

NTPC LIMITED

3X800 MW PVUNL PATRATU STPP PHASE-I

**TECHNICAL SPECIFICATION
FOR
MILL REJECT SYSTEM**

SPECIFICATION NO.: PE-TS-434-160-A101 Rev 0



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

	TITLE 3X800 MW PATRATU STPP PHASE-I MILL REJECT HANDLING SYSTEM (CONVEYOR TYPE) CONTENTS	SPECIFICATION NO. PE-TS-434-160-A101
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SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS

SUB-SECTION IA – Specific Technical Requirement (Mechanical)

SUB-SECTION IB – Specific Technical Requirement (Electrical)

SUB-SECTION IC – Specific Technical Requirement (C&I)



TITLE

3X800 MW PATRATU STP

SPECIFICATION NO.

VOLUME: II B

REV 00

Section I A

SPECIFIC TECHNICAL REQUIREMENTS

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PROJECT INFORMATION

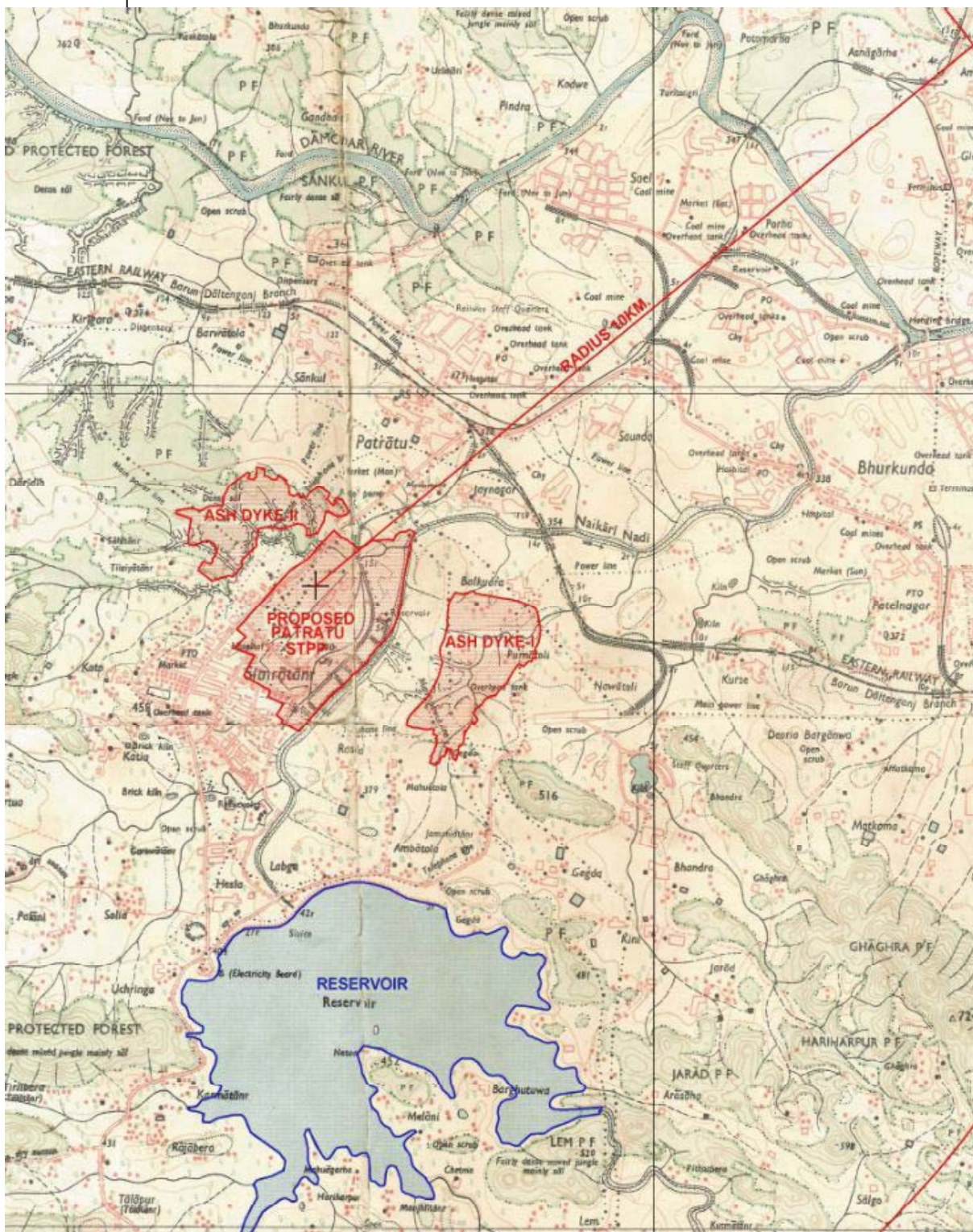
CLAUSE NO.	PROJECT INFORMATION			एन टी पी सी NTPC															
	PATRATU STPS EXPANSION PHASE-I (3X800 MW)																		
1.00.00	BACKGROUND A Memorandum of Agreement (MOA) has been entered on 29.07.2015 amongst Govt. of Jharkhand (GoJ), Jharkhand Urja Vikash Nigam Limited (JUVNL), Jharkhand UrjaUtpadan Nigam Limited (JUUNL), Jharkhand BijliVitaran Nigam Limited (JBVNL) and NTPC Limited to form a Joint Venture Company of NTPC Limited& JBVNL for transfer of Patratu Thermal Power Station (PTPS) located in Ramgarh District of Jharkhand State to the proposed JV Company for Performance Improvement of existing capacity & 4000 MW Capacity expansion of PTPS. Further to signing of JV agreement on 29.07.2015, a Joint Venture Company namely Patratu Vidyut Utpadan Nigam Limited (PVUNL) has been incorporated amongst GoJ, JUVNL, JBVNL and NTPC Ltd. on 15.10.2015. The Performance Improvement of existing capacity and 4000 MW Capacity expansion of Patratu STPS will be implemented by the JV Company (JVC). The configuration of expansion of 4000 MW shall consist of 5 units of 800 MW to be implemented in two phases; Phase-I: 3x800 MW and Phase-II: 2x800 MW. The present proposal is for Patratu STPS Phase-I (3x800 MW). The project is envisaged to be commissioned during XIII Plan period.																		
2.00.00	CAPACITY Patratu STPS Phase-I: 3x800 MW - Present proposal																		
3.00.00	MODE OF OPERATION Base Load																		
4.00.00	LOCATION AND APPROACH																		
4.01.00	Patratu Thermal Power station (PTPS) is located just outside the coal belt of South Karanpura in Ramgarh District of Jharkhand State. The nearest Railway Station is Patratu which is at a distance of about 4 km on Barkakhana-Barwadih Railway line.																		
4.02.00	The latitudes and longitudes of the site are as follows: <table><tr><th>Corner name</th><th>Latitude</th><th>Longitude</th></tr><tr><td>Top Corner</td><td>23° 38 ' 60 '' N</td><td>85° 17' 51.5" E</td></tr><tr><td>Bottom Corner</td><td>23° 38 ' 12.5 '' N</td><td>85° 17' 27" E</td></tr><tr><td>Left Corner</td><td>23° 38 ' 22.5 '' N</td><td>85° 17' 10.6 '' E</td></tr><tr><td>Right Corner</td><td>23° 38 ' 40 '' N</td><td>85° 17' 57 '' E</td></tr></table>				Corner name	Latitude	Longitude	Top Corner	23° 38 ' 60 '' N	85° 17' 51.5" E	Bottom Corner	23° 38 ' 12.5 '' N	85° 17' 27" E	Left Corner	23° 38 ' 22.5 '' N	85° 17' 10.6 '' E	Right Corner	23° 38 ' 40 '' N	85° 17' 57 '' E
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Right Corner	23° 38 ' 40 '' N	85° 17' 57 '' E																	
4.03.00	Airport The nearest commercial airport is Ranchi at about 45 km by road.																		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02	SUB-SECTION-IB PROJECT INFORMATION	PAGE 1 OF 15															

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5.00.00	A copy of Vicinity plan of the project site is placed at Annexure - I.			
	LAND			
6.00.00	The total land to be transferred to JV Company is 1859 acres. Out of 1859 acre, about 1234 acres of land has been envisaged for Plant, Ash pond and Land on railway track of the for Phase-I (3x800 MW). The balance 625 acre of land shall be transferred during commencement of Phase-II (2x800 MW).			
	WATER			
	The make-up water for PSTPS is to be met from Patratu Dam on Nalkari River (capacity 99 MCM i.e. 110 Cusecs). About 52.34 Cusecs of water will be available at 90% dependable monsoon flow after considering evaporation loss.			
	GoJ/JUVNL owns and controls water of Patratu Dam. GoJ/JUUNL supplies water to PTPS and to the other entities in the vicinity from this water reservoir. JUVNL had entered into agreements with these other entities for supply of water from water reservoir. JUVNL shall revisit these agreements to meet the requirement of water for expansion projects, if required.			
	Make up water requirement of PSTPS, Phase-I (3x800 MW) would be about 27 Cusecs with “Air Cooled Condenser” based power plant. GoJ shall provide the required water from the existing reservoir to the JV Company.			
	The JVC shall be responsible for the water supply arrangement starting at the downstream of intake chamber from where water supply commences for the Station. Ownership of the entire water supply system and related plant and equipment, including the water treatment plant, shall be that of the JVC and after the asset transfer, the JVC shall maintain, take care and use the same. The additional facility including addition of plant, equipment etc. for enhanced requirement (if any) and drawl of water shall be the responsibility of JVC and to be arranged by the JVC at their own cost.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02	SUB-SECTION-IB PROJECT INFORMATION	PAGE 2 OF 15

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7.00.00 7.01.00 7.02.00 7.03.00 7.04.00 8.00.00 9.00.00 10.00.00 11.00.00	COAL Coal Requirement, Availability and Linkage About 12 MTPA of coal will be required to meet coal requirement of the Phase-I (3x800 MW) of the project. The Banhardih captive coal block at a distance of about 155 km from plant is allocated to JUVNL for end use of Patratu expansion. The coal from Banhardih captive coal block shall be transferred to the JVC for the usage of PSTPS with the approval of Ministry of Coal, GOI. MOC (11.09.15) has accorded in-principle approval of the Central Govt. to assign Banhardih Coal Block allocated to JUVNL to the JV Company. Coal Transportation The envisaged mode of coal transportation from the coal mines to the power plant is by Indian Railways through BOBR / BOX- N wagons. Coal Quality 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. Fuel Oil The fuel oils to be used for start-up, coal flame stabilization and low load operation of the steam generator shall be Heavy Fuel Oils having the characteristics given at Annexure-IV-3 and Light Diesel Oil having the characteristics given at Annexure-IV-1. NOT USED 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. FLUE GAS DESULPHURIZATION SYSTEM (FGD) & SCR: The project is envisaged with Flue Gas Desulfurization (FGD) system and SCR 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. POWER EVACUATION SYSTEM 85% of power from the project is envisaged to be allocated to Jharkhand State subject to approval of Ministry of Power, while balance 15% would be as unallocated portion and Project is envisaged as regional project. Since major power (85%) is proposed to be absorbed by Jharkhand, the issue of Associated Transmission		
	EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02
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	System for the project would be taken up with them for planning and execution of transmission system modalities as Inter-State System or ISTS System. Considering overall capacity of the project as 4000 MW, 765 kV step-up system has been envisaged. Two D/C 765 KV line, one each to New Ranchi (Bero) and Gaya has been envisaged. This would also form part of 765 kV transmission corridor connecting Ranchi to Gaya. These lines can be used to evacuate power to the Eastern Region ISTS as well as to Jharkhand State. In view of above, provision of four nos. of 765 kV outgoing Line bays has been kept in the new 765 kV generation switchyard. The issue of power evacuation of the proposed project shall be taken up with appropriate Transmission Utility (STU or CTU) as per regulatory provision, based on allocation of power.		
12.00.00	METEOROLOGICAL DATA		
	The meteorological data from nearest observatory is placed at Annexure-II .		
13.00.00	PLANT WATER SCHEME		
	The Plant water scheme is described below.		
13.01.00	Equipment Cooling Water (ECW) System (Unit Auxiliaries)		
	The plant auxiliaries of Steam Generator and Turbine Generator shall be cooled by Demineralized (DM) water in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from ACW system in a secondary circuit. The station auxiliaries such as Air compressors, Compressors of ash handling plant, compressor of mill reject system etc. shall also be cooled by Demineralized (DM) water in a closed 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 Steam Generator & auxiliaries and TG & its auxiliaries.		
13.02.00	Not used		
13.03.00	Other Miscellaneous Water Systems		
	(a) The drinking water requirement of the plant shall be provided from water treatment plant. (b) Steam Cycle make-up water, makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water shall be provided from demineralizing plant. (c) The quality of Raw Water & DM Water is enclosed with this sub-section as Annexure-III. (d) Effluent from various areas in TG & SG system shall be collected in respective pits in their areas and pumped to a common terminal point as shown in plant water scheme.		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02	SUB-SECTION-IB PROJECT INFORMATION PAGE 4 OF 15

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14.00.00	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.			
15.00.00	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.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02	SUB-SECTION-IB PROJECT INFORMATION	PAGE 5 OF 15

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	ANNEXURE-I			
				
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02	SUB-SECTION-IB PROJECT INFORMATION	PAGE 6 OF 15	

C

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जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : रामगढ़
STATION : Ra

[illegible]

