation Package for field activities on equipment/systems at site	2 sets	2	

**TITLE:**

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

Note:

- Quantity of prints may change during detailed engineering stage based on BHEL / Customer requirement. However the same will be adhered by the bidder without any delivery/commercial implication to BHEL.
- All the drawing documents along with the O&M manual (of all the revisions) are necessarily to be submitted in soft copies in addition to hard copies.
- Bidder to submit soft copies of all the drawing and document along with quality plans for BHEL review and approval.
- The date of submission of drawing documents shall be considered as the date of submission of hard and soft copies whichever is later.
- All the drawings shall be prepared on computer auto cad and other documents (like datasheet etc.) on MS office software. Bidder not complying to the requirement shall not be considered. For the execution of the contract regular meeting (generally once in 15 days or as per project requirement) is required.
- Bidder has to come for meeting with the concerned dealing persons as per BHEL or customer requirement in a short notice.
- Bidder to submit instrument schedule, cable schedule and valve schedule in MS- Excel format during detailed engineering.
- Bidder to also furnish the auto cad copy / MS-word (as applicable)/MS-Excel (as applicable) of the following documents after award of contract. However any other auto cad copy/MS-Excel/MS-word of any other document as per the insistence of BHEL / customer will also be submitted by the bidder without any delivery/commercial implication to BHEL.
 - P&IDs.
 - Equipment lay out of the CHP-Run-Off Water Treatment System.
 - Equipment Cable tray layout for CHP-Run-Off Water Treatment System
 - Equipment earthing layout CHP-Run-Off Water Treatment System
 - Civil scope drawings.
 - Piping lay out drawing for CHP-Run-Off Water Treatment System and yard piping layout.
 - Valve schedule.
 - Instrument schedule.
 - Any Other Dwg/Docs as required.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001
VOLUME II-B
SECTION-C1
REV. NO. 00
DATE:

ANNEXURE-V

MANDATORY SPARES

SI. NO.	PARTICULARS	QUANTITY
	CONTROL & INSTRUMENTATION-PT PLANT	
	MEASURING INSTRUMENTS	
1)	Electronic Transmitters	
(i)	Transmitters of all types and model. (for the measurement of Pressure, differential pressure, flow, level, etc.) including local indication (if applicable)	2 Nos. of each type and model
2)	Temperature elements	
(i)	Temperature Transmitter	2 Nos. of each type and model
(ii)	RTD's*	1 no. of each type
(iii)	Thermo well	1 no. of each type
	* (With head assembly, terminal block and nipple)	** (to be divided into various insertion lengths in proportion to main population)
3)	Local Indicators (Non-Electrical type) -As applicable for the package as per the following items	
(i)	Temperature gauges	1 no. of each range and type
(ii)	Pressure gauges	1 no. of each range and type
(iii)	Differential Pressure Gauges,	1 no. of each range and type
(iv)	Level gauges	1 no. of each range and type
(v)	Flow gauges excluding Rota meters	1 no. of each range and type
(vi)	All types of Rota meters	1 no. of each range and type.
4)	Process Actuated Switch Devices -As applicable for this package, as per the following items	
(i)	Temperature switches	1 no. of each range and type
(ii)	Pressure switches	1 no. of each range and type
(iii)	Differential Pressure switches	1 no. of each range and type
(iv)	level switches	1 no. of each range and type
(v)	Flow switches	1 no. of each range and type
5)	Solenoid Valves	2 Nos. of each type and model
6)	Limit Switches (for Pneumatic Valves and Manual valves)	2 no. of each type
SI. NO.	PARTICULARS	QUANTITY
I	Vertical Turbine (wet pit) Pumps-Coal Decanted water pump (Clarifier Feed Pumps) motor	1 no.
1	Supernatant Transfer Pumps motor	1 no.

Notes:

- 1) Identification: Each spare shall be clearly marked and labelled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents 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 purpose of identification.
- 2) Mandatory spares listed above is bare minimum requirement. In case any additional mandatory spares requirement is covered elsewhere in the tender specification apart from specified above, same shall be deemed to have been covered in bidder's scope of supply.
- 3) Unless stated otherwise, a "set" or "Lot" means items required for complete replacement in one equipment of each type/ size/ range.
- 4) In case of Bought Out items, itemized spares list may be vendor specific and may differ from the list of spares mentioned above. In such cases, the quoted price shall be considered for applicable items only without any change in the contract price.
- 5) In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.
- 6) Any item which is quoted as "not applicable" in the above list and is found to be "applicable" at a later date shall be supplied by the Bidder without any commercial implications.



TITLE:

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-C1

REV. NO. 00

DATE:

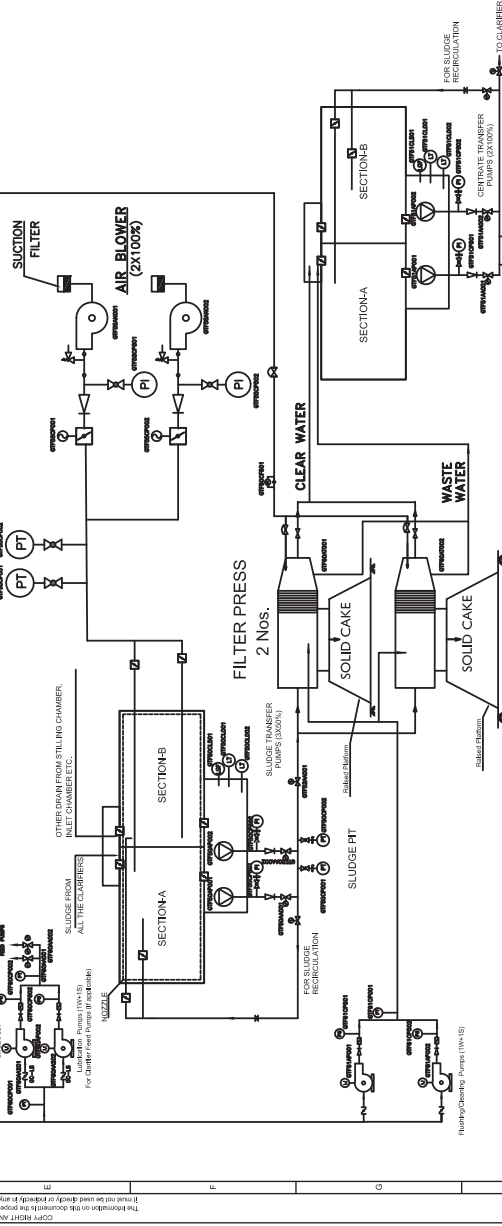
(DRAWINGS)



COPY RIGHT AND CONFIDENTIALITY NOTICE: The information on this document is the property of B... it must not be used directly or indirectly in any way d...

1. PIPE LINE SIZE INDICATED ARE IN mm (NB).

1. PIPE LINE SIZE INDICATED ARE IN mm (NB).
- 1.1. CARBON STEEL PIPING UP TO AND INCLUDING 150NB SHALL BE ERW, IS: 1239 (HEAVY GRADE)
- 1.2. CARBON STEEL PIPING 200NB AND ABOVE SHALL BE IS:2062, ROLLED & WELDED CONFORMING TO IS: 3589.
2. THE P&I DIAGRAM INDICATES ONLY MINIMUM REQUIREMENT OF VALVES, INSTRUMENTATION ETC. BIDDER SHOULD FURNISH COMPLETE SCHEME IN ALL RESPECTS INCLUDING ALL INSTRUMENTS, VALVES ETC. FOR SMOOTH, SAFE, EFFICIENT, TROUBLE FREE OPERATION OF PLANT FOR BHEL / CUSTOMER APPROVAL DURING DETAILED ENGINEERING.
3. LINE SOLUTION HEADER SHALL COVER ALL THE CLARIFIERS BEFORE RETURNING TO THE PREPARATION/DOSING TANK
- TAPPING FROM THIS HEADER SHALL BE TAKEN NEAR THE INDIVIDUAL CLARIFIER.
4. ALL VARIABLE FREQUENCY DRIVES (VFD) SHALL BE CONTROLLED FROM DCCMS.
5. SUITABLE PERMANENT FLUSHING CONNECTION SHALL BE PROVIDED FOR ALL PIPELINES CARRYING SLUDGE AND CHEMICAL LINES. IN CASE, ADEQUATE PRESSURE IS NOT AVAILABLE, SEPARATE BOOSTER PUMPS (2X100G) SHALL BE PROVIDED FOR THE SAME.
6. ALL RECIRCULATION LINES SHALL BE PROVIDED WITH SUITABLE ORIFICE PLATE & SHALL BE DESIGNED BASED ON 50% OF EACH PUMP CAPACITY.
7. WIDTH OF GATES SHALL BE SAME AS THAT OF CHANNEL. CHANNEL WIDTH SHALL BE INCREASED LOCALLY, IF REQUIRED.
8. ALL THE PIPE AND VALVE SIZES AND ANY OTHER SIZES INDICATED IN THE DRAWING ARE MINIMUM REQUIREMENT. PIPE & VALVE SIZES SHALL BE INCREASED WHERE EVER REQUIRED TO MEET THE SYSTEM REQUIREMENT.
9. OVER FLOW & DRAINS FROM VARIOUS CHEMICAL TANKS & FLOOR WASH DRAINS OF CHEMICAL STORAGE CUM DOSING SHED SHALL BE LED TO THE COAL SLURRY SETTLING POND.
10. OVER FLOW & DRAINS FROM ALL STRUCTURES AND PIPING HANDLING WASTE & TREATED WATER SUCH AS AERATOR, STILLING CHAMBER, INLET CHAMBER ETC. SHALL BE LED TO SLUDGE SUMP.
11. THE INSTRUMENTS, VALVES, PIPING, FITTINGS, ETC SHOWN IN P & ID ARE MINIMUM. THE ADDITIONAL VALVES, INSTRUMENTS, PIPING, FITTINGS ETC. SHALL ALSO BE INCLUDED AS INDICATED ELSEWHERE IN THE SPECIFICATION & BASED ON SYSTEM REQUIREMENT. THE PAID TO BE READ IN CONJUNCTION WITH THE TECHNICAL DETAILS SPECIFIED IN OTHER PART OF TECHNICAL SPECIFICATION.

[illegible]



TITLE:

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

DATASHEET-A
(COAL HANDLING PLANT RUN-OFF WATER TREATMENT SYSTEM)



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

DATA SHEET – A

1.	TRANSFER PUMPS TREATMENT PLANT	
1.1		Clarifier feed Pumps (CSSP Area)
1.2	Number	2X50%
1.3	Service	-----Intermittent-----
1.4	Capacity (Each)-Minimum	To suit net Clarifiers output of 2000 cum/hr and Head to meet the system requirement. i.e each pump capacity shall be 1000 cum/hr+ water loss due to sludge.
1.5	Operating Speed (Maximum)	----- 1500 rpm -----
1.6	Pumps & Drives to be designed for	-----Outdoor Duty -----
1.7	Service of duty	-----Continuous -----
1.8	Type of pump	Vertical Turbine (wet pit) Type and non-pull out type.
1.9	Type of Working Fluid	Decanted water
1.10	Maximum water temperature	36 deg C
1.11	Minimum water temperature	25 deg C
1.12	Type of Discharge	-----Above Floor discharge -----
1.13	Type of impeller	-----Closed / Semi-open -----
1.14	Type of lubrication	-----Self water or grease -----
1.15	Suction condition	-----Submerged -----
1.16	Minimum Water level	----- By Bidder -----
1.17	Maximum Water level	-----Local Finished Grade Level (FGL) -----
1.18	Sump Invert level	----- As per design -----
1.19	Operating floor level	-----Minimum 500 mm above FGL -----
1.20	Type of shaft coupling	-----Flexible / Rigid -----
1.21	Material of Construction	
(I).	Suction Bell	2.5%NiCl; IS: 210Gr FG 260; S-0.1% & P-0.15% max.
(II).	Casing / Bowl	2.5%NiCl;IS:210Gr FG 260;S-0.1% & P-0.15% max.
(III).	Impeller	ASTM A351 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 coupling	----- SS ASTM A 276 Gr. 410 -----
(VII).	Shaft sleeves	-----SS - ASTM –A 276 – 410 -----
(VIII).	Shaft bearings	Cutless rubber with bronze retainer for bearings below minimum water level and Thordon type bearing for bearings above minimum water level
(IX).	Column pipe	Fabricated steel as per IS: 2062 (minimum thickness shall not be less than 8 mm) with 2 coats of epoxy coating inside & outside.
(X).	Shaft enclosing tube	----- Not Applicable -----



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

(XI).	Discharge Head	Fabricated steel as per IS:2062 (minimum thickness shall not be less than 8 mm) or Cast Iron with 2 coats of epoxy coating inside and outside.
(XII).	Distance piece (if applicable)	Fabricated steel as per IS:2062(minimum thickness shall not be less than 10 mm) with 2 coats of epoxy coating inside.
(XIII).	Matching flanges	Fabricated steel as per IS:2062
(XIV).	Stuffing box	2.5% NI-CI to IS:210 FG-260
(XV).	Gland	2.5% NI-CI to IS:210 FG-260
(XVI).	Gland packing	Impregnated TEFLON
(XVII).	Gaskets	Wire reinforced rubber gasket / Neoprene rubber / Compressed Asbestos Fiber
(XVIII).	Bolts & nuts	Stainless steel AISI type 304/316 for those coming in contact with water and for others, material shall be high tension carbon steel.
(XIX).	Base plate and Soleplate	Fabricated steel as per IS : 2062 (Minimum 10 thick)
(XX).	Accessories to be provided with each pump	a. Companion flanges with nuts, bolts and gaskets, Positioning dowels, Eye bolts, lifting etc b. Internal piping with valves filters & Instruments for sealing/ cooling/ lubrication system upto and including isolating valve etc as per requirement. c. Non –reverse ratchet shall be provided as per manufacturer's standard practice.
1.22	Other Technical	Refer sub-section titled "General Technical Requirement of Pumps" in Sec-D of Technical Specification
2.	INLET VALVES	
2.1	Inlet valves to Stilling Chamber	One (1) number motorized butterfly valve (Inching Type) located at inlet to stilling chamber along with one (1) number Manual butterfly valve.
2.2	Inlet valves size	Suitable to cater to total flow i.e. Same as that of Pipe Size
2.3	Control	Under " Auto" mode of flow control valve, valve shall automatically maintain the level of water in the Distribution Chamber, i.e valve shall automatically close when reservoir level becomes high.
3.	STILLING CHAMBER	
3.1	No.	One (1) Number
3.2	Purpose	To dampen out any turbulence of the incoming water.
3.3	Type Of Construction	Circular/Rectangular
3.4	Capacity(Design flow)	(2000 + 3% for sludge) Cum/hr.
3.5	Material of construction	RCC (BHEL Scope)
3.6	Drain arrangement	Suitable draining arrangement shall be provided for the stilling chamber and drain lines shall be connected to sludge sump.
4.	PARSHALL FLUME	
4.1	No.	One (1) number
4.2	Purpose	To measure flow.
4.3	Material of construction	RCC (BHEL Scope)
5.	INLET CHAMBER	
5.1	Nos.	One (1) number



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

5.2	Material Of Construction	RCC (BHEL Scope)
5.3	Capacity (Design flow) min.	(2000 + 3% for sludge) Cum/hr
6.	HRSCC (HIGH RECOVERY SOLID CONTACT CLARIFIER)	
6.1	Number	One (1)
6.2	Design Capacity (Net output)	2000 Cum/hr (each).
6.3	Type	Circular High Rate Solids Contact Reactor Type Clarifier (HRSC).
6.4	Material Of Construction	RCC (BHEL Scope)
6.5	MOC of pipe from inlet channel to clarifier	Carbon Steel pipe encased with concrete for buried portion and externally epoxy painted inside the clarifiers.
6.6	Sludge Blow Off to sludge sump	By gravity through telescopic stand-pipe for continuous discharge and through motor operated blow-off valve for intermittent. (Suitable manhole arrangement shall be provided in sludge lines)
6.7	Sludge Blow Off- Pipe Material	CI class A as per IS: 1536)
6.8	Reaction Turbine	With variable frequency drive as per Manufacturer's Standard
6.9	Flushing Connection	Required.
7.	CLARIFIER SCRAPPERS	
7.1	Number required	One (1) assembly per clarifier.
7.2	Material	Mild steel (MS) with rubber inserts (With bitumastic paint protective coating)
7.3	Drive	Slow speed motor driven through reduction gear unit or Variable frequency Drive as per manufacturer's std.
8.	-	
8.1	-	
8.2	-	
9.	SUITABLE ACCESSORIES	
9.1	Access ladder, platform, staircase, hand railings etc.	Shall be provided of structural steel.
9.2	Walkway	Shall be provided with hand railings around launder periphery of width 1000 mm.
10.	Distribution Chamber (Above ground)	
10.1	Number of Basin	One(1) number in twin sections
10.2	Material of Construction	RCC (BHEL Scope)
10.3	Capacity of each section	500 Cum (minimum)
11.	SLUDGE PIT	
11.1	Number	One (1) (Under Ground) in twin section
11.2	Capacity (effective)	1 hrs of storage in each section.
11.3	Dimension	Suitable
11.4	Material	RCC with epoxy paint. (BHEL Scope)
11.5	Location	Shall be finalized during Detailed Engineering (DDE).
11.6	Special arrangement	Agitation/ recirculation line shall be provided in sludge transfer pit.
12.	AIR BLOWER FOR SLUDGE PIT	
12.1	Number	Two (1W+1S)
12.2	Type	Centrifugal /Twin Lobe Type



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

12.3	Duty	Intermittent
12.4	Capacity & Head	As required
12.5	MOC of casing and lobes	CI as per IS 210 FG 260
12.6	MOC of shaft	Carbon steel BS-970 En-8/ANSI-I045
12.7	Accessories Required	Acoustic Enclosure, Suction Filter, Silencer, relief Valve etc
12.8	Location	Outdoor
13.1	FILTER PRESS	
I.	Number	2 Nos
II.	Type	Automatic Chamber filter press with automatic filter cake removal and VFD driven
III.	Flow rate	Each filter press shall be designed for the handling of total sludge generated while the other filter press will be under backwash/cleaning operation ensuring continuous desludging of the sludge generated.
IV.	Sludge consistency required at outlet	20% to 25%
V.	No of cycle per filter press	As per supplier recommendation
VI.	Cycle time (hour)	As per supplier recommendation
VII.	Number of Recessed Plates and chambers	As per supplier recommendation
VIII.	Recessed Plate shifting	Automatic
IX.	Material of Construction:	
X.	Chassis Structure	MS with Epoxy coated
XI.	Filter / End Plates	Polypropylene
XII.	Wetted part (any)	MS with Epoxy coated suitable for intended application
XIII.	Type of Element	Recessed with Centre Feeding/ Polypropylene Membrane & Recessed with Centre Feeding
XIV.	Location	Filter press shall be located in the vicinity of clarifier at elevated RCC structure with platform for maintenance & operation with Solid cake removal from bottom. The clear water shall be routed to clarifiers through Pumping. Suitable collection & disposal arrangement (i.e. sump, Pumps (2x100%) along with associated pipping, instruments , valves etc) to be provided by bidder.
XV.	Cleaning system for filter press, plate & Filter clothe etc.	Suitable arrangement to be provided.
13.2	Coagulant aid Dosing Tanks	
a)	Number	Two (2)
b)	Type	Vertical cylindrical with dished end bottom & with cover at the top.
c)	Capacity (Total)-	To hold coagulant for 24 hours requirement of all the Filter Press operating at design capacity and a design dosage rate of 2 ppm minimum, Whichever is maximum.
d)	Material of Construction	Carbon Steel internally rubber lined and externaly painted with epoxy painting
e)	Agitator & Number	Motor driven with reduction gear unit One(1) per tank
f)	Agitator Shaft material	SS316
g)	Agitator Impeller material	SS316
13.3	Pumps- Metering Pumps	
a)	Number	Two (2x100%)



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

b)	Min Capacity (Each) cum/hr	As per system requirements.				
c)	Head	As per system requirements.				
d)	Type	Simplex hydraulically operated Diaphragm type				
e)	Liquid to handled and concentration	PE Solution				
f)	Capacity control	10 --100% of capacity manually by micrometer dial				
g)	Pump stroke speed per minute	Maximum 100				
h)	Material of Construction:					
I.	Liquid end (pump head valve, valve housing, etc) ,valve spring	AISI -316				
II.	Diaphragm	PTFE				
III.	Packing	PTFE				
IV.	Shaft	Hardened steel EN8-BS-970)/ AISI-316				
V.	Accessories	Pressure Dampeners, Safety Relief valves etc. required				
13.	CHEMICAL DOSING CUM STORAGE AREA					
14.1	Number	One (1)				
14.2	Type	Shed. (BHEL Scope)				
14.3	Area dimensions	Shall be finalized during Detailed Engineering (DDE).				
14.4	Purpose	Location of all chemical dosing tanks including dosing facility of Coal slurry settling ponds, pumps & Storage of chemical required for Alum, Lime, coagulant aid and flocculants dosing for 15 days storage capacity.				
14.	WEIGHING SCALE FOR CHEMICAL					
15.1	Type	Platform & dial type./electronic type				
15.2	Number	Two (2) [One (1) Range 0-500 Kg & One (1) Range 0-2000 Kg]				
15.	HOIST					
16.1	Type	Electric operated				
16.2	Number	One (1).				
16.3	Capacity (Min)	1 Ton				
16.4	Design Standard	IS:3938 Class 2				
16.	CHEMICAL DOSING SYSTEM					
17.1	Chemical tanks					
S.No	Designation	Lime Slaking Tanks	Lime Dosing Tanks	Alum Dosing Tanks	Synthetic Flocculants Dosing tanks	Coagulant aid Dosing Tanks
I.	Number	Two (2)	Two (2)	Two (2)	Two (2)	Two (2)
II.	Type	-	-	-	Vertical cylindrical with dished end bottom & with cover at the top.	Vertical cylindrical with dished end bottom & with cover at the top.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

III.	Capacity (Total)-	To hold lime slurry (of about 10% W/V concentration from Quick lime of purity of 75% CaO) for 24 hours requirement of all the clarifiers operating at design capacity and a design dosage rate of 30 ppm minimum, Whichever is maximum.	To hold lime solution (of about 6% W/V concentration) for 24 hours requirement of all the clarifiers operating at its design capacity and a design dosage rate of 30 ppm minimum, Whichever is maximum	To store alum solution (of about 10% W/V concentration) for 24 hrs req. of all clarifier operating at its design capacity and a dosing rate of 70 ppm min, Whichever is maximum.	To hold coagulant for 24 hours requirement of all the clarifiers operating at design capacity and a design dosage rate of 2 ppm minimum, Whichever is maximum.	To hold coagulant for 24 hours requirement of all the clarifiers operating at design capacity and a design dosage rate of 2 ppm minimum, Whichever is maximum.
IV.	Material of Construction	RCC (BHEL Scope) (With 2 Coats of Bitumastic Paint over 2 coats of Primer)		RCC (BHEL Scope) (With Acid/Alkali resistant Tiles)	Carbon Steel internally rubber lined and externally painted with epoxy painting	
V.	Agitator & Number	Motor driven with reduction gear unit One(1) per tank				
VI.	Disolving Chamber For Each Tank	Required (Stainless steel Material)				Not Applicable
VII.	Agitator Shaft material	SS316				
VIII.	Agitator Impeller material	SS316				
17.2	Pumps- Metering Pumps					
S.No	Designation	Alum Dosing Pumps		Synthetic Flocculants Dosing Pumps		Coagulant aid Dosing Pumps
I.	Number	Two (2x100%)		Two (2x100%)		Two (2x100%)
II.	Min Capacity (Each) cum/hr	As per system requirements.				
III.	Head	As per system requirements.				
IV.	Type	Simplex hydraulically operated Diaphragm type				
V.	Liquid to handled and concentration	Alum solution 10% W/V		-		-
VI.	Capacity control	10 --100% of capacity manually by micrometer dial				
VII.	Pump stroke speed per minute	Maximum 100				
VIII.	Material of Construction:					
a.	Liquid end (pump head valve, valve housing, etc) ,valve spring	AISI -316				
b.	Diaphragm	PTFE				



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

c.	Packing	PTFE			
d.	Shaft	Hardened steel EN8-BS-970)/ AISI-316			
e.	Accessories	Pressure Dampeners, Safety Relief valves etc. As required			
17.	Pumps- Horizontal Centrifugal Pumps				
S.No	Designation	Flushing/Cleaning Filter Press Pump for	Supernatant Transfer Pumps	Lime Slurry Transfer Pumps	Lime Dosing Pumps
18.1	Number	Two (1) (1W+1S)	Two (2) (2x50%)	Two (2) (1W+1S)	Two (2) (1W+1S)
18.2	Min Capacity (Each) cum/hr	To Suit Requirement of one (1) Filter Press.	1000 cum/hr	As per System Req.	As per System Req.
18.3	Operating Speed	-----1500 rpm (max)-----			
18.4	Pumps & Drives To be Designed for	-----Outdoor Duty-----			
18.5	Service of Duty	-----Continuous-----			
18.6	Type of Pump casing	-----Radially Split Type-----			
18.7	Type of Working Fluid	-----Service Water-----	Supernatant	Lime Solution (10% v/v)	Lime Solution (6% v/v)
18.8	Max. Water Temperature	45 Deg.C	45 Deg.C	80 Deg.C	80 Deg.C
18.9	Min. Water Temperature	33 Deg.C	33 Deg.C	40 Deg.C	40 Deg.C
18.10	Type of Lubrication	-----Grease-----			
18.11	Suction Condition	-----Flooded-----			
18.12	Material of Construction				
I.	Casing	ASTM A351 CF8M	ASTM A351 CF8M	2.5% Ni Cl IS210 Gr FG 260	2.5% Ni Cl IS210 Gr FG 260
II.	Impeller	ASTM A351 CF8M	ASTM A351 CF8M	ASTM A351 CF8M	ASTM A351 CF8M
III.	Wearing rings (If applicable)	-----SS316-----			
IV.	Shaft	-----SS410-----			
V.	Shaft Sleeves	-----SS410-----			
VI.	Stuffing Box	-----2.5% Ni Cl IS210 Gr FG 260-----			
VII.	Gland	-----2.5% Ni Cl IS210 Gr FG 260-----			
VIII.	Bolts & Nuts	Stainless steel for those coming in contact with water and for others, material shall be high tension carbon steel.			
IX.	Base Plates	-----Carbon Steel (Minimum 10 mm thick)-----			
18.13	Accessories to be provided with each pump	a. Companion flanges with nuts, bolts and gaskets, Internal piping with valves filters & Instruments for sealing/ cooling/ lubrication system up to and including isolating valve etc, b. Positioning dowels, drain plugs, vent valve etc c. Coupling guards, Eye bolts, lifting etc.			



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001
VOLUME-II-B
SECTION-C1
REV. NO. 00 DATE:

18.14	Other Technical	Refer sub-section titled “General Technical Requirement of Pumps” in Sec-D of Technical Specification	
18.	Pumps- Vertical Sump Pumps		
S.No	Designation	Sludge Transfer Pumps	Centrate Transfer Pump
19.1	Number	Two (2x100%)	Two (2x100%)
19.2	Min Capacity (Each) cum/hr	As Per System Req.	
19.3	Operating Speed	1500 rpm (Maximum)	
19.4	Pumps & Drives To be Designed for	Outdoor Duty	
19.5	Service of Duty	Continuous	
19.6	Type of Pump	Vertical, non-clog, Sump pumps	
19.7	Type of Working Fluid	Sludge	
19.8	Type of Discharge	Above Floor Discharge	
19.9	Type of impeller	----- open -----	
19.10	Type of lubrication	-----grease -----	
19.11	Suction condition	-----Submerged -----	
19.12	Minimum Water level	----- By Bidder -----	
19.13	Maximum Water level	-----Local Finished Grade Level (FGL) -----	
19.14	Operating floor level	-----Minimum 500 mm above FGL -----	
19.15	Type of shaft coupling	-----Flexible / Rigid -----	
19.16	Material of Construction		
I.	Suction Bell/casing	2.5%NiCl; IS: 210Gr FG 260; S-0.1% max. & P-0.15% max.	
II.	Impeller	ASTM A351 CF8M	
III.	Shaft	SS410	
IV.	Shaft coupling	SS410	
V.	Shaft sleeves	SS410	
VI.	Column pipe & Discharge Pipe	CS as per IS2062 (Min. 8 mm thickness) with 2 coats of epoxy coating inside & outside.	
VII.	Shaft enclosing tube (If Applicable)	CS as per IS2062 (Min. 8 mm thickness) with 2 coats of epoxy coating inside & outside.	
VIII.	Stuffing box	2.5% NI-Cl to IS:210 FG-260	
IX.	Gland	2.5% NI-Cl to IS:210 FG-260	
X.	Gland packing	TIWA	
XI.	Gaskets	Neoprene rubber	
XII.	Bolts & nuts	Stainless steel.	
XIII.	Base plate and Soleplate	Carbon Steel (Min.10 mm Thick)	
19.17	Accessories to be provided with each pump	d. Companion flanges with nuts, bolts and gaskets, Positioning dowels, Eye bolts, lifting etc e. Non –reverse ratchet shall be provided as per manufacturer's standard practice.	
19.18	Other Technical	Refer sub-section titled “General Technical Requirement of Pumps” in Sec-D of Technical Specification	



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

19.	VALVES All the valves shall generally be conforming to the requirements specified in the Chapter titled "General Technical Requirement Of Low Pressure Piping" considering the following aspects as minimum requirement:
20.1	Coagulant (Alum) and Coagulant aid Services i. Type of Valves <u>For Isolation</u> a) Saunder's Patented Diaphragm Valves b) Ball Valves in CPVC pipes <u>For non-return / Check</u> Swing Check type /Dual Plate type ii. Material of Construction Valves <u>Diaphragm Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40 ; BS: 1452 Gr.220/Equivalent. OR Cast Steel to ASTM. A 216GR. WCB and Body shall be internally lined with Soft Natural rubber, Ebonite or Polypropylene b) Diaphragm shall be shall be of reinforced rubber /Hypalon/ approved equivalent c) Stem, Compressor & Bush shall be Stainless steel Construction <u>Ball Valves in CPVC Pipe lines</u> a) Body , Ball & stem shall be of CPVC b) Seat ring & Packing shall be EPDM / or equivalent <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and <u>shall be lined with natural Rubber, PTFE or Viton or Stainless Steel – 316</u> b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and <u>shall be coated with PVDF, or suitable elastomer or Stainless Steel – 316</u> c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS – 316 e) Material of construction of spring in dual type valve shall be of INCONEL or better
20.2	Lime slurry/Solution/ Suspensions i. Type of Valves <u>For Isolation</u> Non-lubricated Plug Valves <u>For non-return / Check</u> Swing Check type /Dual Plate type ii. Material of Construction Valves <u>Plug Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt b) Plug shall be Stainless steel to AISI 316 c) Body Sleeve & Seat shall be PTFE d) Gland & Gland nut shall be SS 304/316 e) Cover shall be of Cast Steel to ASTM A 216 Gr WCB <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and <u>shall be lined with natural Rubber, PTFE or Viton or Stainless Steel – 316</u> b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and <u>shall be coated with PVDF, or suitable elastomer or Stainless Steel – 316</u> c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS-316 e) Material of construction of spring in dual type valve shall be of INCONEL or better
20.3	Sludge i. Type of Valves <u>For Isolation</u> Gate or Sluice or Knife edge type Slide Valves



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

		For non-return / Check Swing Check type /Dual Plate type ii. Material of Construction <u>Gate / Sluice / Knife Edge Slide Valve</u> a) Body,Disc : Cast Iron b) Stem : Stainless Steel AISI 420 d) Packing : PTFE e) Gland & Gland nut : AISI 420 f) Hand wheel : Cast Iron <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron BS:1452 Gr.220 or Eqvt b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB / High tensile Brass or BS: 2872 equivalent. c) Disc facing ring and Body Seat rings shall be Stainless Steel. d) Bearing bushes shall be Leaded tin Bronze. e) Material of construction of spring in dual type valve shall be of INCONEL or better
20.4	Other Requirements: - Butterfly valves shall conform to design standard latest revision of AWWA C-504/EN 593/equivalent standard of required class/rating. - Plug valves shall be designed as per BS: 5353 Cl.150 or equivalent. - Valves for alum solution shall be Saunders's patented Diaphragm type designed as per BS: 5156 or approved equivalent standard. - Sluice/Gate Valves shall conform to BS: 5150 (BS: 5163 PN 16) PN16, IS:14846 of rating PN 1.6 (min.). Stem, seat ring and wedge facing ring shall be of stainless steel construction. Other parts shall be as per IS: 14846 /BS:5163). Flanges shall be designed as per ANSI B 16.5 Cl. 150 (min.) to meet with the piping flanges. Valves shall be of outside screw and rising stem type. Gate valves for sizes below 50 NB and below shall conforms to IS:778 Class-2/ANSI B16.34 straight, rising stem; without side screw. - Sluice/Gate valves shall be provided with the following accessories in addition to the standard items: - Hand wheel - Manual Gear reduction unit operator for valves 200 NB and above - Bypass valve for valve of sizes 350 NB and above. - Draining arrangement wherever required. - Arrow indicating flow direction. - Position indicator. - Sluice/Gate Valves shall be provided with back seating bush to facilitate gland renewal during full open condition. - Design standard for Gates shall be IS: 3042 or Equivalent. Material of Construction - Frame and Door : Cast Iron IS:210 Gr.260 - Spindles, bolts & nuts: M.S. to IS:2062 - Face & seat rings : Gun metal (as per IS: 3042). - All the parts of gates shall be applied with the coats of heavy duty bitumastic paint. Each of the gates shall be provided with hand wheel and a position indicator. - Sluice valve/knife edge type slide valves shall design by IS 14846. Plug valves shall be used for the application of lime slurry/lime solutions conforming to BS: 5353 Class 150 or Equivalent. - Valves will be used to start/stop or control flow. Gates will be primarily used for isolation of flow in open channels although these should be capable of throttling the flow too. However, contractor can provide either isolation gates or butterfly valves in various RCC tanks/pits/sumps such as sludge pit, distribution chamber etc. Sample valves will be used in sample collection lines. Unless otherwise specified all the valves shall be supplied with counter flanges by the Contractor. - All valves shall be suitable for service conditions i.e. flow, temperature and pressure under which they are required to operate. All the valves shall be of standard pressure rating of the relevant design standard. Nonstandard pressure rating shall not be accepted. The pressure and temperature rating of the valve shall not be less than the maximum expected pressure and temperature plus 5% additional margin of the system in which valves are proposed to be installed. The pressure rating of individual piping system component such as valves, flanges etc. shall however be not less than that specified.	



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C1

REV. NO. 00

DATE:

20.	PIPING All the piping shall generally be conforming to the requirements specified in the Chapter titled “General Technical Requirement Of Low Pressure Piping” considering the following aspects as minimum requirement:	
21.1	Decanted & Supernatant water	Carbon Steel: IS: 1239 Part-I (Heavy grade-Black), ASTM-A-53 Type-E Grade B / ASTM A 36 /IS: 3589 - Grade 410; / IS-2062 Gr.-B (for fabricated from plates) / Equivalent
21.2	Coagulant (Alum)	Rubber lined Steel/CPVC Schedule 80
21.3	Lime slurry/Solution/ Suspensions	CPVC as per ASTM F441 CPVC 4120 Sch. 80
21.4	Coagulant aid Solution	Rubber lined Steel/CPVC as per ASTM F441 CPVC 4120, Schedule80/equivalent.
21.5	Sludge	1) GRP as per ASTM D3517/ AWWA C950-88/AWWA M45 2) HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS:4984 or Equivalent for buried portion
21.6	Chemical Waste from vessels and tanks	1) Rubber lined Steel (as referred above) 2) HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS: 4984 or Equivalent for buried portion.



TITLE:

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C2

REV. NO. 00

DATE:

**SECTION-C2
(SPECIFIC TECHNICAL REQUIREMENT-ELECTRICAL)**

	TITLE: ELECTRICAL EQUIPMENT SPECIFICATION FOR CHP RUN OFF WATER TREATMENT PLANT (ELECTRICAL PORTION) 2 X 660 MW TALCHER TPP	SPECIFICATION NO.
		VOLUME NO. : II-B
		SECTION: C
		REV NO. : 00 DATE: 07.09.22 SHEET: OF

SPECIFIC TECHNICAL REQUIREMENTS:

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

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

- a) Services and Equipment as per “Electrical Scope between BHEL and Vendor”.
- b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The bidder without any extra charge shall provide the same.
- c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
- d) Electrical load requirement for CHPWTP package.
- e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer / BHEL approval without any commercial and delivery implications to BHEL.
- g) Various drawings including GA drg, data sheet as per required format, quality plans, calculations, test reports, test certificates, operation and maintenance manuals, characteristic curves, wiring diagrams/schemes etc. shall be furnished as specified at contract stage. All documents shall be subject to customer / BHEL approval without any commercial implications to BHEL.
- h) The sub-vendor list for various electrical items is subject to BHEL/Customer approval without any commercial implications.
- i) Motors shall meet minimum requirement of Electric motor specification.
- j) Purchaser will furnish data sheets to the vendor after award of contract. Vendor shall furnish filled in data sheets meeting the specification requirements.
- k) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.
- l) Cable BOQ worked out based on routing of cable listing provided by the vendor for “both end equipment in vendor’s scope” shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.
- m) All Structural steel required for electrical equipment supplied by Vendor- as per scope split, shall be in Vendor’s scope.

2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:

Refer “Electrical Scope between BHEL and Vendor”.

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

बी एच ई एल BHEL	TITLE: ELECTRICAL EQUIPMENT SPECIFICATION FOR CHP RUN OFF WATER TREATMENT PLANT (ELECTRICAL PORTION) 2 X 660 MW TALCHER TPP	SPECIFICATION NO.
		VOLUME NO. : II-B
		SECTION: C
		REV NO. : 00 DATE: 07.09.22 SHEET: OF
3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated. In line with this, the bidder as technical offer shall furnish two signed and stamped copies of the following: a) A copy of this sheet “Electrical Equipment Specification for DM/ PT PLANT package and sheet “Electrical Scope between BHEL and Vendor” with bidder’s signature and company stamp. b) Electrical load requirement. 3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer. 4.0 LIST OF ENCLOSURES 4.1 Electrical scope between BHEL & vendor 4.2 Customer (NTPC) specification for Motors & Cabling (for vendor scope as per scope split) 4.3 Quality plan for motors & NTPC quality assurance 4.5 Datasheet A & C (ANNEX-I) 4.6 ~~List of Mandatory Spares (ANNEX-II)~~ 4.7 Electrical Load data format (ANNEX-III) 4.9 BHEL cable listing format (ANNEX-IV)		

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGES : CHPWTP

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 2 X 660MW TALCHER TPP (EPC)

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	BHEL BHEL BHEL	BHEL Vendor BHEL	1. For 3.b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Termination at BHEL equipment terminals by BHEL. 3. Termination at Vendor equipment terminals by Vendor.
4	Junction box for control & instrumentation cable	Vendor	Vendor	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, optical fibre etc.	Vendor	Vendor	Refer C&I portion of specification for scope of fibre Optical cables if used between PLC/ microprocessor & DCS.
6	Cable trays, accessories & cable trays supporting system 100/ 50 mm cable trays/ Conduits/ Galvanised steel cable troughs for local cabling	BHEL Vendor	BHEL Vendor	Local cabling from nearby main route cable tray (BHEL scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs, as per approved layout drawing during contract stage.
7	Cable glands, lugs and bimetallic strip for equipment supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and control cables.
8	Conduit and conduit accessories for cabling between equipment supplied by vendor	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Lighting	BHEL	BHEL	
10	Equipment grounding (including electronic earthing) &	BHEL	BHEL	Refer note no. 4 for electronic earthing

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGES : CHPWTP

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 2 X 660MW TALCHER TPP (EPC)

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
	lightning protection			
11	Below grade grounding	BHEL	BHEL	
12	LT Motors with base plate and foundation hardware	Vendor	Vendor	Makes shall be subject to customer/ BHEL approval at contract stage.
13	Mandatory spares	Vendor	-	Vendor to quote as per specification.
14	Recommended O & M spares	Vendor	-	As specified elsewhere in specification
15	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	
16	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable and electronic earthing cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Electrical Equipment & cable tray layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish Electrical equipment layout & cable tray layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Cabling arrangement of the same (wherever overhead cable trays, trenches, cable ducts, conduits etc.) shall be decided during contract stage. Electrical equipment layout & cable tray layout drawing shall be subjected to BHEL/ customer approval without any commercial implications to BHEL.
18	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGES : CHPWTP

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 2 X 660MW TALCHER TPP (EPC)

3. In case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.
4. Vendor shall indicate location of Electronic Earth pit in their Civil assignment drawing.