CLAUSE NO.	PROJECT INFORMATION			एन टी पी सी NTPC
	ANNEXURE-III			
	RAW WATER ANALYSIS			
	S.No	Constituent	As	mg/l
	1	Calcium	CaCO ₃	105
	2	Magnesium	CaCO ₃	81
	3	Sodium	CaCO ₃	70
	4	Potassium	CaCO ₃	7
		Total cations	CaCO ₃	263
	5	HCO ₃	CaCO ₃	180
	6	P- Alkalinity	CaCO ₃	0
	7	Chloride	CaCO ₃	60
	8	Sulphate	CaCO ₃	23
		Total Anions	CaCO ₃	263
	9	Silica, Reactive	Si	3
	10	Iron (Total)	Fe	0.6
	11	pH	-	7.0-7.8
	12	Turbidity	NTU	100
	13	Total dissolved solids		230-300
14	Temperature	Deg C	20-35	
15.	Organics (KMnO ₄)		2	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02	SUB-SECTION-IB PROJECT INFORMATION	PAGE 9 OF 15

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	ANNEXURE-III			
	THE MINIMUM QUALITY OF DM WATER TO BE CONSIDERED FOR MAKE-UP WATER			
	Sl.No.	Characteristics	Value	
	1.	Silica (Max.)	0.02 ppm as SiO ₂	
	2.	Iron as Fe	Nil	
	3.	Total hardness	Nil	
	4.	pH value	6.8 -7.2	
	5.	Conductivity	Not more than 0.1micro mho/cm excluding the effects of free CO ₂	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02		SUB-SECTION-IB PROJECT INFORMATION
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	ANNEXURE-IV-1																											
	LIGHT DIESEL OIL CHARACTERISTICS AS PER IS 15770-2008 <table><tr><th>Characteristics</th><th>LDO</th></tr><tr><td>1. Pour Point (max)</td><td>21 °C & 12°C for Summer and Winter respectively</td></tr><tr><td>2. Kinematic viscosity in centistokes at 40 deg.C</td><td>2.5 to 15.0</td></tr><tr><td>3. Sediment percent by mass (max)</td><td>0.10</td></tr><tr><td>4. Total sulphur percent by mass (max)</td><td>1.5</td></tr><tr><td>5. Ash percentage by mass (max)</td><td>0.02</td></tr><tr><td>6. Carbon residue (Rams bottom) percent by pass (max.)</td><td>1.50</td></tr><tr><td>7. Acidity inorganic</td><td>Nil</td></tr><tr><td>8. Flash point (Min.) - Pensky Martens</td><td>66 deg.C</td></tr><tr><td>9. Copper strip corrosion for 3 hours at 100°C</td><td>Not worse than No. 2</td></tr><tr><td>10. Water content, % by volume (max)</td><td>0.25</td></tr><tr><td>11. GCV(kcal/kg)</td><td>10,000</td></tr></table>				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
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02	SUB-SECTION-IB PROJECT INFORMATION	PAGE 11 OF 15																								

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	ANNEXURE-IV-2						
	DOMESTIC COAL CHARACTERISTICS						
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	17	11	18	10	
1.2	Ash (%)	36	42	34	44	30	
1.3	Volatile matter (%)	23	19	24	19	28	
1.4	Fixed carbon (%)	27	22	31	19	32	
2.0	ULTIMATE ANALYSIS						
2.1	Carbon (%)	33.31	27.23	39.07	25.72	44.43	
2.2	Hydrogen (%)	3.49	3.05	3.53	2.93	3.72	
2.3	Sulphur (%)	0.6	0.9	0.5	0.95	0.35	
2.4	Nitrogen (%)	0.9	1.3	0.8	1.4	0.6	
2.5	Oxygen (%) (By difference)	11.7	8.52	11.1	7	10.9	
2.6	Total Moisture (%)	14	17	11	18	10	
2.7	Ash (%)	36	42	34	44	30	
2.8	GCV (kcal/kg)	3400	2900	3900	2800	4400	
2.9	Hard Grove index	55	50	60	45	65	
2.10	YGP Index (mg/kg)	75	80	70	85	65	
2.11	Carbonates	0.3	0.38	0.27	0.2	0.43	
2.12	Phosphorous	0.05	0.04	0.06	0.03	0.07	
2.13	Chloride	0.08	0.15	0.05	0.18	0.04	
2.14	Trace Elements (ppm)						
2.14.1	Arsenic	1	1.5	0.5	2.5	0.4	
2.14.2	Lead	35	75	25	150	10	
2.14.3	Mercury	0.1	0.5	0.08	0.6	0.06	
2.14.4	Selenium	0.8	1	0.6	1.5	0.5	
3.0	ASH ANALYSIS						
3.1	Silica (%)	59.25	63.4	56.92	63.56	54.2	
3.2	Alumina (%)	27.62	27.29	28.47	27.2	29.89	
3.3	Iron Oxide (%)	6.75	5.48	7	5.46	7.5	
3.4	Titania (%)	1.95	0.88	2.5	0.98	2.82	
3.5	P ₂ O ₅ (%)	0.24	0.3	0.11	0.35	0.1	
3.6	Lime (%)	0.9	0.7	1.5	0.6	1.6	
3.7	Magnesia (%)	0.2	0.3	0.15	0.35	0.1	
3.8	Sulphuric Anhydride (%)	1.2	0.5	1.4	0.4	1.7	
3.9	Sodium Oxide (%)	0.17	0.25	0.15	0.3	0.15	
3.10	Balance Alkalies (By Difference) (%)	1.72	0.9	1.8	0.8	1.94	
4.0	ASH FUSION RANGE (Under reducing atmosphere)						
4.1	Initial Deformation Temperature (°C)	1100	1100	1100	1100	1100	
4.2	Hemispherical temperature (°C)	1300	1250	1350	1250	1350	
4.3	Flow temperature (°C)	1400	1400	1400	1400	1400	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02		SUB-SECTION-IB PROJECT INFORMATION		PAGE 12 OF 15	

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	ANNEXURE-IV-3				
	FUEL OIL CHARACTERISTICS				
	Sl. No.	Characteristics	Heavy Furnace Oil grade HV (HFO) IS-1593-1982	Low Sulphur Heavy Stock (LSHS) IS-11489-1985	Heavy Petroleum stock (HPS) IS-11489-1985
	1.	Total sulphur content	4.5% Max.	1.0% Max.	4.5% Max.
	2.	Gross calorific value (KCal/kg)	of the order of 10,000	of the order of 10,000	of the order of 10,000
	3.	Flash Point (Min)	66 deg C	76 deg C	66 deg C
	4.	Water content by volume (Max)	1.0%	1.0%	1.0%
	5.	Sediment by weight (Max)		0.25%	0.25% 0.25%
	6.	Asphaltene content by weight (Max.)	2.5%	2.5%	2.5%
	7.	Kinematic viscosity in Centistokes	370 at 50deg C	100 at 100deg C	100 at 100deg C
	8.	Ash Content by weight (Max.)	0.1%	0.1%	0.1%
	9.	Acidity (inorganic)	Nil	Nil	Nil
	10.	Pour Point (Max.)	57 deg C	66 deg C	72 deg C
	11.	Sodium content	—	—	100 ppm
	12.	Vanadium content	25 ppm	25ppm	25 ppm
13.	Specific heat below pour point (KCal/Kg °C)		0.65		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02		SUB-SECTION-IB PROJECT INFORMATION	PAGE 13 OF 15

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	ANNEXURE-IV-4 TYPICAL IMPORTED COAL AND ASH CHARACTERISTICS <table> <tr> <th data-bbox="459 363 537 390">Sl.No.</th><th data-bbox="565 363 812 432">Characteristics (as received basis)</th><th colspan="2" data-bbox="998 363 1187 390">Imported Coal</th></tr> <tr> <td></td><td></td><th data-bbox="1052 432 1133 459">Worst</th><th data-bbox="1222 432 1284 459">Best</th></tr> <tr> <td>1.0</td><td>Proximate Analysis</td><td></td><td></td></tr> <tr> <td>1.1</td><td>Total Moisture (%)</td><td>20</td><td>16</td></tr> <tr> <td>1.2</td><td>Ash (%)</td><td>10</td><td>10</td></tr> <tr> <td>1.3</td><td>Volatile Matter (%)</td><td>30</td><td>45</td></tr> <tr> <td>1.4</td><td>Fixed Carbon (%)</td><td>40</td><td>29</td></tr> <tr> <td>1.5</td><td>Total (%)</td><td>100</td><td>100</td></tr> <tr> <td>2.0</td><td>Ultimate Analysis</td><td></td><td></td></tr> <tr> <td>2.1</td><td>Carbon (%)</td><td>56.4</td><td>62.4</td></tr> <tr> <td>2.2</td><td>Hydrogen (%)</td><td>4.5</td><td>4.9</td></tr> <tr> <td>2.3</td><td>Sulphur (%)</td><td>0.9</td><td>0.8</td></tr> <tr> <td>2.4</td><td>Nitrogen (%)</td><td>0.9</td><td>0.5</td></tr> <tr> <td>2.5</td><td>Oxygen (%) (By difference)</td><td>7.3</td><td>5.4</td></tr> <tr> <td>2.6</td><td>Carbonates (%)</td><td>0</td><td>0</td></tr> <tr> <td>2.7</td><td>Phosphorous (%)</td><td>0</td><td>0</td></tr> <tr> <td>2.8</td><td>Total Moisture (%)</td><td>20</td><td>16</td></tr> <tr> <td>2.9</td><td>Ash (%)</td><td>10</td><td>10</td></tr> <tr> <td></td><td>Total</td><td>100</td><td>100</td></tr> <tr> <td>2.10</td><td>GCV (Kcal/Kg)</td><td>5800</td><td>6500</td></tr> <tr> <td>2.11</td><td>Hard Grove Index</td><td>45</td><td>60</td></tr> <tr> <td>2.12</td><td>YGP (mg/kg)</td><td>100</td><td>70</td></tr> <tr> <td>3.0</td><td>Ash Analysis</td><td></td><td></td></tr> <tr> <td>3.1</td><td>Silica (SiO₂) (%)</td><td>32.74</td><td>34.94</td></tr> <tr> <td>3.2</td><td>Alumina(Al₂O₃) (%)</td><td>30.5</td><td>28.43</td></tr> <tr> <td>3.3</td><td>Iron Oxides(Fe₂O₃) (%)</td><td>18.2</td><td>15.2</td></tr> <tr> <td>3.4</td><td>Titania (TiO₂)</td><td>1.56</td><td>1.76</td></tr> <tr> <td>3.5</td><td>Phosphoric Anhydride(P₂O₅) (%)</td><td>0.44</td><td>0.54</td></tr> <tr> <td>3.6</td><td>Lime (CaO) (%)</td><td>6.12</td><td>7.62</td></tr> <tr> <td>3.7</td><td>Magnesia (MgO) (%)</td><td>1.83</td><td>1.93</td></tr> <tr> <td>3.8</td><td>Sulphuric Anhydride (%)</td><td>6.95</td><td>7.65</td></tr> <tr> <td>3.9</td><td>Sodium Oxide (Na₂O) (%)</td><td>0.3</td><td>0.4</td></tr> <tr> <td>3.10</td><td>Balance alkalies (by difference)</td><td>1.36</td><td>1.56</td></tr> <tr> <td></td><td>Total</td><td>100</td><td>100</td></tr> <tr> <td>4.0</td><td>Ash Fusion Temperature reducing temperature</td><td></td><td></td></tr> <tr> <td>4.1</td><td>Initial deformation Temp (°C)</td><td>1100</td><td>1250</td></tr> <tr> <td>4.2</td><td>Hemispherical Temp. (°C)</td><td>1300</td><td>1350</td></tr> <tr> <td>4.3</td><td>Flow Temp. (°C)</td><td>1400</td><td>1400</td></tr> </table>	Sl.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 (SiO ₂) (%)	32.74	34.94	3.2	Alumina(Al ₂ O ₃) (%)	30.5	28.43	3.3	Iron Oxides(Fe ₂ O ₃) (%)	18.2	15.2	3.4	Titania (TiO ₂)	1.56	1.76	3.5	Phosphoric Anhydride(P ₂ O ₅) (%)	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 (Na ₂ O) (%)	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		
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MILL REJECT SYSTEM (CONVEYOR TYPE)
SPECIFIC TECHNICAL REQUIREMENTS

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SUB-SECTION – IA
SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)



TITLE

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MILL REJECT SYSTEM (CONVEYOR TYPE)

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1.0 INTENT OF SPECIFICATION

- 1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's/sub-vendor's works, painting, forwarding, proper packing and shipment and delivery at site, unloading, handling & transportation at site, Mandatory spares, E&C spares and maintenance tools and tackles, Supervision of Erection & Commissioning, structural work, minor civil works as required performance and guarantee testing and handing over of Mechanical Conveyor Type Mill Reject Handling System as per details in different sections of this specification for 3X800 MW PATRATU STPP is being set up by PVUNL at Patratu in the district of Ramgarh, Jharkhand, India.
- 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 the contractor of the responsibility of providing such facilities to complete the supply, erection & commissioning and PG testing of the MILL REJECT SYSTEM (CONVEYOR TYPE) and its accessories.
- 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 judgement is not in full accordance herewith.
- 1.4 The extent of work under the contract includes all items shown in the flow diagram, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly extent of work 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 The general term 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 is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.
- 1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory 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 **within 10 days of receipt of tender documents**. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication 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 Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.
- 1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.
- 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.

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1.9 In the event of any conflict between the requirements of two clauses of this specification documents or requirements of different codes and standards specified, the more stringent requirement as per the interpretation of the owner shall apply. 1.10 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection. 1.11 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 including their consultant as interpreted by BHEL in the relevant context. For details refer the relevant clause in GCC. Note: Bidder to note that BHEL reserves the right for drawing/document submission through web based Document Management System. Bidder would be provided access to the DMS for drawing/document 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://dmsserver.bhelpem.com/Wrench%20Web%20Access/Login.aspx).			

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1.0 The mill rejects handling system shall be designed on the basis of the followings:-

S. No	Descriptions	Unit	Quantity
1	Number of mills (Working + Standby) at 100% BMCR	Nos.	9 Nos.(W) + 0 (SB)
2	Maximum mill rejects generation rate per mill (@ 1% of mill capacity)	t/h	0.915
3	Mill rejects temperature (normal/ max)	°C	180 /200
4	Mill arrangement		Rear mill arrangement
5	Density of material	Kg / m ³	1600 kg/m ³ for volumetric calculation; 2400 kg/m ³ for civil & structural design calculation
6	Normal size	mm	(-) 40 mm (about 80-85 % of total reject)
7	Maximum size	mm	+50mm (about 15-20 % of total reject), however system shall be designed for maximum particle size of 100 mm.

Note: Material of Pyrite hopper and the chain conveyor shall be designed to withstand the temperature of 200 deg. C. However, occasional burning coal shall also be considered for system sizing.

2.0 System Description

The mill rejects or pyrites, transferred from each coal mill are collected in a small pyrite hopper through inlet chute. The water filled volume of the pyrite hopper has been considered as 30 minutes of maximum specified mill reject collection (1TPH) whichever is maximum. Each pyrite hopper shall be provided with pneumatically operated plate valve / gate valve with limit switch at the inlet and outlet of the pyrite hopper. Therefore, Limit switch shall be used to monitor the inlet valve open / close position whenever the pyrite hopper is to be emptied. In normal condition, the inlet valve shall be open and outlet valve will be closed. However, when rejects are required to be removed from the pyrite hopper, inlet valve will be closed first and outlet valve shall open to discharge the pyrites / rejects to conveyor to transport these in to the bunker.

Spray quenching arrangement shall be provided to bring the surface temperature of rejects below set point. For this, service water shall be sprayed over hot reject in the pyrite hopper or conveyor at suitable location after a pre-set time. Frequency of water quenching may be changed as required. One no. RTD and One no. level switches (radio frequency type) shall be provided in each pyrite hopper which shall sense the temperature and level in the pyrite hopper respectively.

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At the bottom of this pyrite hopper, pneumatically actuated plate / gate valve shall be provided to allow the discharge of the material onto main conveyor. Each pyrite hopper will feed the main conveyor through discharge spout sequentially. The main conveyor will collect the pyrites from all nine (9) working coal mills. Pyrites shall then be transferred to a horizontal conveyor in transverse direction to 1st horizontal conveyor. Pyrites will be then discharged to vertical conveyor (Bucket Elevator) and then to bunker (silo).

A bunker of effective storage capacity 16 hours of rejects generation rate shall be provided for each unit. Manual discharge sector gate shall be provided at the bottom of the bunker along with canvass chute to unload the material onto purchaser's truck.

A DDCMIS control system based control system will be provided for mill reject handling system. Various controls and interlocks will be provided for the trouble free operation of the plant. Suitable alarm / annunciation system will be provided to warn of any malfunctioning of the mill reject handling system.

The mill rejects handling system shall be overground and shall be designed for minimum dust nuisance.

3.0 SCOPE OF WORK

Design, engineering, manufacture, inspection and testing at vendor's / sub-vendor's works, painting, forwarding, proper packing, shipment and delivery at site, unloading, handling & transportation at site including mandatory spares, maintenance tools & tackles and erection & commissioning spares, Supervision of Erection & Commissioning, structural work, minor civil works as required, Performance and guarantee testing and handing over of Metallic belt conveyor/Chain Flight Conveyor type **Mill Reject Handling System** as per details in different sections of this specification.

Detailed system write up & control philosophy shall be furnished by the successful bidder during detail engineering & the same shall be subject to customer approval during detail engineering.

3.1 SCOPE OF SUPPLY

Scope of supply shall comprise of but not necessarily limited to the following:

- 1) Pyrite Hoppers : 27 nos. of pyrite hoppers complete with flexible / expansion joint at its inlet / outlet, rupture disc, by pass chute, inspection window, fasteners and connecting chutes, water spray nozzles & steel supporting structures. Necessary insulation & cladding, if required, to maintain surface temperature of pyrite hopper within 60° C shall be provided. Also, 27 nos. of RTDs for pyrite hoppers (one at each pyrite hopper) shall be provided.
- 2) 27 nos. (1 No. per pyrite hopper) of RF type level switches for pyrite hoppers.
- 3) 27 nos. of pneumatic cylinder operated plate / knife gate valve with manual override hand wheel along open and close limit switches at mill outlet / pyrite hopper inlet
- 4) 27 nos. of pneumatic cylinder operated plate / knife gate valve with manual override hand wheel along open and close limit switches at pyrite hopper outlet.

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5)

27 nos. of pneumatic cylinder operated plate / knife gate valve at by pass chute of pyrite hopper with manual override to provision hand-wheel operation of valve. It should be provided with both open & close limit switches for interlock with pyrite hopper inlet plate / knife gate valve.

6)

27 nos. vibrating feeders, if required, (electromagnetic or electro-mechanic or any other type) at pyrite hopper outlet for smooth unloading of rejects from pyrite hopper, shall be provided. The vibrating feeders shall be provided with electromagnetic drives, connection joints, inlet & outlet chutes along with steel supporting structures.

7)

The chutes shall be provided between mill outlet and pyrite hopper, between pyrite hopper and conveyor, between conveyor discharge end pulley and bunker. The chutes shall also be provided between pyrite hopper and vibrating feeder (if applicable), between vibrating feeder and conveyor and between conveyor and bucket elevator if vibrating feeders are provided in the system.

8)

Mechanical conveyor system of following types along with accessories including steel belt, pans, carrying idlers, head pulley, tail pulley, take up device, suitable electric drives /VFD/gear box / geared motor, tensioning arrangement, safety guard, sensors for automatic control system, bearings, shafts, etc. as applicable for the system shall be provided :-
Metallic belt conveyor/Chain Flight Conveyor.

9)

All necessary supporting structural, supporting frame, short support, stringers, conveyor gallery with walkway, platforms, anchor fasteners as required for mechanical conveyor system shall be provided. 800 MM walkways on both sides of the conveyor shall be provided for maintenance.

10)

All insert plates, embedment plate, foundation bolts / anchor bolts etc. as required for bidder's equipment shall be provided by the bidder.

11)

3 nos. bucket elevators (inclined conveyor not acceptable due to layout constraint) along with all accessories and auxiliaries for successful installation and operation of the system shall be provided.

12)

Mill reject storage silos: Three nos. mill reject bunker (i.e. one no per unit) along with structures, complete with lining in the conical portion, lever operated bunker discharge gate with canvas chute at bunker outlet, staircase up to bunker top, operating & maintenance platform, hand railing, bag filter with pulse cleaning arrangement, 1 no. RF type level transmitter (if RF type level transmitter is not available then radar type level transmitter can be used) at each silo, pressure relieve valve, vent fan, Monorail hoists at each silo and monorail arrangement etc. The capacity of bunker shall be as indicated elsewhere in the specification.

13)

All piping / tubing, fittings, isolation valves, solenoid valves etc. as required for the water / air service shall be provided to complete the system shall be provided by the bidder. All counter- flanges with nuts, bolts and gaskets at all the terminal points shall be provided by the bidder.

14)

One (1) lot of Pneumatic boxes or panels / Local Control Panel / JBs properly mounted on rack / pyrite hopper structure as required to complete the system. All signals from instruments sensors on each pyrite hopper are to be terminated on local control panel / pneumatic panel dedicated to each pyrite hopper.

15)

One (1) common instrumentation JB to be located at each unit to terminate the cables from individual mills, conveyors and bunker for further termination to DCS.

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16) Two numbers (1 working + 1 standby) of fixed type sump pumps as required each of 10m3/hr. capacity for each underground pit (in case envisaged by bidder) for Bucket elevator area complete with suction (min 5 m long) & discharge pipe as required for termination to nearest pit for pumping out water drains from local pit to nearest plant drain, control panel, instruments and all other accessories shall be provided.

17) Initial fill of all lubricants and fluids.

18) Electrical scope and requirements are indicated elsewhere in the specification.

19) C&I requirements are indicated elsewhere in the specification.

20) Mandatory spares as per **Annexure-II**

21) One set of Erection & commissioning spares and start up spares as per **Annexure-IV**

22) One set of maintenance tools & tackles, as defined in **Annexure-IV** in specification. These tools shall not be used for erection / commissioning purposes and shall be in an unused and new condition when they are handed over to the customer at site. Each tool shall be stamped so as to be identified easily for its use. The tools shall be supplied in steel toolbox and with a copy of instruction manual. The items supplied shall be of the best quality and specially protected against rusting in tropical climate. Items indicated in Annexure-IV are mandatory, further if bidder feels necessary to provide additional tools and tackles for smooth maintenance of equipments, may supply the same shall be quoted.

23) Relevant scope of supply as per GTR, GCC & SCC.

24) Any other instrument, item, structural items etc. as required for making the installation complete in all respect within battery limits and for satisfactory operation of the system, **unless specifically EXCLUDED from the scope under Clause No. 4.0 below.**

3.2 SCOPE OF SERVICES

Detailed Erection and commissioning procedure shall be submitted by successful bidder for carrying out the erection and commissioning at site by BHEL.

Scope of Supervision for Erection & commissioning: Tentatively following visits shall be planned by site team which shall be as follows:-

a) One visit per unit for supervision for erection & commissioning (total 3 Visits).

b) One visits per unit for initial operation of system (total 3 Visits).

c) Any additional visit as per requirement of BHEL site office during erection of equipment.

Note: Bidder shall be informed at least 10 days in advance for the requirement of visit at site. Visiting team shall consist of one or two expert of bidder as deemed necessary by them.

Any other service required for making the installation complete in all respect within battery limits and for satisfactory erection & commissioning of the system, **unless specifically EXCLUDED from scope under Clause No. 4.0 below.**



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4.0 EXCLUSION

- 1) Lighting of Mill bay and bunker area.
- 2) Electrical exclusion as per Electrical scope sheet enclosed elsewhere in the specification.
- 3) Relevant exclusion as per GTR, GCC, SCC & ECC.

5.0 SERVICES TO BE PROVIDED BY THE CUSTOMER

Relevant services as per GCC, SCC & ECC.

6.0 TERMINAL POINTS

Mill Reject inlet towards pyrite hopper side	:	Mill reject spout (tramp iron) as per details indicated in enclosed GA of Mills. Work downstream up to mill reject bunker outlet with canvas chute and discharge gate is by bidder.
Mill Reject outlet towards road tanker / Truck	:	Mill reject bunker outlet with canvas chute. Bidder shall terminate his work with the canvas chute and lever operated discharge gate.
Instrument Air	:	A 25 NB line for instrument air shall be provided by BHEL and terminal point shall be the first mill bay column of each unit. Isolation valve shall be provided by BHEL. Instrument air system supplier. Quantity (per unit) and pressure at terminal point shall be 1.0 M ³ /min and 5 – 7 kg/cm ² .
Service Water for quenching	:	Total 3 - 4 m ³ /Hr water with Service water quality for quenching of mill rejects at 2.5 to 3 Kg/cm ² shall be provided per unit. Tapping / terminal point for the same shall be the first mill bay column of each unit. Isolation valve shall be provided by BHEL.

All terminal points are provided with Isolation valves by BHEL. Any additional isolation valves, expander reducer and any other fittings required at the terminal points from system design point of view shall be in the scope of the bidder.

Further bidder shall check the adequacy of service water being provided by BHEL as indicated above. In case these are not adequate, water requirement for these services shall be indicated by the bidder along with their bid.

7.0 LAYOUT REQUIREMENTS

Conveyor and equipment installation shall be according to the regulations and recommendations of recognized Indian/International Standards, Codes and Statutes, as



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MILL REJECT SYSTEM (CONVEYOR TYPE)

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and where applicable, practice in vogue (to be supported with back up document to the satisfaction of customer).

8.0 EQUIPMENT DESIGN CRITERIA

- 8.1 The minimum design criteria to be followed for various equipment shall be as per requirements indicated under **Annexure-A** (Sub Section- 1A/ Page no. 32) & anywhere else in the specification. In case of any contradictory requirement in specification of particular equipment, the stringent requirement as per the BHEL's engineer shall prevail. Further In case of any contradictory requirement within the same section, and clarifications not having been sought by the bidders within the stipulated period, the most stringent requirement as per interpretation of the BHEL's engineer / customer will prevail. Successful bidder will furnish detailed data sheets / specifications / design calculations for various equipment for customer's / consultant's approval during detail engineering. All comments made by customer / consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

Note: All equipment sizing, capacity of pyrite hopper shall be subject to customer's approval during detail engineering without any cost implication to the customer.

9.0 SUB-VENDOR ITEMS

The tentative make of sub-vendor items shall be as per **Annexure-I** enclosed. All these makes along with make of any other bought out items required for the system will be subject to approval of Customer during detail engineering and before the main vendor places order on the sub-vendor. There will, however, be no commercial implication on account customer's comment on the same

10.0 Mandatory spares

List of mandatory spares is attached as **Annexure-II**.