SUB-SECTION-B – 02

MOTORS

TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW)
EPC PACKAGE
BID DOC NO.: CS-4540-001A-2

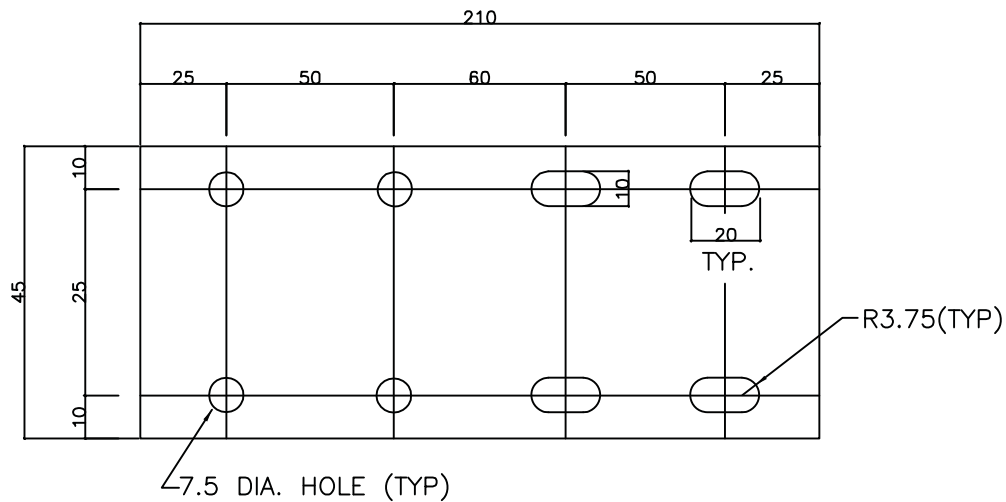
TECHNICAL SPECIFICATION
SECTION - VI
PART-B

CLAUSE NO.	TECHNICAL REQUIREMENTS																						
	MOTORS																						
1.00.00	GENERAL REQUIREMENTS																						
1.01.00	This chapter has to be read in conjunction with sub-section B-0 "General electrical specification" of Technical specification Section- VI, Part-B and Sub-Section-IIB Electrical system/Equipment of Technical Specifications Section-VI, Part-A" Degree of Protection Degree of protection for various enclosures as per IEC60034-05 shall be as follows :- <table><tr><td>i)</td><td>Indoor motors</td><td>-</td><td>IP 55</td></tr><tr><td>ii)</td><td>Outdoor motors</td><td>-</td><td>IP 55 (Additional Canopy to be provided)</td></tr><tr><td>iii)</td><td>Cable box-indoor area</td><td>-</td><td>IP 55</td></tr><tr><td>iv)</td><td>Cable box-Outdoor area</td><td>-</td><td>IP 55</td></tr></table>			i)	Indoor motors	-	IP 55	ii)	Outdoor motors	-	IP 55 (Additional Canopy to be provided)	iii)	Cable box-indoor area	-	IP 55	iv)	Cable box-Outdoor area	-	IP 55				
i)	Indoor motors	-	IP 55																				
ii)	Outdoor motors	-	IP 55 (Additional Canopy to be provided)																				
iii)	Cable box-indoor area	-	IP 55																				
iv)	Cable box-Outdoor area	-	IP 55																				
2.00.00	CODES AND STANDARDS																						
	<table><tr><td>1)</td><td>Three phase induction motors</td><td>:</td><td>IS15999/IEC:60034</td></tr><tr><td>2)</td><td>Single phase AC motors</td><td>:</td><td>IS 996/ IEC:60034</td></tr><tr><td>3)</td><td>Crane duty motors</td><td>:</td><td>IS:3177, IEC:60034</td></tr><tr><td>4)</td><td>DC motors/generators</td><td>:</td><td>IS:4722, IEC:60034</td></tr><tr><td>5)</td><td>Energy Efficient motors</td><td>:</td><td>IS 12615, IEC:60034-30</td></tr></table>			1)	Three phase induction motors	:	IS15999/IEC:60034	2)	Single phase AC motors	:	IS 996/ IEC:60034	3)	Crane duty motors	:	IS:3177, IEC:60034	4)	DC motors/generators	:	IS:4722, IEC:60034	5)	Energy Efficient motors	:	IS 12615, IEC:60034-30
1)	Three phase induction motors	:	IS15999/IEC:60034																				
2)	Single phase AC motors	:	IS 996/ IEC:60034																				
3)	Crane duty motors	:	IS:3177, IEC:60034																				
4)	DC motors/generators	:	IS:4722, IEC:60034																				
5)	Energy Efficient motors	:	IS 12615, IEC:60034-30																				
3.00.00	TYPE																						
3.01.00	AC Motors: a) Squirrel cage induction motor suitable for direct-on-line starting. b) Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30. HT motors shall have minimum design efficiency of 95 %. However, tolerance on this efficiency value shall be applicable as per IEC 60034 c) Motor operating through variable frequency drives shall be suitable for inverter duty with VPI insulation. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable.																						
3.02.00	DC Motors: Shunt wound.																						
4.00.00	RATING																						
	(a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor. (b) Whenever the basis for motor or driven equipment ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.																						
5.00.00	TEMPERATURE RISE																						
	Air cooled motors 70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation. Water cooled 80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.																						
<table><tr><td>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</td><td>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2</td><td>SUB SECTION-II-B-02 MOTORS</td><td>PAGE 1 OF 4</td></tr></table>				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-II-B-02 MOTORS	PAGE 1 OF 4																
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-II-B-02 MOTORS	PAGE 1 OF 4																				

CLAUSE NO.	TECHNICAL REQUIREMENTS		
6.00.00	OPERATIONAL REQUIREMENTS		
6.01.00	Starting Time		
6.01.01	For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.		
6.01.02	For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.		
6.01.03	For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.		
6.01.04	Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.		
6.02.00	Torque Requirements		
6.02.01	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor rated torque.		
6.02.02	Pull out torque at rated voltage shall not be less than 205% of rated torque. It shall be 275% for crane duty motors.		
6.03.00	NOT USED.		
7.00.00	DESIGN AND CONSTRUCTIONAL FEATURES		
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors, space heater terminals inside the main terminal box may be acceptable.		
7.02.00	All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). The method of movement of primary and secondary coolant shall be self-circulated by fan or pump directly mounted on the rotor of the main motor as per IEC 60034-6. However VFD driven motors can be offered with forced cooling type with machine mounted fan or pump driven by separate electric motor. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below		
	(a)	Fuel oil area	: Group – IIB
	(b)	Hydrogen generation	: Group - IIC or (Group-I, Div-II as per plant area NEC) or (Class-1, Group-B, Div-II as per NEMA /IEC60034)
7.03.00	Winding and Insulation		
	Type	:	Electrolytic grade Copper conductor, Non-hygroscopic, oil resistant, flame resistant Insulation.
	Starting duty	:	Two hot starts in succession, with motor initially at normal running temperature. However, conveyor motors shall be suitable for 3 consecutive hot starts
	11kV, 6.6 KV & 3.3 kV AC motors	:	Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Pressure Impregnated i.e resin poor method. The lightning Impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15.
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-II-B-02 MOTORS
			PAGE 2 OF 4

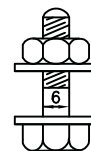
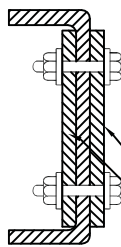
CLAUSE NO.	TECHNICAL REQUIREMENTS		
	240VAC, : Thermal Class (F) or better 415V AC & 220V DC motors		
7.04.00	Motors rated above 1000KW shall have insulated bearings/housing to prevent flow of shaft currents.		
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.		
7.06.00	Noise level for all the motors shall be limited to 85 dB(A) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits prescribed in IS:12075 / IEC 60034-14 . Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting vibration pads.		
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with three numbers duplex RTDs connected to three numbers dual input transmitters with display. However for air compressor, being high speed drive, each motor bearing shall be provided with minimum two numbers of duplex RTDs connected to two numbers dual input transmitters with display unit.		
7.08.00	Motor body shall have two earthing points on diagonally opposite sides.		
7.09.00	11 KV motors shall be offered with Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.		
7.10.00	3.3/6.6 KV motors shall be offered with dust tight phase segregated double walled (metallic as well as insulated barrier) Terminal box. Contractor shall provide termination kit for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided.		
7.11.00	The spacing between gland plate & centre of bottom terminal stud shall be as per Table-I.		
7.12.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.		
7.13.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 6.6 KV, 3.3 kV /415V systems without any injurious effect on its life.		
7.14.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.		
7.15.00	NOT USED		
8.00.00	NOT USED		
10.00.00	TYPE TEST		
10.01.00	HT MOTORS		
	LIST OF TYPE TESTS TO BE CONDUCTED		
	The following type tests shall be conducted on each type and rating of HT motor		
	(a) No load saturation and loss curves upto approximately 115% of rated voltage		
	(b) Measurement of noise at no load.		
	(c) Momentary excess torque test (subject to test bed constraint).		
	(d) Full load test(subject to test bed constraint)		
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-II-B-02 MOTORS
			PAGE 3 OF 4

CLAUSE NO.	TECHNICAL REQUIREMENTS		
	v)	11 kV busduct	- 1 second
	vi)	Switchgears	- 1 second
	vii)	Cables to the feeders protected by breakers	Main protection fault clearing time with 0.12 second minimum
	viii)	Cables of all other feeders	As per MCCB operating time
	ix)	11KV & 3.3KV cable screen	- 2 seconds for the adopted ground fault current
			- 1 second for the adopted ground fault current, for cables connected to miscellaneous switchgear/transformer.
	x)	EHV systems	- 1 second
	(** Note) Thermal withstand design time duration. The indicated values of time durations are used in transformer design for ensuring thermal stability of the transformers and are to be proven through calculations.		
10.00.00	MOTORS The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance): (a) From 50KW & upto 110KW : 11.0 (b) From 110 KW & upto 200 KW : 9.0 (c) Above 200 KW & upto 1000KW : 10.0 (d) From 1001KW & upto 4000KW : 9.0 (e) Above 4000KW : 6 to 6.5 Starting voltage requirement :permissible starting voltage for motor shall be as follows: (a) Up to 85% of rated voltage for ratings below 110 KW (b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW (c) Up to 85% of rated voltage for ratings from 201 KW to 1000 KW (d) Up to 80% of rated voltage for ratings from 1001 KW to 4000 KW (e) Up to 75 % of rated voltage for ratings above 4000KW		
11.00.00	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 shall be designed in such a way that the equipment shall always move/remains (as applicable) to safest position as per system requirement to ensure safety of Man and Machinery.		
12.00.00	Latest Cybersecurity guidelines laid down by CEA/Government of India shall be followed.		
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 B-0 GENERAL ELECTRICAL SPECIFICATION
			PAGE 15 OF 15



SIDE COUPLER PLATE FOR PERFORATED TYPE TRAYS (100/50W TRAYS)

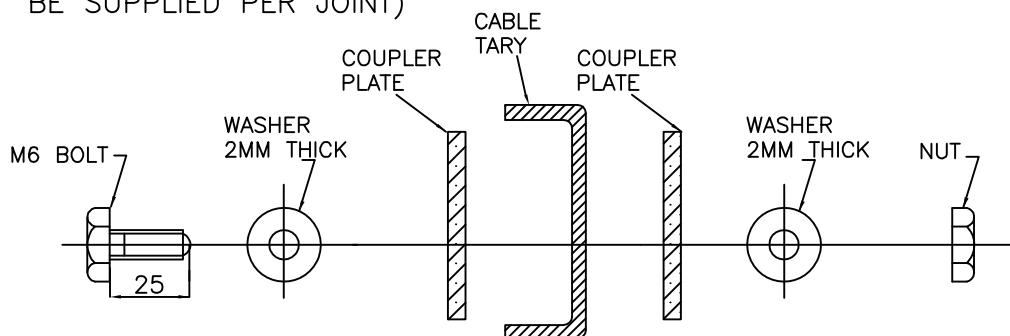
QTY. REQUIRED/TRAY SECTION : 4 NOS.



QTY. REQD/TRAY SECTION

- A) 16 NOS. M6 BOLTS
- B) 16 NOS. NUTS
- C) 32 NOS. WASHERS

(2 NOS. COUPLER PLATES
OF 3 MM THICKNESS TO
BE SUPPLIED PER JOINT)



SEQUENCE OF M6 BOLT, WASHER, NUT, COUPLER PLATE & CABLE TRAY FOR TYPICAL CABLE TRAY JOINT

FOR GENERAL NOTES REFER SHEET 14 OF 14



TYPICAL DETAILS OF CABLE TRAYS AND
ACCESSORIES

DWG. NO.

SHT. 04 OF 14 REV. 01

NOTES:-

1. THE CABLE TRAYS AND ACCESSORIES SHALL BE MADE OF 2mm HOT ROLLED M.S.SHEET CONFIRMING TO IS:1079. ALL THE COUPLER PLATE SHALL BE OF 3 MM THICK.
2. THE CABLE TRAYS AND ACCESSORIES SHALL BE HOT DIP GALVANISED AS PER IS 2629. THE MASS OF ZINC COATING SHALL BE 610 gm/m AND THICKNESS SHALL BE 75 MICRONS (MINIMUM).
3. FOR LADDER TYPE CABLE TRAYS AND ACCESSORIES, ALL RUNGS SHALL BE SLOTTED.
4. PERFORATED TRAYS SHALL BE FABRICATED OUT OF A SINGLE M.S. SHEET.
5. THE DIMENSIONS OF ALL BENDS, TEES, CROSSES, ETC. FOR PERFORATED CABLE TRAYS SHALL BE THE SAME AS FOR LADDER TYPE TRAY FITTINGS.
6. SIDE CHANNELS OF PERFORATED TRAY ACCESSORIES SHALL BE WELDED WITH THE PERFORATED SHEET AT INTERVALS OF 100mm.
7. LENGTH OF WELDING SHALL NOT BE LESS THAN 25mm. WELDING SHALL BE AS PER IS 9595.
8. PREFERABLY SINGLE MS PERFORATED SHEET SHALL BE USED AS BASE OF ALL PERFORATED TYPE TRAY ACCESSORIES. HOWEVER, IF USE OF PIECES OF PERFORATED SHEET IS UNAVOIDABLE FOR BASE, PIECES SHALL BE WELDED WITH EACH OTHER IN LINE WITH THE ABOVE.
9. ALL TRAY CORNERS SHALL BE FREE OF SHARP EDGES & SMOOTH.
10. THE DEPTH, WIDTH AND LENGTH OF TRAYS AND ACCESSORIES SHALL BE WITHIN A TOLERANCE $\pm 2\text{MM}$ PER RELEVANT IS.
11. TO FACILITATE ASSEMBLY, ALL ACCESSORIES AT ENDS SHALL HAVE 100mm STRAIGHT PORTION.
12. ALL NUTS, BOLTS, WASHERS ETC., SHALL BE HOT DIP GALVANISED AS PER IS 1367 FOR SIZES ABOVE 12MM AND ELECTROPLATED/ELECTROGALVANISED FROM SIZE BELOW 12MM.
13. ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE.
14. TRAY ACCESSORIES SHOWN IN THIS DRAWING SHALL BE FACTORY FABRICATED FOR USE AT SITE AS PER APPROVED LAYOUT DRAWINGS. FOR SPECIFIC SITE REQUIREMENTS (E.G. IRREGULAR ANGLE BENDS SUCH AS 30°/60° BENDS, ETC) AS PER SITE LAYOUT CONDITIONS, TRAY ACCESSORIES SHALL BE FABRICATED AT SITE FROM THE STRAIGHT LENGTH OF RESPECTIVE SIZES AS REQUIRED. GALVANISATION DAMAGED DURING CUTTING/WELDING OPERATIONS SHALL BE BRUSHED AND RED LEAD PRIMER, OIL PRIMER AND ALUMINIUM PAINT SHALL BE APPLIED BEFORE INSTALLATION OF THE ACCESSORIES.
15. WIDTH OF CABLE TRAYS PROPOSED TO BE USED FOR PROJECT ARE AS UNDER :
LADDER TYPE CABLE TRAY (MM) : 600, ~~450~~, 300 & 150.
PERFORATED TYPE CABLE TRAY (MM) : 600, ~~450~~, 300, 150, 100 & 50.
16. 600MM WIDE CABLE TRAY SHALL BE SUITABLE FOR WEIGHT OF 100KG/M INCLUDING LIVE LOAD OF RUNNING LENGTH OF CABLE TRAY.
17. CABLE TROUGHS SHALL BE USED FOR BRANCHING OUT FEW CABLES FROM MAIN CABLE ROUTE.
18. MAKE OF ALL ITEMS SHALL BE AS PER ~~BHEL/CUSTOMER~~ NTPC QA APPROVAL.
19. CABLE TROUGHS OR 50/100MM WIDE PERFORATED TYPE TRAY SHALL BE USED FOR LOCAL CABLING/BRANCHING OUT FEW CABLES FROM MAIN ROUTE.



TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.

SHT. 14 OF 14 REV. 01

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN		SPEC. NO. :	DATE:
	CUSTOMER :				QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
	PROJECT:				PO NO.:	DATE:
	ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))		SYSTEM:		SECTION: II	SHEET 1 of 2

S. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	**	
					M C/ N			D	M C N	
		1.WORKMANSHIP	MA	VISUAL	100%	MFG. SPEC.	MFG. SPEC.	LOG BOOK	P -	-
		2.DIMENSIONS	MA	VISUAL	100%	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	LOG BOOK	P -	-
1.0	ASSEMBLY	3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./	MFG.SPEC.	LOG BOOK	P -	-
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MFG. SPEC/ APPROVED DATASHEET	MFG. SPEC/ APPROVED DATASHEET	LOG BOOK	✓ P V	-
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST	MA	VISUAL	100%	IS-325 / IS-12615/ APPROVED DATA SHEET	IS-325 / IS-12615/ APPROVED DATA SHEET	TEST/ INSPN. REPORT	✓ P V *	* NOTE -1
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/ DATA SHEET	APPROVED DRG/ DATA SHEET	TEST/ INSPN. REPORT	✓ P V *	* NOTE -1 & NOTE-2

BHEL				BIDDER/SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Sign & Date		Doc No:		Sign & Date	
Prepared by:	HEMA KUSHWAHA	Checked by:	KUNAL GANDHI	Sign	Date	Sign	Date	Reviewed by:	Name	Seal	
Reviewed by:	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	Sign	Date	Sign	Date	Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN		SPEC. NO :	DATE:
			CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
			PROJECT:		PO NO.:	DATE:
			ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))		SYSTEM:	SECTION: II

	3.NAMEPLATE DETAILS	MA	VISUAL	100%	-	IS-325 / IS-12615 / APPROVED DATA SHEET	SAME AS COL. 7	TEST/ INSPN. REPORT	✓	P	V	-
4.0	PACKING	MA	VISUAL	100%	100%	AS PER MFG. STANDARD / (#).	AS PER MFG. STANDARD / (#).	INSPC. REPORT	✓	P	W	-

NOTES:

1. Routine tests on 100% motors shall be done by the vendor. However, BHEL/ Customer shall witness routine tests on random samples. The sampling plan shall be mutually agreed upon.
2. For exhaust/ventilation fan motors of rating up to 1.5 KW, only routine test certificates shall be furnished for scrutiny.
3. In case test certificates for these tests on similar type, size and design of motor from independent laboratory are available, the same is valid for 5 years.
4. BHEL reserves the right to perform repeat test, if required.
5. After packing and prior to issue MDCC, photographs of items to be despatched shall be sent to BHEL for review.
6. In case of any changes in QP commented by customer at contract stage, same shall be carried out by bidder without any implication to BHEL/ Customer.
7. Project specific QP to be developed based on customer requirement.
8. For export job, BHEL technical specification for seaworthy packing to be followed.
9. Packing shall be suitable for storage at site in tropical climate conditions.
10. Latest revision/ year of issue of all the standards (IS/ ASME/ IEC etc.) indicated in QP shall be referred.

LEGENDS:

*RECORDS, IDENTIFIED WITH "TICK"(✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
 ** M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, B: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, C: CUSTOMER,
 P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE
 MA: MAJOR, MI: MINOR, CR: CRITICAL
 D: DOCUMENTATION

BHEL				BIDDER/ SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Sign & Date		Doc No:		Sign & Date	
Prepared by:	HEMA KUSHWAHA	Checked by:	KUNAL GANDHI	Sign	Date	Reviewed by:	Name	Seal			
Reviewed by:	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL			Approved by:					



NTPC LTD.
(ENGINEERING DIVISION)
ENGINEERING OFFICE COMPLEX
A-8A, SEC-24, NOIDA, U.P. 201301
PH.: 011-8-2596872 FAX: 011-91-4410208

TRANSMITTAL FOR DOCUMENTS

FROM : DGM (QA)

REF. : 01/CQA/0000-SPL-

DATE :03/08//2010

TO: M/s ABB Limited,

Phase Plot No. 5 & 6

Peenya Industrial Area,

Bangalore 560 058

CC :RIO-Bangalore, NTPC LTD

CC: Sh. P.K.Basu, DGM-QA-Elect

Please find enclosed following documents for necessary action at your end as indicated in purpose code

S. No.	Item	RQP No	Rev No	No. of Copies	Purpose code	Remarks
01	LT MOTOR 55 KW-200 KW	0000-999-QVE-P-259	00	1	11	

- 1.Approved in CAT-I
- 2.Approved in CAT-II With comments resubmit
- 3.Not APPROVED- CAT-III
- 4.Approved in CAT-IV(For information only)
- 5Released for Fabrication/Construction

- 6.for your comments
- 7.Revised as per your comments
8. For your approval
- 9.for your information
- 10.As-built
- 11.Approved for Reference subject to approval of Endorsement sheet

SIGNATURE :

NAME :

O.P.NIRANJAN

FORMAT NO. : QS-01-DIV-P-02/F2-

ENGINEERING DIVISION

MANUFACTURER'S NAME AND ADDRESS		REFERENCE QUALITY PLAN				TO BE FILLED IN BY NTPC			
ABB LTD., Phase Plot No 5 & 6 Peenya Industrial Area, Bangalore - 560058		ITEM/EQUIPMENT : LT MOTOR SUB-SYSTEM : 55 KW - 200KW	QPN NO: NTPC-RQP-001 REV. NO.: 00 DATE: 29-07-2010 PAGE: 1 OF 6	SIGN. OF MGR'S	QPN NO.: 0000-999 - QVE - P - 259 REV. NO.: 0 DATE: 30/07/10 PAGE: 1 OF 6 VALID UPTO: 29/07/13	REVIEWED BY: V. SHIRIVASTAV O. P. NIKRASHIAN P. K. BASU	APPROVED BY:	REMARKS	
SL. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD
1.	2.	3.	4.	5.	M	C/N	7.	8.	9. D

1 INCOMING INSPECTION									
A BOUGHT OUT ITEMS									
1	Casting Body, End shield, Terminal box, Bearing Cover.	a) Surface defects b) Dimn. Conformity c) Hardness d) Tensile strength e) Chemical composition	Major Major Major Major Major	Visual Measure Mech Mech Chem	100% 1 sample/heat 1 sample/lot 1 sample/lot 1 sample/lot	- - 1 sample/lot 1 sample/lot 1 sample/lot	No defect ABB Drawing FG150-3GYN951001/ FG200-3GYN951002	No defect ABB Drawing 3GT951001 3GT951008/ 3GT951019	Inspn. report Supply TC - do - - do - - do -
2	STAMPINGS FOR ROTOR & STATOR	a) Thickness b) Burr height c) Grade d) Core loss (before and after ageing) e) Magnetic Induction test. f) Insulation Resistance	Major Major Major Major Major Major	Measure Measure Measure Electrical Electrical Electrical	1 sample/lot - do - - do - - do - - do - - do -	1 sample/lot - do - - do - - do - - do - - do -	ABB Drawing 3GT951001 3GT951008/ 3GT951019	ABB Drawing 3GT951001 3GT951008/ 3GT951019	Suppl. TC - do - - do - - do - RM certificate
3	STATOR STACK	g) Vendor Identification a) Dimn. Conformity (Core length & inner diameter) b) Stacking Factor c) Slot alignment c) cleanliness	Major Major Major Major Major	Visual Measure Measure Visual Visual	1 Piece 1 sample/lot 1 sample/lot - do - - do -	- do - 1 sample/lot 1 sample/lot - do - - do -	3GTD431001 ABB Drawing 3GT951008/ 3GT951019	3GTD431001 ABB Drawing 3GT951008/ 3GT951019	Inspn. Report Inspn. Report - do - - do -
4	ALUMINIUM DIE-CAST ROTOR	a) Chemical comp b) Conductivity c) Free from Blow Hole & cracks d) Dimension	Major Major Major Major	Chemical Electrical Visual Mech	1 sample/lot 1 sample/lot 100% 1 sample/lot	- One Sample per lot - do - - do -	3GT952001 - do - - do - ABB Drawing	3GT952001 - do - - do - ABB Drawing	Sup TC Inspn. Report - do - - do -

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
 ** MI MANUFACTURER/SUB-SUPPLIER. C: MAIN SUPPLIER. N: NTPC. P: PERFORM. W: WITNESS AND. V: VERIFICATION. AN: APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W".

MANUFACTURER'S NAME AND ADDRESS		REFERENCE QUALITY PLAN				TO BE FILLED IN BY NTPC					
ABB LTD. Phase Plot No 5& 6 Peenya Industrial Area, Bangalore - 560058		ITEM/EQUIPMENT : EUT MOTOR		SIGN. OF NTPC		QIP NO.: 0000-999 - QVE - P - 259		REVIEWED BY: V. SHIRVASTAVA		APPROVED BY: P. K. BASI	
		SUB-SYSTEM : 55 KW - 2000 KW		REV. NO.: 00		DATE : 29-07-2010		REV. NO.: 0		DATE : 30/07/10	
		PAGE : 2 OF 6		PAGE : 2 OF 6		VALID UPTO: 29/07/13		ACCEPTANCE NORM		FORMAT OF RECORD	
		QUANTUM OF CHECK		REFERENCE DOCUMENT		AGENCY		REMARKS			
SL. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	6.	7.	8.	9.	10.	11.	
1.	2.	3.	4.	5.							

5	SHAFT MACHINED	a) Dimension b) Ultrasonic Testing c) Tensile Strength, Yield Strength, Elongation d) Hardness e) Chemical composition f) Heat treatment g) Inclusion rating	Major	Mech	1 sample/lot Lot 100 %	-	ABB Drawing 3GT951004/ 3GTD951014 -do-	ABB Drawing 3GT951004/ 3GTD951014 -do-	Suppl TC -do-	P	-	
6	FAN BLADE (ALUMINIUM)	a) Internal dia b) Overall dia c) Casting defect	Major	Measure	1 sample/lot 100 %	-	ABB Drawing 3GT952005 -do-	ABB Drawing 3GT952005 -do-	Inspr. Report -do-	P	-	
7	TERMINAL PLATE EPOXY Molded	a) Material b) Proof voltage test	Major	Visual	1 sample/lot	-	3GT 964302	3GT 964302	Suppl TC -do-	V	-	
8	Space heater	a) I R b) HV test c) Continuity & wattage	Major	Electrical	100 %	-	3GYN960004	3GYN960004	Supplier TC -do-	V	-	
9	INSULATING PAPER	a) Type of paper b) Thickness	Major	Review TC	1 sample/lot	-	3GT954303 / 3GTD954311 -do-	3GT954303 / 3GTD954311 -do-	Suppl TC Inspr. Report + Suppl. TC -do-	P	-	
10	FIBER GLASS SLEEVE	c) BDV Test a) Dimn. (Bore dia & Wall thickness) b) Voltage proof test c) IR value d) Bending test e) Stability test	Critical	Electrical	1 sample/lot	-	-do-	-do-	-do-	P	V	

LEGEND: * RECORDS IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION

** M: MANUFACTURER/SUB-SUPPLIER, C: MAIN SUPPLIER, N: NTPC, P: PERFORM, W: WITNESS AND, V: VERIFICATION AS APPROPRIATE. CHIP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMLAT NO.: QS-01-QA1-P-10/P1-R1

1/1

ENG. DIV/O&I

Note: NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of inspection

MANUFACTURER'S NAME AND ADDRESS		REFERENCE QUALITY PLAN				TO BE FILLED IN BY NTPC			
ABB LTD., Phase Plot No 5& 6 Peenya Industrial Area, Bangalore - 560038		ITEM / EQUIPMENT : LT MOTOR SUB-SYSTEM : 55 KW - 200K W	QP NO.: NTPC-RQP-001 REV. NO.: 00 DATE : 29-07-2010 PAGE : 4 OF 6	SIGN. OF MGR'S	QP NO.: 0000-999 - QVE - P - 259 REV. NO.: 0 DATE : 30/07/10 PAGE : 4 OF 6 VALID UPTO: 29/07/13	REVIEWED BY: V SRIVASTAVA O P NIBHANIAN P K BASU	APPROVED BY: [Signature]		
COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

15	Brazing Alloys Rods	Chemical composition	Major	Chemical	1 sample/lot	-	3GYN 954406	3GYN 954406	Suppl TC	V		
16	PAINTS	a) Shade b) Shelf life	Major Minor	Measure Visual	1 sample/lot 100%	-	As per Customer Requirement As per Manuf Recommends	As per Customer Requirement As per Manuf Recommends	Shade Card Suppl TC	P		
B-1	Coil Forming	a) Conductor diameter b) No of turns	Major Major	Measure Visual	100% 100%	-	Winding sheet Winding sheet	Winding sheet Winding sheet	-	P		
2	WOUND STATOR	a) Resistance b) H.V. Test c) Surge test	Major Major Major	Electrical Electrical Electrical	100% 100% 100%	100% 100% 100%	Winding sheet IS - 325 WI - 01	Winding sheet IS - 325 WI - 01	Inspn record -do- -do-	W/V W/V W/V	V V V	Witness by ABB on 25% Lot
3	VPI	d) Overhang Dimensions (by snap gauge) e) Application of Trophicalisation gel on Winding Overhang	Minor Major	Measure Visual	100% 100%	- 100%	ABB Drawings -do-	ABB Drawings -do-	-do- -do-	W/V W/V	- V	
		a) Preheating b) Vacuum created c) Viscosity d) Gel time e) Air pressure f) Curing Cycle	Major Major Major Major Major	Mechanical Mechanical Measure Mechanical	100% 100% Once daily Once in a month 100% 100%	100% 100% Once daily Once in a month 100% 100%	WI-02 -do- -do- Resin Manf Std WI-02 -do-	WI-02 -do- -do- Resin Manf Std WI-02 -do-	Inspn Record -do- -do- -do- -do- -do-	W W W W W	V V V V V	VPI process carried out at M/S Rajamane & Hegade Pvt.Ltd Tumkur

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION
 ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION AS APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"
 FORMAT NO.: QS-01-QA1-P-10/FL-R1
 ENGG. DTS: QAA1
 1/1
 Note: NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of inspection

ABB		REFERENCE QUALITY PLAN				TO BE FILLED IN BY NTPC					
MANUFACTURER'S NAME AND ADDRESS		ITEM / EQUIPMENT		SIGN. OF NTPC		QIP NO. : 0000-999 - QVE - P - 259		REVIEWED BY :		APPROVED BY :	
ABB LTD., Phase Plot No 5 & 6 Peenya Industrial Area, Bangalore - 560058		SUB-SYSTEM : 55 KW - 200KW		REV. NO. : 00 DATE : 29-07-2010 PAGE : 5 OF 6		QIP NO. : 0000-999 - QVE - P - 259		V. SHIRIVASTAVA O. P. NIRANJAN P. K. BASU		[Signature]	
COMPONENT & OPERATION		CHARACTERISTICS		TYPE OF CHECK		QUANTUM OF CHECK		REFERENCE DOCUMENT		ACCEPTANCE NORM	
SL. NO	2.	3.	4.	5.	6.	7.	8.	9.	10.	REMARKS	
1.											

II. INPROCESS INSPECTION											
1	Machined rotor	a) Dimension- OD b) Runout	Critical Major	Measure Mech	100% sample	100%	ABB Drg ABB Drg	Insp record	P P	- -	Effective Control of Material / Sub Assemblies according to internal specifications to be maintained
2	Rotor Assembly	Dynamic Balancing	Critical	Mech	100%	100%	ISO 1940 / G2.5	Record	P	V	Rotor and Fan balanced separately
3	Fan	Dynamic Balancing	Critical	Mech	100%	100%	ISO 1940 / G2.5	Record	P	V	
4	Assembly	a) Rotor and stator selection as per BOM b) T box location and cabling c) Name plate preparation and fixing	Major Major Major	Visual Visual Visual	100% 100% 100%	- - -	As per specification As per specification As per specification	- - -	P P P	- - -	
III. FINAL INSPECTION											
Type test approval / clearance to be obtained from NTPC Egg. before offering for inspection											
A. TYPE TEST											
B. ROUTINE TEST	a) Name plate verification b) Mounting dimensions c) Space heater insulation resistance and H.V. test d) Resistance of stator winding e) Insulation resistance before & after H.V. test of stator winding f) No load test at rated voltage	Major Major Major Major Major Major	Visual Measure Electrical Electrical Electrical Electrical	100% 100% 100% 100% 100% 100%	100% 100% 100% 100% 100% 100%	100% 100% 100% 100% 100% 100%	Approved Data sheet Do/Drg IS : 325 do IS : 325/ NTPC Tech. Specification IS : 325	Approved Data sheet Do/Drg IS : 325 do IS : 325/ NTPC Tech. Specification IS : 325	Test Result Test record Test record Test record Test record Test record	P P P P P P	W W W W W W

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
**** N: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER N: NTPC P: PERSON W: WITNESS AND V: VERIFICATION AS APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS W**
 FORMAT NO.: QS-01-QA1-P-10/F1-R1
 ENGG. DIV./QA&I
 1/1
 Notice: NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of inspection

MANUFACTURER'S NAME AND ADDRESS		REFERENCE QUALITY PLAN				TO BE FILLED IN BY NTPC			
ABB LTD., Phase Plot No 5& 6 Peenya Industrial Area, Bangalore - 560058		ITEM / EQUIPMENT : LT MOTOR SUB-SYSTEM : 55 KW - 2000W	Q.P. NO. : NTPC-HOP-001 REV. NO. : 00 DATE : 29-07-2016 PAGE : 6 OF 6	Q.P. NO. : 0000-999 / QVE - P - 259 REV. NO. : 0 DATE : 30/07/16 PAGE : 6 OF 6 VALID UPTO : 29/07/19	Q.P. NO. : 0000-999 / QVE - P - 259 REV. NO. : 0 DATE : 30/07/16 PAGE : 6 OF 6 VALID UPTO : 29/07/19	Q.P. NO. : 0000-999 / QVE - P - 259 REV. NO. : 0 DATE : 30/07/16 PAGE : 6 OF 6 VALID UPTO : 29/07/19	Q.P. NO. : 0000-999 / QVE - P - 259 REV. NO. : 0 DATE : 30/07/16 PAGE : 6 OF 6 VALID UPTO : 29/07/19	Q.P. NO. : 0000-999 / QVE - P - 259 REV. NO. : 0 DATE : 30/07/16 PAGE : 6 OF 6 VALID UPTO : 29/07/19	Q.P. NO. : 0000-999 / QVE - P - 259 REV. NO. : 0 DATE : 30/07/16 PAGE : 6 OF 6 VALID UPTO : 29/07/19
SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

		g) H.V. test between Ph to Ph & Ph to earth	Major	Electrical	100%	100%	ADS & IS325	ADS & IS325	Test record	P	W	W
		h) Locked rotor test	Major	Electrical	100%	100%	IS : 4029	IS : 4029/Data sheet	Test record	P	W	W
		i) Reduced voltage running	Major	Electrical	100%	100%	IS : 325	IS : 325	Test record	P	W	W
		j) Over speed test at 120% of rated speed for 2 min	Major	Electrical	100%	100%	Data sheet / No Abnormal Vibration	Data sheet / No Abnormal Vibration	Test record	P	W	W
		k) Vibration measurement at rated speed & voltage	Major	Measure	100%	100%	IS:12075	IS:12075	Test record	P	W	W
		l) Test for degree of protection with 0.1mm feeler gauge wire	Major	Visual	100%	1 sample/ rating/lot	IS-325/IS4029	IS-325/IS4029	Test record	P	W	W
		m) Direction of rotation	Major	Electrical	100%	100%	Approved data sheet	Approved data sheet	-do-	P	W	W
		n) Completeness of assembly & Accessories	Major	Visual	100%	100%	-do-	-do-	-do-	P	W	W
		o) Air Gap Measurement	Major	Measure	100%	1 Sample/Lot	ABB Drawing	ABB Drawing	-do-	P	W	W
C	PAINTING	a) Paint shade	Minor	Visual	100%	100%	Approved data sheet	Approved data sheet		P	W	W
		b) Paint thickness	Minor	Measure	100%	100%	NTPC spec/Data Sheet/WI-04	NTPC spec/Data Sheet/WI-04		P	W	W
		c) Scratch test (adhesion test)	Minor	Measure	100%	1 each type	-do-	-do-		P	W	W
D	PACKING	a) Fixing of key in keyway	Minor	Visual	100%	-	-do-	-do-		P	-	-
		b) Mounting pad	Minor	Visual	100%	-	-do-	-do-		P	-	-
		c) Sturdiness of packing	Minor	Visual	100%	-	-do-	-do-		P	-	-
		d) Case marking	Minor	Visual	100%	-	-do-	-do-		P	-	-

LEGEND: * RECORDS IDENTIFIED WITH TICK (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION
 ** M: MANUFACTURER/SUB-SUPPLIER, C: MAIN SUPPLIER, N: NTPC, P: PERFORM, W: WITNESS AND, V: VERIFICATION AS APPROPRIATE. **CHP:** NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"
 FORMAT NO.: QS-01-QA1-P-10/F1-RI
 1/1
 ENGG. DIV. / QA&I
 Note: NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of inspection

SUB-SECTION–E-42

MOTORS

**TALCHER THERMAL POWER PROJECT
STAGE-III (2 X 660 MW)
EPC PACKAGE**

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

CLAUSE NO.		QUALITY ASSURANCE													SUB-SECTION –E-47 MOTOR		Page 1 of 2					
TESTS/CHECKS		MOTOR																				
TEMS/COMPONENTS		Visual	Dimensional	Make/Type/Rating /General Physical Inspection	Mech/Chem. Properties	NDT /DP/MP/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-4722 /IS- 9283/IS 2148/IEC60034\IEC 60079-II IS-12615	Vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion		
		Plates for stator frame, end shield, spider etc.	Y	Y	Y	Y	Y			Y												
		Shaft	Y	Y	Y	Y	Y	Y														
		Magnetic Material	Y	Y	Y	Y			Y			Y										
		Rotor Copper/Aluminium	Y	Y	Y	Y			Y		Y				Y							
		Stator copper	Y	Y	Y	Y			Y		Y				Y							
		SC Ring	Y	Y	Y	Y	Y			Y		Y										
		Insulating Material	Y	Y	Y	Y	Y			Y					Y							
		Tubes, for Cooler	Y	Y	Y	Y	Y					Y		Y								
		Sleeve Bearing	Y	Y	Y	Y	Y					Y		Y								
		Stator/Rotor, Exciter Coils	Y	Y	Y	Y				Y		Y										
		Castings, stator frame, terminal box and bearing housing etc.	Y	Y	Y	Y	Y				Y											
		Fabrication & machining of stator, rotor, terminal box	Y	Y			Y				Y	Y										
		Wound stator	Y	Y						Y	Y											
		Wound Exciter	Y	Y						Y	Y											
		Rotor complete	Y	Y	Y					Y						Y	Y					
		Exciter, Stator, Rotor, Terminal Box assembly	Y	Y						Y												
		Accessories, RTD, BTD, CT, Space heater, antifriction bearing, gaskets etc.	Y	Y	Y																	

CLAUSE NO.	QUALITY ASSURANCE														
Complete Motor		Y	Y	Y							Y	Y	Y	Y1	Y
Note: 1. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, following methodology to be followed for Inspection Categorization: Note for LT Motor: i) Motor rating up to 50 KW: Inspection CAT- III : Acceptance of Motor up to 50 KW is based on COC of the Manufacturer and Main Contractor confirming as follows: "It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequency variation, hot starts, pull out torque, starting KVA/KW, temperature rise, distance between center of stud gland plate and tested in accordance with approved drawing /data sheets." ii) Motor rating above 50 KW & less than 75 KW: Inspection CAT- II as per NTPC approved MQP: Acceptance of Motor rating above 50 KW & less than 75 KW is based on NTPC review of Routine Test inspection report as per IS:12615 - 2018 (including latest revision) duly witnessed by main contractor along with COC of the Manufacturer and Main Contractor confirming as follows: "It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequency variation, hot starts, pull out torque, starting KVA/KW, temperature rise, distance between center of stud gland plate, space heater and tested in accordance with approved drawing /data sheets." iii) Motor rating 75 KW & above: Inspection CAT-I: As per NTPC approved MQP. 2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard 3. Makes of major bought out items for HT motors will be subject to NTPC approval. 4. Y1 = for HT Motor / Machines only. 5. For LT Motors, stator core stack length & grade, no load loss and winding resistance w.r.t. type tested motor for IE2/IE3 shall be checked/verified in addition to Compliance of relevant standard IS:12615/IEC requirement. In case actual results are not within the tolerance limit as declared by manufacturer during QP submission, the motor shall be subjected to efficiency test.															
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 –E-47 MOTOR				Page 2 of 2					

TECHNICAL SPECIFICATION/DATASHEET

S.No.	Parameters	Requirement
1	Applicable Standards	1) Three phase induction motors : IS:325, IEC:60034, IS:12615 2) Single phase AC motors : IS:996, IEC:60034 3) Energy Efficient motors : IS 12615, IEC:60034-30
2	Rated voltage	415V, 3 Phase
3	Frequency (Hz)	50Hz
4	Permissible variations for	
	a) Voltage	+/-10%
	b) Frequency	+3% & -5%
	c) Combined	10% (Sum of absolute values)
	System fault level at rated voltage	50KA for 1 sec
	Short time rating for terminal boxes	50KA for .25 sec
5	Type of motors	Continuous duty squirrel cage induction motor suitable for direct-on-line starting
6	Efficiency class	IE3
7	Design margin over continous max. demand of the driven equipment (min)	10%
8	Starting requirement	
	a) Minimum permissible voltage as a percentage of rated voltage, at start to bring the driven equipment upto the driven equipment upto rated speed	(a) Below 110KW : Up to 85% of rated voltage (b) From 110 KW & upto 200 KW : Up to 80% of rated voltage
	b) Maximum locked rotor current	as per IS 12615
	c) Starting duty	Two hot starts in succession, with motor initially at normal running temperature.
	d) the locked rotor withstand time under hot condition at highest voltage limit	a) atleast 2.5 secs. more than starting time(for motors with starting time upto 20 secs. at minimum permissible voltage during starting b) atleast 5 secs. more than starting time(for motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting c) more than starting time by at least 10% of the starting time(For motors with starting time more than 45 secs.at minimum permissible voltage during starting d) Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.
	e)The ratio of locked rotor KVA at rated voltage to rated KW	(a) Below 110KW : 11.0 (b) From 110 KW & upto 200 KW : 9.0
9	Torque (percent of full load torque)	1) Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque. 2) Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.
10	Noise level (max.)	85dB(A)
11	Vibration shall be limited within the limits	as per IS:12075 / IEC 60034-14
12	Construction Features	
(i)	Enclosure Details	
	a) Degree of protection	i) Indoor motors - IP 55 ii) Outdoor motors - IP 55 (Additional Canopy to be provided)
	b) Method of ventilation	Totally enclosed fan cooled (TEFC) or totally enclosed tube or ventilated (TETV) or Closed air circuit air cooled (CACA) type.
(ii)	Insulation	Class F temperature rise limited to class -B
(iii)	Bearings	Grease lubricated ball or roller bearings for Horizontal motors Grease lubricated ball or roller bearings or combined trust and guide bearing for Vertical motors
13	Main terminal box	
	Type	-Motor terminal box shall be detachable type and located in accordance with Indian Standards clearing the motor base- plate/ foundation. -Terminals shall be stud or lead wire type, substantially constructed and thoroughly insulated from the frame. - The terminals shall be clearly identified by phase markings, with corresponding direction of rotation marked on the non-driving end of the motor.
	DOP	same as motor
	Position when viewed from the non driving end	- Left hand side
	Rotation	90 Deg.
	Space heater	Motors rated 30KW and above sapce heater required.Separate terminal box for space heaters & RTDs shall be provided.
	Cable glands and lugs	-Motor terminal box shall be furnished with suitable cable lugs and double compression brass glands to match with cable used.
	Minimum clearances to be provided between phase to phase and phase to earth	25MM
14	Earthing points 2 nos. suitable for conenction	GS Flat- 50 x 6 OR 25 X 6 OR 25 X 3
15	Paint shade	RAL 5012 (Blue)/Light grey finish No. 631 as per IS: 5 (subject to customer approval)

DATA TO BE FURNISHED BY SUCCESSFUL BIDDER AFTER ORDERING		
1. GENERAL		
i)	Manufacturer & Country of origin.	
ii)	Equipment driven by motor)	
iii)	Motor type	
iv)	Country of origin	
v)	Quantity	
2. DESIGN AND PERFORMANCE DATA		
i)	Frame size	
ii)	Type of duty	
iii)	Type of enclosure and method of cooling	
vi)	Type of mounting	
vii)	Direction of rotation as viewed from DE END	
viii)	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)	
ix)	(A) Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)	
	(B) Rating as specified in load list/Maximum continuous load demand of driven equipment	
xi)	Rated speed at rated voltage and frequency	
xii)	At rated Voltage and frequency	
	a) Full load current (Amps)	
	b) No load current (Amps)	
xiii)	Power Factor at	
	a) 100% load	
	b) At duty point	
	c) 75% load	
	d) 50% load	
	e) NO load	
	f) Starting.	
xiv)	Efficiency at rated voltage and frequency	
	a) 100% load	
	b) At duty point	
	c) 75% load	
	d) 50% load	
xv)	Starting current (amps) at	
	a. 100 % voltage	
	b. 85% voltage	
	c. 80% voltage	
xvi)	Starting time with minimum permissible voltage	
	a. Without driven equipment coupled	
	b. With driven equipment coupled	
xvii)	Safe stall time with 110% of rated voltage	
	a. From hot condition	
	b. From cold condition	
xviii)	Torques :	
	a. Starting torque at min. permissible voltage(kg-mtr.)	
	b. Pull up torque at rated voltage.	
	c. Pull out torque	
	d. Min accelerating torque (kg.m) available	
	e. Rated torque (kg.m)	
xix)	Stator winding resistance per phase (ohms at 20 Deg.C.)	
xx)	GD ² value of motors	
xxi)	Locked rotor KVA input (at rated voltage)	
xxii)	Locked rotor KVA/KW.	
xxiii)	Bearings	
	a. Type	
	b. Manufacturer	
	c. Self Lubricated or forced Lubricated	
	d. Recommended Lubricants	
	e. Guaranteed Life in Hours	
	f. Whether Dial Type thermometer provided	
	g. Oil pressure Gauge/switch	
	i. Range	
	ii. Contact Nos. & ratings	
	iii. Accuracy	
xxiv)	Vibration	
	a) Velocity (mm/s)	
	b) Displacement (microns)	
xxv)	Noise level (DB)	
3. CONSTRUCTIONAL FEATURES		
i)	Stator winding insulation	
	a. Class & Type	
	b. Tropicalised (Yes/No)	
	c. Temperature rise over specified max.	
	i. Cold water temperature of 38 DEG. C.	
	ii. Ambient Air 50 DEG. C.	
	d. Method of temperature measurement	
	e. Stator winding connection	
	f. Number of terminals brought out	
ii)	Type of terminal box for	
	a. stator leads	

	b. space heater	
	c. Temperature detectors	
	d. Instrument switch etc.	
iii)	For main terminal box	
	a. Location	
	b. Entry of cables	
	c. Recommended cable size	
	d. Fault level (MVA)	
	e. No. of Eathing Pads	
iv)	Temperature detector for stator winding	
	a. Type	
	b. Nos. provided	
	c. Location	
	d. Make	
	e. Resistance value at 0 deg. C. (ohms)	
vi)	Paint shade	
vii)	Weight of(approx)	
	a. Motor stator (KG)	
	b. Motor Rotor (KG)	
	c. Total weight (KG)	
4. LIST OF CURVES		
i)	Torque speed characteristic of the motor	
ii)	Thermal withstand characteristic	
iii)	Starting. current Vs. Time	
iv)	Starting. current Vs speed	
v)	P.F. and Effi. Vs Load	

LOAD TITLE		RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONT ROL CODE	REMA RKS	LOAD No.	VERIFICATI ON FROM MOTOR DATASHEE T (Y/N)	KKS NO	
		NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	Nos							
1		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
ANNEXURE-III																						
NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER																						
2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=24 V																						
: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTOR CONTROLLED)																						
LOAD DATA (ELECTRICAL)	JOB NO.	ORIGINATING AGENCY										PEM (ELECTRICAL)										
	PROJECT TITLE	2 X 660MW TALCHER TPP										NAME		DATA FILLED UP ON								
	SYSTEM	DM/ PT PLANT										SIGN.		DATA ENTERED ON								
	DEPTT. / SECTION	MAX										SHEET 1 OF 1		REV. 00 DE'S SIGN. & DATE								

ANNEXURE IV

[illegible]

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

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

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

(A) SYSTEM VOLTAGE CODES:

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

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

(B) CABLE VOLTAGE CODES:

A = 11KV (Power cables)

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

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

(C) CABLE CODES

PVC Copper

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

PVC Aluminium

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

XLPE Copper

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

XLPE Aluminium

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

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



TITLE:

**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME-II-B

SECTION-C3

REV. NO. 00

DATE:

**SECTION-C3
(SPECIFIC TECHNICAL REQUIREMENT-C&I)**

	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) CHP RUN OFF TREATMENT PLANT	
1. The control system for CHPWTP shall be DDCMIS based (BHEL's scope). Profibus based controls and conventional controls (hardwired 4-20mA/DI/DO) are envisaged for this package. 2. Bidder to provide Profibus PA protocol compatible PT(Pressure Transmitters),DPT(Differential Pressure Transmitters),TT(Temperature Transmitters) and Flow/Level Transmitters(DP based) for entire CHPWTP: package. 3. All motorized valves shall be supplied with Non-intrusive Profibus based Electric Actuator(with integral starter) for CHPWTP: package along with necessary interface units for linking to corresponding Control System as applicable. 4. Profibus based electronic positioner (as per standard and proven practice of valve OEM) is to be provided with all the pneumatic operated control valves. 5. The Profibus protocol design shall be further validated by BHEL and approved by NTPC during detailed engineering and any variation/changes required based on DDCMIS system requirements and actual field installation, operational philosophy etc. shall be considered by bidder without any implications 6. Bidder to note that all transmitters(except Profibus compatible transmitters) shall be smart type and shall have 4-20mA DC signal with superimposed digital communication(HART) 7. Profibus DP based IMC in LV SWGR/MCC (BHEL's scope) shall be provided. 8. Redundancy of instruments to be provided by bidder shall be as follows:- (i) Triple redundancy for all analog and binary inputs required for protection of system/drives. (ii) For all other control functions dual redundancy of the sensors shall be provided by the bidder. 9. Bidder to provide Comprehensive Annual Maintenance Services (AMS) for three (03) years after warranty period for the Analyser instruments and Profibus instruments of CHPWTP:.		

	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) CHP RUN OFF TREATMENT PLANT	
10. Bidder shall provide the following :- a) Configuration/ diagnostic tool for Non-intrusive profibus based actuators - 5 Nos. or 5% of total quantity of actuator whichever is more. b) Configuration/ diagnostic tool for all Profibus based instruments – 2 Nos of each make. Bidder shall also provide all required software (lifetime licensed) and hardware (cables/connectors, Tablet/ Laptop etc.) along with these tools. 11. Bidder to provide all the instruments envisaged for sea water applications, with wetted parts made of Monel/ Hastelloy C For Chlorine application: Instruments shall be provided with wetted parts (e.g. diaphragm seal, etc.) made of Hastelloy C. Also, filled liquid shall be Fluorolube oil/ Inert Hydrocarbon /CTFE etc., for these applications. For applications of FECL3 solution: Instruments shall be provided with wetted parts (e.g. diaphragm seal, etc.) made of Tantalum. Diaphragm seal shall be provided with Instruments having contact with corrosive media. 12. Bidder to provide Junction Boxes in field for termination of all the instruments. 13. Bidder to provide atleast 20% spare terminals in Junction boxes,LIE/LIRs etc. 14. All the transmitters supplied by Bidder shall be LIE/LIR mounted . The LIE/LIRs shall be in Bidder's scope of supply. 15. All the instruments having contact with corrosive media shall be provided with chemical/diaphragm seal. 16. All weather Local Panel fitted with integral Air Conditioner shall be provided by the Bidder for housing analyzers etc if the same are not kept in AC rooms. 17. For level transmitters, electronics items etc. all weather canopy\ rack enclosures shall be provided by Bidder for protection from direct sunlight and rain for open locations. For applications where transmitter location is not accessible, the transmitter shall have separate sensor unit and electronic unit for such applications. It should be mounted at accessible location.		

	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) CHP RUN OFF TREATMENT PLANT	
18. All field instruments/analyzers/actuators/sov/control valves etc. shall be hooked with DDCMIS based control system as per requirement mentioned elsewhere in the specification. 19. All electrical devices like switches/ transmitters/ controller/ analyzer/ solenoid valves which are located in the in hazardous areas shall be made intrinsically safe by providing suitable type of transformer isolated barrier / Zener barrier of standard make & shall be provided with explosion proof enclosure suitable for hazardous areas described in National Electric Code (USA), Article 500, Class-I, Division-I or EN60079-14 or shall comply with the essential requirements of ATEX directives. 20. All measuring instruments/equipment/analysers and subsystems offered by the Bidder shall be from reputed experienced manufacturers ((from BHEL/customer approved vendor list) of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards. Further, Bidder to meet the provenness criteria for all the supplied C&I items mentioned elsewhere in the specification 21. 230 V AC UPS Power supply shall be provided by BHEL at a single point, further distribution to various instruments/equipment of the system shall be in bidder scope. Bidder to include necessary power distribution board in his scope. Any power supply other than the above, if required by any instrument/equipment has to be derived by the bidder from the above supply & all necessary hardware for the same shall be in bidder scope. Further, Bidder to furnish UPS load data during detailed engineering in BHEL format. 22. Bidder to provide mandatory spares for C&I items as per mandatory spares list 23. Bidder to perform tests of C&I items/instruments/systems as per Quality plans/type test attached in the specification. 24. Bidder's representative shall be present at BHEL-PEM for 3 man-days, for preparation of Control scheme of CHPWTP . All the expenses like boarding, lodging and travel, air fare etc. shall be in bidder's scope. 25. Bidder's presence is required for 3 Man days (Excluding travel time) at EDN Bangalore during FAT of DDCMIS for certifying correctness & completeness of implementation of Control logic. Intimation regarding FAT shall be given 2		

	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) CHP RUN OFF TREATMENT PLANT	
days in advance. All the expenses like boarding, lodging and travel, air fare etc. shall be in bidder's scope. 26. Bidder's presence is required for 15 Man days (in three visits) at site during commissioning of DDCMIS for assistance related to process correctness. Three visits shall be made with total 15 Man days(excluding travel time) in which one visit shall be of 5 man days each. All the expenses like boarding, lodging and travel, air fare etc. shall be in bidder's scope. 27. Bidder shall furnish Instrument Schedule, Control Scheme, I/O list, Drive list, Cable Schedule, Cable interconnection, Instrument/SOV/Analyzers Installation diagram, Instrument/Analyzer datasheets, JB grouping, SOV grouping,Annunciation list, List of Instruments/devices for Profibus/HART,configuration diagram for Profibus based actuators/instruments in BHEL approved format. Also, editable database format like MS Excel, MS Access etc. of these documents shall also be provided by Bidder. 28. Bidder shall provide complete Instrumentation for control, monitoring and operation of entire CHPWTP . The requirements given are to be read in conjunction with detailed Technical specification. Further in case of any discrepancy in the requirement, the more stringent requirement as per interpretation of BHEL/customer shall prevail without any commercial implication.		

		SECTION: C SUB SECTION : C&I SHEET 9 of 10
	SPECIFIC TECHNICAL REQUIREMENTS (C&I)	
ACTUATORS		

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	ELECTRICAL ACTUATORS			
	General Requirements	Actuators shall be designed for valve operation to ensure proper function in accordance with specifications given below and complying to EN15714-2 or equivalent. All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions.		
4.00.00	REQUIREMENT FOR NON-INTRUSIVE PROFIBUS ACTUATOR			
4.01.00	Type	1. The actuators shall have integral starters with built in SPP (Single Phasing Preventer). 415 V, 3 phase 3 wire power supply shall be given to the actuator from switch board as applicable through a switch fuse unit. Control voltage of the motor starter shall be 110 V AC / 24 V DC, derived suitably from 415V power supply. 2. The actuators shall be Non- Intrusive electric actuator. All actuator settings including torque, limit shall be possible without opening the actuator cover and LCD indication shall be available integral to actuator body		
4.02.00	Rating	1. Supply Voltage & frequency: 415V +/- 10%, 3 Phase, 3 Wire & 50HZ +/- 5%. 2. Sizing: Open/Close at rated speed against designed differential pressure at 90% of rated voltage. For ON/OFF type: Three successive open-close operations or 15 minutes, whichever is higher. For inching type: 150 starts per hour or required cycles, whichever is higher		
4.03.00	Construction	1. Enclosure: Totally enclosed weatherproof, minimum IP-68 degree of protection. 2. Manual Wheel: Shall disengage automatically during motor operation.		
4.04.00	Motor	Type: Squirrel cage induction motor suitable for Direct On-Line (DOL) starting Enclosure: Totally enclosed, self-ventilated Insulation: Class F. Temperature rise 70 Deg C. over 50 Deg C ambient. Bearings: Double shielded, grease lubricated antifriction		
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-17 ELECTRICAL ACTUATORS	PAGE 1 OF 4

CLAUSE NO.	TECHNICAL REQUIREMENTS एनटीपीसी NTPC		
4.05.00 4.06.00 4.07.00 4.08.00 4.09.00 4.10.00 4.11.00	Position / Torque Transmitter Local Operation LCD Display Wiring Terminal Block Accessories SIL Certification	Earth Terminals: Two Protection: Single Phasing Protection, Over-heating protection through Thermostat (as applicable) and wrong phase sequence protection shall be provided over and above other protection features standard to bidder's design. Suitable means shall be provided to diagnose the type of fault locally. The Position/ Limit measurement shall be done using absolute encoders which will give information of position/ limit in both the directions. Electronic measurement of torque shall be provided. It shall be possible to operate the actuator locally also. Lockable local/remote selection shall be provided on the actuator. A local LCD display shall be provided to give information regarding actuator alarms, status and valve position indications as a minimum in local. Suitable voltage grade copper wire. For power cables, the grade of TBs shall be minimum 650V. All required accessories for calibration / settings/ configuration of various parameters of actuator shall be provided. All actuators shall be certified for SIL 2 or better. contd. on next page	
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-III-C-17 ELECTRICAL ACTUATORS	PAGE 2 OF 4

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
4.12.00 4.13.00 4.14.00	REQUIREMENT FOR NON-INTRUSIVE PROFIBUS ACTUATOR Interfaces For ON-OFF and INCHING type actuators interface with the control system shall be through fieldbus network. a) Open/ close commands, open/ close feedback status, disturbance signal etc. shall be available to the Control System through the fieldbus network along with diagnostics. The detailed diagnostics including the actuator operating data shall be available to the DDCMIS through the fieldbus network. b) All actuators shall be Profibus compatible. However the exact protocol shall be based on finalized protocol of If Profibus DP protocol is envisaged then actuator shall have two (redundant) Profibus DP ports for connecting the redundant Profibus DP cables. That is if one profibus cable is cut or not working/ not available, then complete actuator functionality shall be available through the second redundant cable without any manual intervention. Also, for Profibus DP cable connection, suitable connector integral to the actuator, or external devices/ accessories (mounted inside minimum IP65 protection class enclosure) shall be provided so that the actuator can be isolated online from the profibus network without disturbing the Profibus communication of other actuators of the segment. c) Open/close command termination logic shall be suitably built inside actuator. d) For all actuators GSD and DTM files are to be provided which shall be configured/ tested with DCS for proper interfacing and diagnostics. Terminal Box Suitable terminals/ connectors, integral to actuator, for terminating fieldbus cables and power cables shall be provided. Necessary glands for power cables and armored fieldbus cables shall be provided. Training Contractor shall provide training on Non-Intrusive Profibus Electric Actuator along with detail training on Profibus interface used in actuator for Employer's personnel.		
	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-17 ELECTRICAL ACTUATORS	PAGE 3 OF 4

	DATASHEET FOR MOTORISED VALVE ACTUATOR (2X660MW Talcher STPP)		SPECIFICATION NO.:	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE:06/03/2020
			SHEET 1	OF 4
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL *	* PROJECT	2X660 MW TALCHER STPP		
	OFFER REFERENCE			
	* TAG NO. SERVICE			
	* DUTY	☐ ON / OFF ** ☐ INCHING		
	* LINE SIZE (inlet/outlet): MATERIAL			
	* VALVE TYPE	☐ GLOBE ☐ GATE ☐ REG. GLOBE ☐ BUTTERFLY		
	* OPENING / CLOSING TIME			
	* WORKING PRESSURE			
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF -20 to 70 DEG C AND RELATIVE HUMIDITY OF 0-95% IN HOT HUMID AND TROPICAL ATMOSPHERE AND HIGHLY POLLUTED AT PLACES OF COAL DUST AND FLY DUST		
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY		
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY		
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY		
	CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF, DUST TIGHT SUITABLE FOR OUTDOOR USE WITHOUT CANOPY, NEMA6/IP:68	
MECHANICAL POSITION INDICATOR		TO BE PROVIDED FOR 0-100% TRAVEL		
BEARINGS		DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.		
GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION		METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.		
SIZING		OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 85% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING SERVICE - 150 STARTS/HR MINIMUM & FOR REGULATING SERVICE - 600 STARTS/HR MINIMUM as per IEC60034-1		
HANDWHEEL as per standard EN 12570:2000	* REQUIRED	☒ YES ☐ NO		
	* ORIENTATION	☐ TOP MOUNTED ☐ SIDE MOUNTED		
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.			
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY		
	MOTOR MAKE / MODEL / TYPE / RATING (KW) (REFER NOTE NO. 6 & 7)	BIDDER TO SPECIFY		
	@ MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT-INCLUSIVE OF I.S. TOLERANCE		
	ACTUATOR APPLICABLE WIRING DIAGRAM (TO BE DECIDED DURING DETAILED ENGINEERING)	BIDDER TO FURNISH WIRING DIAGRAM		
	COLOUR SHADE	☐ BLUE (RAL 5012) ☐ SIEMENS GRAYRAL 7030/32 ☒ TO BE DECIDED DURING DETAILED ENGINEERING		
	PAINT TYPE	☐ ENAMEL ☐ EPOXY CONFIRMING TO CORROSION CATEGORY C5-I ☒ TO BE DECIDED DURING DETAILED ENGINEERING		
	SHAFT RPM	BIDDER TO SPECIFY		
	OLR SET VALUE	BIDDER TO SPECIFY		
	@ STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		

	DATASHEET FOR MOTORISED VALVE ACTUATOR (2X660MW Talcher STPP)		SPECIFICATION NO.:	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE:06/03/2020
			SHEET 2	OF 4
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
	@ PWR SUPP TO MTR / STARTER	415V, 3PH, AC		
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER ■ 230 V ■ 110 V		
	@ ENCLOSURE CLASS OF MOTOR	☐ IP 67 ■ ☐ IP 68 ■ FLAME PROOF TO BE DECIDED DURING DETAILED ENGINEERING		
	@MOTOR BEARING WITH 2 EARTH TERMINALS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI FRICTION		
	@ INSULATION CLASS	CLASS F. TEMPERATURE RISE 70 Deg C. OVER 50 Deg C AMBIENT		
	@ WINDING TEMP PROTECTION	■ THERMOSTAT (3 Nos., 1 IN EACH PHASE)		
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED (THERMISTOR PTC)		
INTEGRAL STARTER	INTEGRAL STARTER	■ REQUIRED ☐ NOT REQUIRED		
	TYPE OF SWITCHING DEVICE	■ CONTACTORS ■ CONTACTORS(REVERSING TYPE) ■ THYRISTORS		
	TYPE	☐ CONVENTIONAL ■ NON-INTRUSIVE PROFIBUS		
	IF NON-INTRUSIVE PROFIBUS (REFER BELOW POINT a – g)			
	a) INTERFACE WITH CONTROL SYSTEM	■ PROFIBUS ☐ HARDWIRED		
	b) FIELD BUS PROTOCOL	■ PROFIBUS DP ☐ PROFIBUS PA ☐ FOUNDATION FIELD BUS		
	c) REDUNDANT PORTS(IN CASE, PROFIBUS DP PROTOCOL)	■ REQUIRED ☐ NOT REQUIRED		
	d)TORQUE/LIMIT MEASUREMENT TRANSMITTER(REFER NOTE NO.9)	■ REQUIRED ☐ NOT REQUIRED		
	e)POSITION MEASUREMENT TRANSMITTER(REFER NOTE NO.9)	■ REQUIRED ☐ NOT REQUIRED		
	f)LCD DISPLAY INTEGRAL TO ACTUATOR BODY(REFER NOTE NO.10)	■ REQUIRED ☐ NOT REQUIRED		
	g) SIL CERTIFICATION(SIL 2 OR BETTER)	■ REQUIRED ☐ NOT REQUIRED		
	STEP DOWN CONT. TRANSFORMER	■ REQUIRED		
	OPEN / CLOSE PB	■ REQUIRED ☐ NOT REQUIRED		
	STOP PB	■ REQUIRED ☐ NOT REQUIRED		
	INDICATING LAMPS	■ REQUIRED ☐ NOT REQUIRED		
	LOCAL REMOTE S/S(LOCKABLE)	■ REQUIRED ☐ NOT REQUIRED		
	STATUS CONTACTS FOR MONITORING	■ REQUIRED ☐ NOT REQUIRED		
	INTEGRAL STARTER DISTURBED SIGNAL (TO BE DECIDED DURING DETAILED ENGINEERING)	REQUIRED MOTOR THERMOSTAT STRIP O/L RELAY OPTD, CONT./POWER SUPPLY FAILED,S/S IN LOCAL/REMOTE/OFF MODE,TORQUE SWITCH OPEN/CLOSE CUT OFF/STOP PB OPTD, VALVE JAMMED ETC)		
	ACTION ON LOSS OF EXTERNAL ELECTRIC POWER	■ STAYPUT ■ FAIL SAFE TO BE DECIDED DURING DETAILED ENGINEERING		
	INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter) DATASHEET & WIRING DIAGRAM OF	TYPE OF ISOLATING DEVICE	■ INTERPOSING RELAY ■ OPTO COUPLER TO BE DECIDED DURING DETAILED ENGINEERING	
QUANTITY		■ 2 NOs. ■ 3 NOs. TO BE DECIDED DURING DETAILED ENGINEERING		
DRIVING VOLTAGE		■ 20.5 – 24V DC ☐ _____ V DC		
DRIVING CURRENT		■ 125mA MAX ☐ _____ mA MAX		

	DATASHEET FOR MOTORISED VALVE ACTUATOR (2X660MW Talcher STPP)		SPECIFICATION NO.:	
			VOLUME	II B
			SECTION	D
			REV. NO.	00
			DATE:06/03/2020	
		SHEET	3	OF 4

Data Sheet A & B

DATA SHEET-A (TO BE FILLED BY PURCHASER)	DATA SHEET-B (TO BE FILLED-UP BY BIDDER)

ISOLATION DEVICE TO BE PROVIDED(NOT APPLICABLE FOR NON- INTRUSIVE PROFIBUS ACTUATOR)	LOAD RESISTANCE	☒ > 192 ohms - <25 k ohms ☐ > _____ ohms - < _____ ohms	
TORQUE SWITCH (NOT APPLICABLE FOR NON- INTRUSIVE PROFIBUS ACTUATOR)	MFR & MODEL NO.	BIDDER TO SPECIFY	
	OPEN / CLOSE	☒ 1 No. ☐ 2Nos. / ☒ 1 No. ☐ 2Nos	
	CONTACT TYPE	2 NO + 2 NC	
	RATING	5A 240V AC AND 0.5A 220V DC	
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE	
	ACCURACY	+3% OF SET VALUE	
LIMIT SWITCH (NOT APPLICABLE FOR NON- INTRUSIVE PROFIBUS ACTUATOR)	MFR & MODEL NO.	BIDDER TO SPECIFY	
	OPEN : INT : CLOSE	☐ 1 No. ☒ 2 Nos. (ADJ.) ☐ 1 No. ☒ 2Nos.	
	CONTACT TYPE	2 NO + 2 NC	
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V	
	ACCURACY	2% OF SET VALUE	

POSITION TRANSMITTER (ALSO REFER NOTE NO.9)	POSITION TRANSMITTER	☒ REQUIRED ☐ NOT REQUIRED	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	TYPE	☒ ELECTRONIC (2 WIRE) R/I CONVERTER ☒ ELECTRONIC (2 WIRE) CONTACTLESS TO BE DECIDED DURING DETAILED ENGINEERING	
	SUPPLY	☒ 24V DC ☐	
	OUTPUT	☒ 4-20mA	
	ACCURACY	± 1% FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY (NON NTEGRAL)	240V AC,1 PH.,50 Hz	
	@ POWER SUPPLY (INTEGRAL)	BIDDER TO SPECIFY	
	@ RATING		
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED	
	ENCL CLASS ACTUATOR/MOTOR T.B.	@ ☒ IP 68 @ ☒ TO BE DECIDED DURING DETAILED ENGINEERING	
	@ EARTHING TERMINAL	REQUIRED	
	PLUG & SOCKET	☒ REQUIRED ☒ NOT REQUIRED (TO BE DECIDED DURING DETAILED ENGINEERING)	
	NO. OF PINS REQUIRED	☒ 9 PINS ☒ 13 PINS (TO BE DECIDED DURING DETAILEDENGINEERING)	
	NOS. OF PLUG & SOCKET	☐ 1 Nos. for ON/OFF ☐ 2 NOS.(for inching duty)	
CABLE GLANDS	@ POWER CABLE GLAND	QUANTITY & SIZE TO BE DECIDED DURING DETAILED ENGINEERING	
	@ SPACE HEATER CABLE GLAND		
	CONTROL CABLE GLANDS-1		

	DATASHEET FOR MOTORISED VALVE ACTUATOR (2X660MW Talcher STPP)		SPECIFICATION NO.:	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE:06/03/2020
			SHEET 4	OF 4
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
	CONTROL CABLE GLANDS-2			
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY	_____ Kg.	
NOTES: SCOPE: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY. CODES & STANDARDS: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH: IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691, IS-4722, IEC 60947-5-1 AND EN 15714-3 :2010 OR LATEST VERSION. - TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C. - CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED. - THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION.THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE. - THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING. - THE MOTOR SHALL BE CAPABLE OF STARTING AT 85 PERCENT OF RATED VOLTAGE RUNNING AT 80 PERCENT OF RATED VOLTAGE AT RATED TORQUE AND 85 PERCENT RATED VOLTAGE AT 33 PERCENT EXCESS RATED TORQUE FOR A PERIOD OF 5 MINUTES EACH - IN ADDITION TO ABOVE REQUIREMENTS FOR LIMIT/TORQUE SWITCH, MECHANICAL END STOP WITH ACCURACY OF 2% SHALL BE SUPPLIED. - THE POSITION/LIMIT MEASUREMENT SHALL BE DONE USING ABSOLUTE ENCODERS WHICH WILL GIVE INFORMATION OF POSITION/LIMIT IN BOTH THE DIRECTIONS.ELECTRONIC MEASUREMENT OF TORQUE SHALL BE PROVIDED - A LOCAL LCD DISPLAY SHALL BE PROVIDED TO GIVE INFORMATION REGARDING ACTUATOR ALARMS, STATUS AND VALVE POSITION INDICATION AS A MINIMUM IN LOCAL. - IT SHOULD BE POSSIBLE TO OPERATE THE ACTUATOR LOCALLY. LOCKABLE LOCAL/REMOTE SELECTION SHALL BE PROVIDED ON THE ACTUATOR. - LOCAL POSITION INDICATOR SHALL BE PROVIDED FOR 0 TO 100 % TRAVEL. - CONTROL WIRING SHALL BE SUITABLE VOLTAGE GRADE COPPER WIRE OF 1.5 SQ. MM. - ENDURANCE: RATED TORQUE RANGE SHOULD BE BASED ON ISO 5211, ISO5210. - TAG PLATE SHALL BE CONFIRMING TO STANDARD BS-15714. - THE ACTUATORS SHALL BE DESIGNED TO BE SELF-LOCKING UPON LOSS OF POWER. MOTOR SHALL BE DESIGNED TO CLOSE IN 30 SECS. FROM FULL OPEN POSITION AND SHALL HAVE ADEQUATE CAPACITY TO OPEN AND CLOSE UNDER FULL UNBALANCED DESIGN PRESSURE. - AUTOMATIC PHASE CORRECTION FACILITY AND POTENTIAL FREE CONTACT FOR ANNUNCIATION OF POWER FAILURE SHALL BE PROVIDED. - LIMIT SWITCHES SHALL BE SILVER PLATED WITH HIGH CONDUCTIVITY AND NON-CORROSIVE TYPE. CONTACT RATING SHALL BE SUFFICIENT TO MEET THE REQUIREMENT OF CONTROL SYSTEM SUBJECT TO A MINIMUM OF 60 V, 6 VA RATING. PROTECTION CLASS SHALL BE IP67. - SUITABLE TERMINALS/CONNECTORS.INTEGRAL TO ACTUATORS ,FOR TERMINATING FIELDBUS(PROFIBUS-DP) CABLES AND POWER CABLES SHALL BE PROVIDED.NECESSARY GLANDS FOR POWER CABLES AND ARMORED FIELDBUS CABLES SHALL BE PROVIDED. - THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +5% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%. - ACTUATOR SHALL ATTAIN FULL SPEED OPERATIONS BEFORE VALVE LOAD IS ENCOUNTERED AND IMPART AN UNSEATING BLOW TO START THE VALVE IN MOTION (HAMMER BLOW EFFECT). - OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 90% OF RATED VOLTAGE.				
NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @ BE FILLED BY ES				

NAME	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL
SIGNATURE				SIGNATURE

	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I)	
1.FIELD & MEASURING INSTRUMENTS. 2.PROCESS CONNECTION AND PIPING. 3.INSTRUMENT INSTALLATION DIAGRAM.		