11.0 Quality of service water

Analysis of service water, required for quenching, is attached in project information.

12.0 List of drawings/ documents along with schedule of submission

The main drawings list along with schedule of submission after award of contract shall be done as per attached **Annexure-V**.

13.0 Painting

Relevant input drawings are listed below and attached as **Annexure III**.

14.0 General Technical Requirement

General technical requirement of end customer is attached as **Annexure IX**.

14.0 PERFORMANCE GUARANTEE

General technical requirement of end customer is attached as **Annexure VII**.

15.0 Input drawings

Relevant input drawings are listed below and attached as **Annexure X**.

- 1) Flow diagram for Mill Rejects Handling System Drg. No. PE – DG – 434 – 160 – A001, R0
- 2) Layout for Mill rejects handling system, Drg. No. PE – DG – 434 – 160 – A002, R0

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3)

Plot plan, Drg. No.PE – DG – 434 – 100 – M001

4)

General Arrangement of Mill HP-1103 (with planetary gear box)

5)

Foundation plan of Mill

The flow diagram shows the minimum requirement to be followed including minimum requirement of instruments. Any additional equipment/instruments required for safe, efficient & reliable operation of the system within the battery limit shall also be considered as included in bidder’s scope without any commercial/ cost implication to BHEL.

15.0

OTHER REQUIREMENTS

i)

Site Visit before submission of offer

Bidders shall make Site visit in order to familiarize themselves with the existing facility and condition of site before submitting the bid in order to make their offer complete. BHEL shall not entertain any cost implication for making the system complete for any lack of input data during detail engineering.

ii)

Technical Requirements

1)

End connections for IA pipelines for sizes 50 NB & below shall be screwed and then seal welded with zinc rich electrode.

2)

Chain, drag link, sprocket and sprocket shaft or equivalent arrangement shall be designed considering factor of safety as 5 (min).

3)

Bag filter with vent fan shall be provided in the bunker and in no case, conveyor shall be kept open to the atmosphere. Dusty air from the conveyor shall pass through vent fan only.

4)

SS tubing is to be provided for pneumatic connection / instrument air connection.

5)

All valves including isolation valves (water lines, air lines, before and after solenoid valves etc.) as required for successful operation shall be provided by bidder.

6)

All structural supports excepts columns and pipe rack, as required for supporting of pipes of mill reject handling system, shall be provided by bidders.

7)

Operation philosophy and control philosophy shall be submitted by the vendor during detail engineering stage for BHEL /CUSTOMER /CONSULTANT approval and approved document shall be adhered and the system shall be provided accordingly for which no commercial implication shall be entertained by BHEL.

8)

All possible efforts shall be made by the bidder to get the approval of drawings and documents from BHEL / customer / consultant at the earliest and the documents prepared / generated by them or their sub-vendors shall be checked by their competent authority before submission to BHEL.

9)

Revision made by the bidder in any drawings and documents shall be highlighted by indicating the no. of revisions in a triangle without fail so that the minimum time is required by BHEL to review the drawings and documents.

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10)

Civil works will be provided by BHEL / customer. Hence, bidder has to furnish the civil inputs in time. Bidder to furnish the civil foundation drawing along with the loading data for approval during detailed engineering stage showing / indicating the followings :-

a)

Scope of work by BHEL / customer and bidder shall be indicated with different legend or in the form of note.

b)

Recommended locations of earthing pads.

c)

Civil loads shall be furnished showing detailed calculation.

d)

Details of pockets as required for anchor bolts.

11)

Bidder to depute competent designer (s) at BHEL's/ CUSTOMER /CONSULTANT office during detailed engineering stage to discuss drawings and other technical documents as and when required by BHEL. However, minimum 7 days notice shall be served for the same.

12)

All the drawings which are required to be furnished to BHEL during detailed engineering stage shall include technical parameters, details of paints, BOQ / BOM etc in tabular form indicating all components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

13)

All drawings and documents including general arrangement drawing, data sheet, calculation etc. shall be furnished to BHEL during detailed engineering stage and shall include / indicate the following details for clarity w.r.t. inspection, construction, erection and maintenance etc.:-

a)

All drawings and documents shall bear BHEL's title block and drawing / document number.

b)

All drawings and documents shall indicate the list of all reference drawings including general arrangement.

c)

All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view, all major self-manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.

14)

Bidder shall check that specification of all the items are available in the NIT specification. However, in the event of absence of specification for any item, bidder will approach BHEL to furnish the specification of missing items and new specification will be adhered by the bidder for which no commercial implication shall be entertained by BHEL.

15)

Bar chart, list of drawings and documents including data sheet, manual calculation, quality plan, field quality plan, PG test procedure, list of sub – vendors (mechanical, C & I and erection and commissioning), technical specification and material of construction, painting specification / schedule, dispatch schedule etc. of various items as required by BHEL / customer / consultant shall be submitted to BHEL / customer / consultant during detail engineering stage for approval and the approved drawings / documents shall be adhered by the bidder without any commercial implication.

16)

“Technical deviations” shall be clearly indicated in bidder’s offer in “Schedule of deviation format” only.

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17) The specific technical requirements of various items of mill reject handling system shall be as per enclosed technical specification. In case of any contradictory requirement, the stringent requirement as per the interpretation of BHEL’s engineer shall be final and binding on the bidder for which BHEL shall not entertain any commercial implication during detail engineering stage. 18) Bidder to furnish detailed BOQ along with each drawing. Bidder to indicate all details in drawing required for erection of component.			



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ANNEXURE A: EQUIPMENT DESIGN/SELECTION CRITERIA

S. No.	Equipment	Design / Selection / Sizing Criteria
01.	Metallic belt conveyor/Chain Flight Conveyor.	1) Rated capacity of the conveyor – 9 T/Hr, Design capacity of the conveyor – 15 T/Hr. 2) Should have provision of variable speed through VVVF drive
02.	Pyrite Hopper & Accessories	a) Capacity of pyrite hoppers : 30 Minutes of Maximum specified mill reject collection(1TPH) b) MOC: MS to IS 2062 Gr. A (min), min. 10 mm thk, suitably stiffened with rolled steel sections. c) Rupture Disc Bursting Pressure – 0.5 kg /cm ² (g)
03.	System Sizing Basis and Reject size to be handled	+50mm (about 15-20 % of total reject), however system shall be designed for maximum particle size of 100 mm. System shall be sized for one normal cycle. Max. size of rejects to be handled – up to 50 mm (5% of total reject) rest 25 mm & below
04.	Bunker & its Accessories	a) Quantity – One (1) per unit b) Effective Storage Capacity – 125 T c) Minimum free board – 500 mm d) Bunker Plate – 10 mm thk. MS Plate conforming to IS 2062 Gr A e) Liner : 3 mm thick SS - 304 in conical & straight length portion of the bunker f) Manually operated sector Gate i. Size – 400 mm x 400 mm (clear open) ii. Type – Twin Sector, manually lever operated iii. MOC – CI to IS 210/ MS 10 mm thick (min) to IS 2062 (Gr. A min) with 10 thick SAILHARD / TISCRAAL LINER on inner surface g) Staircase on Silo: Complete staircase to be provided up to top of silo with operating / maintenance platform at all levels having any equipment requiring operation & maintenance. Bag Filter a) Material of Filter Cloth – Polyester felt needle suitable for Prolonged operation up to a temperature of 150°C without losing its collection efficiency & durability. b) Air to Cloth Ratio – 1.5 (Further 10 % additional bags shall be provided) c) Filter body – MS, IS 2062, Gr. A (min), 3.0 mm thick (min) d) Bag cage – MS, IS 1079, galvanised e) Outlet Air Quality – 30 mg/nm ³ (max) f) Bag Cleaning Mechanism – Automatic and shall comprise of solenoid valves, air nozzles, adjustable solid state timer, one no. pressure switch for supply air for filter cleaning, one no. differential pressure switch across bag filter, piping and fittings etc.. g) Common or separate Electric hoist over bag filter & bucket



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		elevator: Shall have 25% margin over weight of bag filter, but in no case the capacity shall be lower than 1.0 T.	
		h) Vent fan	
05.	Lines for Various Services	Service	Velocity in m/sec
		Compressed / Instrument Air / water lines	Pipe size below 50 mm, 15 m / sec
			Material of Construction & other details
			Pipes 50 NB & below shall have screwed / socket welded end. Material of construction of instrument air and water lines shall be IS 1239, Part –2. Instrument air pipe shall be galvanised internally as per IS 4736.
06.	Knife Gate/Plate Valve (pyrite hopper inlet, emergency discharge, hopper isolation/maintenance)	Material of Construction Body – CI to IS 210 Gr FG 260 Gate/Plate – SS or ASTM A240-Type 304 (min. 10 mm thickness) Size – 200 NB (min) for all valves	
07.	Fittings, Flanges, Fasteners & Gaskets	Fittings (Elbow, Tees and Reducers)	
		Service	Requirements
		Instrument Air	IS 1239, Part-2 (Galvanized)
		Water (if applicable) and conveying air	IS 1239, Part –2
		Flanges	
		Service	Requirement
		All services	Fabricated out of IS 2062 Gr. A Plates/ Equivalent as per ASME B 16.5
08.	fixed type Sump Pumps (If applicable)	Capacity – To meet system requirement but not less than 10 m ³ /hr MOC i. Casing & suction bell – 2.5 % Ni-CI to IS 210, FG260 ii. Impeller – 2.5 % Ni-CI to IS 210 , FG260 iii. Shaft/Sleeves – EN-8	



TITLE TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM -----	SPECIFICATION NO.	
	VOLUME II-B	
	SECTION	
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QUALITY ASSURANCE

QUALITY PLANS, INSPECTION & TESTING PROCEDURE

The following Quality plans/ Check lists of mechanical items are attached for ready reference of supplier.

- a) Local Panel
- b) Pyrite Hopper
- c) Terminal Box
- d) Bunker Discharge Gate
- e) Pressure Relief Valve
- f) Chain Pulley Block
- g) Bag Filter
- h) Expansion bellow
- i) Knife Gate Valves
- j) Sump Pumps
- k) Pipes
- l) Plates & Structures

The inspection requirements indicated in the above QP's / CL's shall be adhered to as a minimum. However, manufacturer specific changes shall be suitably reflected for customer / client consideration. Inspection requirement of some of the items are also elaborated in the technical specification under Sec-D. The QP's for above items as well as other items not listed above but required, as part of the system shall be prepared by the successful bidder in project specific format to be finalised with the successful bidder after award of contract.

Standard Quality Plans of few instruments & motors are enclosed elsewhere in the specification, for compliance by the bidder.

All QP's/CL's shall be submitted by the bidder for Customer/Consultant's review and approval. All comments made by customer / consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

		S/Contractor :- Manufacturer :-			Manufacturing Quality Plan Item :- Rupture Disc QAP No. :- LOI Nos:-			Project:- Package :- Mill Rejects System Client :-			
					Contractor :- M/s BHEL			Consultant :-			
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking	Remarks	
1	2	3	4	5	6	7	8	9	10	11	
								TYPE	M	C	
1	Materials -> Rupture Disc Material	Physical & Chemical Properties	Major	Chemical Analysis, YTS & UTS	1 per Heat	ASTM A240 / Type - 304 / Appved Data Sheet / Drg.	ASTM A240 / Type - 304 / Appved Data Sheet	MTC	✓	V	V
2	Final Inspection -> Dimension -> Burst Test of Rupture Disc	Measurement Functional	Major Major	Measurement Burst Test @ 200 Degree Centigrade	100% 1 per lot offered	App. Drawing Approved drawing / Datasheet	App. Drawing Min 0.4 bar (g) @ 200 degree C Max 0.6 bar (g) @ 200 degree C / App. Data Sheet	IR / Burst Test Certificate	✓	P	W W
		LEGENDS:- Records identified by ✓ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness			For Client Use:-			Document No.:-			
Manufacturer / Sub Vendor SIGNATURES		Contractor			Name & Signature of Approving Authority with Seal						

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

		S/Contractor :- Manufacturer :-		Manufacturing Quality Plan Item:- CHAIN PULLY BLOCK QAP No. :- LOI Nos:-			Project:- Package :- Mill Rejects System Client :-			
					Contractor :- M/s BHEL			Consultant :-		
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking	Remarks
1		3	4	5	6	7	8	9	10	11
								TYPE	D	
1	Materials									
->	Load Chain	Mech. Properties Breaking Load Test, Proof Load test	Major	Review of Mfr's Test Certificate	1 per Lot	IS:6216 /Appr. Drg / Appr. Data sheet	IS:6216 /Appr. Drg / Appr. Data sheet	MTC	✓ P/V	V
->	Load Sheave	Mech. Properties Chemical Composition	Major	Lab Analysis	1 per Heat	IS:1865 /Appr. Drg / Data sheet	IS:1865 /Appr. Drg / Data sheet	MTC	✓ P/V	V
->	Gear & Pinion	Chemical Composition	Major	Lab Analysis	1 per Heat	IS:4432/Appr. Drg / Data sheet	IS:4432/Appr. Drg / Data sheet	MTC	✓ P/V	V
->	Hook	Mech. Properties Chemical Composition	Major	Lab Analysis	1 per Heat	IS:8610 / IS:1875 /Appr. Drg / Data sheet	IS:8610 / IS:1875 /Appr. Drg / Data sheet	MTC	✓ P/V	V
2	In Process									
->	Hook	Proof Load Test	Major	Load Test	100%	IS:8610 /Appr. Drg / Appr. Data sheet	IS:8610 /Appr. Drg / Appr. Data sheet	MTC / IR	✓ P	V
		DPT after Load Test	Major	DPT	100%	ASTM E-165	ASTM E-165 / No Defects	IR	✓ P	V
3	Final Inspection									
->	Assembly	Operation Check Functional Test Load Test & Over Load Test Overall Dimensions Visual (After Load Test)	Major Major Major Major Major	Visual Visual Load Test Measurement Visual	100% 100% 100% 100% 100%	Smooth Operation / IS 3832 Appr. Drg / App. Data Sheet IS 3832	Smooth Operation / IS 3832 Appr. Drg / App. Data Sheet IS 3832	IR IR IR IR IR	✓ P ✓ P ✓ P ✓ P ✓ P	V V V V V
		LEGENDS:- Records identified by ✓ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document No.:-		
Manufacturer / Sub Vendor		Contractor				Name & Signature of Approving Authority with Seal				
SIGNATURES										

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

बी एच ई एल BHEL		S/Contractor :- Manufacturer :-		Manufacturing Quality Plan Item :- Bag Filter (Without Enclosure) QAP No. :- LOI Nos:-				Project:- Package :- Mill Rejects System Client :-							
Components / Operations		Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Contractor :- M/s BHEL				Consultant :-			
Sl. No.								Format of Records	Agency for Checking			Remarks			
1	2	3	4	5	6	7	8	9	10			11			
								TYPE	D	M	C	N			
1	Materials														
1.1	Manifold Body / Casings (MS Plate / Sheet / Pipe)	Chemical & Physical	Major	Chemical & Mechanical	1 per Lot	App. Drawing / Data Sheet / IS:2062 Gr. A / IS:1079 Gr. 0 / IS: 1239 Class Med.	App. Drawing / Data Sheet / IS:2062 Gr. A / IS:1079 Gr. 0 / IS: 1239 Class Med.	MTC	✓	V	V	V			
1.2	Bag Cages (Inserts)	Chemical & Physical	Major	Chemical & Mechanical	1 per Lot	App. Drawing / data sheet / IS:7887 Gr.8 / IS:1079 Gr. 0	App. Drawing / data sheet / IS:7887 Gr.8 / IS:1079 Gr. 0	MTC	✓	V	V	V			
1.3	Solenoid Valves	Functional	Major	Operational	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	✓	P	V	V			
1.4	Sequence Controller	Functional	Major	Operational	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	✓	P	V	V			
1.5	Filter Bags (Make :- Charminar / Supreme)	Physical	Major	Visual / Measurement	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	✓	P	V	V			
2	In Process														
2.1	Manifold	Dimensional & Visual	Minor	Dimensional & Visual	100%	As per Mfr's Drg.	As per Mfr's Drg.	IR	✓	P	V	V	** -> DPT & Hydro - Test of Manifold to be witnessed by M/s MBPL		
2.2		Welding	Major	DPT on Final Weld	100%	ASTM E-165	No Defect	IR	✓	P	V**	V			
2.3		Hydro Test for 30 Minutes	Major	Leakage	100%	Appr. Data sheet	No Leakage	IR	✓	P	V**	V			

Document No.:-

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking	Remarks
1	2	3	4	5	6	7	8	9	10	11
								TYPE	D	
3	Final Inspection									
3.1	Assembly \$-> Pneumatic Test at 1.1 times W/Pressure	Dimensional Pne. test \$of Manifold in Assly. Functional Test of Pulsing System	Major Major Major	Measurement Leakage by soap solution Pulse Sequence	100% 100% 100%	Appr. Drawing Appr. Data Sheet Appr. Data sheet / Testing Procedure	Appr. Drawing No Leakage Appr. Data sheet / Testing Procedure	IR IR IR	✓ ✓ ✓	Pressure Drop across Filter Bags & Emission Level at Filter outlet shall be checked at Site
4	Painting	Measurement & Visual	Major	DFT / Finish	100%	Appr. Painting Schedule	Appr. Painting Schedule	IR	✓	
TESTING PROCEDURE TO BAG FILTER										
1-> Functional test through compressed air , Sequential pulsing through valves and sequential controller on No - Load Condition to be conducted. 2-> The Soenoid valve shall be connected to the sequential timer and suitable electric supply shall be provided. Air header to be connected to supply of compressed air. The Timer is set and Sequential operation of Solenoid operated valve is observed.										
LEGENDS:- Records identified by ✓ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness						For Client Use:-		Document No.:-		
						Manufacturer / Sub Vendor SIGNATURES		Name & Signature of Approving Authority with Seal		

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

		S/Contractor :- Manufacturer :-			Manufacturing Quality Plan Item :- MS GI ERW Pipes (IS:1239/IS3589) QAP No. :- LOI Nos:-			Project:- Package :- Mill Rejects System Client :-				
					Contractor :- M/s BHEL			Consultant :-				
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking D M C N		Remarks	
1	Final Inspection of Finished Pipes	3	4	5	6	7	8	9	10		11	
1	Final Inspection of Finished Pipes	Physical Dimensional	Major	Visual Measurement	100%			IR	-	P	W*	V
		Mechanical Properties	Major	Tensile, elongation, Bend or Flattening	100%			IR	✓	P	W*	W*
		Chemical	Major	Chemical Analysis	1 per heat	IS:1239 / IS:3589 / Approved Data Sheet	IS:1239 / IS:3589 / Approved Data Sheet	IR / TC	✓	P / V	V	V
		Hydro Test	Major	Pressure Testing	100%			TC	✓	P / V	V	V
2	Galvanising (For GI Pipes)	Uniformity & mass of Zinc Coating, Adhesion test, Free bore test	Major	As per IS:4736	As per IS:4736	As per IS:4736 / Approved Data Sheet	As per IS:4736 / Approved Data Sheet	IR	✓	P	W #	V
3	Identification	Verification of Batch No. / Mfg stamp / Heat No.	Major	Visual	100%	Mfgr Practise / IS 1239 / IS 3589	Mfgr Practise / IS 1239 / IS 3589	IR	✓	P	W	V
4	Review of QA Documents					As per QAP	As per QAP		✓	V	V	V
NOTES :- For SAIL Pipes verification of reports for the tests mentioned in Sl. No. 1 & 2 by BHEL & KPCL. For GI Pipes, Galvanising Check as per relevant standard shall be done. All material shall be as per approved data sheet in case of ambiguity in QAP, material as data sheet shall be final.												
		LEGENDS:- Records identified by ✓ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness			For Client Use:-			Document No.:-				
Manufacturer / Sub Vendor SIGNATURES		Contractor			Name & Signature of Approving Authority with Seal							
Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final												

		S/Contractor :- Manufacturer :-		Manufacturing Quality Plan Item :- Knife Gate Valve [Manual / Pneumatic] QAP No. : LOI Nos:-			Project:- Package :- Mill Rejects System Client :-			
				Contractor :- M/s BHEL			Consultant :-			
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking	Remarks
1	2	3	4	5	6	7	8	9	10	11
LEGENDS:- Records identified by ✓ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness										
1 Raw Material / Bought Out's										
1.1	Body	Chemical & Mechanical	Major	Foundry TC	1 per Heat	Relevant IS / Appr. Drg / Data Sheet	do	TC	✓ P/V	V
1.2	Gate	do	Major	Lab Analysis	1 per lot	do	do	Mill / Lab TC	✓ P/V	V
1.3	Stem (For Manual Valve)	do	Major	Lab Analysis	1 per batch	do	do	do	✓ P/V	V
1.4	Pneumatic Cylinder (For Pneu. Valve)	Visual & Functional	Major	Mfr's TC Review	100%	Smooth Operation	Smooth Operation	Mfr's TC	✓ P/V	V
2 In - Process Inspection										
2.1	Body, Gate	Dimensional	Major	Measurement	100%	Mfr's Drawing	In-Process Insp. Record	-	P	V
2.2	Body Shell Test	Leak Tightness	Major	Hydro Static Test #	100%	Approved Drg / Data Sheet	No Leakage	IR	✓ P	V
3 Final Inspection										
3.1	Assembled Valve	Dimension	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓ P	W
3.2	do	Function	Major	Operation	100%	Smooth Operation	Smooth Operation	IR	✓ P	W
3.3	do	Seat Leakage	Major	Hydro Static Test #	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓ P	W
Manufacturer / Sub Vendor		Contractor		For Client Use:-						
SIGNATURES		Name & Signature of Approving Authority with Seal								

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

S/Contactor :- 		S/Contactor :- Manufacturer :-			Manufacturing Quality Plan Item :- Sump Pump QAP No. :- LOI Nos:-			Project:- Package :- Mill Rejects System Client -		
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking	Remarks
1	2	3	4	5	6	7	8	9	10	11
1	Raw Material / Bought Out's									
1.1	Casing	Chemical, Mechanical, Hardness, Surface Defect	Major	Chem. Comp. Mechanical Hardness Visual	1 per Heat 1 per Heat 1 Per Heat 100 %	Relevant IS / Appr. Drg / Data Sheet	Relevant IS / Appr. Drg / Data Sheet	TC	✓ P/N	V
1.2	Impeller	do	Major	do	do	do	do	do	✓ P/N	V
1.3	Shaft	Chemical, Mechanical, Surface Defect	Major	Chem. Comp. Mechanical Visual & UT if Dia >50 mm	1 per Heat 1 per Heat 100 %	Relevant IS / Appr. Drg / Data Sheet / ASTM E 388 for UT	Relevant IS / Appr. Drg / Data Sheet / ASTM E 388	do	✓ P/N	V
1.4	Shaft Sleeve	Chemical Hardness	Major	Chem. Comp. Hardness	do	do	do	do	✓ P/N	V
2	In - Process Inspection									
2.1	Casing	Soundness of Casting / Leakage	Major	Hydro Static Test	100%	Appr drg. / Data Sheet / IS 5120	No Leakage	IR	✓ P	V
2.2	Impeller	Residual unbalance	Major	Dyanamic / Static Balancing	100%	Approved Drg / Data Sheet / ISO 1940 Gr. 6.3	ISO 1940 Gr. 6.3	IR	✓ P	V

Hyd. Test at 200% of pump rated head or 150% of Shut off head which ever is higher for 30 min.

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking	Remarks		
1	2	3	4	5	6	7	8	9	10	11		
								TYPE	D	M	C	N
3	Final Inspection											
3.3	Performance Test with Calibrated Test Lab Motor	Q Vs Head, Power & Efficiency, Noise & Vibration	Major	Measurement & Curves	100%	Approved Drg / Data Sheet / HIS	Approved Drg / Data Sheet / HIS	IR	✓	P	W	W
3.2	Pump strip test in case of doubt due to abnormal sound	Undue Wear	Major	Visual / Strip Test	100%	Mfr's Standard	No Undue Wear	IR	✓	P	W	W
3.3	Painting	Visual & Measurement	Major	Visual & Measurement	100%	As per approved Painting Schedule	As per approved Painting	IR	-	P	-	-
				LEGENDS:-				Document No.:-				
				Records identified by ✓ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report				For Client Use:-				
Manufacturer / Sub Vendor				M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N-> CLIENT				Name & Signature of Approving Authority with Seal				
SIGNATURES				P->Perform, V-> Verification, W-> Witness								

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

S/Contractor :-		Manufacturing Quality Plan Item :-EXPANSION BELLOW QAP No. :- LOI Nos:-				Project:- Package :- Mill Rejects System Client :-			
Manufacturer :-									
S/Contractor :-									
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S/Contractor :-									

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

Manufacturer's Name & Address :			MANUFACTURING QUALITY PLAN					Project :						
SAIL / TISCO			Item : MS Plates & Structures		QP No. : Rev. No. : 0		BHEL Ref. : Contract No. : Contractor : BHEL SUB-CONTRACTOR-							
			Sub-System :		Date : Page No. : 11 of 1									
Sl. No.	Components & Operations	Characteristic /Item	Class	Type/method of check	Extent of Check	Reference Document	Acceptance	Format of Record		Agency			Remarks	
1	2	3	4	5	6	7	8	9	D	10			11	
RAW MATERIAL														
1	Steel Plates	Chemical composition and Mechanical test	Major	Review of corelated MTC	One/heat	IS:2062	IS:2062	Mfgr. TC	✓	3		2,1	Refer Note Below	
2		Visual and dimensional Check	Major	Visual and measurement	100%	Mfgr. TC	Mfgr. TC IS 1852	Mfgr. TC	✓	3	2,1			
3		Identification / Marking	Major	Co-relation establish	100%	AS per manufacturing practice	AS per manufacturing practice IS 2062	Mfgr. TC	✓	3	2	1		
			LEGEND :			BHEL Doc. No. PE-QP-279-166-A801			Rev. 0					
			1 - BHEL / CUSTOMER 2 - VENDOR 3 - Manufacturer			P - Agency Performing the Test W - Agency Witnessing the Test V - Agency Verifying the Test								
MANUFACTURER/ SUBCONTRACTOR			CONTRACTOR			CR - Critical Characteristics MA - Major Characteristics MI - Minor Characteristics								
SIGNATURE						REVIEWED BY			NAME & SIGNATURE OF APPROVING AUTHORITY					

Notes:

- 1 In case material is despatched directly from SAIL/TISCO plant/stockyard or procured from dealer against co-related TC's witnessing by BHEL is waived off and material will be accepted based on MTC of SAIL/TISCO.
- 2 In case material is procured from dealer and co-related TC's are not available, check on 100% quantity of plates will be performed on sample drawn from each plate at NABL certified/ approved laboratory or any govt approved laboratory for chemical & physical properties, However dimensional check shall be witnessed by BHEL.
- 3 There will not be any inspection by CUSTOMER.