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC																			
2.00.00	SPECIFICATION FOR ELECTRONIC TRANSMITTERS																				
2.01.00	SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF PRESS AND DP BASED FLOW / LEVEL MEASUREMENTS																				
	Microprocessor based 2 wire loop powered electronic transmitter with 4-20 mA DC HART/ /Profibus PA complying to IEC 61158.) output signal shall be provided.																				
	<table><tr><th>Range</th><th>Accuracy (For calibrated Range)</th><th>Turndown (For span)</th><th>Stability (% of Calibrated range)</th></tr><tr><td><=400mmwc</td><td>0.1%</td><td>20:1</td><td>+/-0.2% for 1 year</td></tr><tr><td>>400mmwc</td><td>0.060%</td><td>50:1</td><td>+/-0.25 % for 10 year</td></tr><tr><td>>250 kg/cm2</td><td>0.065%</td><td>10:1</td><td>+/- 0.15 % for 5 years</td></tr></table>	Range	Accuracy (For calibrated Range)	Turndown (For span)	Stability (% of Calibrated range)	<=400mmwc	0.1%	20:1	+/-0.2% for 1 year	>400mmwc	0.060%	50:1	+/-0.25 % for 10 year	>250 kg/cm2	0.065%	10:1	+/- 0.15 % for 5 years				
Range	Accuracy (For calibrated Range)	Turndown (For span)	Stability (% of Calibrated range)																		
<=400mmwc	0.1%	20:1	+/-0.2% for 1 year																		
>400mmwc	0.060%	50:1	+/-0.25 % for 10 year																		
>250 kg/cm2	0.065%	10:1	+/- 0.15 % for 5 years																		
	Above parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only. Transmitter shall have weather proof IP-67 metallic housing with durable corrosion resistant coating, integral digital display with self-indicating diagnostics, Plug and socket type electrical connection for HART and ½ "NPT (F) for Profibus type Transmitter, calibration using Profibus calibrator, 2/3/5 Valve non integral manifold and rack with canopy. For HART transmitter SIL 2 certification is required. For primary air and flue gas applications, DPT shall be provided for pressure measurement below range of 2000 mmwc. For corrosive, viscous, solid bearing, slurry type process fluids, suitable diaphragm seal shall be provided. Parts below seal shall be removable for cleaning. Entire volume shall be completely filled with inert liquid suitable for instruments. LVDT type transmitter is not acceptable.																				
2.02.00	GUIDED WAVE RADAR TYPE LEVEL TRANSMITTER																				
	<table><tr><td>Type</td><td>Microprocessor based 2 wire type (loop powered), HART protocol compatible Guided wave radar transmitter.</td></tr><tr><td>Principle</td><td>TDR (Time domain reflectometry)</td></tr><tr><td>Probe Type & Material</td><td>(i) Coaxial probe of SS316/316L. If required, probe shall be suitable for overfill prevention. (ii) Rod probe, cable probe of SS316/SS316L can be used for applications wherever coaxial probe is not suitable.</td></tr><tr><td>Output signal</td><td>4-20 mA DC along with superimposed digital signal (based on HART protocol), suitable for over fill prevention.</td></tr><tr><td>Accuracy</td><td>+/- 0.5% of calibrated span or minimum 5mm.</td></tr><tr><td>Power supply</td><td>24 VDC +/- 10%.</td></tr><tr><td>Housing</td><td>Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.</td></tr><tr><td>Adjustment/ calibration</td><td>Using hand held HART calibrator/ centralized PC based system (as applicable).</td></tr><tr><td>Zero & span</td><td>Continuous, temper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument</td></tr></table>	Type	Microprocessor based 2 wire type (loop powered), HART protocol compatible Guided wave radar transmitter.	Principle	TDR (Time domain reflectometry)	Probe Type & Material	(i) Coaxial probe of SS316/316L. If required, probe shall be suitable for overfill prevention. (ii) Rod probe, cable probe of SS316/SS316L can be used for applications wherever coaxial probe is not suitable.	Output signal	4-20 mA DC along with superimposed digital signal (based on HART protocol), suitable for over fill prevention.	Accuracy	+/- 0.5% of calibrated span or minimum 5mm.	Power supply	24 VDC +/- 10%.	Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.	Adjustment/ calibration	Using hand held HART calibrator/ centralized PC based system (as applicable).	Zero & span	Continuous, temper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument		
Type	Microprocessor based 2 wire type (loop powered), HART protocol compatible Guided wave radar transmitter.																				
Principle	TDR (Time domain reflectometry)																				
Probe Type & Material	(i) Coaxial probe of SS316/316L. If required, probe shall be suitable for overfill prevention. (ii) Rod probe, cable probe of SS316/SS316L can be used for applications wherever coaxial probe is not suitable.																				
Output signal	4-20 mA DC along with superimposed digital signal (based on HART protocol), suitable for over fill prevention.																				
Accuracy	+/- 0.5% of calibrated span or minimum 5mm.																				
Power supply	24 VDC +/- 10%.																				
Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.																				
Adjustment/ calibration	Using hand held HART calibrator/ centralized PC based system (as applicable).																				
Zero & span	Continuous, temper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument																				
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 2 OF 34																	

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC
2.03.00	adjustment	without any level in the tank/sump etc.	
	Display	Integral digital display.	
	Load Impedance	500 ohms (minimum).	
	Electromagnetic compatibility	Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2	
	Mounting	(i) External cage shall be provided where ever side mounting is required. External cage and other mounting accessories to be provided by the contractor. (ii) Where ever top mounting is required, all mounting accessories, stilling well (as required) etc., shall be provided by the contractor. (iii) All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations.	
	Note: Four wire type transmitters can also be provided for applications where 2- wire transmitter has some technical limitations, subject to employer's approval during detailed engineering stage. However, in such cases isolated 4-20 mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 240V AC / 24V DC.		
	Ultrasonic Type level Transmitter		
	S.No.	Features	Essential/Minimum requirement
	1.	Type of Transmitter	Non-contact Microprocessor based 2 wire type (loop powered), HART protocol compatible Ultrasonic transmitter.
	2.	Output signal	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol).
3.	Accuracy	+/- 0.5% of calibrated span or minimum 5mm.	
4.	Power supply	24 V DC +/- 10%.	
5.	Temperature compensation	To be provided within transducer.	
6.	Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.	
7.	Adjustment/calibration/ maintenance	Using hand held HART calibrator/ centralized PC based system (as applicable).	
8.	Zero and Span adjustment	Continuous, tamper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument without any level in the tank/sump etc.	
9.	Sensor Material	Corrosion resistant material to suit individual application requirement.	
10.	False signal tolerance	Transmitter shall be capable of ignoring false echoes from internal tank/sumps obstructions such as pipes, heating coils or agitator blades. Also transmitter shall have adjustable damping circuitry.	
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 3 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC
2.04.00	11.	Range	Range of transmitter shall be capable of covering the complete level span of tank taking care of blocking distance, frequency attenuation due to surface, obstructions, vapors etc.
	12.	Display	Integral digital display
	13.	Diagnostics	Loss of echo alarm etc.
	14.	Load Impedance	500 ohms (minimum).
	15.	Electrical Connection	Plug and socket
	16.	Accessories	- All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations. - All mounting accessories required for erection and commissioning shall be provided. - For hazardous area, explosion proof enclosure as described in NEC article 500
	Note: 1) Contractor can also provide Radar type transmitter as per above specification in place of ultrasonic transmitter subject to approval by Employer during detailed Engineering. Sonic frequency based transmitters can also be provided under “ultrasonic transmitters” category for fly ash silo level. 2) Four wire type transmitters can also be provided for applications where 2- wire transmitter has some technical limitations, subject to employer's approval during detailed engineering stage. However, in such cases isolated 4-20 mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 240V AC / 24V DC. 3) For applications where transmitter location is not accessible, the transmitter shall have separate sensor unit and electronic unit for such applications. It shall be possible to mount the electronic unit at accessible location.		
	HART Hand Held calibrator Hand held calibrator shall be provided for adjustment/calibration/maintenance of the HART compatible transmitters. The hand held calibrator shall be suitable for all types of transmitters supplied in the package. If one type of hand held type calibrator is not suitable for communicating with all types of transmitters then separate hand held calibrator will be provided for that specific type of transmitter.		
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 4 OF 34	

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
3.04.00	Thermo well (for all process temp. elements) (a) Shall be one piece solid bored type of 316 SS of step-less tapered design. (As per ASME PTC 19.3, 1974) (b) For Mill classifier outlet long life solid sintered tungsten carbide material of high abrasion resistance shall be provided. (c) For Air & Flue gas 316 SS protecting tube with welded cap. (However contractor shall provide better material for Flue gas service if required based on the specified boiler design parameters). (d) For furnace zone, impervious ceramic protecting tube of suitable material along with Incoloy supporting tubes and adjustable flanges.			
3.05.00	Not Used			
3.06.00	TEMPERATURE TRANSMITTER Minimum technical requirements shall be as follows: Single input/Dual input temperature transmitter shall be 2-wire loop powered directly from 4-20mA input cards of DDCMIS. Transmitter shall be fully compatible with thermocouples and RTDs being provided. It shall be capable to handle Pt-100 RTD, Thermocouple –K, R & S types (selectable through HART/ Profibus terminal/calibrator). Temperature compensation for T/C shall be performed in the transmitter itself. In case of failure (open or burn-out) of RTD/thermocouple, transmitter shall provide low temperature output. Transmitter shall be HART/Fieldbus (Profibus PA complying to IEC 61158)compatible, have EMC compatibility as per EN 61326, weather proof IP-67 metallic housing with durable corrosion resistant coating, plug and socket type electrical connection for HART and 1/2” NPT(F) connection for Fielbus , integral digital display with self-indicating diagnostics, operating ambient temperature of 85 deg C without display & 70 deg C with display, suitable for 2 inch pipe mounting in enclosure/rack . Composite Accuracy shall be as follows :. RTD =<0.25% of 0-250 deg C span, T/C -K type =<0.2 % of 0-600 deg C span, CJC accuracy (for T/C) shall be < 1 deg C.			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2		PAGE 7 OF 34
		SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)		

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	Notes : 1. Dual input temperature transmitter shall have bump less changeover facility to second sensor in case first sensor fails. This changeover is to be alarmed in control system. 2. Composite accuracy is to be calculated as summation of all applicable accuracies of temperature transmitter for converting sensor input to output (e.g., A/D accuracy, basic accuracy, digital accuracy, etc.) and temperature effect on these accuracies at ambient temperature of 50 deg C, based on the figure/ formula given in the standard product catalogue for span as specified above for various types of temperature elements specified. 3. Above mentioned parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only. 4. Dual input temperature transmitters can also be accepted in place of single input TT.			
3.07.00	Din rail temperature transmitter 4-20mA HART based suitable for mounting on DIN-rails in JB's. The specifications of the JB's shall be same as indicated in Subsection INST CABLE with additional DIN-rails and IP 65 Protection class. This temperature transmitter shall be the ones which are especially designed for DIN-rail mounting with IP 20 protection class. These shall have terminals for input/output provided on front side when mounted on DIN-rail. Head mounted temperature transmitter with clamps to make it suitable for DIN-rail mounting shall not be acceptable under this category. Accuracy of Din rail should be $\therefore$ RTD $\leq 0.4\%$ of 0-250 deg C span, T/C -K type $\leq 0.4\%$ of 0-600 deg C span, CJC accuracy (for T/C) shall be < 1 deg C. Other specifications shall be as mentioned in clause 3.06.00. Exact applications shall be as defined in PART-A of specifications.			
3.08.00	Multi Input Temperature transmitter (Temperature Multiplexer) For only information related temperature inputs fieldbus based Multi input temperature transmitters can be provided. Transmitters shall be capable of withstanding ambient temperature upto 85 deg C. Maximum number of inputs per such temperature transmitter shall be eight. One (1) no. input shall be kept as spare wired upto TBs of field mounted panel in each multi input TT. These shall be installed in field mounted panels with minimum IP 55 protection class. Exact applications shall be as defined in PART-A of specifications.			
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 8 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
5.00.00	IMPACT HEAD TYPE FLOW ELEMENT The impact head type element shall be tubular insert type with four impact ports facing upstream direction, located precisely for determination of average flow velocity and shall be of SS 316 L. Accuracy shall be 1.0% of actual value or better. Repeatability shall be + 0.1% of actual value or better. The elements shall be supplied complete with mounting hardware; end support plugs and CS valve manifold (1/2" NPT connection) for instrument connections. All pertinent data including instrument tag no. for the flow element shall be punched on a stainless steel plate and affixed to the element.		
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 9 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS 			
	Flushing arrangement shall be provided. For quantity and line size etc., refer Part-A. Dual path transit time clamp-on Ultrasonic Flow meter may also be used for measurement of CW flow.			
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 10 OF 34	

CLAUSE NO.	TECHNICAL REQUIREMENTS			एन टी पी सी NTPC
12.00.00	SPECIFICATION FOR CORIOLIS FLOW TRANSMITTER			
	Type	Coriolis		
	Material of Wetted Parts	316 SS		
	Material of Housing	304L SS		
	Accuracy	± 0.2% of Rate		
	Repeatability	± 0.1% of Rate		
	Output	4-20 mA DC, HART Compatible		
	Power Supply	230 VAC or 24VDC operated		
	Process Temperature range	0-200 degree Celsius		
	Others	Drain / purging arrangement shall be provided as per standard practice.		
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 22 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC
	Notes: Coriolis Mass flow meter upstream of Burners shall be sized to measure minimum flow corresponding to one burner operation and maximum BMCR rating flow with 25% margin. The offered Coriolis type flow transmitter shall be suitable for intended application. Contractor shall submit flow and sizing calculation for Employer's approval. For each type of Coriolis type flow transmitter general arrangement and assembly drawing and cable wiring diagram shall be submitted for Employer's approval.		
13.00.00	SPECIFICATION FOR FLOW ELEMENTS		
13.01.00	Orifice Plate		
	Features	Essential/Minimum Requirements	
	Type	Concentric as per ASME PTC-19.5 (Part-II), ISA RP-3.2, 1960 or BS-1042, ISO 5167	
	Material	316 SS	
	Thickness	3 mm for main pipe diameter up to 300 mm and6 mm for main pipe dia above300 mm.	
	Tappings	Flanged weld neck or D & D/2 with 3 pairs of tapping (as applicable). Root valves to be provided in all the tappings. However for flow elements in CPU, DM & PT plant- 2 Pairs of Tappings shall be provided as minimum.	
	Beta Ratio	0.34 to 0.7	
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 23 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC																																												
13.04.00	NOT USED																																															
14.00.00	NOT USED																																															
15.00.00	PROCESS ACTUATED SWITCHES																																															
	<table><tr><th>FEATURES</th><th colspan="3">ESSENTIAL / MINIMUM REQUIREMENTS</th></tr><tr><td></td><td>Pressure/ Draft Switches/ DP Switches</td><td>Temperature switches</td><td>Level switches</td></tr><tr><td>Sensing Element</td><td>Piston actuated for high pressure and diaphragm or bellows for low pr./ vacuum</td><td>Vapor pressure sensing, liquid filled bellow type with SS bulb and capillary (5 m minimum, to suit application)</td><td>Capacitance types, float type, conductivity type, RF type, Ultrasonic type as per suitability to the application. .</td></tr><tr><td>Material</td><td>316 SS</td><td>Bulb 316 SS/ capillary 304 SS</td><td>316 SS</td></tr><tr><td>End connection</td><td>½ inch NPT (F)</td><td>½ inch NPT (F)</td><td>Manufacturer standard</td></tr><tr><td>Over range/ proof pressure</td><td>150% of maximum operating pr.</td><td>-</td><td>150% of maximum operating pr.</td></tr><tr><td>Repeatability</td><td colspan="3">+/- 0.5% of full range</td></tr><tr><td>No. of contacts</td><td colspan="3">2 No.+2NC. SPDT snap action dry contact</td></tr><tr><td>Rating of contacts</td><td colspan="3">60 V DC, 6 VA (or more if required by DDCMIS)</td></tr><tr><td>Elect. Connection</td><td colspan="3">Plug in socket.</td></tr><tr><td>Set point adjustment</td><td colspan="3">Provided over full range.</td></tr></table>				FEATURES	ESSENTIAL / MINIMUM REQUIREMENTS				Pressure/ Draft Switches/ DP Switches	Temperature switches	Level switches	Sensing Element	Piston actuated for high pressure and diaphragm or bellows for low pr./ vacuum	Vapor pressure sensing, liquid filled bellow type with SS bulb and capillary (5 m minimum, to suit application)	Capacitance types, float type, conductivity type, RF type, Ultrasonic type as per suitability to the application. .	Material	316 SS	Bulb 316 SS/ capillary 304 SS	316 SS	End connection	½ inch NPT (F)	½ inch NPT (F)	Manufacturer standard	Over range/ proof pressure	150% of maximum operating pr.	-	150% of maximum operating pr.	Repeatability	+/- 0.5% of full range			No. of contacts	2 No.+2NC. SPDT snap action dry contact			Rating of contacts	60 V DC, 6 VA (or more if required by DDCMIS)			Elect. Connection	Plug in socket.			Set point adjustment	Provided over full range.		
FEATURES	ESSENTIAL / MINIMUM REQUIREMENTS																																															
	Pressure/ Draft Switches/ DP Switches	Temperature switches	Level switches																																													
Sensing Element	Piston actuated for high pressure and diaphragm or bellows for low pr./ vacuum	Vapor pressure sensing, liquid filled bellow type with SS bulb and capillary (5 m minimum, to suit application)	Capacitance types, float type, conductivity type, RF type, Ultrasonic type as per suitability to the application. .																																													
Material	316 SS	Bulb 316 SS/ capillary 304 SS	316 SS																																													
End connection	½ inch NPT (F)	½ inch NPT (F)	Manufacturer standard																																													
Over range/ proof pressure	150% of maximum operating pr.	-	150% of maximum operating pr.																																													
Repeatability	+/- 0.5% of full range																																															
No. of contacts	2 No.+2NC. SPDT snap action dry contact																																															
Rating of contacts	60 V DC, 6 VA (or more if required by DDCMIS)																																															
Elect. Connection	Plug in socket.																																															
Set point adjustment	Provided over full range.																																															
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 24 OF 34																																												

CLAUSE NO.	TECHNICAL REQUIREMENTS				एनटीपीसी NTPC
16.00.00 17.00.00	Dead band adjustment	Adjustable/ fixed as per requirement of application.			
	Enclosure	Weather and dust proof as per IP-55, metallic housing.			
	Accessories	Siphon, snubber, chemical seal, pulsation dampeners as required by process	Thermo well of 316 SS and packing glands	All mounting accessories	
	Mounting	Suitable for enclosure/ rack mounting or direct mounting	Suitable for rack mounting or direct mounting	-	
	Power Supply (wherever required)	As per Contractor's Standard practice.			
	Notes :- 1) 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. 2) Pressure/ Diff pressure switches for very low press/ DP measurements can have sensor material other than SS316 in case of any technical limitation and the offered product is standard product of the manufacture for very low pressure applications. 3) Repeatability can be upto +/-1% of full range in case of switches with diaphragm seals or very low pressure/DP range. 4) The specifications of switches for air conditioning & ventilation system / process can be as per system manufacturer's standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice. 5) For ESP Level Switches following requirements are to be met: i) ESP Level Switches calibration shall not be affected by changes in ambient temperature. ii) Active build up compensation to be provided to sense and auto correct the effect of ash deposition on level probe. iii) Self- -diagnostic features like health status, maintenance requirement, instrument failure, false alarm etc. to be provided. The manufacturer shall submit adequate supporting documents, catalogues for establishing the above features. 6) Vibration Rod type switches to be provided for first two fields of ESP.				
	NOT USED				
	SOLENOID VALVES				
	Solenoid valves shall fulfil the following requirements:				
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 25 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	a. Type 2/3/4 way SS 316/Forged Brass (depending on the application subject to Employer's approval during detailed Engg.) b. Power supply : 24 V DC $\pm$ 10%. c. Plug and socket electrical connection. d. Insulation : Class 'H' e. IP Class : IP65		
18.00.00	REVERSE ROTATION INDICATOR (RRI) 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.		
19.00.00	WATER SYSTEM RELATED SPECIAL INSTRUMENTS (DM PLANT, CPU PLANT, PT PLANT, ETC)		
19.01.00	ANALYSER INSTRUMENTS: 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.		
19.02.00	Residual Chlorine Analyser 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. 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.		
19.03.00	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.		
19.04.00	Parshall Flume 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.		
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 26 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC																												
19.05.00	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 Accuracy shall be +/- 1 % or better. 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. The Type makes and models no. shall be subject to Owner's approval.																													
	Electronic Flow-Meter 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. 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. The flow meter shall meet or exceed the following requirement : <table><tr><td>(a)</td><td>Output</td><td>:</td><td>4-20 mA DC Isolated output</td></tr><tr><td>(b)</td><td>Accuracy</td><td>:</td><td>± 0.5% of calibrated span or better *</td></tr><tr><td>(c)</td><td>Repeatability</td><td>:</td><td>± 0.2% of calibrated span or better</td></tr><tr><td>(d)</td><td>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)</td><td>Protection class</td><td>:</td><td>IP-55</td></tr><tr><td>(e)</td><td>Flow tube</td><td></td><td>SS304</td></tr><tr><td>(f)</td><td>liner</td><td></td><td>Hard Rubber</td></tr></table> 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.	(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	
(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																											
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 27 OF 34																										

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
21.00.00	Limit switches			
	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.			
	For main plant application limit switches are to be provided as per contractor standard and proven practice.			
	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 .			
	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.		
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	ENCLOSURE/CABINETS / PANELS FOR EQMS AND ANALYSERS OF PT, LET, CHLORINATION, DM/RO, CWT AND CPU PLANT 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. 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 .		
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 31 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC	
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	

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC	
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	: 0.01 to 150MPY	
		Imbalance (Pitting Index)	: 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		
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 33 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
28.00.00	10.	Mounting	All weather Local Panel fitted with integral Air Conditioner are to be provided by the Contractor.	
	ORP/PH PORTABLE METER			
	Sensor Probe Specification Requirement			
	S.no	Feature	pH	ORP
	b)	Electrode	: Glass	: Platinum
c)	Accuracy	: < ± 1% of reading	: < ± 1mv	
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 BID DOC. NO.:CS-4540-001A-2		SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
				PAGE 34 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS						
3.00.00 3.01.00 3.02.00	SUB SECTION IIIC-12						
	SPECIFICATION OF ANALYSERS						
	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.						
	.						
	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.	
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 3 OF 6	

CLAUSE NO.	TECHNICAL REQUIREMENTS						
3.02.00	Minimum specifications of analysers continued						
	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.					
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.							
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 4 OF 6	

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनडीपीसी NTPC																
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 ASTMA182 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><thead><tr><th>Piping System</th><th>Material</th></tr></thead><tbody><tr><td>1. 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. 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. Blow down header</td><td>Stainless steel, ASTM A 312, Type 304 Schedule 160</td></tr><tr><td>4. Miscellaneous drains receiver holder</td><td>Stainless steel, ASTM A 312, Type 304 Schedule 40</td></tr><tr><td>5. 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. 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. 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.
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.																			
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							एन टी पी सी NTPC
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		
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 6 OF 6		

ANALYSER INSTRUMENTS OF CHPWTP :

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

SERVICES FOR ANALYSER INSTRUMENTS OF CHPWTP 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 CHPWTP 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 CHPWTP

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			एनटीपीसी NTPC
	AMS for Profibus Instruments			
9.00.00				
10.00.00	ANNUAL MAINTENANCE SERVICES			
10.01.00	The requirements specified below are applicable for warranty (defect liability period) and 3 years AMS period.			
10.01.01	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. 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.			
10.02.00	The services under Post Warranty Maintenance Agreement, shall broadly comprise of the following:			
10.02.01	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.			
10.02.02	Software Maintenance/ Support Contractor shall maintain the existing operating & application software for any debugging requirements to have consistent performance of the system.			
10.02.03	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.			
10.03.00	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.			
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-III-C-16	PAGE 4 OF 4

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

Sl. No	FEATURES	ESSENTIAL/MINIMUM REQUIREMENTS		
		Pr. Gauge/ DP Gauge/ Draught gauges	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, SS Thermowell siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	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			एनटीपीसी NTPC
	CONTROL VALVES, ACTUATORS & ACCESSORIES			
1.00.00	CONTROL VALVES, ACTUATORS & ACCESSORIES			
1.01.00	General Requirements			
1.01.01	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.			
1.01.02	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.			
1.01.03	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.			
1.01.04	Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.			
1.02.00	CONTROL VALVE SIZING & CONSTRUCTION			
1.02.01	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.			
1.02.02	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.			
1.02.03	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.			
1.02.04	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			
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	एनटीपीसी NTPC									
	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><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 stellited with stellited 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 stellited with stellited faced guide posts and bushings.		
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 stellited with stellited faced guide posts and bushings.								
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 2 OF 5							

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	2.	Severe flashing/cavitati on services	Alloy steel ASTM-A217 Gr. WC9 440 C	
	3.	Low flashing/cavitati on service	Alloy steel ASTM-A217 Gr. WC6 17-4 PH SS	
	4.	DM water service	316 SS 316 SS	
	NOTE: (a) Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34.			
	(b) Severe flashing / cavitation services includes as a minimum all control valves whose downstream piping is connected to condenser or flash tank.			
	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.			
4.00.00	END PREPARATION			
	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.			
5.00.00	VALVE ACTUATORS			
	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.			
	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.			
	The travel time of the pneumatic actuators shall not exceed 10 seconds.			
6.00.00	CONTROL VALVE ACCESSORY DEVICES			
6.01.00	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			
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 3 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS				
8.00.00	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.				
	TEST AND EXAMINATION				
	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:				
	8.01.00	Non Destructive Test as per ANSI B-16.34.			
	8.02.00	Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test.			
	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			
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.				
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.				
	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.				
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																																																																																										
	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.																																																																																										
1.04.00	For skid mounted instruments and instruments integral to equipments, process connection and piping can be in line with bidder's standard and proven practice.																																																																																										
1.05.00	Contractor shall furnish "Certificate of Compliance" of erection of PCP as per NTPC approved documents.																																																																																										
1.06.00	PAINTING COLOR SCHEME FOR IMPULSE PIPING <table><tr><th rowspan="2">S. No.</th><th rowspan="2">Area / Equipment</th><th colspan="2">Impulse Pipe Ground Color</th><th colspan="3">Identification Tag/Band</th></tr><tr><th>Color</th><th>RAL</th><th>Color</th><th>ISC No.</th><th>RAL</th></tr><tr><td>1)</td><td>Air</td><td>Grey</td><td>9002</td><td>Sky Blue</td><td>101</td><td></td></tr><tr><td>2)</td><td>Water</td><td>Grey</td><td>9002</td><td>Sea Green</td><td>217</td><td></td></tr><tr><td>3)</td><td>Steam</td><td>Aluminum</td><td></td><td>Signal Red</td><td>537</td><td>3001</td></tr><tr><td>4)</td><td>Air Steam Mixture</td><td>Aluminum</td><td></td><td>Sky Blue</td><td>101</td><td></td></tr><tr><td>5)</td><td>Gas</td><td>Grey</td><td>9002</td><td>Canary Yellow</td><td>309</td><td></td></tr><tr><td>6)</td><td>Oils</td><td>Grey</td><td>9002</td><td>Light Brown</td><td>410</td><td></td></tr><tr><td>7)</td><td>Pulverized Fuel</td><td>Grey</td><td>9002</td><td>Silver Grey</td><td>628</td><td></td></tr><tr><td>8)</td><td>Fire Installations</td><td>Fire Red</td><td>536 (ISC) 3001 (RAL)</td><td>White</td><td></td><td>9010</td></tr><tr><td>9)</td><td>HP Dosing</td><td>Grey</td><td>9002</td><td>Dark Admiralty Grey</td><td>632</td><td></td></tr><tr><td>10)</td><td>LP Dosing / acid / alkali Piping</td><td>Grey</td><td>9002</td><td>Signal Red</td><td>537</td><td></td></tr><tr><td>11)</td><td>Ash Piping</td><td>Grey</td><td>9002</td><td>French Blue</td><td>166</td><td></td></tr></table> Note: Ground color indicated against each piping shall be followed in case piping is not insulated /cladded.	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		
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																																																																																						
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-06 PROCESS CONNECTION AND PIPING	PAGE 2 OF 2																																																																																							

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC
6.00.00	FIELD MOUNTED LOCAL JUNCTION BOXES (AS PER STANDARD AND PROVEN Practice of vendor (i) No. of ways 12/24/36/48/64/72/96/128 with 20% spares terminals. (ii) Material and Thickness 4mm thick Fiberglass Reinforced Polyester (FRP). (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. (iv) Protection Class IP: 55 min. for indoor & IP-65 min for outdoor applications. (v) Grounding To be provided. (vi) Color RAL 7035		
11.00.00	CONDUITS AND CABLE TRAYS TO BE PROVIDED AS PER STANDARD AND PROVEN PRACTISE OF CONTRACTOR.		
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-07 INSTRUMENTATION CABLES
			PAGE 6 OF 6

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

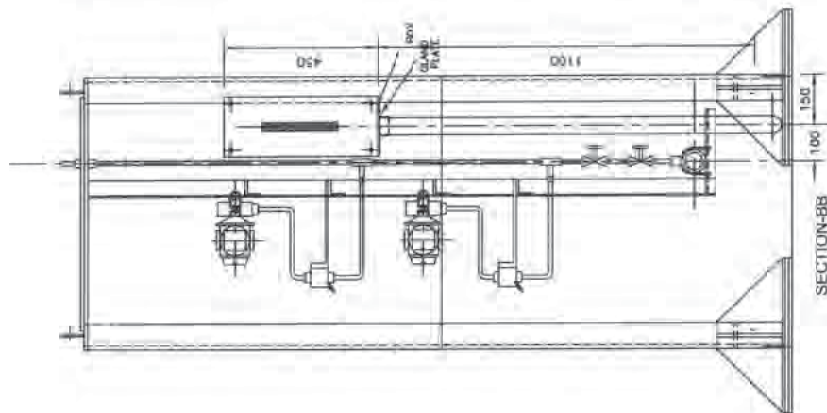
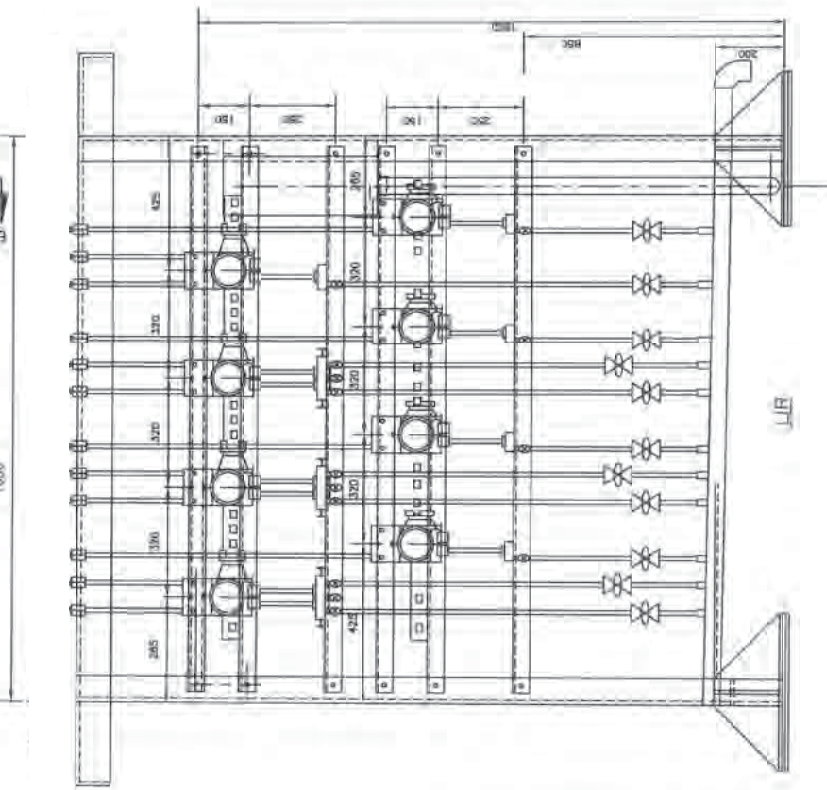
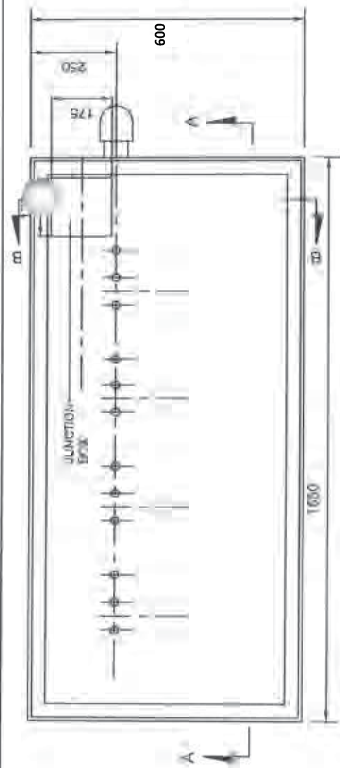


एन टी पी सी लिमिटेड
NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

INTERFACING OF ACTUATORS

[illegible]

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
The part of this document will be reproduced by any means without the written permission.



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

FOR TENDER PURPOSE ONLY

प्रतिष्ठान
NTPC

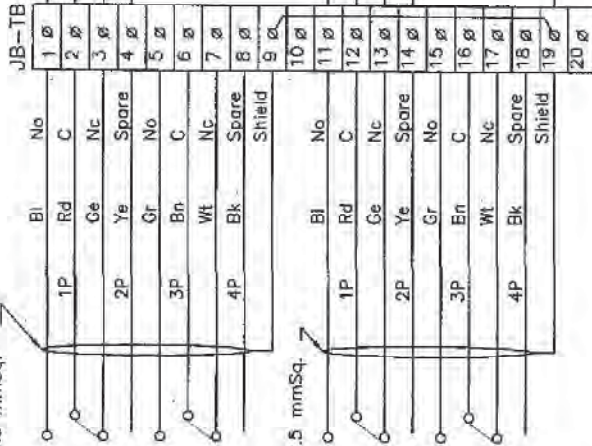
NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT									
TITLE		TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK									
REV. NO.	DATE	SCALE	DATE	SCALE	DATE	SCALE	DATE	SCALE	DATE	SCALE	DATE
A		A1		A1		A1		A1		A1	
0000-999-POI-A-064		0000-999-POI-A-064									
01-03-03		01-03-03									

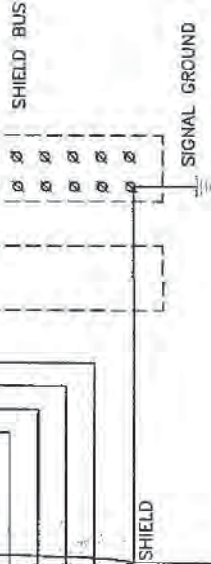
SECTION-AA
LIR WITHOUT PURGING

MARSHALLING/TERMINATION CUBICLE

4 PAIR, 0.5 mmSq.



4 PAIR, 0.5 mmSq.



FOR TENDER PURPOSE ONLY

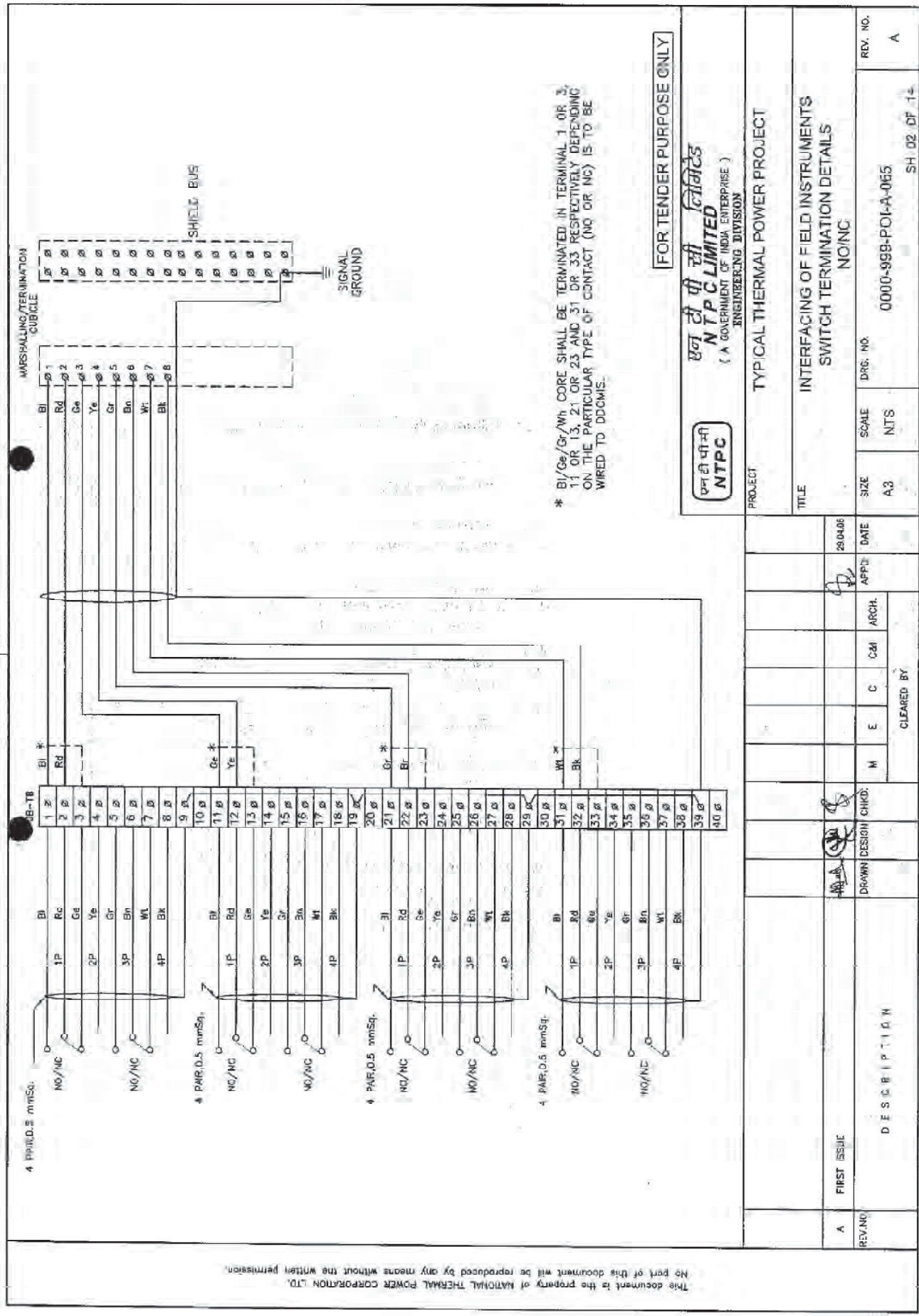
एन टी पी सी लिमिटेड
NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

एन टी पी सी
NTPC

PROJECT TYPICAL THERMAL POWER PROJECT

TITLE INTERFACING OF FIELD INSTRUMENTS/
SWGR SWITCH (COC) TERMINATION DETAILS

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
A	FIRST ISSUE										29.04.08	A3	NTS	0000-999-POI-A-065	A
														SH 01 OF 14	