		S/Contractor :- Mfgr:- Works:-			Manufacturing Quality Plan Item :-Local Panels QAP No. LOI Nos:-			Project:- Package :- Mill Rejects System Client :-				
					Contractor :- M/s BHEL			Consultant :-				
Sl. No.	Components / Operations	3	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking			Remarks
1			4	5	6	7	8	9	10	11		
								TYPE	D	M	C	N
1	Materials CRCA Sheet	Visual	Major	Visual	100%	Appr. Drg / IS: 513	Appr. Drg / IS: 513	IR	-	P	-	-
	Chem. & Physical.	Chem. & Physical.	Major	Chem. & Physical.	100%	Do	Do	TC	✓	V	V	V
	Thickness	Thickness	Major	Measurement	100%	App. Drawing	App. Drawing	IR/TC	✓	V	V	V
2	Bought outs Verification of type, size & Make of FLV unit, PG, PS, SV	Visual	Major	Visual	100%	Appr. Drawing / Data Sheet	Approved Drawing / Data Sheet	IR/TC	✓	V	V	V
3	Painting Pre Treatment 7 tank process	Physical	Major	DFT / Shade / Finish	100%	Appr. Painting Schedule	Appr. Painting Schedule	IR/TC	✓	V	V	V
4	Final Inspection	Visual	Major	Visual	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	✓	P	W	V
	Dimension	Dimension	Major	Measurement	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	✓	P	W	V
	Check for Pneumatic Circuit	Check for Pneumatic Circuit	Major	Visual	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	✓	P	W	V
	Check for Wiring / Mountings / Terminations	Check for Wiring / Mountings / Terminations	Major	Visual / Continuity	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	✓	P	W	V
	Functional Check for Solenoid Valve	Functional Check for Solenoid Valve	Major	Functional	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	✓	P	W	V
5	QA Documents	Review	Major	verification	100%	-	-	-	-	-	-	-
		LEGENDS:-			Document. No.:-							
		Records identified by ✓ shall be essentially included in QA documentation. TC-Test Certificate, IR - Insp. Report										
		M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N ->CLIENT										
SIGNATURES		P->Perform, V-> Verification, W-> Witness			Name & Signature of Approving Authority with Seal							
Manufacturer / Sub Vendor		Contractor										

			SI/Contractor :- Mfgr:- Works:-		Manufacturing Quality Plan Item :- Pyrite Hopper QAP No. LOI Nos		Project:- Package :- Mill Rejects System Client :-					
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9	10	11		
Contractor :- M/s BHEL												
1	Raw Materials											
1.1	Plates for Body	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Elongation Chemical Comp.	100% 100% 1/Heat 1/Heat	App. Drg. / Data Sheet / IS Standard Mfr's Drg. / IS Standard	App. Drg. / Data Sheet / IS Standard Mfr's Drg. / IS Standard	- - MTC MTC	P P P/V P/V	- - V V	- - V V	- - V V
1.2	Spray Nozzle	Surface Defects Chemical Check Dimensions	Major	Visual Chemical Comp. Measurement	100% 1/Lot 100%	Mfr's Drg. / IS Standard Mfr's Drg. / IS Standard	Mfr's Drg. / IS Standard Mfr's Drg. / IS Standard	- MTC IR	P P/V P	- V V	- V V	- V V
2	In - Process Insp.											
2.1	Welders & Welding	WPS / PQR / WPQ Welding Defects	Major	Procedure / Qualification DPT on Root run DPT on Final run	100% 100% 10%	ASME sec - IX ASTM E-165 ASTM E-165	ASME sec - IX ASTM E-165 ASTM E-165	WPS / PQR IR IR	P/V P/V P/V	V V W	V V W	Welders to be approved by BHEL W W
2.2	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-	P	-	-	-
3	Final Inspection											
3.1	Final Assy	Completeness & Dimension Finish / DFT	Major	Visual Visual, Measurement	100% 100%	App. Drg. / Data sheet App. Painting Schedule	App. Drg. / Data sheet App. Painting Schedule	IR IR	P/V P/V	W* W	W* W	* -> Witness 10% Painting shall be Heat Resistance
3.2	Painting	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	P/V	V	V	V
4	QA Documentation											
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	P/V	V	V	V
LEGENDS:- Records identified by ✓ shall be essentially included in QA documentation. TC-Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> Client P->Perform, V-> Verification, W-> Witness			For Client Use:-			Document No.:-						
Manufacturer / Sub Vendor			Contractor			Name & Signature of Approving Authority with Seal						
SIGNATURES												

			S/Contractor :- Mfgr:-			Manufacturing Quality Plan Item :- Terminal Box QAP No. :- LOI Nos:-			Project:- Package :- Mill Rejects System Client :-		
Contractor :- M/s BHEL			Consultant :-								
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking	Remarks	
1	2	3	4	5	6	7	8	9	10	11	
1											
1.1	Plates for Body	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Elongation Chemical Comp.	100% 100% 1/Heat 1/Heat	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	- - MTC MTC	P - P/V P/V	- - V V	
2											
2.1	Welders Qualification & Welding	WPS / PQR / WPQ Welding Defects	Major	Procedure / Qualification DPT on Root run DPT on Final run	100% 100% 10%	ASME sec - IX ASTM E-165 ASTM E-165	ASME sec - IX ASTM E-165 ASTM E-165	WPS / PQR IR IR	P/V P/V P/V	V V W	
2.2	Flange Machining and Drilling	Dimensions	Major	Measurement	100%	Mfr/Appr. Drg	Mfr/Appr. Drg	IR	P	-	
2.3	Connection -pipe to flange, pipe to body	Fit up	Major	Joint set up, PCD, Orientation	100%	Mfr/Appr. Drg	Mfr/Appr. Drg	IR	P	-	
2.4	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-	P	-	
3											
3.1	Final Assy	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	P/V	W	
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	P/V	-	
4											
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	P/V	V	
LEGENDS:- Records identified by ✓ shall be essentially included in QA documentation. TC-Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness			For Client Use:-			Document No.:-					
Manufacturer / Sub Vendor			Contractor								
SIGNATURES			Name & Signature of Approving Authority with Seal								

S/Contractor :-		Manufacturing Quality Plan					Project:- Package :- Mill Rejects System Client :-						
Mfggr:- Works:-		Item :- Bunker Sector Gate QAP No. :- LOI Nos:-					Consultant :-						
SI. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking			Remarks	
1	2	3	4	5	6	7	8	9	D	M	C	K	11
Contractor :- M/s BHEL													
1	Raw Materials												
1.1	Plates for Body	Dimensions Surface Defects Physical Check	Major	Measurement Visual TS & Elongation	100% 100% 1/Heat	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	-	-	P	-	-	
1.2	Shaft	Chemical Check	Major	Chemical Comp.	1/Heat	do	do	TC	✓	P/V	V	V	
		Physical Check		1/Heat	TC			✓	P/V	V	V		
		Chemical Check		1/Heat	TC			✓	P/V	V	V		
1.3	Cylinder / Actuator	UT If Dia > 50 mm Visual / Specification	Major	Internal defect Visual	100% 100%	do do	do	IR Mir's TC	✓ ✓	P/V V	V V	V V	
2	In - Process Insp.												
2.1	Welders & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR	✓	P/V	V	V	Welders to be approved by BHEL / CLIENT
3	Final Inspection	Completeness & Dimension	Welding Defects	DPT on Root run DPT on Final run	100% 10%	ASTM E-165 ASTM E-165	ASTM E-165 ASTM E-165	IR IR	✓ ✓	P/V P/V	V W	V V	
			Final Assy	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	✓	P/V	W	W	
				Operation with job / shop actuator	Visual	100%	Proper Working	Smooth Operation	IR	✓	P/V	W	W
3.3	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	-	P/V	W	-	Painting before disp.
4	QA Documentation												
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		-	P/V	V	V	
				LEGENDS:- Records identified by ✓ shall be essentially included in QA documentation.TC -Test Certificate,IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N-> CLIENT P->Perform. V-> Verification. W-> Witness				Document No.:-					
Manufacturer / Sub Vendor		Contractor											
SIGNATURES		Name & Signature of Approving Authority with Seal											

		Sl/Contractor :- Mfr:- Works:-			Manufacturing Quality Plan Item :- Pressure Relief Valve QAP No. : LOI Nos:-			Project:- Package :- Mill Rejects System Client :-		
					Contractor :- M/s BHEL			Consultant :-		
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking	Remarks
1	2	3	4	5	6	7	8	9	10	11
								TYPE	D M C K	
1	Raw Materials									
1.1	Plates for Body	Dimensions Surface Defects Physical Check (Chemical Check)	Major	Measurement Visual TS & Elongation Chemical Comp.	100% 100% 1/Heat 1/Heat	App. Drg. / IS Standard	App. Drg. / Data Sheet / IS Standard	- - MTC MTC	- - P/V P/V	- - V V
2	In - Process Insp.									
2.1	Welders & Welding	WPS / PQR / WPQ Welding Defects	Major	Procedure / Qualification DPT on Root run DPT on Final run Visual, Measurement	100% 100% 10% 100%	ASME sec - IX ASTM E-165 ASTM E-165 Mfr's Standard	ASME sec - IX ASTM E-165 ASTM E-165 Mfr's Standard	WPS / PQR IR IR -	P/V P/V P/V P/V -	V V V V -
2.2	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Measurement						
3	Final Inspection									
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	P/V	W
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	P/V	-
4	QA Documentation									
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	P/V	V
						For Client Use:-		Document No.:-		
Manufacturer / Sub Vendor		Contractor		LEGENDS:- Records identified by ✓ shall be essentially included in QA documentation. TC-Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness						
SIGNATURES		Name & Signature of Approving Authority with Seal								



TITLE
3X800 MW PATRATU STPP PHASE-I
MILL REJECT SYSTEM (CONVEYOR TYPE)
SPECIFIC TECHNICAL REQUIREMENTS

SPECIFICATION NO. PE-TS-434-501-A501

REV 00

Section IA Date APRIL 2019

SECTION – IA
CUSTOMER SPECIFICATION

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	MILL REJECT SYSTEM			
1.00.00	To handle the Mill Rejects on a continuous basis, the Bidder shall provide a Mill Reject Handling System. The Mill Reject Handling System shall comprise a pneumatic conveying system or Mechanical Conveying system. The Rejects shall be stored in storage silo. From the storage silo the Mill Rejects shall be disposed off in trucks.			
1.01.00	The scope of supply for mill reject handling system shall include but not limited to the following:			
1.01.01	Pneumatic conveying system:			
	(a.) One (1) no. pyrite hopper with discharge chute, emergency chute work etc. for each mill as required. (b.) One (1) no. pneumatically operated isolation gate for inlet and one (1) no. manually operated isolation gate for outlet of pyrite hoppers complete with compressed air pipe work, solenoid valves & supporting arrangement for each pyrite hopper. (c.) Conveying pipework from individual mill reject handling equipment to the reject storage silos with all accessories such as bends, fixtures, flange joints, structural steel supports, anchors/inserts, trestles, walkways etc. as required. (d.) Mill reject storage silos, one (1) no. for each row of mills in a unit in steel construction each having an effective storage capacity of sixteen (16) hours considering all the working mills of each row of the unit in operation and rejecting @ of 1 % of mill capacity for the worst coal conditions. Necessary supporting steel structure, platforms, staircase, manual operated unloading gate, 3 mm thick SS plate liners covering straight length portion and conical portion of mill reject storage hoppers (bunkers), level switches, air relief devices, etc. shall also be provided. The storage silos shall be designed to provide a clear access of 4.5 m for a Road Tanker/Trucks to come under the silo & receive the rejects using suitable chute work. (e.) Suitable spray quenching system, to cool the mill reject in pyrite hoppers. (f.) Two (2) nos. air receivers per unit of adequate capacity with all accessories, interconnecting piping, support etc. (g.) Three nos. (2 working+ 1 standby) of screw type air compressors with drives and accessories to cater the compressed air requirements of mill reject handling system for all units working simultaneously. Compressors shall be located in the main compressor house. (h.) Necessary lifting devices of adequate capacity to handle the mill reject handling equipment.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATIONS SECTION-VI, PART-A BID DOC.NO. CS-9585-001-2	SUB-SECTION-IIA-17 MILL REJECT SYSTEM	PAGE 1 OF 3

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.01.02				

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	k) Two numbers (1 working+ 1 standby) of fixed type sump pumps each of 10m³/hr capacity for each pit of Bucket Elevator.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATIONS SECTION-VI, PART-A BID DOC.NO. CS-9585-001-2		SUB-SECTION-IIA-17 MILL REJECT SYSTEM
				PAGE 3 OF 3