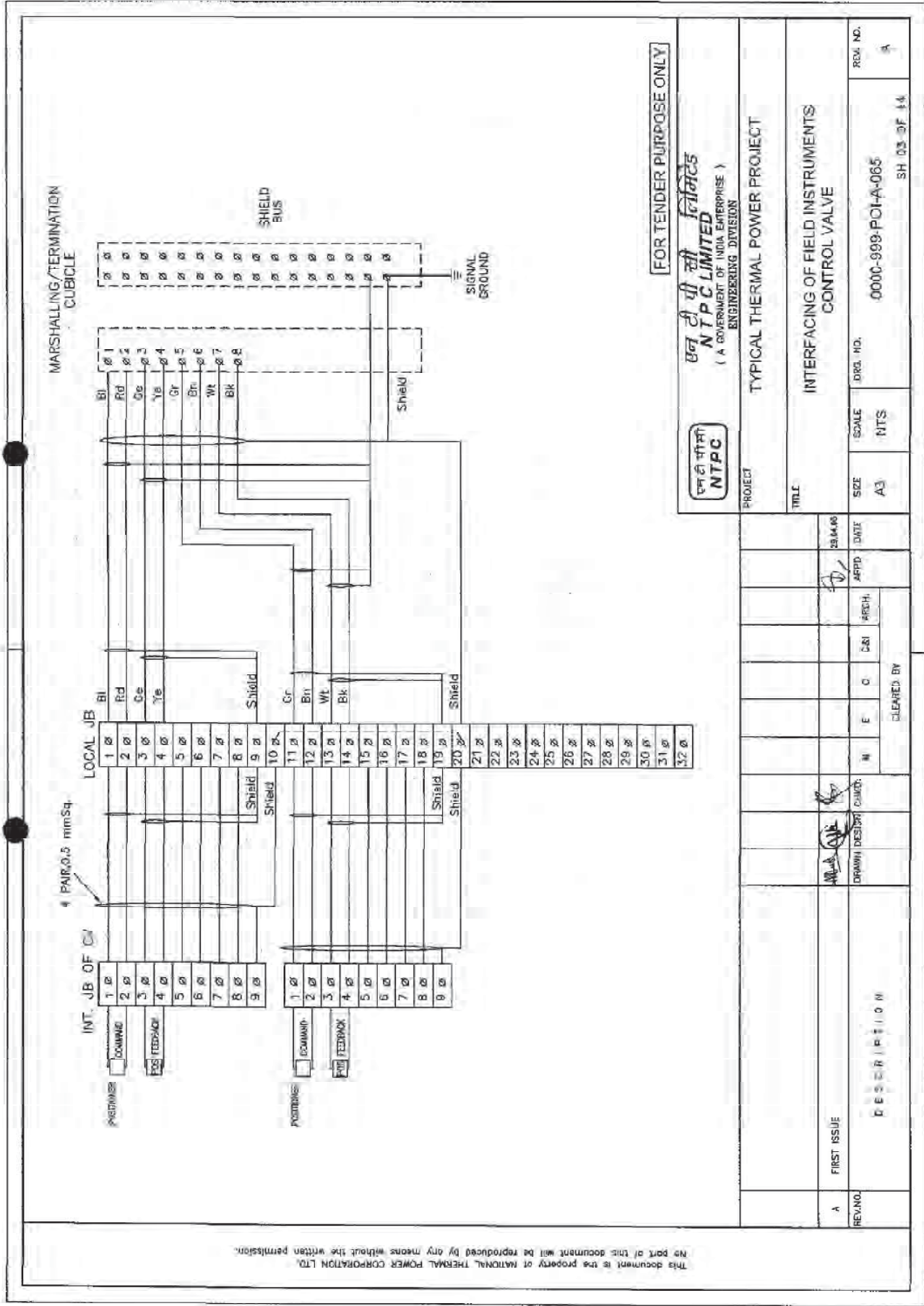
FOR TENDER PURPOSE ONLY

एन टी पी सी लिमिटेड
NTPC LIMITED
 (A GOVERNMENT OF INDIA ENTERPRISE)
 ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF FIELD INSTRUMENT'S SWITCH TERMINATION DETAILS	
NO/NC		NO/NC	
SIZE	SCALE	DRG. NO.	REV. NO.
A3	NTS	0000-999-P01-A-065	A
		SH. 02 OF 14	

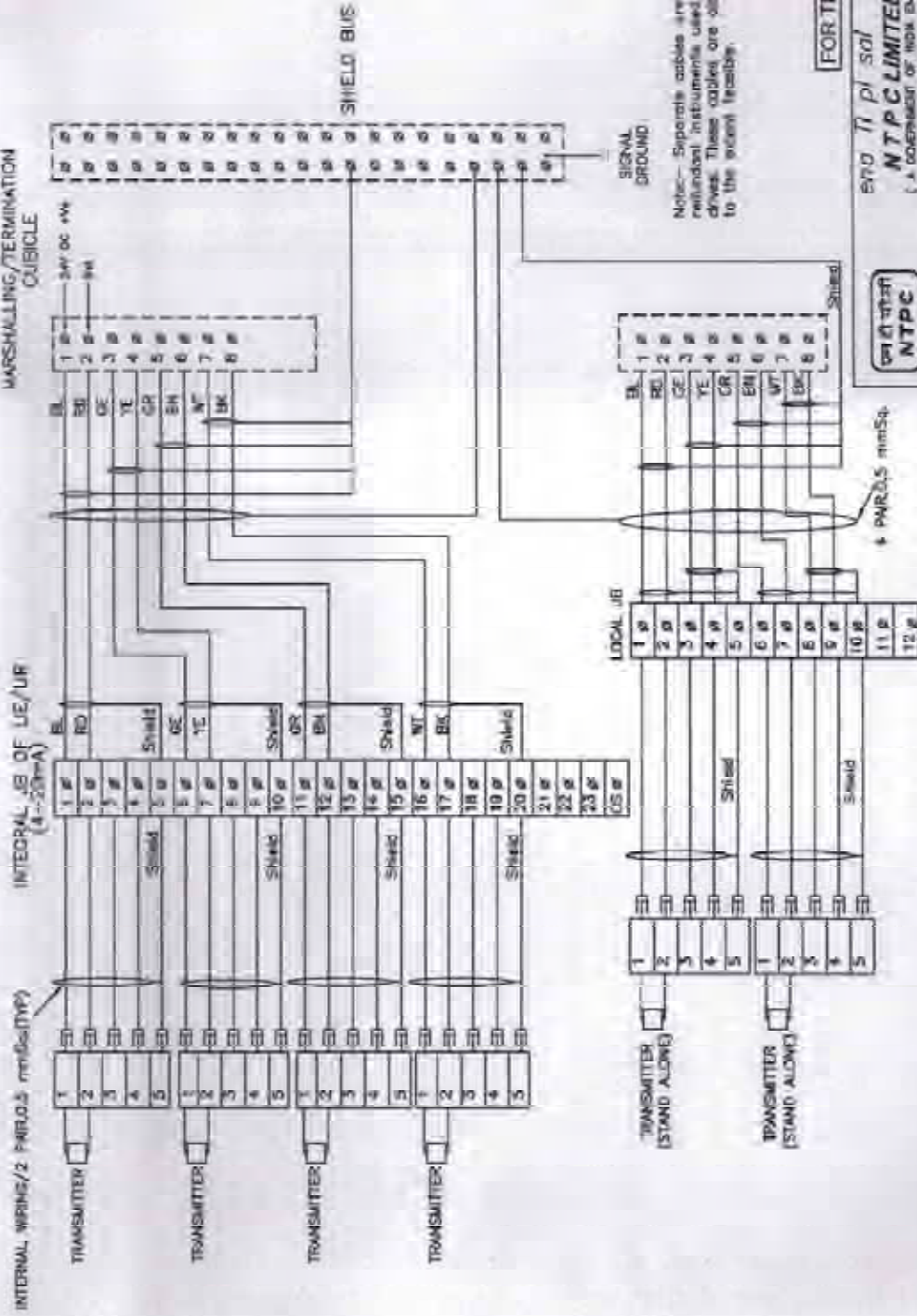
A	FIRST ISSUE	DRAWN	DESIGN	CHKD:	DATE	200408
DESCRIPTION						
CLEARED BY						
M E C CM ARCH.						
APPR: 						

The document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.



This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

The document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
 No part of this document will be reproduced by any means without the written permission.



FOR TENDER PURPOSE ONLY

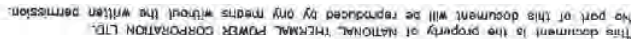
END IN P/SAL Islamabad

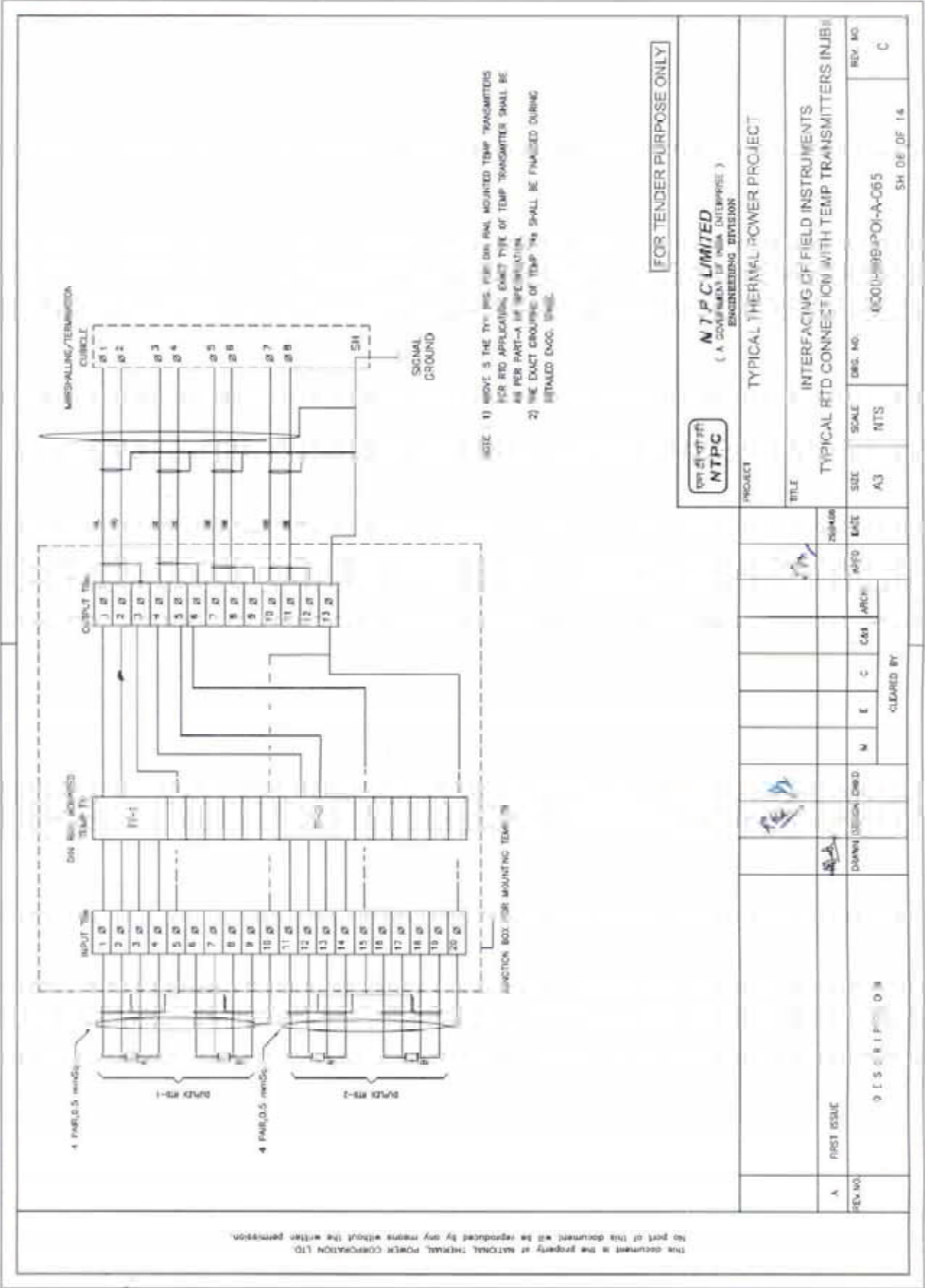
NTPC LIMITED

(A GOVERNMENT OF INDIA ENTERPRISE)

ENGINEERING DIVISION

REV. NO.	C										REV. NO.		SH 04 OF 14										
	D E E E B P T I O N										0000-999-POI-P-085												
	DRAWN DESIGN CHECK										SIZE A3			Dwg. No.									
	PROJECT										NTS			0000-999-POI-P-085									
TYPICAL THERMAL POWER PROJECT																							
INTERFACING OF FIELD INSTRUMENTS																							
6-20mA																							
TITLE																							
PROJECT																							
DATE 10/12/08																							
DATE 13/12/08																							
APPRO																							
CHECKED BY																							
C																							
E																							
F																							
G																							
H																							
I																							
J																							
K																							
L																							
M																							
N																							
O																							
P																							
Q																							
R																							
S																							
T																							
U																							
V																							
W																							
X																							
Y																							
Z																							
AA																							
AB																							
AC																							
AD																							
AE																							
AF																							
AG																							
AH																							
AI																							
AJ																							
AK																							
AL																							
AM																							
AN																							
AO																							
AP																							
AQ																							
AR																							
AS																							
AT																							
AU																							
AV																							
AW																							
AX																							
AY																							
AZ																							
BA																							
BB																							
BC																							
BD																							
BE																							
BF																							
BG																							
BH																							
BI																							
BJ																							
BK																							
BL																							
BM																							
BN																							
BO																							
BP																							
BQ																							
BR																							
BS																							
BT																							
BU																							
BV																							
BW																							
BX																							
BY																							
BZ																							
CA																							
CB																							
CC																							
CD																							
CE																							
CF																							
CG																							
CH																							
CI																							
CJ																							
CK																							
CL																							
CM																							
CN																							
CO																							
CP																							
CQ																							
CR																							
CS																							
CT																							
CU																							
CV																							
CW																							
CX																							
CY																							
CZ																							
DA																							
DB																							
DC																							
DD																							
DE																							
DF																							
DG																							
DH																							
DI																							
DJ																							
DK																							
DL																							
DM																							
DN																							
DO																							
DP																							
DQ																							
DR																							
DS																							
DT																							
DU																							
DV																							
DW																							
DX																							
DY																							
DZ																							
EA																							
EB																							
EC																							
ED																							
EE																							
EF																							
EG																							
EH																							
EI																							
EJ																							
EK																							
EL																							
EM																							
EN																							
EO																							
EP																							
EQ																							
ER																							
ES																							
ET																							
EU																							
EV																							
EW																							
EX																							
EY																							
EZ																							
FA																							
FB																							
FC																							
FD																							
FE																							
FF																							
FG																							
FH																							
FI																							
FJ																							
FK																							
FL																							
FM																							
FN																							
FO																							
FP																							
FQ																							
FR																							
FS																							
FT																							
FU																							
FV																							
FW																							
FX																							
FY																							
FZ																							
GA																							
GB																							
GC																							
GD																							
GE																							
GF																							
GG																							
GH																							
GI																							
GJ																							
GK																							
GL																							
GM																							
GN																							
GO																							
GP																							
GQ																							
GR																							
GS																							
GT																							
GU																							
GV																							
GW																							
GX																							
GY																							
GZ																							
HA																							
HB																							
HC																							
HD																							
HE																							
HF																							
HG																							
HH																							
HI																							
HJ																							
HK																							
HL																							
HM																							
HN																							
HO																							
HP																							
HQ																							
HR																							
HS																							
HT																							
HU																							
HV																							
HW																							
HX																							
HY																							
HZ																							
IA																							
IB																							
IC																							
ID																							
IE																							
IF																							
IG																							
IH																							
II																							
IJ																							
IK																							
IL																							
IM																							
IN																							
IO																							
IP																							
IQ																							
IR																							
IS																							
IT																							
IU																							
IV																							
IW																							
IX																							
IY																							
IZ																							
JA																							
JB																							
JC																							
JD																							
JE																							
JF																							
JG																							
JH																							
JI																							
JJ																							
JK																							
JL																							
JM																							
JN																							
JO																							
JP																							
JQ																							
JR																							
JS																							
JT																							
JU																							
JV																							
JW																							
JX																							
JY																							
JZ																							
KA																							
KB																							
KC																							
KD																							
KE																							
KF																							
KG																							
KH																							
KI																							
KJ																							
KK																							
KL																							
KM																							
KN																							
KO																							
KP																							
KQ																							
KR																							
KS																							
KT																							
KU																							
KV																							
KW																							
KX																							
KY																							
KZ																							
LA																							
LB																							
LC																							
LD																							
LE																							
LF																							
LG																							
LH																							
LI																							
LJ																							
LK																							
LL																							
LM																							
LN																							
LO																							
LP																							
LQ																							
LR																							
LS																							
LT																							
LU																							
LV																							
LW																							
LX																							
LY																							
LZ																							
MA																							
MB																							
MC																							
MD																							
ME																							
MF																							
MG																							
MH																							
MI																							
MJ																							
MK																							
ML																							
MM																							
MN																							
MO																							
MP																							
MQ																							
MR																							
MS																							
MT																							
MU																							
MV																							
MW																							
MX																							
MY																							
MZ																							
NA																							
NB																							
NC																							
ND																							
NE																							
NF																							
NG																							
NH																							
NI																							
NJ																							
NK																							
NL																							
NM																							
NN																							
NO																							
NP																							
NQ																							
NR																							
NS																							
NT																							
NU																							
NV																							
NW																							
NX																							
NY																							
NZ																							
OA																							
OB																							
OC																							
OD																							
OE																							
OF																							
OG																							
OH																							
OI																							
OJ																							
OK																							
OL																							
OM																							
ON																							
OO																							
OP																							
OQ																							
OR																							
OS																							
OT																							
OU																							
OV																							
OW																							
OX																							
OY																							
OZ																							
PA																							
PB																							
PC																							
PD																							
PE																							
PF																							
PG																							
PH																							
PI																							
PJ																							
PK																							
PL																							
PM																							
PN																							
PO																							
PP																							
PQ																							
PR																							
PS																							
PT																							
PU																							
PV																							
PW																							
PX																							
PY																							
PZ																							
QA																							
QB																							
QC																							
QD																							
QE																							
QF																							
QG																							
QH																							
QI																							
QJ																							
QK																							
QL																							
QM																							
QN																							
QO																							
QP																							
QQ																							
QR																							
QS																							
QT																							
QU																							
QV																							
QW																							
QX																							
QY																							
QZ																							
RA																							
RB																							
RC																							
RD																							
RE																							
RF																							
RG																							
RH																							
RI																							
RJ																							
RK																							
RL																							
RM																							
RN																							
RO																							
RP																							
RQ																							
RR																							
RS																							
RT																							
RU																							
RV																							
RW																							
RX																							
RY																							
RZ																							
SA																							
SB																							
SC																							
SD																							
SE																							
SF																							
SG																							
SH																							
SI																							
SJ																							
SK																							
SL																							
SM																							
SN																							
SO																							
SP																							
SQ																							
SR																							
SS																							
ST																							
SU																							
SV																							
SW																							
SX																							
SY																							
SZ																							
TA																							
TB																							
TC																							
TD																							
TE																							
TF																							
TG																							
TH																							
TI																							
TJ																							
TK																							
TL																							
TM																							
TN																							
TO																							
TP																							
TQ																							
TR																							
TS																							
TT																							
TU																							
TV																							
TW																							
TX																							
TY																							
TZ																							
UA																							
UB																							
UC																							
UD																							
UE																							
UF																							
UG																							
UH																							
UI																							
UJ																							
UK																							
UL																							
UM																							
UN																							
UO																							
UP																							
UQ																							
UR																							
US																							
UT																							
UU																							
UV																							
UW																							
UX																							
UY																							
UZ																							
VA																							
VB																							
VC																							
VD																							
VE																							
VF																							
VG																							
VH																							
VI																							
VJ																							
VK																							
VL																							
VM																							
VN																							
VO																							
VP																							
VQ																							
VR																							
VS																							
VT																							
VU																							
VV																							
VW																							
VX																							
VY																							
VZ																							
WA																							
WB																							
WC																							
WD																							
WE																							
WF																							
WG																							
WH																							
WI																							
WJ																							
WK																							
WL																							
WM																							
WN																							
WO																							
WP																							
WQ																							
WR																							
WS																							
WT																							
WU																							
WV																							
WW																							
WX																							
WY																							
WZ																							
XA																							
XB																							
XC																							
XD																							
XE																							
XF																							
XG																							
XH																							
XI																							
XJ																							
XK																							
XL																							
XM																							
XN																							
XO																							
XP																							
XQ																							
XR																							
XS																							
XT																							
XU																							
XV																							
XW																							
XX																							
XY																							
XZ																							
YA																							
YB																							
YC																							
YD																							
YE																							
YF																							
YG																							
YH																							
YI																							
YJ																							
YK																							
YL																							
YM																							
YN																							
YO																							
YP																							
YQ																							
YR																							
YS																							
YT																							
YU																							
YV																							
YW																							
YX																							
YY																							
YZ																							
ZA																							
ZB																							
ZC																							
ZD																							
ZE																							
ZF																							
ZG																							
ZH																							
ZI																							
ZJ																							
ZK																							
ZL																							
ZM																							
ZN																							
ZO																							
ZP																							
ZQ																							
ZR																							
ZS																							
ZT																							
ZU																							
ZV																							
ZW																							
ZX																							
ZY																							
ZZ																							





This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

Marshalling/ Termination Cubicle POST-A

02	BLUE	COMMON	NO	OPEN LS	1st SOV
04	RED	COMMON	NO	CLOSE LS	1st SOV
06	GREY	COMMON	NO	OPEN LS	2nd SOV
08	YELLOW	COMMON	NO	CLOSE LS	2nd SOV
10	GREEN	COMMON	NO	OPEN LS	2nd SOV
12	BROWN	COMMON	NO	CLOSE LS	2nd SOV
14	WHITE	COMMON	NO	OPEN LS	2nd SOV
16	BLACK	COMMON	NO	CLOSE LS	2nd SOV

SIGNAL GROUND

MULTI PAIR, 0.5 Sq. mm

Marshalling/ Termination Cubicle POST-B

01	BLUE	RELAY PANEL	P1	1st SOV
04	RED	RELAY PANEL	P2	2nd SOV
06	GREY	RELAY PANEL	P3	3rd SOV
08	YELLOW	RELAY PANEL	P4	4th SOV
10	GREEN	RELAY PANEL		
12	BROWN	RELAY PANEL		
14	WHITE	RELAY PANEL		
16	BLACK	RELAY PANEL		

SIGNAL GROUND

MULTI PAIR, 0.5 Sq. mm

1) * FEEDBACKS OF SOVs CAN BE GROUPED IN FIELD JB AND MULTI PAIR CABLE IS TO BE USED (INDIA 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.

PROJECT TYPICAL THERMAL POWER PROJECT

TITLE INTERFACING OF FIELD INSTRUMENTS
INTERFACE OF DDGMS WITH MCC/SWGR/ACTUATOR (SINGLE COIL SOLENOID)

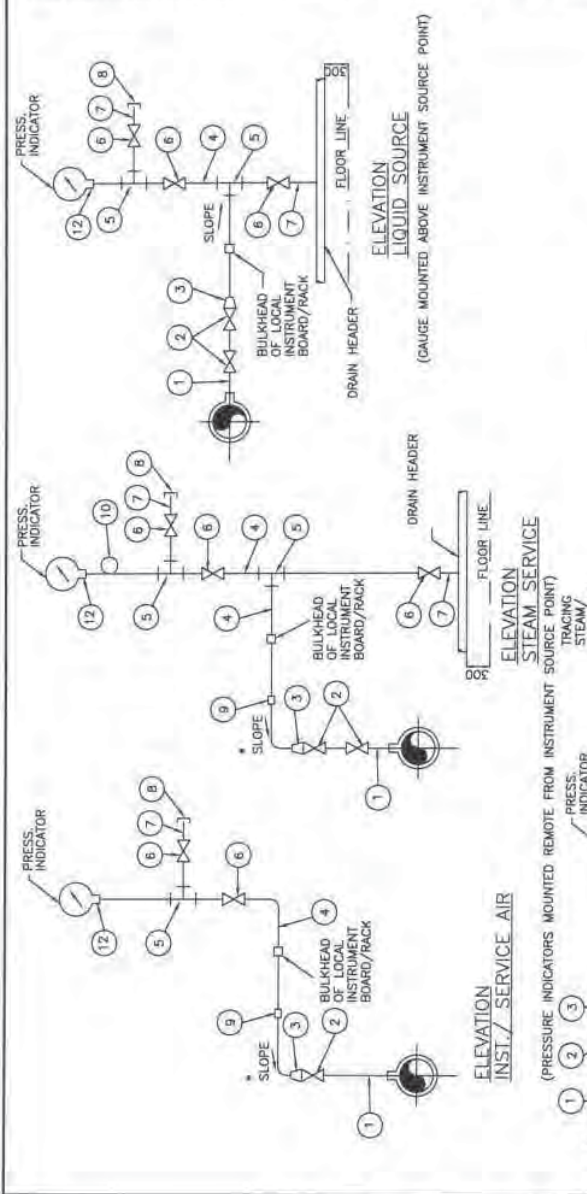
SIZE A3 **SCALE** NTS **DRS. NO.** 00N0-999-FOI-A-065 **REV. NO.** C

DATE 30.10.22 **APPROV.** **DESIGN** **CHECK** **RELEASED BY**

DESCRIPTION

REV. NO. **DESCRIPTION** **DATE** **BY** **CHKD** **APPD** **REV**

LIST OF MATERIALS	
ITEM NO.	DESCRIPTION
1.	1/2" 3/4" 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(WATER ELEMENT)
17.	ISOLATION VALVE 316 SS 1/4" SW



- NOTES:-
1. THE MATERIAL SPECIFICATION AND SCHEDULE NO. OF IMPULSE PIPE & NIPPLE AS LISTED THEREIN SHALL BE AS PER TECHNICAL SPECIFICATIONS.
 2. THE CONNECTION DETAILING OF PIPING AS LISTED SHALL BE AS PER TECHNICAL SPECIFICATIONS. WELDING SHALL BE AS PER TECHNICAL SPECIFICATIONS.
 3. INSTRUMENTS VALVES BODY STEM MATERIAL AND PRESSURE CLASS SHALL BE AS PER TECHNICAL SPECIFICATIONS.
 4. FOR BOILER AIR/FUE 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.

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INSTRUMENT INSTALLATION DIAGRAM (FOR PRESSURE GAUGE)	
REV. NO.	0000-999-POI-A-022	REV. NO.	A
SCALE	N.T.S.	SCALE	N.T.S.
SIZE	A3	SIZE	A3
DATE	21.08.12	DATE	21.08.12
APPD	T.G.	APPD	T.G.
CHKD.	M	CHKD.	M
ARCH.	E	ARCH.	E
Cleared by		Cleared by	
DESCRIPTION		DESCRIPTION	
FIRST ISSUE		FIRST ISSUE	

No part of this document will be reproduced by any means without the written permission.
This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.

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:—

1. SEE NOTES UNDER DRG. NO.0000-999-POI-A-022.
2. IMPULSE LINE DRAIN CONNECTIONS SHALL BE DONE AS PER TECHNICAL SPECIFICATIONS
3. THE SLOPE IN THE HORIZONTAL OF THE IMPULSE PIPE SHALL BE APPROX. 50 mm/mtr.
4. THE EXACT ORIENTATION OF THE TRANSMITTERS WITH RESPECT TO VALVE, MANIFOLDS ETC. WILL BE DETERMINED BY THE ENGINEERING KEEPING IN VIEW THE MANUFACTURER'S RECOMMENDATIONS.
5. 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 AIR HEADER WILL BE SUPPLIED THROUGH A 1/2" NB PURGE ROTAMETERS AS SHOWN IN DRG. NO. 0000-999-POI-A-034 TYPICALLY.

FOR TENDER PURPOSE ONLY

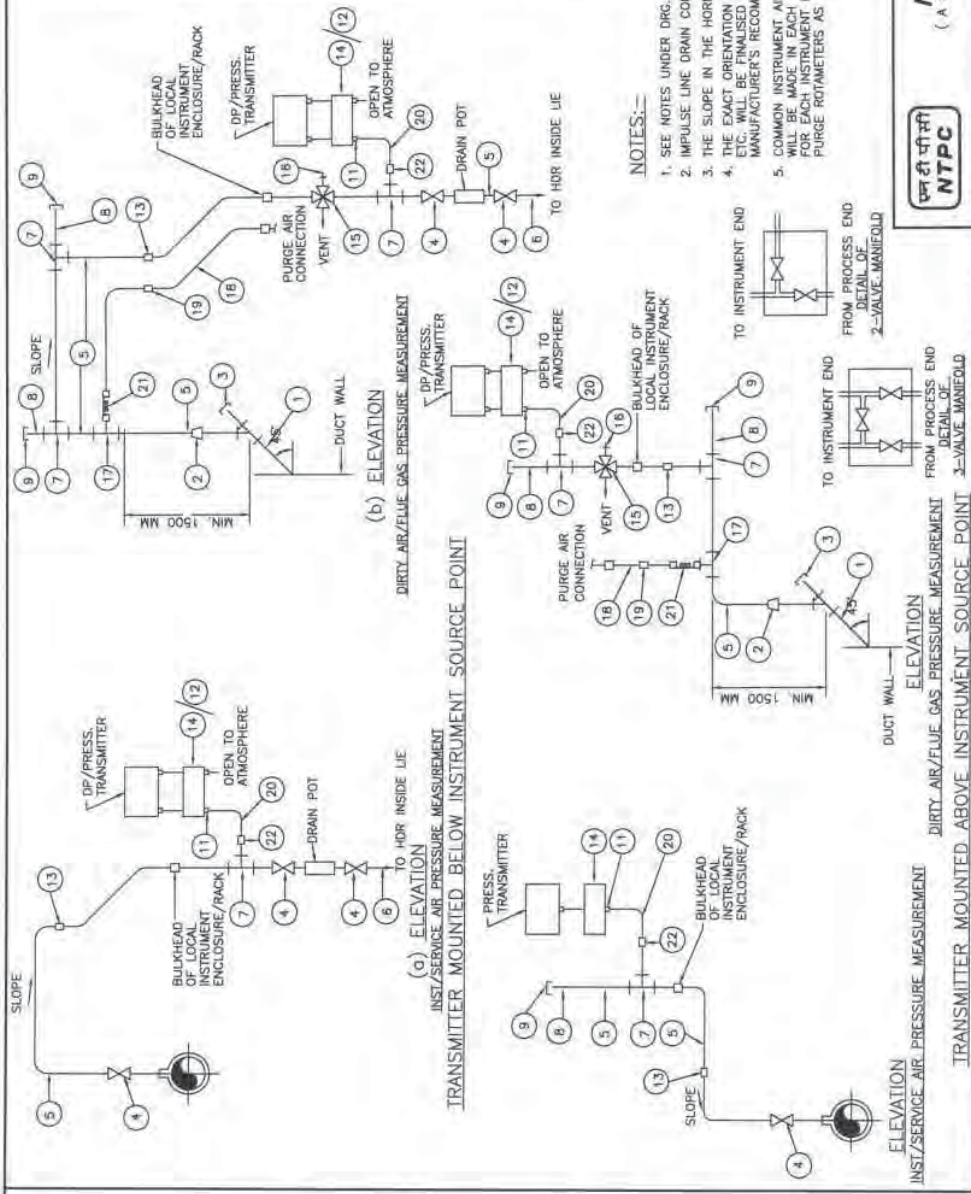


NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

TYPICAL THERMAL POWER PROJECT

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

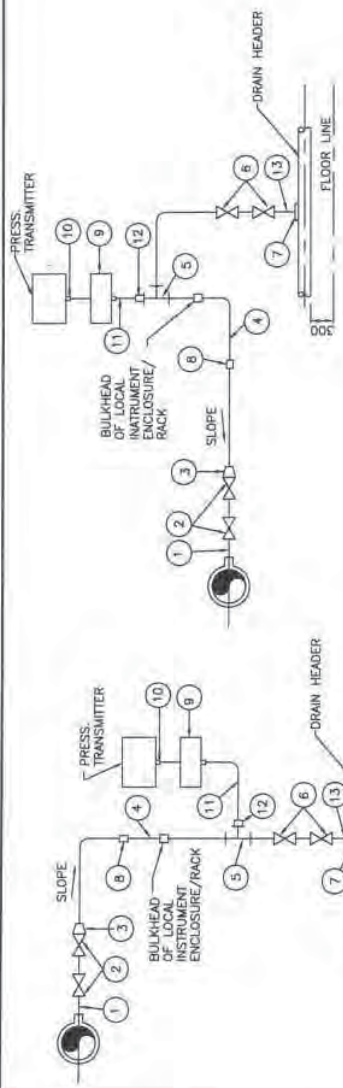
SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-023	A



REV. NO.	DESCRIPTION	DATE	APPD.	ARCH.	CHECKED BY
A	FIRST ISSUE	21.08.12	T.G.	C&I	

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

No part of this document will be reproduced by any means without the written permission.
This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.



LIST OF MATERIALS

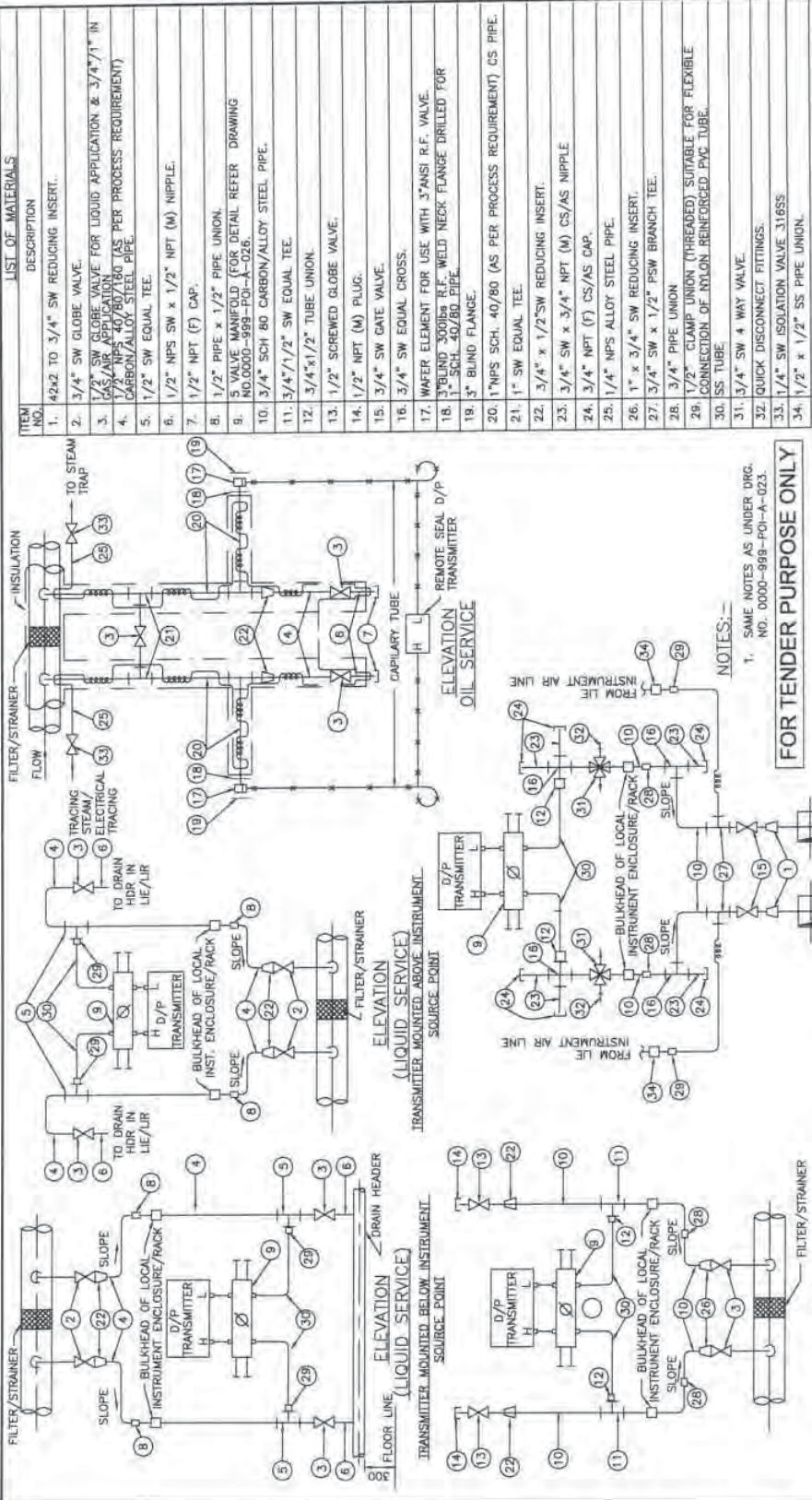
ITEM NO.	DESCRIPTION
1.	1/2" x 3/4" NPS SCH. 80/160 XXS/PM1 NIPPLE OF MATERIAL SAME AS THAT OF MAIN PIPE.
2.	3/4" x 1" SW GLOBE VALVE.
3.	3/4" x 1" TO 1/2" REDUCING INSERT
4.	1/2" NPS PIPE
5.	1/2" SW EQUAL TEE
6.	1/2" SW GLOBE VALVE
7.	1/2" NPS SCH. 80/160 SW x 1/2" CS/AS COUPLER
8.	1/2" PIPE UNION
9.	2/3 VALVE MANIFOLD (FOR DETAIL SEE DRAWING NO.0000-102-POI-A-023.
10.	SUITABLE ADAPTER
11.	SS TUBE
12.	1/2" PIPE x 1/2" TUBE UNION
13.	1/2" NPS SCH. 80/160 SW x 1/2" NPT(M) CS/AS NIPPLE

TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT
ELEVATION
LIQUID PRESSURE MEASUREMENT
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT
ELEVATION
LIQUID PRESSURE MEASUREMENT

FOR TENDER PURPOSE ONLY



NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION



NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INSTRUMENT INSTALLATION DIAGRAM	
DIFF. PRESS. MEASUREMENT (LIQUID, OIL, AIR/GAS SERVICE)		REV. NO. A	
REV. NO.	DESCRIPTION	SIZE	SCALE
A	FIRST ISSUE	A3	N.T.S.
DRAWN DESIGN CHKD.		0000-999-POI-A-030	
T.G.		21.08.13	
Cleared By		APPD	
M		E	
C		CHK	
ARCH.		DATE	

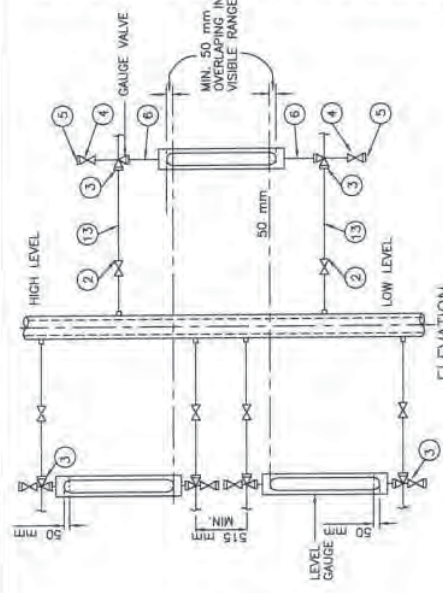
FOR TENDER PURPOSE ONLY

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

No part of this document will be reproduced by any means without the written permission of NATIONAL THERMAL POWER CORPORATION LTD.

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	3/4" 1" NPS SCH 40/80/160/PSI T&S PER PROCESS REQUIREMENT, CARBON / ALLOY STEEL PIPE.
2.	3/4" SW GLOBE VALVE.
3.	3/4" SW UNION.
4.	3/4" NPT GLOBE VALVE.
5.	3/4" NPT (M) CAP.
6.	3/4" NPT (F) UNION CONNECTION.
7.	1" SW EQUAL UNION.
8.	1" x 1/2" SW REDUCING INSERT.
9.	1" SW EQUAL TEE.
10.	1/2" SW GLOBE VALVE.
11.	1/2" NPS SW 1/2" NPT(M) CS/AS NIPPLE.
12.	1/2" NPT (F) CAP
13.	3/4"x1/2" NPS SCH 40/80 CS/AS PIPE.
14.	1/2" NPS SCH 80/160 CS/AS NIPPLE.
15.	1" SW GLOBE VALVE.

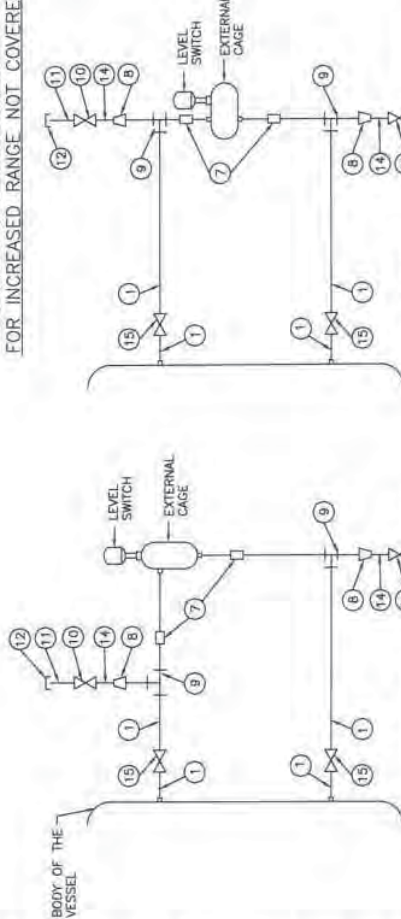


ELEVATION

LOCAL LEVEL INDICATION USING GAUGE GLASS

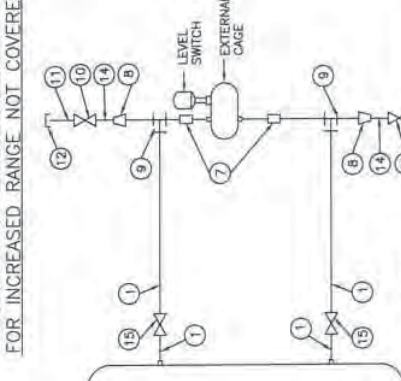
LOCAL LEVEL INDICATION USING MULTIPLE GAUGES

FOR INCREASED RANGE NOT COVERED IN A SINGLE UNIT



ELEVATION

FLOAT OR DISPLACER OPERATED EXTERNAL CAGE TYPE LEVEL SWITCH INSTALLATION



ELEVATION

FLOAT OR DISPLACER OPERATED EXTERNAL CAGE TYPE LEVEL SWITCH INSTALLATION

NOTES:-

1. FOR LEVEL GAUGE 3/4" AND FOR LEVEL SWITCH 1" PROCESS CONNECTION SHALL BE PROVIDED.
2. NOTES UNDER DRG. NO. 0000-999-POI-A-023 (WHICHEVER ARE RELEVANT).

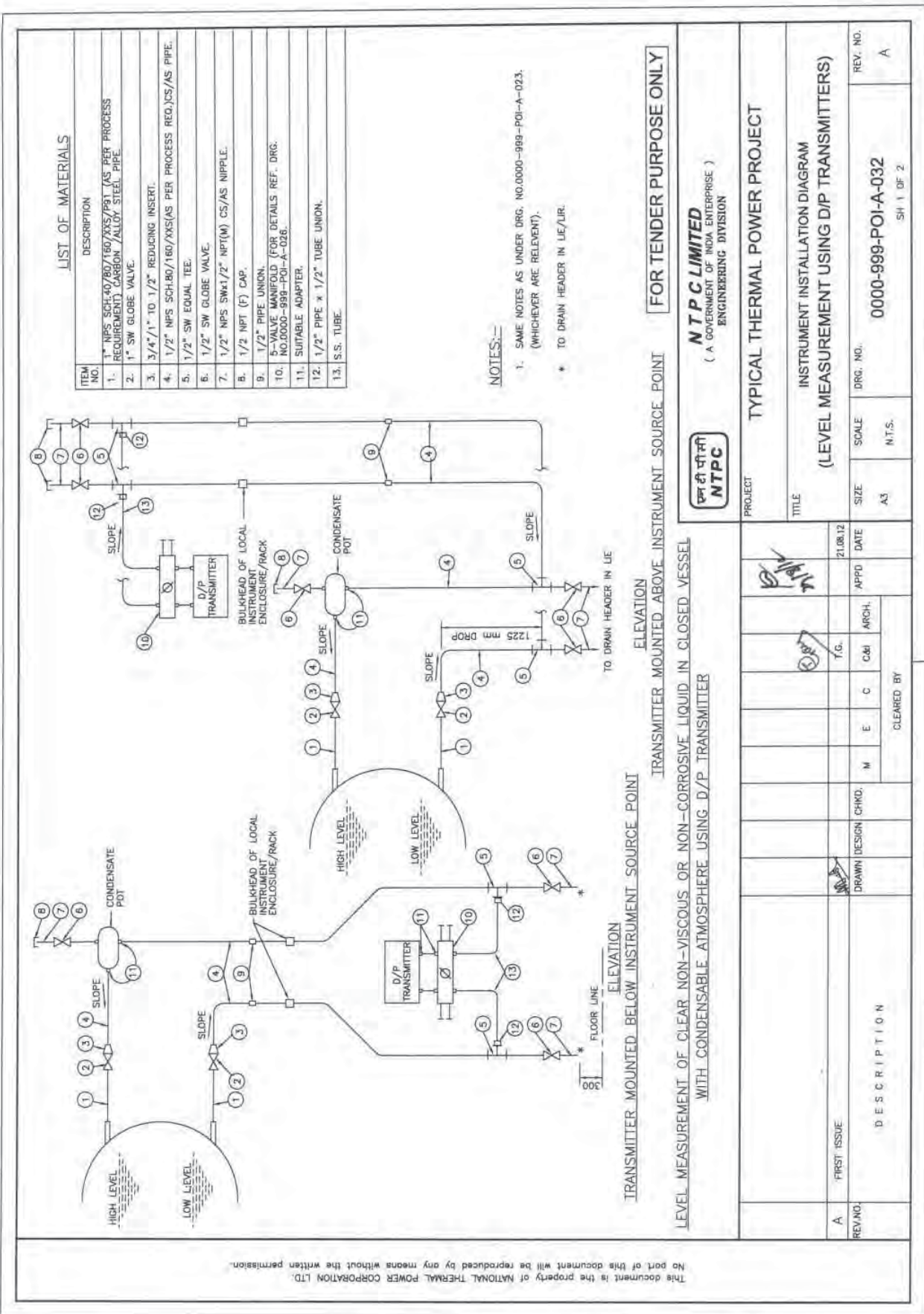
FOR TENDER PURPOSE ONLY



NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

TYPICAL THERMAL POWER PROJECT

PROJECT		TYPICAL THERMAL POWER PROJECT													
TITLE		INSTRUMENT INSTALLATION DIAGRAM (LEVEL GAUGE & SWITCHES)													
REV. NO.		SIZE		SCALE		DRG. NO.		REV. NO.		A		0000-999-POI-A-031			
A		A3		N.T.S.											
REV. NO.		DATE		APPD		F.G.		C&I		ARCH.		CLEARED BY			
A		21.08.12													
FIRST ISSUE															
DRAWN															
DESIGN															
CHKD.															
DESCRIPTION															

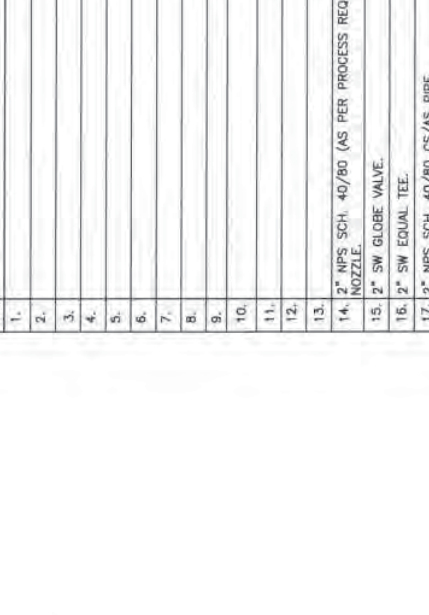


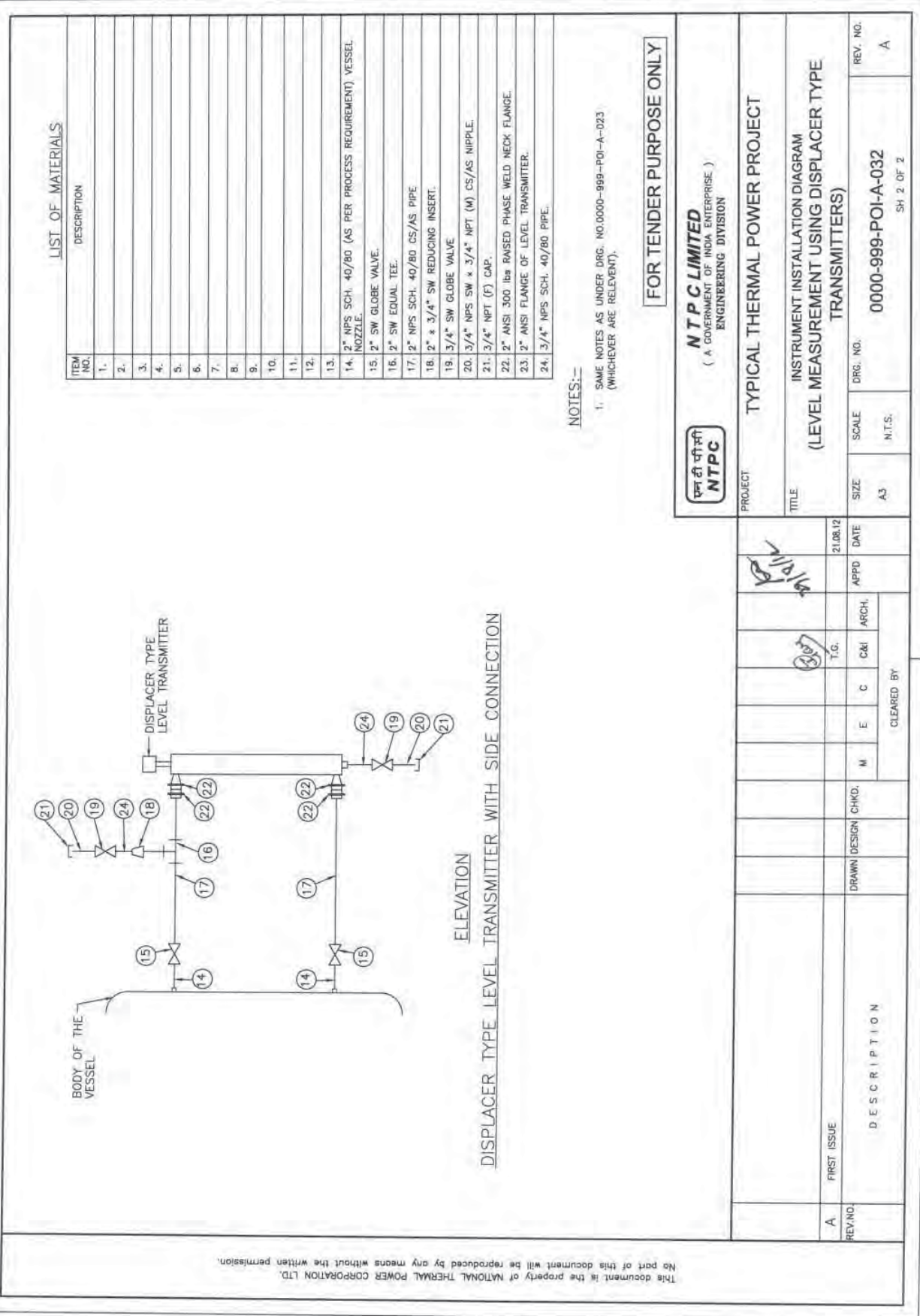
No part of this document is the property of NATIONAL THERMAL POWER CORPORATION LTD. This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT USING D/P TRANSMITTERS)	
REV. NO.	A	SCALE	DRG. NO.
		A3	0000-999-POI-A-032
		N.T.S.	SH 1 OF 2
DESCRIPTION		Cleared by	
DRAWN		CHKD.	
DESIGN		ARCH.	
DATE		APPD	
21.08.12		DATE	

LIST OF MATERIALS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">ITEM NO.</th> <th style="width: 95%;">DESCRIPTION</th> </tr> </thead> <tbody> <tr><td>1.</td><td></td></tr> <tr><td>2.</td><td></td></tr> <tr><td>3.</td><td></td></tr> <tr><td>4.</td><td></td></tr> <tr><td>5.</td><td></td></tr> <tr><td>6.</td><td></td></tr> <tr><td>7.</td><td></td></tr> <tr><td>8.</td><td></td></tr> <tr><td>9.</td><td></td></tr> <tr><td>10.</td><td></td></tr> <tr><td>11.</td><td></td></tr> <tr><td>12.</td><td></td></tr> <tr><td>13.</td><td></td></tr> <tr><td>14.</td><td>2" NPS SCH. 40/80 (AS PER PROCESS REQUIREMENT) VESSEL NOZZLE.</td></tr> <tr><td>15.</td><td>2" SW GLOBE VALVE.</td></tr> <tr><td>16.</td><td>2" SW EQUAL TEE.</td></tr> <tr><td>17.</td><td>2" NPS SCH. 40/80 CS/AS PIPE</td></tr> <tr><td>18.</td><td>2" x 3/4" SW REDUCING INSERT.</td></tr> <tr><td>19.</td><td>3/4" SW GLOBE VALVE</td></tr> <tr><td>20.</td><td>3/4" NPS SW x 3/4" NPT (M) CS/AS NIPPLE.</td></tr> <tr><td>21.</td><td>3/4" NPT (F) CAP.</td></tr> <tr><td>22.</td><td>2" ANSI 300 lbs RAISED PHASE WELD NECK FLANGE.</td></tr> <tr><td>23.</td><td>2" ANSI FLANGE OF LEVEL TRANSMITTER.</td></tr> <tr><td>24.</td><td>3/4" NPS SCH. 40/80 PIPE.</td></tr> </tbody> </table>						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.	ELEVATION  DISPLACER TYPE LEVEL TRANSMITTER WITH SIDE CONNECTION						NOTES:- SAME NOTES AS UNDER DRG. NO.0000-999-POI-A-023 (WHICHEVER ARE RELEVANT).					
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.																																																																		
FOR TENDER PURPOSE ONLY																																																																			
NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION																																																																			
TYPICAL THERMAL POWER PROJECT																																																																			
PROJECT TITLE INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT USING DISPLACER TYPE TRANSMITTERS)																																																																			
REV. NO. A		SCALE A3		DRG. NO. 0000-999-POI-A-032		REV. NO. A																																																													
DESCRIPTION		DRAWN DESIGN CHKD.		APPD DATE		ARCH.		CLEARED BY																																																											



LIST OF MATERIALS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>ITEM NO.</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr><td>1.</td><td></td></tr> <tr><td>2.</td><td></td></tr> <tr><td>3.</td><td></td></tr> <tr><td>4.</td><td></td></tr> <tr><td>5.</td><td></td></tr> <tr><td>6.</td><td></td></tr> <tr><td>7.</td><td></td></tr> <tr><td>8.</td><td></td></tr> <tr><td>9.</td><td></td></tr> <tr><td>10.</td><td></td></tr> <tr><td>11.</td><td></td></tr> <tr><td>12.</td><td></td></tr> <tr><td>13.</td><td></td></tr> <tr><td>14.</td><td>2" NPS SCH. 40/80 (AS PER PROCESS REQUIREMENT) VESSEL NOZZLE.</td></tr> <tr><td>15.</td><td>2" SW GLOBE VALVE.</td></tr> <tr><td>16.</td><td>2" SW EQUAL TEE.</td></tr> <tr><td>17.</td><td>2" NPS SCH. 40/80 CS/AS PIPE</td></tr> <tr><td>18.</td><td>2" x 3/4" SW REDUCING INSERT.</td></tr> <tr><td>19.</td><td>3/4" SW GLOBE VALVE</td></tr> <tr><td>20.</td><td>3/4" NPS SW x 3/4" NPT (M) CS/AS NIPPLE.</td></tr> <tr><td>21.</td><td>3/4" NPT (F) CAP.</td></tr> <tr><td>22.</td><td>2" ANSI 300 lbs RAISED PHASE WELD NECK FLANGE.</td></tr> <tr><td>23.</td><td>2" ANSI FLANGE OF LEVEL TRANSMITTER.</td></tr> <tr><td>24.</td><td>3/4" NPS SCH. 40/80 PIPE.</td></tr> </tbody> </table>						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.	ELEVATION DISPLACER TYPE LEVEL TRANSMITTER WITH SIDE CONNECTION						NOTES:- SAME NOTES AS UNDER DRG. NO.0000-999-POI-A-023 (WHICHEVER ARE RELEVANT).					
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.																																																																		
FOR TENDER PURPOSE ONLY																																																																			
NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION						TYPICAL THERMAL POWER PROJECT																																																													
PROJECT						TITLE																																																													
INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT USING DISPLACER TYPE TRANSMITTERS)						REV. NO. A																																																													
SCALE A3						DRG. NO. 0000-999-POI-A-032																																																													
SIZE A3						N.T.S. SH 2 OF 2																																																													

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

LIST OF MATERIALS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">ITEM NO.</th> <th style="width: 95%;">DESCRIPTION</th> </tr> </thead> <tbody> <tr><td>1.</td><td></td></tr> <tr><td>2.</td><td></td></tr> <tr><td>3.</td><td></td></tr> <tr><td>4.</td><td></td></tr> <tr><td>5.</td><td></td></tr> <tr><td>6.</td><td></td></tr> <tr><td>7.</td><td></td></tr> <tr><td>8.</td><td></td></tr> <tr><td>9.</td><td></td></tr> <tr><td>10.</td><td></td></tr> <tr><td>11.</td><td></td></tr> <tr><td>12.</td><td></td></tr> <tr><td>13.</td><td></td></tr> <tr><td>14.</td><td>2" NPS SCH. 40/80 (AS PER PROCESS REQUIREMENT) VESSEL NOZZLE.</td></tr> <tr><td>15.</td><td>2" SW GLOBE VALVE.</td></tr> <tr><td>16.</td><td>2" SW EQUAL TEE.</td></tr> <tr><td>17.</td><td>2" NPS SCH. 40/80 CS/AS PIPE</td></tr> <tr><td>18.</td><td>2" x 3/4" SW REDUCING INSERT.</td></tr> <tr><td>19.</td><td>3/4" SW GLOBE VALVE</td></tr> <tr><td>20.</td><td>3/4" NPS SW x 3/4" NPT (M) CS/AS NIPPLE.</td></tr> <tr><td>21.</td><td>3/4" NPT (F) CAP.</td></tr> <tr><td>22.</td><td>2" ANSI 300 lbs RAISED PHASE WELD NECK FLANGE.</td></tr> <tr><td>23.</td><td>2" ANSI FLANGE OF LEVEL TRANSMITTER.</td></tr> <tr><td>24.</td><td>3/4" NPS SCH. 40/80 PIPE.</td></tr> </tbody> </table>						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.	ELEVATION DISPLACER TYPE LEVEL TRANSMITTER WITH SIDE CONNECTION						NOTES:- SAME NOTES AS UNDER DRG. NO.0000-999-POI-A-023 (WHICHEVER ARE RELEVANT).					
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.																																																																		
FOR TENDER PURPOSE ONLY																																																																			
NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION						TYPICAL THERMAL POWER PROJECT																																																													
PROJECT						TITLE																																																													
INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT USING DISPLACER TYPE TRANSMITTERS)						0000-999-POI-A-032																																																													
SCALE						DWG. NO.																																																													
A3						M.T.S.																																																													
REV. NO.						SH 2 OF 2																																																													

LIST OF MATERIALS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">ITEM NO.</th> <th style="width: 95%;">DESCRIPTION</th> </tr> </thead> <tbody> <tr><td>1.</td><td></td></tr> <tr><td>2.</td><td></td></tr> <tr><td>3.</td><td></td></tr> <tr><td>4.</td><td></td></tr> <tr><td>5.</td><td></td></tr> <tr><td>6.</td><td></td></tr> <tr><td>7.</td><td></td></tr> <tr><td>8.</td><td></td></tr> <tr><td>9.</td><td></td></tr> <tr><td>10.</td><td></td></tr> <tr><td>11.</td><td></td></tr> <tr><td>12.</td><td></td></tr> <tr><td>13.</td><td></td></tr> <tr><td>14.</td><td>2" NPS SCH. 40/80 (AS PER PROCESS REQUIREMENT) VESSEL NOZZLE.</td></tr> <tr><td>15.</td><td>2" SW GLOBE VALVE.</td></tr> <tr><td>16.</td><td>2" SW EQUAL TEE.</td></tr> <tr><td>17.</td><td>2" NPS SCH. 40/80 CS/AS PIPE</td></tr> <tr><td>18.</td><td>2" x 3/4" SW REDUCING INSERT.</td></tr> <tr><td>19.</td><td>3/4" SW GLOBE VALVE</td></tr> <tr><td>20.</td><td>3/4" NPS SW x 3/4" NPT (M) CS/AS NIPPLE.</td></tr> <tr><td>21.</td><td>3/4" NPT (F) CAP.</td></tr> <tr><td>22.</td><td>2" ANSI 300 lbs RAISED PHASE WELD NECK FLANGE.</td></tr> <tr><td>23.</td><td>2" ANSI FLANGE OF LEVEL TRANSMITTER.</td></tr> <tr><td>24.</td><td>3/4" NPS SCH. 40/80 PIPE.</td></tr> </tbody> </table>						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.	ELEVATION DISPLACER TYPE LEVEL TRANSMITTER WITH SIDE CONNECTION						NOTES:— SAME NOTES AS UNDER DRG. NO.0000-999-POI-A-023 (WHICHEVER ARE RELEVANT).					
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.																																																																		
FOR TENDER PURPOSE ONLY																																																																			
NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION						TYPICAL THERMAL POWER PROJECT																																																													
PROJECT						TITLE																																																													
INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT USING DISPLACER TYPE TRANSMITTERS)						REV. NO.																																																													
SCALE						DWG. NO.																																																													
SIZE						M.T.S.																																																													
A3						0000-999-POI-A-032																																																													
SH 2 OF 2						A																																																													

LIST OF MATERIALS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>ITEM NO.</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr><td>1.</td><td></td></tr> <tr><td>2.</td><td></td></tr> <tr><td>3.</td><td></td></tr> <tr><td>4.</td><td></td></tr> <tr><td>5.</td><td></td></tr> <tr><td>6.</td><td></td></tr> <tr><td>7.</td><td></td></tr> <tr><td>8.</td><td></td></tr> <tr><td>9.</td><td></td></tr> <tr><td>10.</td><td></td></tr> <tr><td>11.</td><td></td></tr> <tr><td>12.</td><td></td></tr> <tr><td>13.</td><td></td></tr> <tr><td>14.</td><td>2" NPS SCH. 40/80 (AS PER PROCESS REQUIREMENT) VESSEL NOZZLE.</td></tr> <tr><td>15.</td><td>2" SW GLOBE VALVE.</td></tr> <tr><td>16.</td><td>2" SW EQUAL TEE.</td></tr> <tr><td>17.</td><td>2" NPS SCH. 40/80 CS/AS PIPE</td></tr> <tr><td>18.</td><td>2" x 3/4" SW REDUCING INSERT.</td></tr> <tr><td>19.</td><td>3/4" SW GLOBE VALVE</td></tr> <tr><td>20.</td><td>3/4" NPS SW x 3/4" NPT (M) CS/AS NIPPLE.</td></tr> <tr><td>21.</td><td>3/4" NPT (F) CAP.</td></tr> <tr><td>22.</td><td>2" ANSI 300 lbs RAISED PHASE WELD NECK FLANGE.</td></tr> <tr><td>23.</td><td>2" ANSI FLANGE OF LEVEL TRANSMITTER.</td></tr> <tr><td>24.</td><td>3/4" NPS SCH. 40/80 PIPE.</td></tr> </tbody> </table>						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.	ELEVATION DISPLACER TYPE LEVEL TRANSMITTER WITH SIDE CONNECTION						NOTES:- SAME NOTES AS UNDER DRG. NO.0000-999-POI-A-023 (WHICHEVER ARE RELEVANT).					
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.																																																																		
FOR TENDER PURPOSE ONLY																																																																			
NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION						TYPICAL THERMAL POWER PROJECT																																																													
PROJECT						TITLE																																																													
INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT USING DISPLACER TYPE TRANSMITTERS)						REV. NO. A																																																													
SCALE A3						DRG. NO. 0000-999-POI-A-032																																																													
SIZE A3						N.T.S. SH 2 OF 2																																																													

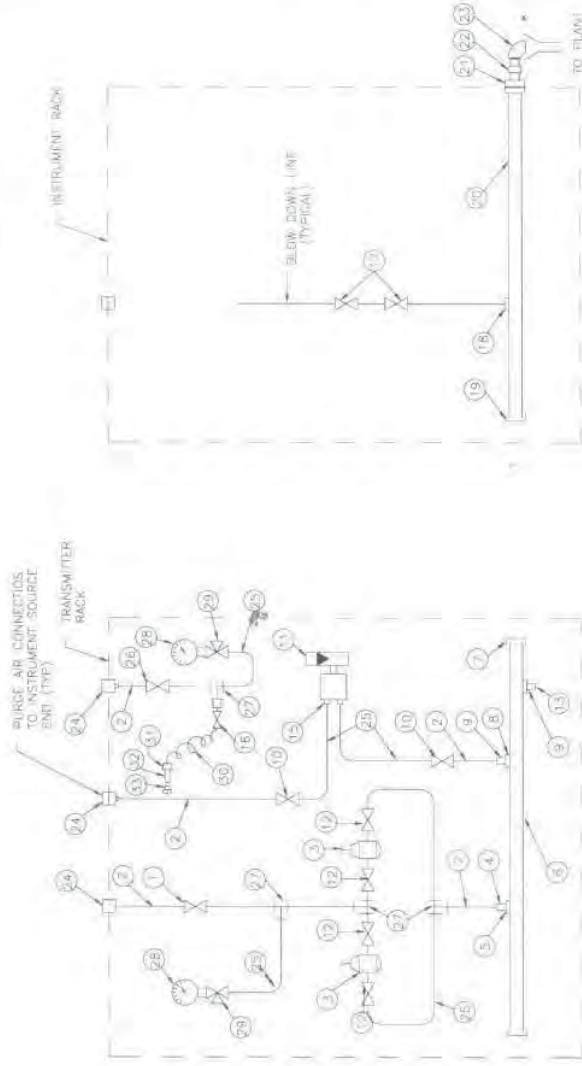
This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

[illegible]

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

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. NETTLE 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 WTS/SSM/EDME & 1/4" THER. AIR/FUEL GAS
18.	1/2" SW HALF COUPLER
19.	2" SW CAP SS.
20.	2" NB ASTM 105 DR. 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" SW x 1/2" NPT THREADED, SUITABLE FOR 50 PIPE CONNECTION
25.	1/2" 6.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" DIA. x 1/2" NPT HR. GAUGE
29.	1/2" SW x 1/2" NPT (F) PR. GAUGE VALVE SS.
30.	1/2" 10 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.



TYPICAL BLOW DOWN HEADER CONNECTION INSIDE THE INSTRUMENT RACK/ENCLOSURE

TYPICAL PURGE AIR CONNECTION INSIDE THE INST. ENCLOSURE (APPLICABLE FOR AIR & FUEL GAS SERVICE INSTRUMENTS REQUIRING PURGE AIR)

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/FUEL 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 STEAM/WATER. ALL ITEMS EXCEPT DRAIN POT TO BE PROVIDED.
3. 61 PIPES SHALL BE PROVIDED FOR PURGE AIR CONNECTION OUTSIDE I.E./L/R.

FOR TENDER PURPOSE ONLY



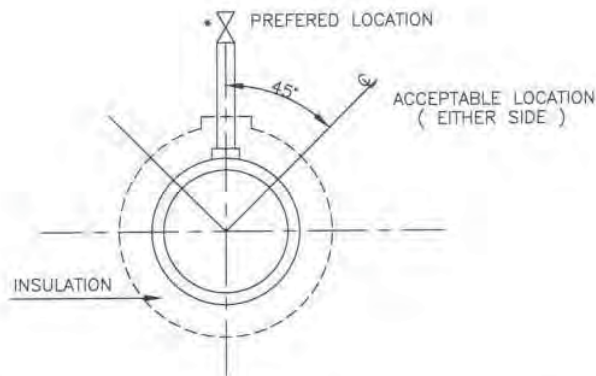
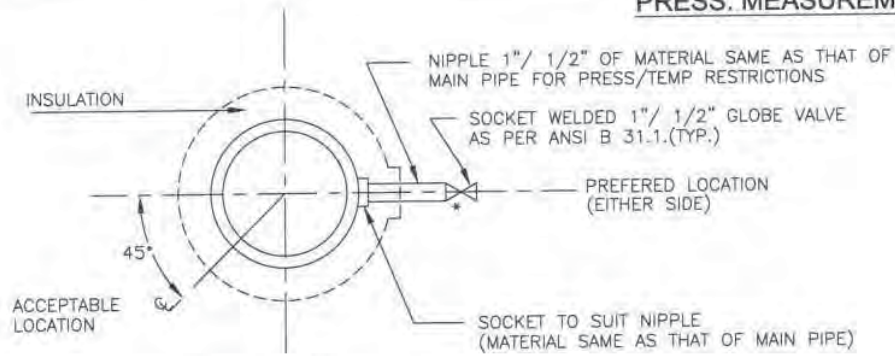
NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

ENGINEERING DIVISION

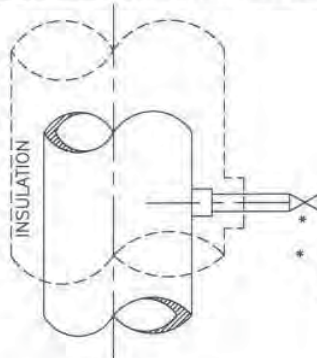
PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INSTRUMENT INSTALLATION DIAGRAM TYPICAL PURGE AIR CONNECTION & BLOWDOWN HEADER CONNECTION INSIDE INSTRUMENT RACK	
REV. NO.	3	DRG. NO.	0000-999-POI-A-034
SCALE	N.T.S.	SIZE	A3

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

PRESS. MEASUREMENT



PRESSURE CONNECTION ON HORIZONTAL PIPE



* USE DOUBLE ISOLATION VALVES FOR PRESSURE EQUAL TO OR EXCEEDING 40 Kg/Cm².

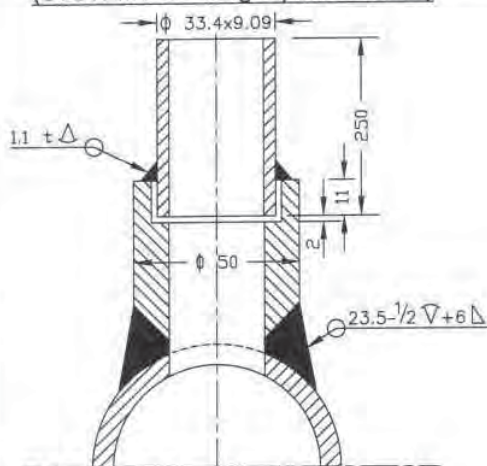
PRESSURE CONNECTIONS ON VERTICAL PIPES

FOR TENDER PURPOSE ONLY

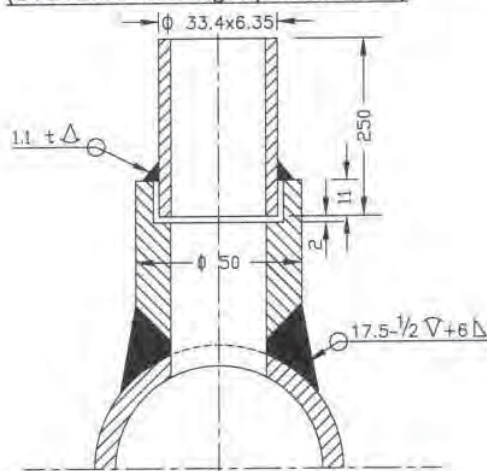
एन टी पी सी NTPC NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION									
PROJECT TYPICAL THERMAL POWER PROJECT									
TITLE INSTRUMENT SOURCE CONNECTION DETAILS									
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CAL	T.G.
A	FIRST ISSUE								
CHECKED BY DATE SIZE A4 SCALE N.T.S. DRG. NO. 0000-999-POI-A-035 REV. NO. A									

PRESSURE MEASUREMENT

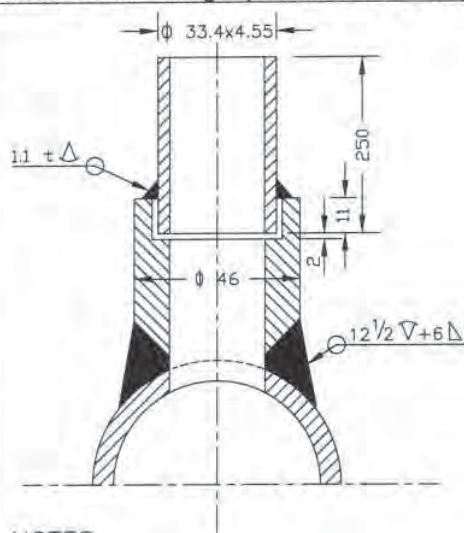
(SYSTEM PR. >40Kg/Sq Cm CL 9000)



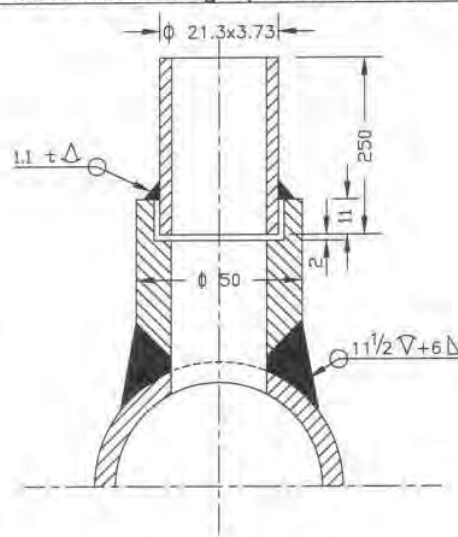
(SYSTEM PR. >40Kg/Sq Cm CL 6000)



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



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



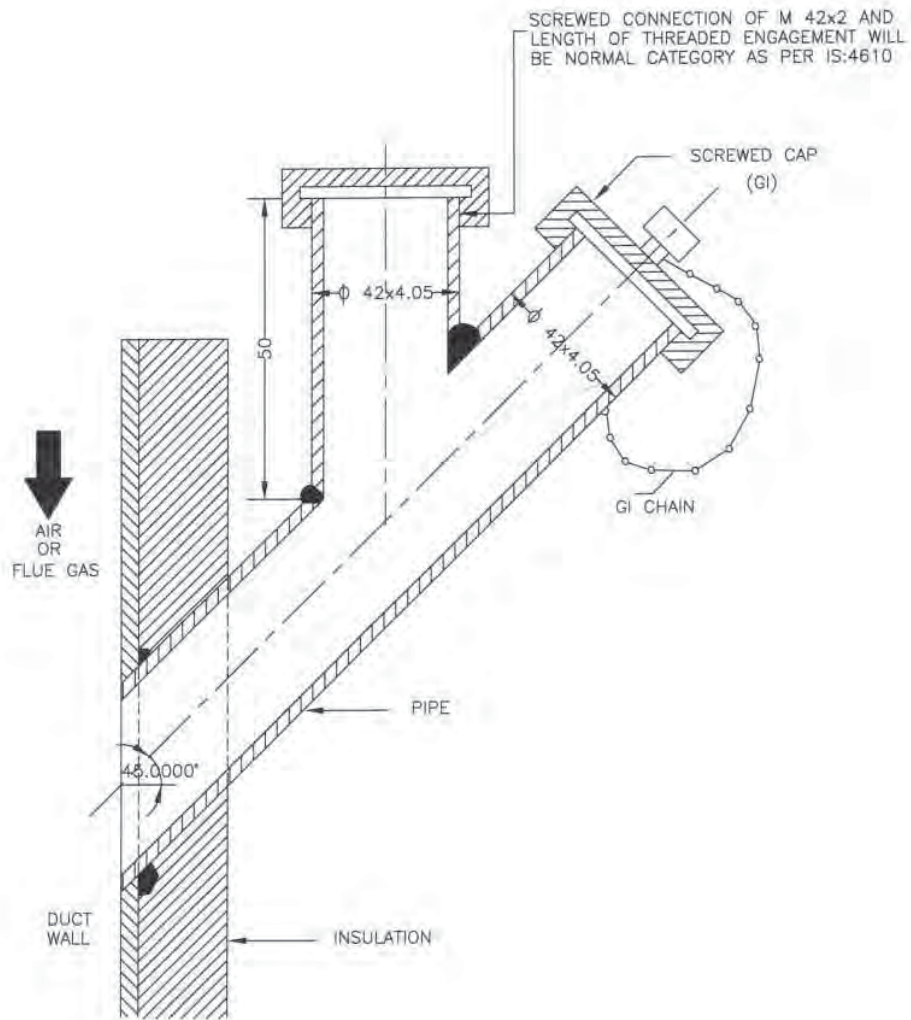
NOTES:-

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

एन टी सी NTPC NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION										
PROJECT TYPICAL THERMAL POWER PROJECT										
TITLE INSTRUMENT SOURCE CONNECTION DETAILS										
REV. NO.	DESCRIPTION	DRAWING DESIGN	CHKD.	W	E	C	DIT	ARCH.	APPR.	DATE
SIZE A4 SCALE N.T.S. DRG. NO. 0000-999-POI-A-035 REV. NO. A Sh-2 Of 14										

PRESS. MEASUREMENT



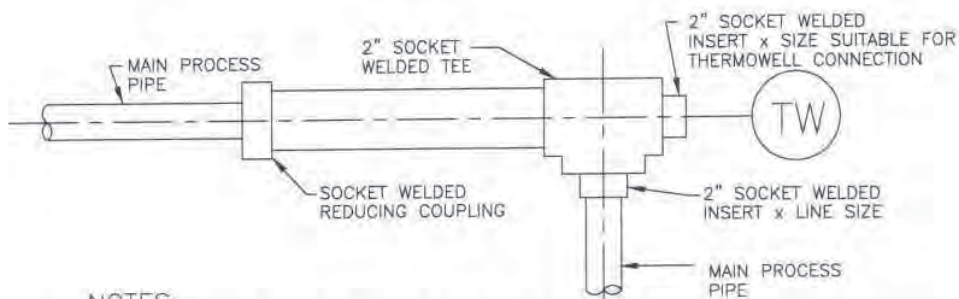
NOTES:-

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

FOR TENDER PURPOSE ONLY

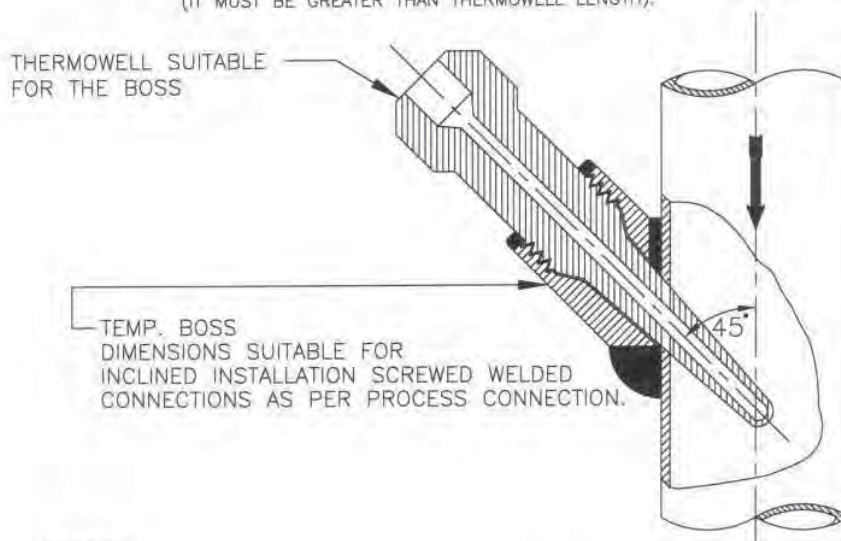
		NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION	
PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INSTRUMENT SOURCE CONNECTION DETAILS	
REV. NO.	DESCRIPTION	DRAWN DESIGNED CHKD. M E C D I ARCH. APPD. DATE 01.06.10 CLEARED BY	SIZE A4 SCALE N.T.S. DRG. NO. 0000-999-POI-A-035 Sh-3 of 14 REV. NO. A

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).