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC																																	
1.00.00	MILL REJECT HANDLING SYSTEM Dense phase pneumatic conveying system or mechanical conveying system shall be employed for handling of the mill rejects. Each mill reject discharge hopper shall be fitted with a positive pressure pneumatic conveying vessel which shall discharge the mill rejects through pipe line to a storage Silo (If applicable). The transmitting vessel shall operate on level probe mode with timer back-up.																																				
2.00.00	MILL REJECT HANDLING SYSTEM OF PNEUMATIC TYPE MEETING THE FOLLOWING REQUIREMENTS SHALL BE PROVIDED. Three nos. of Screw type Compressor (2 no. operating + 1 no. stand by) with drives and accessories to cater the compressed air requirements of mill reject handling system for all the three units working simultaneously for the worst coal condition. Compressors shall be located in the main compressor house. <table><tr><th>Sl. No.</th><th>System</th><th>Parameter</th></tr><tr><td>1.</td><td>Duty</td><td>Continuous</td></tr><tr><td>2.</td><td>Number of mill reject silos & capacity</td><td>a) One (1) no. for each row of mills in a unit in steel construction b) 16 hours storage capacity considering all the working mills of each row of the unit for worst coal condition.</td></tr><tr><td>3.</td><td>Number of mills working per boiler</td><td>As specified by Boiler/ Mill manufacturer</td></tr><tr><td>4.</td><td>Design value of reject</td><td>1% of the mill design capacity for the worst coal condition or maximum actual, whichever is higher.</td></tr><tr><td>5.</td><td>Maximum temp. of rejects</td><td>As specified by boiler/ mill manufacturer.</td></tr><tr><td>6.</td><td>Maximum size of mill reject to be handled</td><td>(-) 40 mm</td></tr><tr><td>7.</td><td>Bulk density of mill rejects for volumetric computation</td><td>1600 kg/m³</td></tr><tr><td>8.</td><td>Bulk density of mill rejects for Loads/strength computation</td><td>2400 kg/m³</td></tr><tr><td>9.</td><td>Inlet valve of the vessel</td><td>Plate valve/dome valve/butterfly valve/cone valve.</td></tr><tr><td>10.</td><td>Sizing grid</td><td>Yes (To separate over size rejects/to give control feed to crushers, if proposed)</td></tr></table>				Sl. No.	System	Parameter	1.	Duty	Continuous	2.	Number of mill reject silos & capacity	a) One (1) no. for each row of mills in a unit in steel construction b) 16 hours storage capacity considering all the working mills of each row of the unit for worst coal condition.	3.	Number of mills working per boiler	As specified by Boiler/ Mill manufacturer	4.	Design value of reject	1% of the mill design capacity for the worst coal condition or maximum actual, whichever is higher.	5.	Maximum temp. of rejects	As specified by boiler/ mill manufacturer.	6.	Maximum size of mill reject to be handled	(-) 40 mm	7.	Bulk density of mill rejects for volumetric computation	1600 kg/m ³	8.	Bulk density of mill rejects for Loads/strength computation	2400 kg/m ³	9.	Inlet valve of the vessel	Plate valve/dome valve/butterfly valve/cone valve.	10.	Sizing grid	Yes (To separate over size rejects/to give control feed to crushers, if proposed)
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-9585-001-2	SUB-SECTION-A-25 MILL REJECT HANDLING SYSTEM	PAGE 1 OF 4																																	

CLAUSE NO.	TECHNICAL REQUIREMENTS		
3.00.00	11.	Emergency ** discharge chute with knife edge gate valves	Yes.
	12.	Piping	MS IS: 3589/ MS ERW IS 1239 heavy grade
	13.	Bends/Fittings Laterals	Alloy CI Minimum hardness 400 BHN
	**	The wearing parts of all the valves shall be provided with abrasion resistant material of hardness of 350-400 BHN.	
	MILL REJECT HANDLING SYSTEM OF MECHANICAL TYPE MEETING THE FOLLOWING REQUIREMENT SHALL BE PROVIDED:		
	The discharged rejects from coal mill shall be collected in a dedicated pyrite hopper. Each pyrite hopper shall be provided with cylinder operated knife gate valves at inlet and outlet. Material from pyrite hoppers shall be removed by mechanical conveyor and fed to main conveyor for further conveying. The main conveyor shall be located in a tunnel. Necessary ventilation for tunnel shall be provided. The main conveyor shall feed to a bucket elevator type conveyor which in turn will feed to main storage silo.		
3.01.00	1. Pyrite Hopper		
	a)	Minimum effective storage	: 30 minutes of maximum specified mill reject collection
	b)	No. pyrite hopper	: One (1) for each mill, supported independently on steel columns
	c)	Function	: To store mill reject on load maintenance of conveyors and act as a transition tank for falling mill rejects during normal working.
	d)	Number and type of isolation gates	: Cylinder operated sliding type gates reject feeding at inlet and outlet of pyrite hopper.
	e) Accessories		
	a)	Pyrite hopper	: Access doors/ manholes /Inspection windows/Poke holes Size: 300 mm dia circular or 300 mm x300 mm, if rectangular
	2) Material of construction		
a)	Pyrite hopper	: Tested quality mild steel plates of	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-9585-001-2	SUB-SECTION-A-25 MILL REJECT HANDLING SYSTEM
PAGE 2 OF 4			

CLAUSE NO.	TECHNICAL REQUIREMENTS एनटीपीसी NTPC		
3.02.00 3.03.00		thickness not less than 10 mm (IS: 2062) and suitably stiffened with rolled steel sections.	
	b) Slide gates	:	Carbon steel
	Metallic Conveyors		
	Data Sheet		
	1) Function	:	To convey mill rejects, from pyrite hopper to main storage silo.
	2) Location	:	Under the coal mill, and upto main mill reject storage silo in each unit/ bucket elevator.
	3) No.	:	one (1) no. working set of conveyors per row of mills per boiler
	4) Capacity	:	It shall be designed for continuous removal of mill rejects.
	5) Continuous normal operating capacity	:	To meet the mill rejects removal rates specified.
	6) Continuous maximum operating capacity	:	At least 25% margin on normal operating capacity.
	7) Tensioning arrangement		Hydraulic/pneumatic
	8) Metallic belt conveyor will be required to handle highly abrasive rejects continuously. So all components shall be of proven design having a track record of trouble free-operation in order to avoid problems of frequent stoppages. The conveyor shall be sized for startup with load.		
	9) The conveyor shall be fully enclosed in casing.		
	10) VOID		
	11) The conveyor/rollers bearings shall be grease packed with facility of recharging from outside		
	12) Reliable and proven hydraulic/pneumatic auto take up arrangements, with facility of adjustment of tension. The tension assembly shall be designed to absorb any momentary shock loading.		
	14) 800 mm walkway along both sides of conveyor for Maintenance shall be provided in the tunnel.		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-9585-001-2	SUB-SECTION-A-25 MILL REJECT HANDLING SYSTEM PAGE 3 OF 4



TITLE
3X800 MW PATRATU STPP PHASE-I
MILL REJECT SYSTEM (CONVEYOR TYPE)
SPECIFIC TECHNICAL REQUIREMENTS

SPECIFICATION NO. PE-TS-434-160-A101
REV 00
Section IA **Date** APRIL 2019
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SECTION – IA

ANNEXURES

ANNEXURE- I					
SUB VENDOR LIST FOR MILL REJECT HANDLING SYSTEM (CONVEYOR TYPE)					
Sl. No.	DESCRIPTION	MAKE	WORKS	INSPECTION CATEGORY	REMARKS
A	SELF MANUFACTURED				
1	Chain Links/Steel belt/Apron	Self Manufactured	Supplier's works	I / II	In case bid has been submitted on collaboration route, items identified under self manufactured items shall be sourced from collaborator/ Principal/ approved and proven sources of principal
2	Conveyor casing				
3	Pyrite Hopper				
5	Bunker Discharge Gate (Sector Gate)				
6	Pressure Relief Valve				
B	BOUGHTOUT ITEMS (ELECTRICAL)				
1	Motor	Marathon,	kolkata	I	Upto 15 KW
		Crompton Greaves	Ahmednagar		
		NGEF	Bangalore		
		ABB	Bangalore/Faridabad		
		Siemens	Mumbai		
		Jyoti	Baroda		
		LHP	Solapur		
		BHEL	Bhopal		
		Bharat Electric (BHEL)			
		Bharat Bijlee	Mumbai		
KEC	Bangalore/Hubli				
2	Air Filter/Lubricator/Regulator	SHAVONORGAN	MUMBAI/BANGLORE	III	
	PLACKA	CHENNAI			
3	Annunciator	IIC	MUMBAI	III	
	Minilec	AHEMDABAD			
		PROCON	CHENNAI		
4	Solenoid Valve	Rotex	Baroda	III	
		Avcon	Mumbai		
		Asco	Chennai		
		SMC	Noida		
		Nucon	Hyderabad		
5	Pulse Jet Valves	ASCO	CHENNAI	III	
	MANIK	PUNE			
6	Cable Lug	DOWELLS	MUMBAI	III	
		BILLET (3D)	VALSAD		
		WAGO	INDIA		
		COMETT	MUMBAI		
7	Limit Switch	BCH	NEW DELHI	III	
		SIEMENS	NEW DELHI		
		JAIBALAJI	NEWDELHI		
8	Interposing Relay	ECONIX	MUMBAI	III	
		PHEONIX	DELHI		
9	ZERO SPEED SWITCHES	JAYSHREE	PUNE	III	
		PROTOCONTROL	PUNE		
		P&F	BANGALORE		
10	JUNCTION BOX	AJMERA INDUSTRIAL & ENGINEERING WORKS	SHREE NAGESH INDL. ESTATE, STATION ROAD, MUMBAI	III	FOR GALVANIZED AND FRP JUNCTION BOXES
		FLEXPRO ELECTRICALS PVT. LTD.	GIDC, Kabilpore, Navsari-Gujarat		Metal type junction box only
		K.S.INSTRUMENTS PVT.LTD.	Industrial Suburb, Yeshwanthpur Bangalore-Karnataka		
		SUCHITRA INDUSTRIES	REJAMAHALVILAS EXTN 2ND STG BANGALORE		
			Panchratna Industrial Estate, Sarkhej-Bavla Road Ahmedabad-Gujarat		Registered for FRP JB's AND METAL JB's.
		Shrenik & Company,			
		Hoffman	BANGALORE		
		Rittal	BANGALORE		
11	FUSE	GE	INDIA	III	
		Bussmann	INDIA		
12	MCCB /SFU, MPCB, MCB with 'C' Characteristics, Power Contactor	Schenider	INDIA	III	
		Siemens	INDIA		
		ABB	INDIA		
		L&T	INDIA		
13	VFD	Schenider	INDIA	III	
		Allen Bradelly	INDIA		
		ABB	INDIA		
		YASKAWA	INDIA		
		Toshiba	INDIA		
		Siemens	INDIA		
14	Selector Switch	Schenider	INDIA	III	
		Siemens	INDIA		
		L&T	INDIA		
		Kaycee	INDIA		
15	Indication Lamps, PushButton, Aux. Contactor, Aux. Relays	Schenider	INDIA	III	
		Siemens	INDIA		
		ABB	INDIA		
		L&T	INDIA		
16	Timer	BCH	INDIA	III	
	EAPL	INDIA			
17	Control Transformer, Reactors	Kappa	BANGALORE	III	
	TS International	BANGALORE			
18	Power Monitor Relay	Minilec		III	

19	TEMPERATURE ELEMENT	GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	Goa	II	
		DETRIVE INSTRUMENTATION & ELECTRONICS LTD.	WORLI, MUMBAI		
		PYRO ELECTRIC INSTRUMENTS GOA PVT.LTD.	GOA		
		TECHNO INSTRUMENTS	Gandhinagar-Gujarat		
		Tempsens Instrument (I) Pvt Ltd	UDAIPUR-RAJASTHAN		
		TM TECNOMATIC SPA	CREMONA-ITALY		
		TOSHNIWAL INDUSTRIES PVT. LTD.,	Ajmer,-Rajasthan		
		Thermal Instrument India Pvt. Ltd.	Mahim Mumbai		
		Baumer Technologies India Pvt. Ltd.	ANDHERI(E) MUMBAI		
20	TRANSMITTERS	ABB LIMITED	FARIDABAD-HARYANA	II	PRESSURE TRANSMITTER, DP TRANSMITTER and TEMP TRANSMITTER
		Endress + Hauser (India) Pvt. Ltd.,	New Delhi		For temperature transmitter only. . .
		Moore Industries International Inc.	CALIFORNIA-USA		INDIAN REPRESENTATIVE: CHEMTROL INDUSTRIES LTD.
		NIVO CONTROLS PVT. LTD.	Indore-M.P		For Capacitance type only
		Pune Techtrol Pvt. Ltd.	MIDC Bhosari, Pune-Maharashtra		Only for capacitance Type Level Transmitter
		EMERSON PROCESS MANAGEMENT (INDIA) PVT.LTD.	BANDRA EAST MUMBAI-MAHARASHTRA		
		SIEMENS LIMITED	Worli Mumbai-Maharashtra		
		SMART INSTRUMENTS LTD, BRAZIL	Agents: Digital Electronic Ltd. 74/11 'C' Cross Road MIDC Andheri (East) MUMBAI-MAHARASHTRA-INDIA Phone- 28208477 Pincode : 400093 Email : corp@delbby.rpgms.ems .vsnl.net.in		LD-301 & T-301 TRANSMITTER FROM M/S SMART EQUIPMENTS BRAZIL.
		SBEM PVT. LTD.	PUNE SATARA ROAD PUNE,-MAHARASHTRA		FOR CAPACITANCE TYPE.
		Honeywell Automation India Limited	NEW DELHI-DELHI-INDIA		
		TOSHNIWAL INDUSTRIES PVT. LTD.,	Ajmer,-Rajasthan,		
		V. AUTOMAT & INSTRUMENTS (P) LTD.	NEW DELHI-		a)DISPLACEMENT TYPE TRANSMITTERS. b)PRESSURE AND DP TRANSMITTERS
		YOKOGAWA INDIA LIMITED,	HOSUR ROAD, BANGALORE,- KARNATAKA		