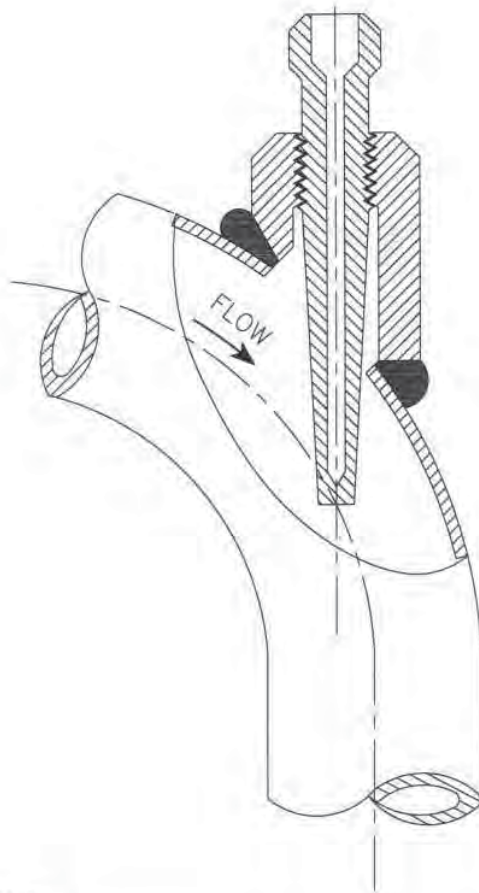
NOTES:-

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																																													
<table border="1" style="width: 100%;"> <tr> <td style="width: 15%;">REV. NO.</td> <td style="width: 35%;">DESCRIPTION</td> <td style="width: 10%;">DRAWN</td> <td style="width: 10%;">DESIGN</td> <td style="width: 10%;">CHKD.</td> <td style="width: 10%;">M</td> <td style="width: 10%;">E</td> <td style="width: 10%;">C</td> <td style="width: 10%;">CAT</td> <td style="width: 10%;">ARCH.</td> <td style="width: 10%;">APPO.</td> <td style="width: 10%;">DATE</td> </tr> <tr> <td>A</td> <td>FIRST ISSUE</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="12" style="text-align: center;">CLEARED BY</td> </tr> </table>										REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CAT	ARCH.	APPO.	DATE	A	FIRST ISSUE											CLEARED BY											
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CAT	ARCH.	APPO.	DATE																																		
A	FIRST ISSUE																																												
CLEARED BY																																													
SIZE: A4		SCALE: N.T.S.		DRG. NO.: 0000-999/102-POI-A-035		REV. NO.: A																																							

TEMP. MEASUREMENT



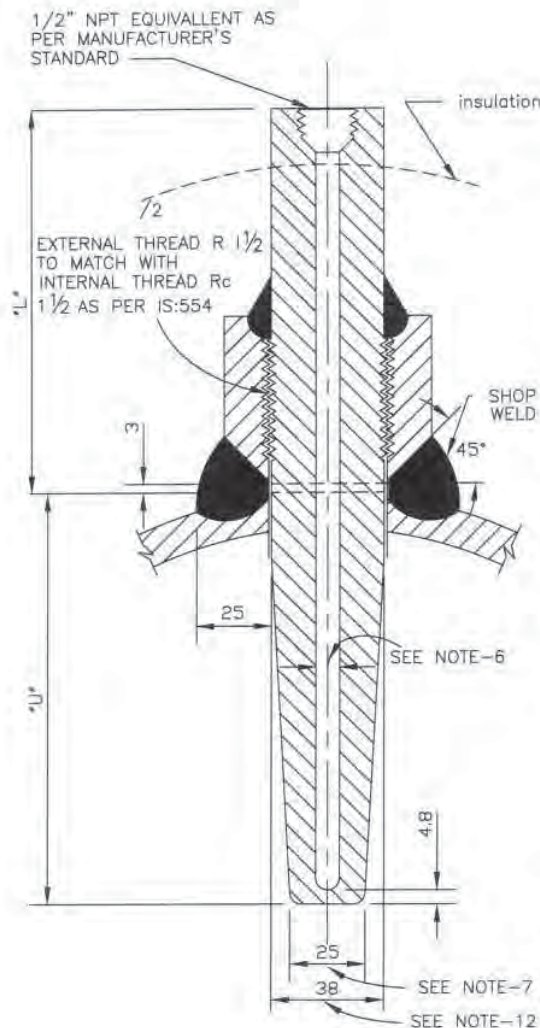
NOTES:-

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.

FOR TENDER PURPOSE ONLY

 NTPC NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION									
PROJECT TYPICAL THERMAL POWER PROJECT									
TITLE INSTRUMENT SOURCE CONNECTION DETAILS									
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	DATE	APPRO.
A	FIRST ISSUE								
Cleared by									
SIZE A4		SCALE N.T.S.		DRG. NO. 0000-999-POI-A-035		REV. NO. A		SH-5 OF 14	

TEMP. MEASUREMENT



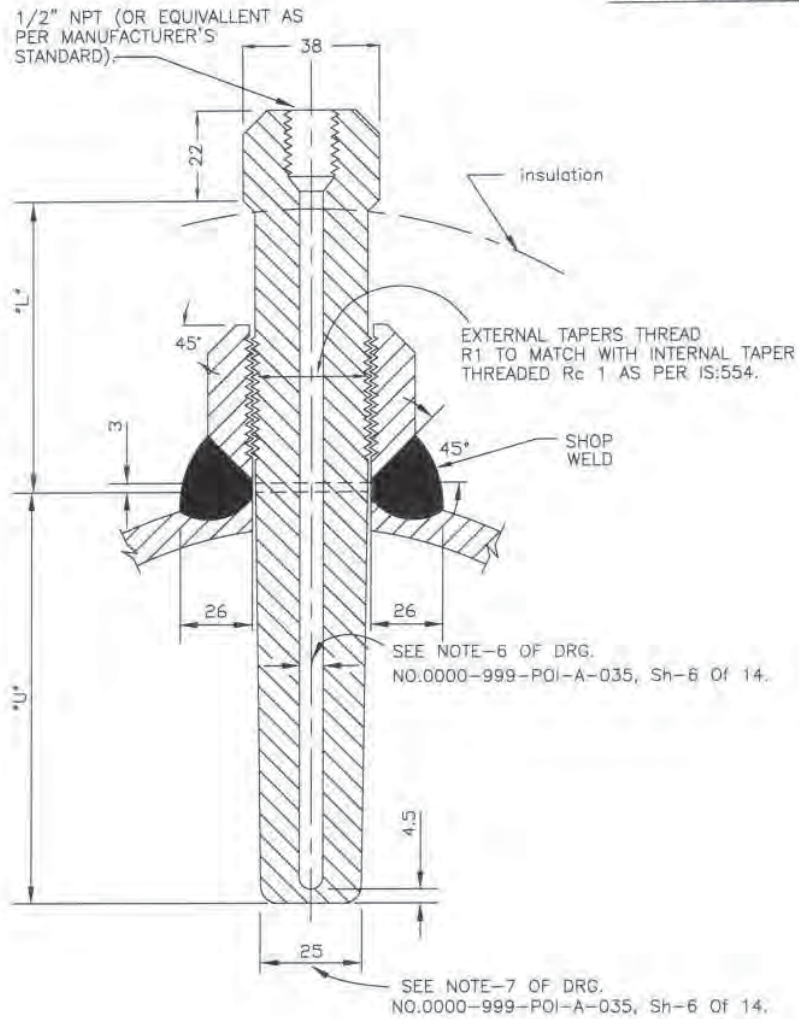
NOTES:-

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 SELECTED BASED ON PARTICULAR APPLICATION AND THE SAME SHALL BE SUBJECT TO OWNER'S APPROVAL DURING DETAILED ENGINEERING.
14. ALL 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	
REV. NO.	DESCRIPTION	DRAWN: [Signature] DESIGN: [Signature] CHKD: [Signature] N: [Signature] E: [Signature] C: [Signature] C&I: [Signature] ARCH: [Signature] APPD: [Signature] DATE: 21.08.18	SIZE: A4 SCALE: N.T.S. DRG. NO: 0000-999-POI-A-035 SH-6 OF 14 REV. NO: A

TEMP. MEASUREMENT



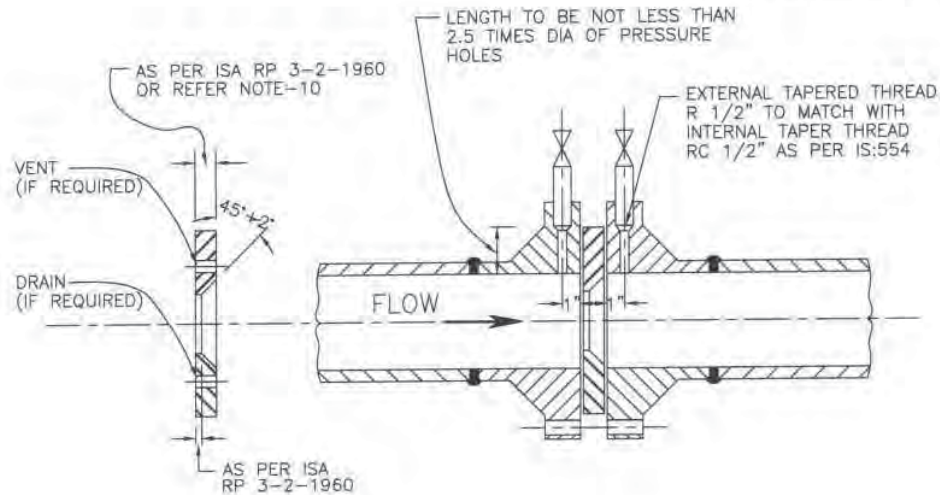
NOTES:-

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.

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 SOURCE CONNECTION DETAILS									
REV. NO. A	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	DATE	31.08.14
SIZE: A4 SCALE: N.T.S. DRG. NO. 0000-999-POI-A-035 Sh-7 Of 14 REV. NO. A									

FLOW MEASUREMENT



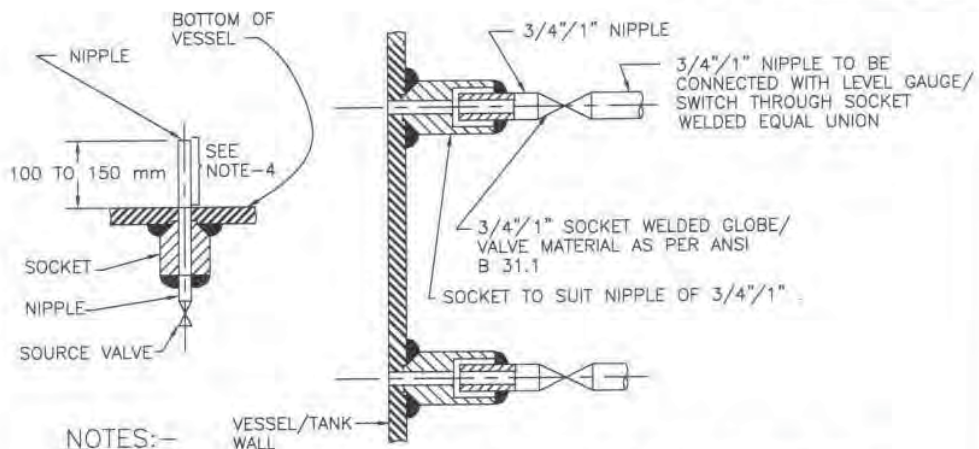
NOTES:-

- ORIFICE PLATE MOUNTED BETWEEN FLANGES WITH FLANGE TAPPING (AS SHOWN ABOVE) SHOULD BE LIMITED TO PIPE SIZES OF 2" OR LARGER.
- 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.
- 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.
- PIPING FLANGES SHALL BE ANSI WELD NECK, RAISED FACE TYPE. THE FLANGE IS TO BE ALIGNED WITH THE FACE PERPENDICULAR TO THE FLOW AXIS.
- BIDDER TO SUPPLY ORIFICE PLATE SPECIAL TYPE (HAVING PRESS. CONNECTIONS) OF FLANGES ALONG WITH GASKETS, NIPPLES AND SOURCE VALVES.
- 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.
- THE LOCATION OF PRESSURE TAPS MUST BE WITHIN 1.5 mm (1/16") OF THE DISTANCE SPECIFIED.
- 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.
- 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).
- 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.
- 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.
- ORIFICE PLATE SHOULD BE OF 316 SS (ASTM A167-54 GRADE-II).
- RECOMMENDED MINIMUM LENGTHS OF STRAIGHT PIPE PRECEDING AND FOLLOWING ORIFICES SHALL BE AS PER EN ISO 5167:2003.
- THREE PAIRS OF PRESSURE TAPS SHALL BE PROVIDED WITH NIPPLES OF REQUIRED LENGTH AND SOURCE VALVES AND THE UN-USED TAPS ARE PLUGGED.
- 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.

FOR TENDER PURPOSE ONLY

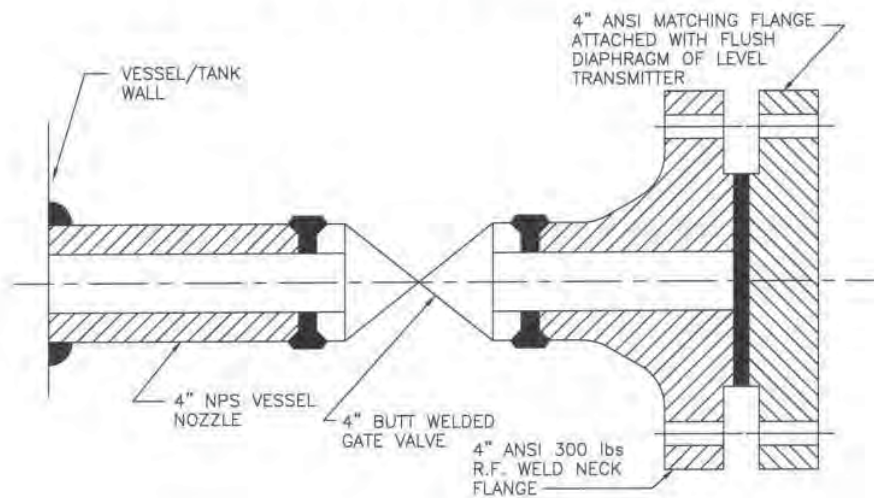
		 NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION	
PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INSTRUMENT SOURCE CONNECTION DETAILS	
REV. NO.	DESCRIPTION	SIZE	SCALE
A	FIRST ISSUE	A4	N.T.S.
DRAWN DESIGN CHD.		DRG. NO.	0000-999-POI-A-035
CHECKED BY		SH-12 OF 14	
APPROVED BY		REV. NO. A	

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.



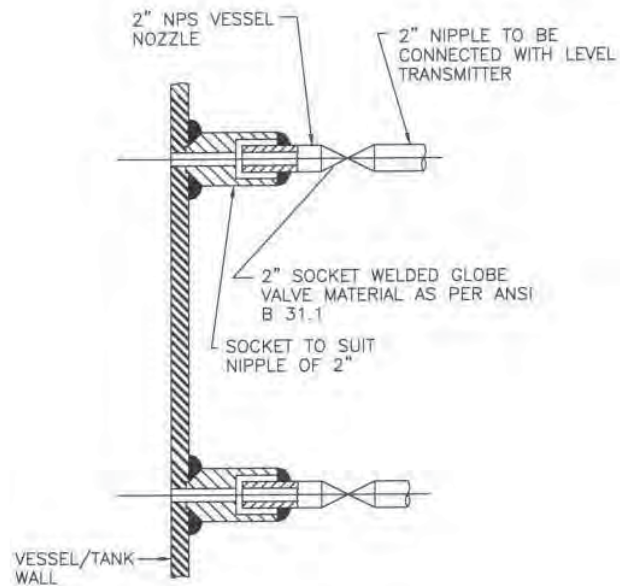
NOTES:-

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.

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 SOURCE CONNECTION DETAILS										
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHG.	M	E	C	CHK	APPR.	DATE
A	FIRST ISSUE									07.08.19
CLENED BY										
SIZE	A4	SCALE	N.T.S.	DRG. NO.	0000-999-POI-A-035			REV. NO.	A	
Sh-13 Of 14										

LEVEL MEASUREMENT

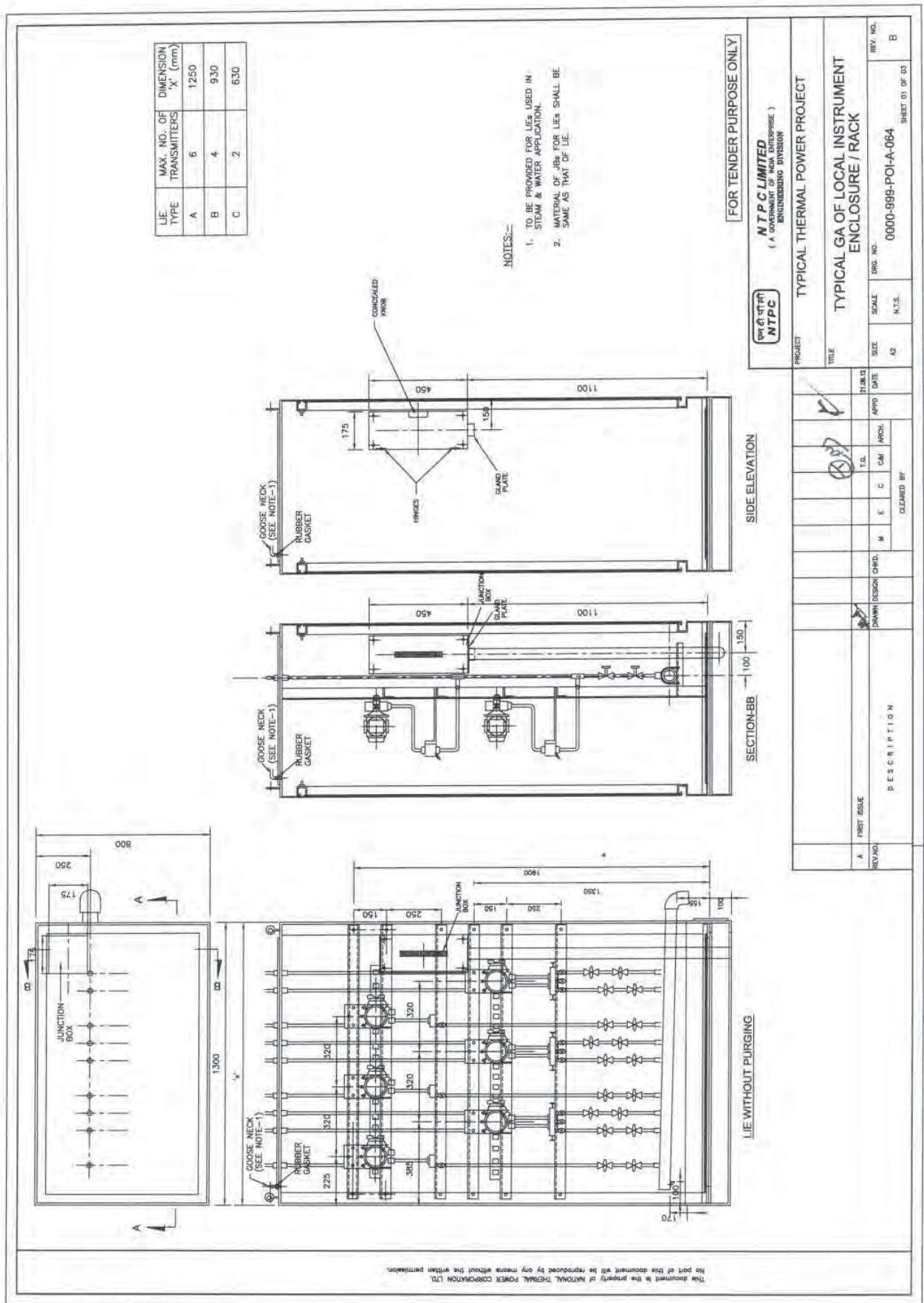


NOTES:-

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.

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 SOURCE CONNECTION DETAILS									
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	DATE	DATE
A	FIRST ISSUE							31.08.10	
Cleared By									
SIZE	SCALE	DRG. NO.	0000-999-POI-A-035				REV. NO.	A	
A4	N.T.S.					Sh-14 Of 14			



	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
		SECTION	D
		REV. NO. 03	DATE : 16-09-2013
		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.

	SPECIFICATION FOR LOCAL PANELS	SPECIFICATION NO.: PE-SS -999- 145 -054A	
		VOLUME	II B
		SECTION	D
		REV. NO. 03	DATE : 16-09-2013
		SHEET	4 OF 6

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.

	SPECIFICATION FOR LOCAL PANELS	SPECIFICATION NO.: PE-SS -999- 145 -054A	
		VOLUME	II B
		SECTION	D
		REV. NO. 03	DATE : 16-09-2013
		SHEET	5 OF 6

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, corrossion, incidental damage due



SPECIFICATION FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS -999- 145 -054A

VOLUME II B

SECTION D

REV. NO. 03

DATE : 16-09-2013

SHEET 6 OF 6

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		

CLAUSE NO.	QUALITY ASSURANCE																																																																																																																																																																												
<table><tr><th colspan="10">MEASURING INSTRUMENTS</th><th colspan="2">Page- 1/2</th></tr><tr><td rowspan="10">Item Components Sub System Assembly</td><td colspan="10">Attributes Characteristics</td><td></td><td></td></tr><tr><td>Dimensions (R)</td><td>Make, Model, Type, Rating (R)</td><td>Process / Electrical connection (R)</td><td>Calibration (R)</td><td>Test as per standard(R)</td><td>Insulation Resistance (R)</td><td>IBR Certification (As applicable)</td><td>Hydro Test(R)</td><td>Material Test certificate ®</td><td></td><td></td></tr><tr><td>1. PR Gauge (IS-3624)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td></tr><tr><td>2. Temp. Gauge (BS-5235)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td></tr><tr><td>3. Pr./D.P.Switch(BS-6134)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>4. Electronic Transmitter(IEC-60770)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>5. Temp. Switch</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>6. Electrical Metering Instrument (IS-1248)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>7. Transducer (IS-14570)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>8. Thermocouples (IEC – 584 / ANSI-MC-96.1)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>9. RTD(IS-2848)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>10. Thermowell</td><td>Y</td><td></td><td>Y</td><td></td><td></td><td></td><td>Y</td><td>Y</td><td>Y</td></tr><tr><td colspan="10">R-Routine Test A- Acceptance Test Y – Test applicable</td><td></td><td></td></tr><tr><td colspan="12">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.</td></tr></table>														MEASURING INSTRUMENTS										Page- 1/2		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- 1/2																																																																																																																																																																			
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.																																																																																																																																																																													
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-E-51 MEASURING INSTRUMENT (PRIMARY & SECONDARY)				PAGE 1 OF 2																																																																																																																																																																	

CLAUSE NO.	QUALITY ASSURANCE												
	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
	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
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.													
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-E-51 MEASURING INSTRUMENT (PRIMARY & SECONDARY)				PAGE 2 OF 2	

CLAUSE NO.	QUALITY ASSURANCE																			एन टी पी सी NTPC	
	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	
VOLTAGE STABILISER			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	
R-Routine Test			A- Acceptance Test						Y – Test applicable												
* Transfer time and Over shoot /under shoot during load & system transfer shall be recorded.																					
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													एन टी पी सी NTPC			
	INSTRUMENTATION CABLE																
	TESTS ITEMS	Conductor Resistance ® & (A)	High Voltage ® & (A)	Insulation Resistance ® & (A)	Constructional detail, dimensions (A)	Outer-Sheathe/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.															
		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-54 INSTRUMENT CABLE			PAGE 1 OF 1						

CLAUSE NO.	QUALITY ASSURANCE													एन टी पी सी NTPC																																																																																																																																					
	CONTROL VALVE ACTUATORS AND ACCESSORIES. <table><tr><th>TESTS</th><th rowspan="12">ITEMS</th><th>MAKE,MODEL, TAG (R)</th><th>DIMENSION®</th><th>SURFACE FINISH®</th><th>HEAT TREATMENT®</th><th>MATERIAL TEST CERTIFICATES®</th><th>IBR CERTIFICATES®</th><th>HYDRAULIC TEST , SEAT LEAKAGE ®</th><th>UT/RADIOGRAPHY FOR >900 LB RATING®</th><th>MPI/DP®</th><th>PRESSURE RESISTANCE®</th><th>TIMING OPEN/CLOSE®</th><th>LINEARITY/HYSTERISIS®</th><th>FUNCTIONAL TEST, REVIEW FOR MAKE AND TC OF ACCESSORIES®</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CONTROL VALVE AND ACTUATOR</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>OVERALL</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td><td>Y</td><td>Y</td><td>Y</td></tr><tr><td>BODY</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>BONNET</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>TRIM</td><td></td><td>Y</td><td></td><td></td><td></td><td>Y</td><td></td><td></td><td>Y*</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>PNEUMATIC ACTUATOR</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Y</td><td></td><td></td><td></td></tr><tr><td>ELECTRO PNEUMATIC POSITIONER</td><td>Y</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Y</td></tr></table> R- ROUTINE TEST A - ACCEPTANCE TEST Y - TEST APPLICABLE Y* - UT ON SPINDLE DIA >= 40 MM. NOTE : 1) 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 FINALISATION FOR ALL ITEM.														TESTS	ITEMS	MAKE,MODEL, TAG (R)	DIMENSION®	SURFACE FINISH®	HEAT TREATMENT®	MATERIAL TEST CERTIFICATES®	IBR CERTIFICATES®	HYDRAULIC TEST , SEAT LEAKAGE ®	UT/RADIOGRAPHY FOR >900 LB RATING®	MPI/DP®	PRESSURE RESISTANCE®	TIMING OPEN/CLOSE®	LINEARITY/HYSTERISIS®	FUNCTIONAL TEST, REVIEW FOR MAKE AND TC OF ACCESSORIES®															CONTROL VALVE AND ACTUATOR														OVERALL	Y	Y	Y			Y	Y					Y	Y	Y	BODY		Y	Y	Y	Y				Y	Y	Y				BONNET		Y	Y	Y	Y										TRIM		Y				Y			Y*						PNEUMATIC ACTUATOR	Y	Y									Y				ELECTRO PNEUMATIC POSITIONER	Y													Y
TESTS	ITEMS	MAKE,MODEL, TAG (R)	DIMENSION®	SURFACE FINISH®	HEAT TREATMENT®	MATERIAL TEST CERTIFICATES®	IBR CERTIFICATES®	HYDRAULIC TEST , SEAT LEAKAGE ®	UT/RADIOGRAPHY FOR >900 LB RATING®	MPI/DP®	PRESSURE RESISTANCE®	TIMING OPEN/CLOSE®	LINEARITY/HYSTERISIS®	FUNCTIONAL TEST, REVIEW FOR MAKE AND TC OF ACCESSORIES®																																																																																																																																					
CONTROL VALVE AND ACTUATOR																																																																																																																																																			
OVERALL		Y	Y	Y			Y	Y					Y	Y	Y																																																																																																																																				
BODY			Y	Y	Y	Y				Y	Y	Y																																																																																																																																							
BONNET			Y	Y	Y	Y																																																																																																																																													
TRIM			Y				Y			Y*																																																																																																																																									
PNEUMATIC ACTUATOR		Y	Y									Y																																																																																																																																							
ELECTRO PNEUMATIC POSITIONER		Y													Y																																																																																																																																				
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-55 CONTROL VALVE			PAGE 1 OF 1																																																																																																																																											

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													
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-56 Electrical Actuator				PAGE 1 OF 1			

CLAUSE NO.	QUALITY ASSURANCE													एन टी पी सी NTPC																																																																																																																																																																
	Process, Connection & piping FOR C&I SYSTEMS <table><tr><th>ITEMS</th><th>TESTS</th><th>Visual & Dimensions ®</th><th>GA, BOM, Layout of component & construction feature, Paint Shade/thickness ®</th><th>Flattening,flaring,hydrotest,hardness check as per ASTM standard (A)</th><th>Component Ratings ®</th><th>Wiring ®</th><th>Make, Model, Type, Rating®</th><th>IR & HV ®</th><th>Review of TC for instrument/devices (R)</th><th>Accessibility of TBs/Devices Illumination,grounding ®</th><th>Tubing ®</th><th>Leak/Hydro test(A)</th><th>Chemical/physical properties of material (A)</th><th>Proof pressure test,Dismantling & reassembly test,Hydraulic impulse and vibration test (R)</th><th>Tests as per standards & specification</th></tr><tr><td>Local Instrument enclosure</td><td></td><td>Y</td><td>Y</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>Local instruments racks</td><td></td><td>Y</td><td>Y</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>Junction Box</td><td></td><td>Y</td><td>Y*</td><td></td><td>Y</td><td></td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Gauge Board</td><td></td><td>Y</td><td>Y</td><td></td><td>Y</td><td></td><td>Y</td><td></td><td>Y</td><td></td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>Impulse pipes and tubes</td><td></td><td>Y</td><td></td><td>Y</td><td></td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td></td><td>Y</td><td></td><td></td></tr><tr><td>Socket weld fittings ANSI B-16.11</td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td></td><td>Y</td><td></td><td>Y</td></tr><tr><td>Compression fittings</td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td>Y</td><td>Y</td><td>Y</td><td></td></tr><tr><td>Instrument valves & Valve manifolds</td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td>Y</td><td>Y</td><td></td><td></td></tr><tr><td>Copper tubings ASTM B75</td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Y</td></tr></table> *-applicable for painted junction boxes. Note: R-Routine Test A- Acceptance Test Y – Test applicable Note: This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.														ITEMS	TESTS	Visual & Dimensions ®	GA, BOM, Layout of component & construction feature, Paint Shade/thickness ®	Flattening,flaring,hydrotest,hardness check as per ASTM standard (A)	Component Ratings ®	Wiring ®	Make, Model, Type, Rating®	IR & HV ®	Review of TC for instrument/devices (R)	Accessibility of TBs/Devices Illumination,grounding ®	Tubing ®	Leak/Hydro test(A)	Chemical/physical properties of material (A)	Proof pressure test,Dismantling & reassembly test,Hydraulic impulse and vibration test (R)	Tests as per standards & specification	Local Instrument enclosure		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y				Local instruments racks		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y				Junction Box		Y	Y*		Y		Y	Y								Gauge Board		Y	Y		Y		Y		Y		Y	Y				Impulse pipes and tubes		Y		Y			Y						Y			Socket weld fittings ANSI B-16.11		Y					Y						Y		Y	Compression fittings		Y					Y					Y	Y	Y		Instrument valves & Valve manifolds		Y					Y					Y	Y			Copper tubings ASTM B75		Y					Y								Y
ITEMS	TESTS	Visual & Dimensions ®	GA, BOM, Layout of component & construction feature, Paint Shade/thickness ®	Flattening,flaring,hydrotest,hardness check as per ASTM standard (A)	Component Ratings ®	Wiring ®	Make, Model, Type, Rating®	IR & HV ®	Review of TC for instrument/devices (R)	Accessibility of TBs/Devices Illumination,grounding ®	Tubing ®	Leak/Hydro test(A)	Chemical/physical properties of material (A)	Proof pressure test,Dismantling & reassembly test,Hydraulic impulse and vibration test (R)	Tests as per standards & specification																																																																																																																																																															
Local Instrument enclosure		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y																																																																																																																																																																		
Local instruments racks		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y																																																																																																																																																																		
Junction Box		Y	Y*		Y		Y	Y																																																																																																																																																																						
Gauge Board		Y	Y		Y		Y		Y		Y	Y																																																																																																																																																																		
Impulse pipes and tubes		Y		Y			Y						Y																																																																																																																																																																	
Socket weld fittings ANSI B-16.11		Y					Y						Y		Y																																																																																																																																																															
Compression fittings		Y					Y					Y	Y	Y																																																																																																																																																																
Instrument valves & Valve manifolds		Y					Y					Y	Y																																																																																																																																																																	
Copper tubings ASTM B75		Y					Y								Y																																																																																																																																																															
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-57 PROCESS CONNECTION & PIPING				PAGE 1 OF 1																																																																																																																																																																					

CLAUSE NO.	TECHNICAL REQUIREMENTS					एनटीपीसी NTPC
3.00.00	TYPE TEST REQUIREMENT FOR OTHER C&I SYSTEMS					
	Sl. No	Item	Test Requirement	Standard	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate
	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				एनटीपीसी NTPC
		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				
		thickness			
		Overlap test		No	Yes
	-Over all cable	Flammability Test	IEEE 383	No	Yes
		Swedish Chimney Test	SEN 4241475	No	Yes
		Noise interference	IEEE Trans-actions	No	Yes
		Dimensional checks	IS 10810	No	Yes
		Cross talk	VDE-0472	No	Yes
		Mutual capacitance	VDE-0472	No	Yes
		HV test	VDE-0815	No	Yes
		Drain wire continuity		No	Yes
	* 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. 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. **These tests shall be carried out as per VDE0207 Part 6 & ASTM D-2116 for TEFLON insulated & outer sheathed cables ***Applicable for armoured cables only				
3	DC Power Supply System (Applicable for each model and rating)				
	1)The Type Test reports for offered rectifier module and the controller module irrespective of the rectifier bank shall be acceptable				
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				एनटीपीसी NTPC
		Surge Withstand Capability(SWC)	(ANSI / IEEE No C37.90.1)or (IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18).	Yes	
		Dry Heat Test	IEC-60068-2-2 No or equivalent	Yes	
		Damp Heat test	IEC-60068-2-30 No or IEC-60068-2-78 or equivalent	Yes	
		Vibration test	IEC-60068-2-6 No or equivalent	Yes	
		Electrostatic discharge test	IEC 61000-4-2 No or equivalent	Yes	
		Radio frequency immunity test	IEC-61000-4-6 No or equivalent	Yes	
		Electromagnetic field immunity	IEC 61000-4-3 No or equivalent	Yes	
		Degree of Protection	IS-13947 or No equivalent	Yes	
4	Battery ##	As per standard (col 4)	IS-10918 (Ni-Cd Batteries) IS-1652 (Lead Acid Plant Batteries)	No No	Yes
5	UPS (Applicable for each model and rating) 1) Type Test reports of same series of UPS with similar PCB's cards and controllers as the target UPS system shall be acceptable. 2) For Dry heat, Damp heat and vibration, the tests conducted on individual PCB's shall be acceptable.				
		Surge Withstand Capability(SWC)	(ANSI / IEEE No C37.90.1)or (IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-	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 7 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS					एनटीपीसी NTPC	
	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		
## 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. Note: Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.							
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 		
	REFERENCE CODES AND STANDARDS FOR CONTROL AND INSTRUMENTATION 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. Temperature Measurements - Instrument and apparatus for temperature measurement - ASME PTC 19.3 (1974). - Temperature measurement - Thermocouples ANSI MC 96.1 - 1982. - Temperature measurement by electrical Resistance thermometers - IS:2806. - Thermometer - element - Platinum resistance - IS:2848. Pressure Measurements - Instruments and apparatus for pressure measurement - ASME PTC 19.2 (1964). - Electronic transmitters BS:6447. - Bourdon tube pressure and vacuum gauges - IS:3624 - 1966. - Process operated switch devices (Pr. Switch) BS-6134. Flow Measurements Instruments and apparatus for flow measurements - ASME PTC 19.5 (1972) Interim supplement, Part-II. Measurement of fluid flow in closed conduits - BS-1042. Electronic Measuring Instrument & Control Hardware/ Software - Automatic null balancing electrical measuring instruments - ANSI C 39.4 (Rev. 1973): IS:9319. - Safety requirements for electrical and electronic measuring and controlling instrument - ANSI C 39.5 - 1974. - Compatibility of analog signals for electronic industrial process instruments - ISA - S 50.1 (1982) ANSI MC 12.1 - 1975. - 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

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 		
	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.		
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 99 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 		
	Instrument Switches and Contact - Contact rating - AC services NEMA ICS 2 - 1978 (with revision through May 1983), Part - 2-125, A6000. - Contact rating - DC services NEMA ICS 2-1978 Part-2 125, N600. Enclosures - Type of Enclosures - NEMA ICS Part - 6 - 1978 (with Rev. 1 4/80) through 110.22 (Type 4 to 13). - Racks, panels and associated equipment - EIA : RS - 310 C- 1983 (ANSI C 83.9 - 1972). - Protection class for Enclosures, cabinets, control panels & desks - IS:2147 - 1962. Apparatus, enclosures and installation practices in hazardous area - Classification of hazardous area - NFPA 70 - 1984, Article 500. - Electrical Instruments in hazardous dust location - ISA - 512.11, 1973. - Intrinsically safe apparatus - NFPA 493 1978. - Purged and pressurised enclosure for electrical equipment in hazardous location - NFPA 496-1982. - Enclosures for Industrial Controls and Systems - NEMA IS 1.1 - 1977. Sampling System - Stainless steel material of tubing and valves for sampling system - ASTM 296-82, Grade 7 P 316. - Submerged helical coil heat exchangers for sample coolers ASTM D11 92-1977. - Water and steam in power cycle - ASME PTC 19.11. - Standard methods of sampling system - ASTM D 1066-99. Annunciators - Specifications and guides for the use of general purpose annunciators - ISA S 19.1, 1979. - 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 - Damp heat cycling test - IS:2106		
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 100 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 		
	4. Specification for Electromagnetic Susceptibility - SAMA DMC 33, 1/78 Protections 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. UPS System 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. Control Valves 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		
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 101 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	Process Connection & Piping - Codes for pressure piping "power piping" - ANSI B 31.1. - Seamless carbon steel pipe ASTM - A - 106. - Forged & Rolled Alloy steel pipe flanges, forged fittings and valves and parts - ASTM - A - 182. - Material for socket welded fittings - ASTM - A - 105. - Seamless ferritic alloy steep pipe - ASTM - A - 335. - Pipe fittings of wrought carbon steel and alloy steel - ASTM - A - 234. - Composition bronze of ounce metal castings - ASTM - B - 62. - Seamless Copper tube, bright annealed - ASTM - B - 168. - Seamless copper tube - ASTM - B - 75. - Dimension of fittings - ANSI - B - 16.11. - Valves flanged and butt welding ends - ANSI - B - 16.34. Instrument Tubing - Seamless carbon steel pipe - ASTM - A 106. - Material of socketweld fittings - ASTM - A105. - Dimensions of fittings - ANSI - B - 16.11. - Code for pressure piping, welding, hydrostatic testing - ANSI B 31.1. Cables - Thermocouples extension wires/cables - ANSI MC 96.1 - 1992. - Requirements for copper conductor-Wiring cables for telecommunications & information processing system - VDE:0815. - Colour coding of single or multi-pair cables - ICEA - S - 61-402 (third edition) NEMA WCS - 1979 with revisions thorough 2/83. - Insulation & Sheathing compounds for cables : VDE 0207 (Part-4, 5 & 6). - Guide design and installation of cable systems in power generating stations (insulation, jacket materials) - IEEE Std. 422-1977. - Rules for Testing insulated cables and flexible cables : VVDE - 0472 - Requirements of vertical flame propagation test - IEEE 383 - 1974 (R 1980)			
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 102 OF 114	



TITLE:
**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001	
VOLUME II-B	
SECTION-D	
REV. NO. 00	DATE:

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

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	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: 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	The scope covers the following for the complete LP piping mentioned above: 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	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. 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. Bidder's scope of supply & works shall include but not be limited to the following: 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. 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. c) Weather hoods for pipes crossing ceilings and walls. 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. e) Drain funnels, drip pans, moisture traps etc. wherever required shall be provided. 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. 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. 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. Reinforced concrete valve chambers wherever required for underground piping. 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. Paints and varnishes, primers, thinners etc. as required for anti-corrosive protection of piping & equipment above ground.			
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 2 OF 4

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	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. 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. 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. 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. m) In covered concrete trenches bidder shall supply necessary supporting materials such as stools, saddles, base plates, clamps, U-bolts, angles, clips etc. 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. 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) 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. q) Bidder shall perform necessary internal machining of pipe for installing orifices, flow nozzles, straightening vanes etc. 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. s) In addition to submission of drawings as stipulated above bidder shall also furnish the data/ documents with respect to following: 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.			
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 3 OF 4

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 			
1.04.00	t) Bidder's scope of supply for fabrication, erection, cleaning, testing and commissioning of the piping systems installed by him shall include the following: - All welding consumables like welding electrodes, filler rods and wires; gases like oxygen, acetylenes, argon, carbon-dioxide, propane, backing rings etc. Films for radiographic examination of welds. 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). 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). 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). 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). All scaffolding materials and false work (To be taken back by Bidder after completion of work). The Bidder shall provide Services of erection superintendent and foremen, fitters and riggers, welders, transport and crane operators and other skilled and unskilled labour. 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. 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.			
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.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC																																					
	<u>LOW PRESSURE PIPING</u>																																								
1.00.00 1.01.00	EQUIPMENT SIZING CRITERIA All the piping systems and equipment supplied under this package shall be designed to operate without replacement and with normal maintenance for a plant service life of 30 years, and shall withstand the operating parameter fluctuations and cycling which can be normally expected during this period.																																								
1.02.00	For all Low Pressure piping systems covered under this specification, sizing and system design shall be to the requirements of relevant codes and standard indicated. In addition to this, requirements of any statutory code as applicable shall also be taken into consideration.																																								
1.03.00	Inside diameters of piping shall be calculated for the flow requirements of various systems. The velocities for calculating the inside diameters shall be limited to the following: a) Water Application <table><tr><th colspan="2"></th><th colspan="3">Water Velocity in m/sec</th></tr><tr><th></th><th>Pipe Size</th><th>Below 50 mm</th><th>50-150 mm</th><th>200 mm & above</th></tr><tr><td>(a)</td><td>Pump suction</td><td>-----</td><td>1.2-1.5</td><td>1.2-1.8</td></tr><tr><td>(b)</td><td>Pump discharge and recirculation</td><td>1.2-1.8</td><td>1.8-2.4</td><td>2.1-2.5</td></tr><tr><td>(c)</td><td>Header</td><td>-----</td><td>1.5-2.4</td><td>2.1-2.4</td></tr></table> Pipe line under gravity flow shall be restricted to a flow velocity of 1 m/sec generally. Channels under gravity flow shall be sized for a maximum flow velocity of 0.6 m/sec. WILLIAM & HAZEN formula shall be used for calculating the friction loss in piping systems with the following "C" value: <table><tr><td>(i)</td><td>Carbon steel pipe</td><td>100</td></tr><tr><td>(ii)</td><td>Ductile Iron.</td><td>140</td></tr><tr><td>(iii)</td><td>Rubber lined steel pipe</td><td>120</td></tr><tr><td>(iv)</td><td>Stainless steel pipe</td><td>100</td></tr></table> For calculating the required pump head for pump selection, at least 10% margin shall be taken over the pipe friction losses and static head shall be calculated from the minimum water level of the tank/ sump/ reservoir from which the pumps draw water. 						Water Velocity in m/sec				Pipe Size	Below 50 mm	50-150 mm	200 mm & above	(a)	Pump suction	-----	1.2-1.5	1.2-1.8	(b)	Pump discharge and recirculation	1.2-1.8	1.8-2.4	2.1-2.5	(c)	Header	-----	1.5-2.4	2.1-2.4	(i)	Carbon steel pipe	100	(ii)	Ductile Iron.	140	(iii)	Rubber lined steel pipe	120	(iv)	Stainless steel pipe	100
		Water Velocity in m/sec																																							
	Pipe Size	Below 50 mm	50-150 mm	200 mm & above																																					
(a)	Pump suction	-----	1.2-1.5	1.2-1.8																																					
(b)	Pump discharge and recirculation	1.2-1.8	1.8-2.4	2.1-2.5																																					
(c)	Header	-----	1.5-2.4	2.1-2.4																																					
(i)	Carbon steel pipe	100																																							
(ii)	Ductile Iron.	140																																							
(iii)	Rubber lined steel pipe	120																																							
(iv)	Stainless steel pipe	100																																							

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC																																											
1.05.00	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.																																												
1.06.00	Corrosion allowance of 1.6 mm will be added to the calculated thickness being considered (except stainless steel piping).																																												
1.07.00	Bend thinning allowance/manufacturing allowance etc. shall be as per the requirement of the design code provision.																																												
1.08.00	Material of construction for pipes carrying various fluids shall be as specified elsewhere.																																												
1.09.00	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.																																												
1.10.00	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.																																												
1.11.00	Threaded joints shall be provided with Teflon sealant tapes.																																												
1.12.00	Following types of valves shall be used for the system/service indicated. <table><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		
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																																							
1.13.00	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.																																												
2.00.00	TECHNICAL SPECIFICATION																																												
2.01.00	GENERAL 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																																												
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 2 OF 19																																									

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	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.			
2.02.00	Pipes and fittings			
2.02.01	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.			
2.02.02	Piping and fittings coming under the purview of IBR shall be designed satisfying the requirements of IBR as a minimum.			
2.02.03	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.			
2.02.04	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).			
2.02.05	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.			
2.02.06	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.			
2.02.07	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.			
2.02.08	For rubber lined ERW pipes, beads shall be removed for pipe size 80 NB and above.			
2.02.09	Inspection holes shall be provided at suitable locations for pipes 800 Nb and above as required for periodic observations and inspection purposes.			
2.02.10	At all intersection joints, it is Contractor's responsibility to design and provide suitable reinforcements as per the applicable codes and standards.			
2.02.11	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. 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.			
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			एनटीपीसी NTPC																		
2.03.00	Material 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.																					
2.03.01																						
2.03.02																						
2.03.03																						
2.03.04																						
2.03.05	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.																					
	All materials shall be new and procured directly from the manufacturers. Materials procured from traders or stockists are not acceptable.																					
	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.																					
	Material of construction for pipes carrying various fluids shall be as follows:																					
	<table><tr><th>SI No</th><th>Type of Fluid</th><th>Material</th></tr><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></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
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																				
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			
	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.			
2.03.09	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).			
2.03.10	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.			
2.03.11	Condensate lines shall be to ASTM A 106 Gr. B and dimension to ANSI B 36.10 schedule "standard" as minimum to be maintained.			
2.03.12	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.			
2.04.00	Field routed pipes:			
2.04.01	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.			
2.05.00	Slope/Drains and Vents			
2.05.01	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.			
2.05.02	Air piping shall be sloped so that any part of the system can be drained through the shut-off drain valve or drain plugs.			
2.06.00	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.			
2.06.01	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.			
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 5 OF 19				

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	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.			
	(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.			
	(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.			
	(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.			
2.06.02	Welded Joints (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.			
2.06.03	Flanged Joints (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. (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. (c) Drilling on flanges of flanged valves must correspond to the drilling of flanges on the piping system on which the valves are installed.			
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 6 OF 19

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
2.07.00 2.07.01	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). 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.			
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	Specific technical requirement of laying buried pipe with anti-corrosive treatment The pipe in general shall be laid with the top of the pipe minimum 1.0 (one) meter below finished general ground level.			
2.09.01	Trenching (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.			
2.09.02	Preparation and cleaning of piping (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.			
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 7 OF 19

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
2.09.03	(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. Coating and wrapping/ Anti corrosive Protection Coal tar tape 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: (1) Coating primer (coal tar primer) (2) Coating enamel (coal tar enamel) (3) Wrapping materials. 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. 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. 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. Total thickness of completed coating and wrapping shall not be less than 4.0 mm. 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.			
2.09.04	Trench bed preparation and back filling 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.			
2.09.05	laying of galvanized steel (GI) pipes 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. 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.			
2.10.00	Cleaning and flushing			
2.10.01	All piping shall be cleaned by the Bidder before and after erection to remove grease, dirt, dust, scale and welding slag.			
2.10.02	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			
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 8 OF 19

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	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.			
2.10.03	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.			
2.10.04	All compressed air pipe work shall be cleaned by blowing compressed air.			
2.11.00	Specification for hangers and supports			
2.11.01	All supports and parts shall conform to the requirement of power piping code ANSI B 31.1 or approved equivalent.			
2.11.02	The maximum spans of the supports of straight length shall not exceed the recommended values indicated in ANSI B 31.1.			
2.11.03	At all sliding surfaces of supports suitable arrangement is to be provided to minimize sliding friction.			
2.12.00	Design/Construction/Material Particulars of Gate/ Globe /Check /Butterfly / Ball / Air release /Float valves / Moisture Traps.			
2.12.01	GENERAL (a) All valves shall have indicators or direction clearly marked on the hand-wheel so that the valves opening/closing can be readily determined. (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. (c) The valves coming in vacuum lines shall be of extended gland type and/or water sealed. (d) The actuator-operated valves shall be designed on the basis of the following: (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. (e) Valves coming under the purview of IBR shall meet IBR requirements. (f) All valves shall be provided with embossed name plate giving details such as tag number, type, size etc. (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			
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 9 OF 19

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC																										
2.12.02	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																													
	VALVE BODY MATERIAL Valve body material for various services shall be as follows: 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. 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. 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. Condensate: Cast Carbon Steel / Forged Carbon Steel.																													
2.12.03	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. Standards and Codes <table><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.
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.																													
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 10 OF 19																										

CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.12.04	ANSI-B-16.10 Valves face to face and other relevant dimension.			
	API-598 Valves inspection test.			
2.13.00	End Connections			
	The end connections, shall comply with the following:			
	Socket welding (SW) - ANSI B 16.11			
	Butt Welding (BW) - ANSI B 16.25.			
	Threaded (SC) - ANSI B 2.1			
	Flanged (FL) - ANSI B 16.5& AWWA-C-207 (steel flanges), ANSI B 16.1 (Cast Iron flanges).			
	Gate/Globe/Check Valves			
	(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).			
	(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.			
	(c) All gun metal body valves shall have screwed ends.			
(d) All flanged end valves / specialties shall be furnished along with matching counter flanges, fasteners, gaskets etc. as required to complete the joints.				
(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.				
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:				
(1) Hand wheel				
(2) Position indicator (for above 50 mm NB valve size)				
(3) Draining arrangement wherever required.				
(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.				
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.				
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 11 OF 19				

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
2.13.01	(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.		
	(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);		
	(i)	For bore smaller than or equal to 2" the valves must be of the piston type to be installed, in horizontal position.		
	(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.		
	(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.		
	(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.		
	(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.		
	MATERIAL OF CONSTRUCTION (GATE/GLOBE/CHECK VALVE)			
	(a)	The materials shall generally comply with the following:		
	(1)	Cast Steel Valves		
		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	
	(2)	Stainless steel valves		
		Body & Bonnet	SS 304	
		Disc	-do-	
		Trim.	SS 316	
(3)	Cast iron valves			
	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		
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 12 OF 19

CLAUSE NO.	TECHNICAL REQUIREMENTS				
2.14.00	Hinge pin for non-return valves AISI 316				
	Stem for gate globe valves 13% chromium steel or Equivalent				
	Back seat 13 % chromium steel / 13% Chrome overlay				
	(4) Gun Metal valves				
	Body and bonnet IS 318 Gr. 2/ Equivalent Standard				
	Trim. -do-				
	(b) Cast iron body valves shall have high alloy steel stem and seat.				
	(c) Material for counter flanges shall be the same as for the piping.				
	(d) Forged carbon steel & Forged stainless steel valves are also acceptable in place of Gun metal valves.				
	Air Release Valve				
2.15.00	(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.				
	(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.				
	(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.				
	(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.				
2.15.01	Butterfly valves				
2.15.01	Design/Construction				
	(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.				
	(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				
	(c) Valves-350Nb and above shall have pressure equalizing bypass valves, wherever system parameters warrant the same.				
	(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				
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 13 OF 19

CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.15.02	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. 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.			
	Material of Construction (Butterfly Valves)			
	Materials and other design details shall be as indicated below:			
	(a) Cast Iron Butterfly Valves			
	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		
	(b) Stainless Steel Butterfly Valves			
	Body & Disc	SS 304		
Shaft	SS 316			
Seat Rings	EPT/BUNA-N/Neoprene			
(c) Carbon steel Butterfly Valves				
Body & Disc	ASTM A 216, Gr. WCB			
Shaft	SS 304			
Disc & Seat Rings	EPT/BUNA-N/Neoprene			
(d) Elastomer lined Butterfly Valves				
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			
2.15.03	Proof of Design Test (Type Test) for Butterfly Valves			
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.				
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	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.			
	Float operated valves (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. (b) DESIGN AND CONSTRUCTION FEATURES The following design and construction feature of the valve shall be the minimum acceptable. (c) Valves shall be right-angled or globe pattern. (d) Valves shall be balance piston type with float ball. (e) Leather liner shall not be provided. (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. (g) Valves shall be suitable for flow velocities of 2 to 2.5m/sec. (h) The valves shall have flanged connections.			
2.17.00	Tanks and Accessories			
2.17.01	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.			
2.17.02	DESIGN AND CONSTRUCTION			
	(a) Design of all vertical atmospheric storage tanks containing water, acid, alkali and other chemical shall conform to IS:803 & API 650. (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. (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. (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. (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. (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			
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		एनटीपीसी NTPC																																							
2.17.03	through carbon-di-oxide absorber vessel suitably mounted on the tank. CO2 absorber vessel shall be provided with the initial fill of chemicals.																																									
	(l)	Tanks shall have suitable stairs/ladders on inside and outside of the tanks, manholes / inspection cover as required and also platform suitably located.																																								
	(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																																								
	(o)	Tank fabrication drawing and design calculations shall be approved by the Project Manager.																																								
	Corrosion protection																																									
	(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.																																								
	(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.																																								
	(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.																																								
	----- <table><tr><th>Sl. No.</th><th>Description</th><th>Tech. Particulars</th></tr><tr><td colspan="3">-----</td></tr><tr><td>1.00</td><td colspan="2">CONDENSATE STORAGE TANKS</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></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
	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																																								
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		एनटीपीसी NTPC
		type indicator (Guide wire, Float and Housing of Stainless steel - 316 Gr. construction) 1.09 Manhole (minimum 500mm size) Two (2)-one on shell and the other on roof 1.10 Special Fittings a) Hydraulic Seal of Overflow/Drain Required b) Additional nozzle Connection number and size to be indicated to successful Bidder c) Nozzle connection for Instrument/spare Three (3) nos. for each tank d) CO2 Absorber for vent (not to be kept on roof of tank, but to be kept on ground level) required e) Outside stair case (spiral) required f) Inside Ladder Required g) Draw off sump required h) Root valve for level Transmitter Root valves for two (2) nos. level transmitter for each tank Required -----	
2.18.00	RUBBER EXPANSION JOINTS		
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.		
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.		
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.		
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.		
2.18.05	Reinforcement, consisting of solid metal rings embedded in carcass shall be provided.		
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	
2.18.06	Expansion joints shall be complete with stretcher bolt assembly. The expansion joints shall be suitable to absorb piping movements and accommodate mismatch between pipe lines.	
2.18.07	The expansion joints shall be of heavy duty construction made of high grade abrasion-resistant natural or synthetic rubber compound. The basic fabric for the 'duck' shall be either a superior quality braided cotton or synthetic fiber having maximum flexibility and non-set characteristic.	
2.18.08	The expansion joints shall be adequately reinforced, with solid steel rings, to meet the service conditions under which they are to operate.	
2.18.09	All expansion joints shall be provided with stainless steel retaining rings for DM water application and IS 2062 Gr E-250B galvanized steel retaining rings for ordinary water for use on the inner face of the rubber flanges, to prevent any possibility of damage to the rubber when the bolts are tightened. These rings shall be split and beveled type for easy installation and replacement and shall be drilled to match the drilling on the end rubber flanges and shall be in two or more pieces.	
2.18.10	The expansion joints shall have integral fabric reinforced full-face rubber flanges. The bolt on one flange shall have no eccentricity in relation to the corresponding bolt hole on the flange on the other face. The end rubber flanges shall be drilled to suit the companion pipe flanges. The flanges shall be as per ANSI B 16.5. For higher sizes, not covered under ANSI B 16.5, the same shall be as per AWWA.	
2.18.11	All exposed surfaces of the expansion joint shall be given a 3 mm thick coating of neoprene. This surface shall be reasonably uniform and free from any blisters, porosity and other surface defects.	
2.18.12	Each control unit shall consist of two (2) numbers of triangular stretcher bolt plates, a stretcher bolt with washers, nuts, and lock nuts. Each plate shall be drilled with three holes, two for fixing the plate on to the companion steel flange and the third for fixing the stretcher bolt.	
2.18.13	Each joint shall have a permanently attached brass or stainless steel metal tag indicating the tag numbers and other salient design features.	
2.18.14	Bidder to note that any metallic part which comes in contact with DM /corrosive water shall be of Stainless Steel material.	
2.18.15	Life cycle test for RE Joints of Condenser CW Inlet Outlet lines: Life cycle test certificates shall be furnished by the bidder for each type and size of RE joints supplied by the Bidder, in the absence of which actual Life cycle test shall be conducted on one rubber expansion joint of each type and size.	
2.19.00	STRAINERS	
2.19.01	Simplex type The strainers shall be basket type and of simplex 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 lines. The strainer element shall be 20 mesh. Pressure drop across the strainers in new condition shall not exceed 1.5 MCW at full flow. Wire mesh of the strainers shall be suitably reinforced, to avoid buckling under operation. Strainer shall have screwed blow off connection fitted with a removable plug. The material of construction of various parts shall be as follows: (a) Body IS: 318, Gr. 2 up to 50 mm Nb, and IS: 210 Gr. FG 260 above 50 mm Nb. (For DM water/ -Body: AISI 316 or equivalent)	
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 18 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			एनटीपीसी NTPC
	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		PAGE 22 OF 31
		SUB SECTION A-15 CW SYSTEM		

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
4.03.00	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.			
4.04.00	Impeller Impeller shall be closed or semi-closed as specified elsewhere and designed in conformance with the detailed analysis of the liquid being handled			
4.05.00	Impeller/ Casing Wearing Rings Replaceable type wearing rings shall be provided at suitable locations pumps.			
4.06.00	Shaft The critical speed shall be well away from the operating speed and in no case less than 130% of the rated speed.			
4.07.00	Shaft Sleeves Shaft sleeves shall be fastened to the shaft to prevent any leakage or loosening			
4.08.00	Bearings 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. Bearings shall be easily accessible without disturbing the pump assembly.			
4.09.00	Stuffing Boxes / Mechanical Seals 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.			
4.11.00	Pump Shaft Motor Shaft Coupling The Pump and motor shaft shall be connected with a adequately sized flexible coupling of proven design with a spacer			
4.12.00	Base Plate 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.			
4.13.00	Assembly and Dismantling Assembly and dismantling of each pump with drive motor shall be possible without disturbing the grouting base plate or alignment.			
4.14.00	Drive Motor (Prime Mover) 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.			
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 23 OF 31

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
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 CI IS210 Gr FG 260	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	
	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

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	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.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
	instruments etc. required for this purpose and line shaft bearing lubrication (if required) shall be provided by the Contractor.		
3.12.00	Reverse Rotation 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. b) a reverse rotation detection switch shall be provided to prevent starting of motor while rotating in reverse direction.		
3.13.00	Motor Rating 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. Drive motors shall be connected directly to the line shaft of the pump.		
4.00.00	DESIGN AND CONSTRUCTION		
4.01.00	Pump Type 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		
4.02.00	Discharge head 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.		
4.03.00	Column Pipe Column pipes shall be flanged and bolted and shall be complete with gaskets, nuts, and bolts.		
4.04.00	Impeller The impeller shall be closed, or semi-open or open as specified elsewhere.		
4.05.00	Wearing Rings 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.		
4.06.00	Impeller & Line Shaft Shaft size selected based on maximum combined shear stress must take into consideration the critical speed as per API - 610.		
4.07.00	Pump & Shaft Bearings - lubrication		
4.07.01	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.		
4.07.02	Self water Lubrication System 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/		
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 26 OF 31

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC																									
4.07.03	equivalent. For other line shaft bearings located below minimum water level, cutless rubber bearings can be used. Forced water lubrication system The line shaft shall be provided with shaft enclosing tube to exclude pumped water from shaft and bearings. 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.																										
4.08.00	Thrust Bearings 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. 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.																										
4.09.00	Pump Motor Supports, Base plate etc. 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.																										
4.10.00	Stuffing Box Gland packing shall be provided at the top-of-the-line shaft. Shaft sleeves shall be provided at the stuffing box.																										
4.11.00	Assembly and Dismantling Assembly and dismantling of each pump with drive motor shall be possible without disturbing the grouted base/sole plate or alignment.																										
9.00.00	Technical Data Sheet (if not mentioned specifically elsewhere in the CW System technical specifications) of Pumps <table><tr><th>SN</th><th>Description</th><th>Parameters</th></tr><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="3">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></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></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	
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																									
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 27 OF 31																							

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC																																																
	<table><tr><td>13</td><td>Type of Discharge</td><td>Above Floor</td></tr><tr><td>14</td><td>Type of Impeller</td><td>Closed / Semi-open</td></tr><tr><td>16</td><td>Type of Lubrication</td><td>Forced water/ Self lubrication (as specified)</td></tr><tr><td>18</td><td>Minimum Water Level in sump</td><td>Min submergence level of pump plus 0.5.m</td></tr><tr><td>19</td><td>Maximum Water Level in sump</td><td>As per system requirement (Min 0.2 m below FGL)</td></tr><tr><td>21</td><td>Sump Invert Level</td><td>As per HIS</td></tr><tr><td>22</td><td>Operating Floor Level</td><td>Min. 0.5 M above FGL</td></tr><tr><td>23</td><td>Other dimensions of sump, Fore-bay etc</td><td>As per HIS & system requirement</td></tr><tr><td>25</td><td>Accessories to be provided with each pump</td><td>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</td></tr><tr><td>26</td><td>MOC</td><td></td></tr><tr><td>i</td><td>Suction Bell, Casing / Bowl</td><td>2.5% Nickel Cast Iron, IS: 210 Grade FG 260; S-0.1% max. P-0.15% max.</td></tr><tr><td>ii</td><td>Casing Liner</td><td>Stainless steel (SS)</td></tr><tr><td>iii</td><td>Impeller</td><td>Austenitic SS ASTM A743/ CF8M Grade</td></tr><tr><td>iv</td><td>Wearing rings</td><td>SS-316</td></tr><tr><td>v</td><td>Impeller Shaft, Pump & line shaft, Pump & Shaft Coupling, Pump & Shaft Sleeves</td><td>SS - ASTM A 276 Gr. 410.</td></tr><tr><td>vi</td><td>Shaft bearings</td><td>Cutless rubber with bronze retainer for below minimum water level and Thordon type for above minimum water level.</td></tr></table>			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	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	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.
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	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																																																	
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 SECTION – VI, PART-B BID DOC. NO CS-4540-001A-2	SUB SECTION A-15 CW SYSTEM PAGE 28 OF 31																																																

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC																														
	<table><tr><td>vii</td><td>Column pipe</td><td>Fabricated steel as per IS: 2062 (minimum thickness - 10 mm) with 2 coats of epoxy coating inside & outside.</td></tr><tr><td>viii</td><td>Shaft Enclosing Tubes</td><td>Fabricated steel as per IS: 2062 (minimum thickness - 6 mm) with 2 coats of epoxy coating inside & outside.</td></tr><tr><td>ix</td><td>Discharge Head</td><td>Fabricated steel as per IS: 2062 (minimum thickness - 10 mm) with 2 coats of epoxy coating inside & outside.</td></tr><tr><td>x</td><td>Distance Piece (if applicable)</td><td>Fabricated steel as per IS: 2062 (min thickness 10 mm) with 2 coats of epoxy coating inside.</td></tr><tr><td>xii</td><td>Stuffing Box, Gland</td><td>2.5 % NI-CI to IS-210 FG-260</td></tr><tr><td>xiii</td><td>Gland Packing</td><td>Impregnated Teflon</td></tr><tr><td>xiv</td><td>Gaskets</td><td>Wire reinforced rubber gasket / Neoprene Rubber / Compressed Asbestos Fibre</td></tr><tr><td>xv</td><td>Ladders, Platforms & Other Accessories</td><td>Fabricated steel as per IS: 2062</td></tr><tr><td>xvi</td><td>Bolts & Nuts</td><td>Stainless Still AISI Type 316 for those coming in contact with water and for others material shall be High Tension Carbon Steel</td></tr><tr><td>xvii</td><td>Baseplate & Soleplate (min 12 mm thick), Matching flange</td><td>Fabricated steel as per IS: 2062</td></tr></table>	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		
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 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 29 OF 31																													

CLAUSE NO.	TECHNICAL REQUIREMENTS 			
1.00.00 1.01.00 2.00.00 2.01.00 3.00.00 4.00.00 5.00.00	Annexure-3 SUBMERSIBLE PUMPS SCOPE 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: CODES AND STANDARD 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. List of Applicable Indian Standards IS: 8034 - Submersible pumps for clear cold fresh water IS: 5120 - Technical requirement of Rotodynamic Special Purpose pumps. DESIGN AND PERFORMANCE REQUIREMENTS a) The pump shall be of single stage mono - block type with non-clog design. b) Components of Identical pumps shall be interchangeable. c) Pumps shall have continuously rising head characteristics. MOTOR RATING 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. FEATURES OF CONSTRUCTION a) Pumps shall be of Submersible, wet pit type. 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. 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. 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. e) Impeller 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.			
	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 30 OF 31

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			एनटीपीसी NTPC
	ELEVATORS, CRANES AND HOISTS			
1.00.00	ELEVATOR			
1.01.00	Passenger Elevators for TG Building, Service Building and Administration Building The Passenger elevators for TG Building, Service Building and Administration Building shall be as under. (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	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: (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	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.			
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 		
	(a) Feed water heaters & deaerator. (b) Various pumps & Heat Exchangers. (c) Fans, motors, gear boxes etc., of Main Condenser, vacuum pumps, control fluid room etc. (d) Auxiliary cooling water pumps and DM cooling water pumps of ECW systems and Plate heat exchangers. (e) Central lube oil system room. (f) Any other equipment. The above requirement is indicative only; the requirement given in the respective chapter is to be adhered to.		
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 2 OF 2

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																							
1.00.00	SERVICE ELEVATORS, CRANE, HOIST & MONORAIL																							
	SERVICE ELEVATORS																							
	DESIGN CRITERIA AND OPERATIONAL SPECIFICATION																							
	Design																							
	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.																							
	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.																							
	Elevators shall be designed based on following criteria:																							
	<table><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>				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)	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.																					
CONSTRUCTION																								
Construction of the elevators shall specifically meet all requirements of the codes indicated and shall have following additional features:																								
<table><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)	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					
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																					
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 1 OF 6																								

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.
	1. AUTOMATIC RESCUE DEVICE (ARD) - (BATTERY DRIVE): Bidder to provide a modern Advanced electronic drive system of "RESCUING Passenger Trapped in a ELEVATOR".			
	2. EMERGENCY SAFETY DEVICES : 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.			
	3. Elevator shall have Floor announcement system & Braille switches			
	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.		
	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.		
	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		
	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.		
	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		
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			
1.03.00	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. OPERATION			
1.03.01	Elevator shall have provisions to meet following operational requirements : 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).			
1.04.00	Elevator Electricals:			
1.04.01	Electric motor: 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 .			
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 एनटीपीसी NTPC			
1.04.02 1.04.03 1.04.04	Controls: 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. Cables and wiring: 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. 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). 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. 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. Earthing: 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.			
	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			एनटीपीसी NTPC
	DATA SHEET i) Type of services : Passenger ii) Load carrying capacity : As per specification iv) Rated speed : One (1) m/s v) Total Travel : TG hall- As per layout Service Building- As per layout Administrative Building- As per layout vi) No. of floor to be served : TG hall, Service Building & administrative building: - To be decided during detailed engineering. vii) Method of control : Variable voltage variable frequency (VVVF) viii) Position of M/c room : Directly above lift shaft ix) Size of platform : As per IS14665 & manufacturer's standard latest. x) Size of lift well : -do- xiii) Specification code : As per IS:14665 (5 parts) (Latest Edition). xiv) Design seismic co-efficient : 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			
2.00.00	CRANE, HOIST & MONORAIL			
2.01.00	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. (a) Feed water heaters & deaerator (Applicable Hoists/Chain pully block for maintenance purpose shall be provided). (b) Various pumps & Heat Exchangers. (c) Condenser Water Boxes (front & rear), (Applicable If hinged type water box not envisaged) (d) CW Butterfly Valves (e) Vacuum Pumps (f) Control Fluid Room (g) Auxiliary cooling water (clarified) pumps and DM cooling water pumps of ECW systems. (h) Central Lube Oil System room. (i) Any other equipment. The above requirement is indicative only, the requirement given in the respective chapter is to be adhered to.			
2.02.00	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).			
2.03.00	The design, manufacture inspection and testing of the crane shall comply with the requirement of latest version of IS:3177			
2.04.00	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.			
2.05.00	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. 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. 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.			
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 6 OF 6

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.	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	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.			
	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.		
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.	TECHNICAL REQUIREMENTS			
1.06.05	Following are the Primer/painting schemes envisaged herein: PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104. PS3* - Zinc Chrome primer (Alkyd base) by dip coat. PS4 - Synthetic Enamel (long oil alkyd) to IS2932. PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744 PS9 - Aluminum paint to IS 2339. 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) PS13 - Rust preventive fluid by spray, dip or brush. PS14 - Weldable primer-Deoxaluminat or equivalent. PS16 - High Build Epoxy CDC mastic `15'. PS17 - Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.) PS18 - Epoxy based TiO2 pigmented coat PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=35.0(min.) PS-20 - Epoxy based finish paint			
1.06.06	All weld edge preparation for site welding shall be applied with one coat of wieldable primer.			
1.06.07	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.			
1.06.08	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.			
1.06.09	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. The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner: ▪ Primer coat – Epoxy based zinc phosphate ▪ Intermediate - Epoxy based TiO2 pigmented coat ▪ Finish coat - Epoxy based finish coat/Two pack polyurethane coat 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. c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard			
1.06.10	A)	Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows: Primer : One coat of unmodified epoxy resin along with polyimide hardener. Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct		
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 2 of 8

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	hardener. Total thickness of primer and paint should not be less than 400 microns. B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows: i) For Indoor vessel, tanks, piping, valves & other equipments: (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. Total DFT of paint system shall not be less than 150 microns. ii) For Outdoor vessel, tanks, piping, valves & other equipments: (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. The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied. Total DFT shall not be less than 300 microns.			
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.	SP3/SP4	PS 5	2	25	-	-	-	PS 4	3	35 \$	155 \$	
		SP3/SP4	PS 9*	1	20	-	-	-	PS9*	1	20	40	
3	Constant Load Hanger (CLH) and Variable Load Hanger (VLH)	SP4*	PS19	1	40	-	-	-	PS9*	1	20	40	
4	Piping hangers / supports (other than (3) above. (un-insulated)	SP3/SP5	PS5	2	25	-	-	-	PS17	1	30	70	
									PS4	2	25	100	
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 4 of 8		



Valves													
		Design temperature < or equal to 60 degC	SP3/SP5	PS5	2	35	-	-	-	PS4	2	25	120
5.	Cast/Forged	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	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a) Epoxy coat	2	35	250
										b) Final coat of paint PS17	1	30	
7.	Weld Edges	Within building	SP4*	-do-	1	35	PS18	1	35	a) Epoxy coat	2	25	150
										b) Final coat of paint PS17	1	30	
			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



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.

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 6 of 8



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



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

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.

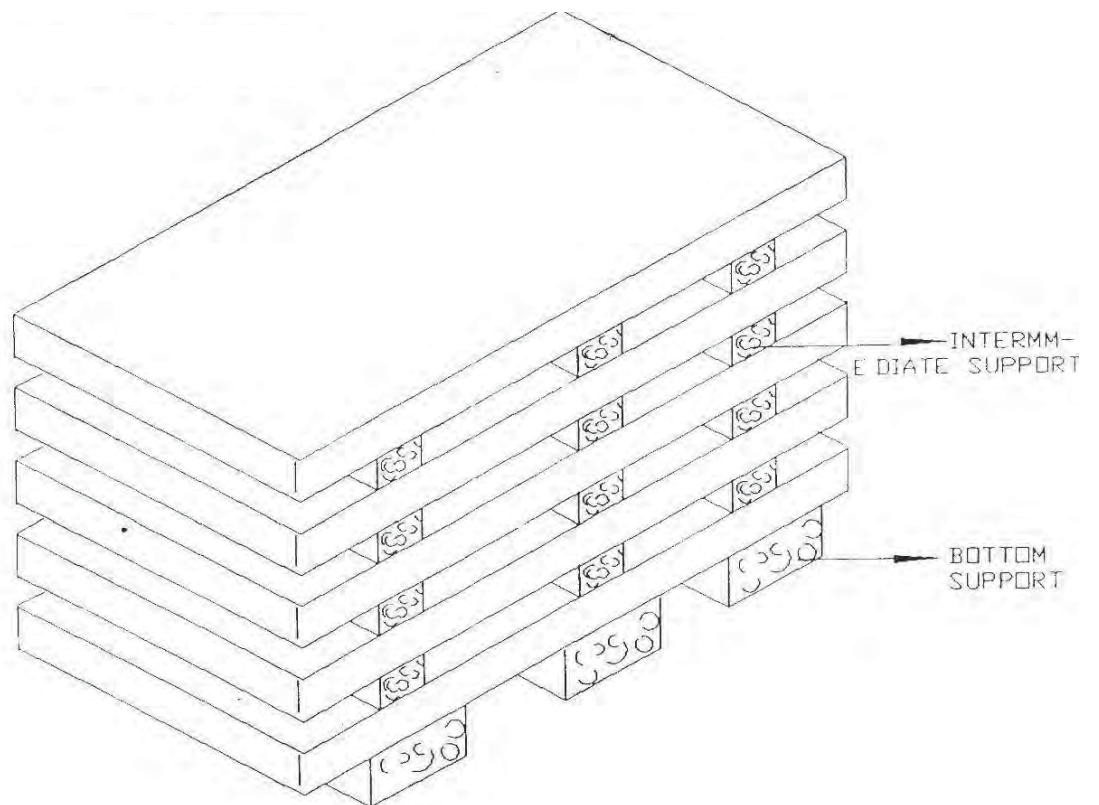


Figure – 1 – PLATE STACKING ARRANGEMENT

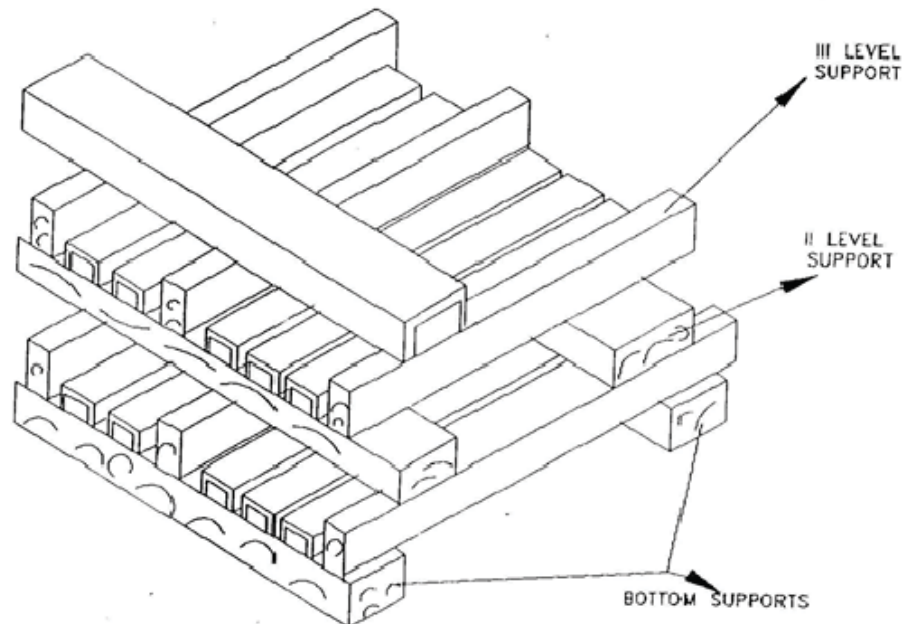


Figure – 2 – STRUCTURAL STEEL STACKING ARRANGEMENT



TITLE:
**TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)**

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME II-B

SECTION-D

REV. NO. 00

DATE:

**SUPERVISION SERVICES
(CHP-RUN-OFF WATER TREATMENT SYSTEM)**



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001
VOLUME II-B
SECTION-D
REV. NO. 00
DATE:

1.0 SCOPE

Supervision of Complete civil structural, architectural & construction works of complete CHP-Run-Off Water Treatment System is in bidder's Scope of work. The duration of supervision shall be Ninety (90) man-days in multiple visits. The Ninety (90) man-days are to be considered as Ninety (90) 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 CHP-Run-Off Water Treatment System 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 CHP-Run-Off Water Treatment System including but not limited to:

- Stilling Chamber, parshall flumes, Interconnecting channels, Bypass Channels, Inlet chambers, telescopic chambers etc.
- Clarifiers, outlet channels up to distribution tank etc.
- Chemical storage shed, including overhead water tanks, Chemical tanks, chemical storage area etc.
- Sludge Pit for Clarifiers including inlet & outlet chambers etc.
- 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 CHP-Run-Off Water Treatment System 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 CHP-Run-Off Water Treatment System.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME III

SECTION-

REV. NO. 00

DATE:

VOLUME-III



TITLE:

TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME III

SECTION-

REV. NO. 00

DATE:

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.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME III

SECTION-

REV. NO. 00

DATE:

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.



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME III

SECTION-

REV. NO. 00

DATE:

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				COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE	



TITLE:
TECHNICAL SPECIFICATION FOR
CHP-RUN-OFF WATER TREATMENT SYSTEM
TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

BHEL DOCUMENTS NO.: PE-TS-497-157-A001

VOLUME III

SECTION-

REV. NO. 00

DATE:

SCHEDULE OF DECLARATION

I certify 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.



THIS IS A PART OF TENDER TECHNICAL SPECIFICATION PE-TS-497-157-A001 R00

SCHEDULE OF DEVIATIONS WITH COST OF WITHDRAWAL

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

CHP-RUN-OFF WATER TREATMENT SYSTEM

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

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.