21	TEMPERATURE GAUGE	A.N. INSTRUMENTS PVT. LTD.	MARKETING DIVISION, 5th FLOOR, 59-B, CHOWRINGHEE ROAD, KOLKATA-WEST BENGAL	III	
		ASHCROFT INDIA PVT LTD.	Plot No.2306, Phase II, GIDC Chhatral Kalol-Gujarat		
		BUDENBERG GUAGE CO.LTD.	PO BOX-5, ALTRINCHAM CHESHIRE-UK-UK		
		FORBES MARSHALL (HYD) LTD.	PLOT NO.A-19/2, & T-4/2, IDA, NACHARAM, HYDERABAD-ANDHRA PRADESH		
		GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	D2/5, Mapusa Industrial Estate, Mapusa, Goa,- MAHARASHTRA		
		GOA THERMOSTATIC INSTRUMENTS PVT.LTD.	FLAT -B , GF, HILL CROWN APTS., COLLEGE ROAD, MAPUSA-GOA		
		GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai -Maharashtra		
		H.GURU INDUSTRIES	10 B, HO-CHI-MINH SARANI, KOLKATA-		
		H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	32,INDUSTRIAL SUBURB YESWANTHAPUR BANGALORE-KARNATAKA		
		Baumer Technologies India Pvt. Ltd.	36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI-Maharashtra		
22	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	A.N. INSTRUMENTS PVT. LTD.	MARKETING DIVISION, 5th FLOOR, 59-B, CHOWRINGHEE ROAD, KOLKATA-WEST BENGAL	III	
		ASHCROFT INDIA PVT LTD.	Plot No.2306, Phase II, GIDC Chhatral Kalol-Gujarat -INDIA		
		BOSE PANDA INSTRUMENTS PVT.LTD.	44, Saheed Hemanta Kumar Bose, Sarani, Kolkata-West Bengal-India		
		FORBES MARSHALL (HYD) LTD.	PLOT NO.A-19/2, & T-4/2, IDA, NACHARAM, HYDERABAD-ANDHRA PRADESH		
		GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai -Maharashtra		
		H.GURU INDUSTRIES	10 B, HO-CHI-MINH SARANI, KOLKATA-WEST BENGAL		
		H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	32,INDUSTRIAL SUBURB YESWANTHAPUR		
		Baumer Technologies India Pvt. Ltd.	36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI-Maharashtra		
23	Pressure/DP/Vacuum Switch	Indfoss	Ghaziabad	II	NTPC approved sub-vendors(No PEM-C & I list is avl in PMD)
		SOR	USA		
		Dressor	USA		
		Delta control	UK		
		Trafag	Ranipet		
		GIC(Gauges Bourdon)	Panvel		
		ASHCROFT INDIA PVT LTD.	USA/GERMANY		
		Switzer	Chennai		
24	Level Switch (Float/Displacer)	DK Instruments	Kolkata	III	NTPC approved sub-vendors
		Levcon	Kolkata		
		Sigma	Mumbai		
		V-Automat	New Delhi		
		SBEM	Pune		
		Flow Star	Faridabad		

25	Level Indicator	Flow Star	Faridabad	III	NTPC approved sub-vendors (No PEM-C & I list is avl in PMD)
		Scientific Devices	Mumbai		
		Gauges Bourden	Panvel		
		SBEM	Pune		
		Pune Techrol	Pune		
		Levcon	Kolkata		
		Sigma	Mumbai		
		V-Automat	New Delhi		
		DK Instruments	Kolkata		
26	DC Lead Acid / Ni-Cd Batteries	AMCO SAFT INDIA LTD	ABBANAKUPPE WORKS HEBBAL BELLARY- JAKKUR ROAD BANGALORE-KARNATAKA INDIA	III	Ni-Cd batteries only
		EXIDE INDUSTRIES LTD	8/42, Kirti Nagar Industrial Area, NEW DELHI		Lead Acid batteries only.
		HBL POWER SYSTEMS LTD	8-2-601, ROAD NO.10, BANJARA HILLS, HYDERABAD-ANDHRA PRADESH		Ni/Cd and TUBULAR TYPE for Lead acid
		HOPPECKE BATTERIEN GMBH & CO.KG,	BONTKIRCHENER STRASSE 1, D-59929 BRILON HOPPECKE, -- GERMANY.		
27	DC BATTERY CHARGER	AMARA RAJA POWER SYSTEMS LIMITED	TIRUPITI, ANDHRA PRADESH TRIPUTI- TAMIL NADU-INDIA Phone- +91-877- 2285561 Pincode : Email : amararaja@amararaja.co	III	
		CHHABI ELECTRICALS PVT.LTD.	MIDC, JALGAON- MAHARASHTRA		
		CHLORIDE POWER SYSTEMS & SOLUTIONS LIMITED	GARIAHAT ROAD KOLKATA-WEST BENGAL- INDIA		
		DUBAS ENGG PVT LTD	347/1A, BILEKAHALLI, 6TH CROSS 2ND STAGE,B.T.M LAYOUT OFF-BANNERGHATTA ROAD, BANGALORE		
		HBL POWER SYSTEMS LTD	ROAD NO.10, BANJARA HILLS, HYDERABAD- ANDHRA PRADESH- INDIA		
		JEMA ENERGY	Paseo del Circuito 10, Lasarte-Oria--SPAIN		For Static SCR Type Full Wave fully Control type
		MASS-TECH CONTROLS PVT.LTD.	2/7, MEGHAL INDL. ESTATE DEVIDAYAL ROAD MULUND, MUMBAI		
		STATCON POWER CONTROLS LTD	A-34, SECTOR-59 NOIDA-UTTAR PRADESH		APPROVED WORKS is, Khasara No. -509, Bama Road, Chhijarsa, Kullich Nagar, Pilikhuwa, Hapur, Ghaziabad, U.P. India- 245304
28	INSTRUMENT FITTINGS	AURA INCORPORATED	Delhi	III	
		Astec Valves & Fittings Pvt. Ltd.,	Mumbai		
		Arya Crafts & Engineering Pvt. Ltd.	Mumbai		
		Comfit & Valve Pvt. Ltd.	Nandasan		
		FLUIDFIT ENGINEERS PVT. LTD.	Mumbai		
		Fluid Controls Pvt. Ltd.	Mumbai		
		HP VALVES & FITTINGS INDIA PVT. LTD.	Chennai		
		PRECISION ENGINEERING INDUSTRIES	Mumbai		
		Panam Engineers,	Mumbai		
		Perfect Instrumentation Control (India) Pvt. Ltd.	Mumbai		
		VIKAS INDUSTRIAL PRODUCTS	Noida		

29	Control / Power Cable	Cords Cable	Bhiwadi	I	
		Radiant Cables	Hyderabad		
		PolyCab	Daman		
		KEI	Bhiwadi		
		Nicco	Kolkata		
		Ravin Cables	Pune		
		Incab	Pune		
		HVPL	Faridabad		
		Torrent cable	Nadiad		
		Havells	Alwar		
		Paramount	Khushkhhera		
		SRI Ram Cables	Bhiwadi		
		Thermocables	Hyderabad		
		Torrent cable	Nadiad		
		Universal Cables	SATNA		
30	Cable Glands	Gemscab	Bhiwadi	III	
		Delton	Faridabad		
		SUNIL & COMPANY	KOLKATA		
		ARUP ENGG	KOLKATA		
31	cable lugs	COMMET	MUMBAI	III	
		QUALITY PRECISION	KOLKATA		
		Dowells	Mumbai		
		Billet 3D	Valsad		
32	Terminal Block	Chetna	Nasik	III	Galvanisation to be done at M/s Eros Infrastructure Pvt. Ltd. or from BHEL-PEM approved galvanizers.
		Phoenix	INDIA		
		Wago	INDIA		
		Connectwel	INDIA		
33	Cable trays and its accessories	EROS METAL WORKS (P) LTD.	Nagpur	III	Galvanizing Unit located at Phas-3, E-11/1, MIDC, Pune .
		INDUSTRIAL PERFORATION (I) PVT.LTD.	Kolkata		
		INDIANA GRATINGS PVT. LTD.	Mumbai		Galvanizing to be done from BHEL-PEM approved galvanizers.
		INDIA ELECTRICALS SYNDICATE	Kolkata		Galvanising can be done from their own galvanising plant or PEM approved galvanising units
		INDMARK FORMTECH PVT. LTD.	Pune		Galvanisation to be done at its own plant or from BHEL-PEM approved galvanizers.
		JAMNA METAL COMPANY	Delhi		
		Maheshwari Electrical Mfrs. Pvt. Ltd.,	Noida		Galvanisation to be done at its own plant or from BHEL-PEM approved galvanizers.
		NAMDHARI INDUSTRIAL TRADERS PVT. LTD	Ludhiana		
		PREMIER POWER PRODUCTS (CAL) PVT. LTD.	Kolkata		its galvanization plant M/s Galbro Ispat Galvanizers Pvt. Ltd.
		PATNY SYSTEMS (P) LTD	SEUNDRABAD		Galvanisation to be done at its own plant or from BHEL-PEM approved additional works at Raipur including galvanizing plant.
		PARMAR METALS PVT.LTD.	RAJKOT		MS&S-MICRO; Galvanisation to be done at its own plant or from BHEL-PEM approved galvanizers. remarks changed w.e.f. 03.07.2014; , Additional Works at "Sankrail Industrial park, Bhagabatipur Mauja, Dhulagarh, Howrah-711302" approved w.e.f. 08.12.2014 ,
		PASSIVE INFRA PROJECTS PVT. LTD.	Delhi		Galvanisation to be done at its own plant or from BHEL-PEM approved galvanizers.,
		PENTAX FERRO INCORPORATE	Mumbai		Approved in permanent category for fabrication of Cable trays & Acc. only. Galvanizing to be done from BHEL approved galvanizers., ,
		RUKMANI ELECTRICAL & COMPONENTS PVT LTD	Kolkata		Galvanisation to be done at its own plant or from BHEL-PEM approved galvanizers.
		RATAN PROJECTS & ENGINEERING CO. PVT.LTD.	Kolkata		
		RABI ENGINEERING WORKS PVT. LTD.	Kolkata		
		SARAL INDUSTRIES	Rae Bareilly		
		UNITECH FABRICATORS and ENGINEERS PVT LTD	Kolkata		
		VINFAB ENGINEERS INDIA PVT. LTD.	Mumbai		Galvanisation to be done at its own plant or from BHEL-PEM approved galvanizers.

34	CABLE TRAY SUPPORT SYSTEM -BOLTABLE	AM-TECH ENGG.SERVICES	Pune	III	WORKS ADDRESSES ARE APPLICABLE FOR MANUFACTURING AND GALVANISING
		INDUSTRIAL PERFORATION (I) PVT.LTD.	Kolkata		
		INDMARK FORMTECH PVT. LTD.	Pune		
		PREMIER POWER PRODUCTS (CAL) PVT. LTD.	Kolkata		
		RATAN PROJECTS & ENGINEERING CO. PVT.LTD.	Kolkata		
35	CABLE TRAY SUPPORT SYSTEM-WELDED(GALV)	STEELITE ENGINEERING	Mumbai	III	Galvanizing Unit located at Phas-3, E 11/1, MIDC. Pune .
		Associated Power Structures Pvt. Ltd.	G. I. D. C., Makarpura, Vadodara-Gujarat		Galvanisation to be done at its own plant or from BHEL-PEM approved galvanizers.
		INDUSTRIAL PERFORATION INDMARK FORMTECH PVT. LTD.	DUM DUM KOLKATA- MIDC BHOSARI PUNE- MAHARASHTRA		
		JAMNA METAL COMPANY	DSIDC, NARLA INDL. AREA DELHI		Galvanisation to be done at its own plant or from BHEL-PEM approved galvanizers.
		PREMIER POWER PRODUCTS PATNY SYSTEMS (P) LTD	Kolkata,-West Bengal SARDAR PATEL ROAD SEUNDRABAD		Galvanisation to be done at its own plant or from BHEL-PEM approved galvanizers.
		PASSIVE INFRA PROJECTS PVT. LTD.	VAISHALI, PITAMPURA Delhi-		Registered in permanent category along with galvanizer M/s Saral Projects and Processors .
		RUKMANI ELECTRICAL & COMPONENTS PVT LTD	KOLKATA-WEST BENGAL- INDIA		Galvanisation to be done at its own plant or from BHEL-PEM approved galvanizers.
		RATAN PROJECTS & ENGINEERING CO. PVT.LTD.	P.K. TAGORE STREET, MAIN BUILDING KOLKATA-WEST BENGAL		
		RABI ENGINEERING WORKS PVT. LTD.	R.N. GUHA ROAD, DUM DUM, KOLKATA-WEST BENGAL		
		SARAL INDUSTRIES	Industrial Area-1 Sultanpur Road Rae Bareli-Uttar Pradesh		
36	CABLE TRAY SUPPORT SYSTEM-WELDED(UNGALV)	UNITECH FABRICATORS and ENGINEERS PVT LTD	M.B.RAOD , BIRATI KALABAGAN KOLKATA	III	HEAT SHRINKABLE TYPE ONLY.
		RASHTRIYA ISPAT NIGAM LIMITED	AMBAWADI AHMEDABAD-		
37	CABLE TERM.& JOINT KITS	STEEL AUTHORITY OF INDIA LTD.	ISPAT BHAWAN LODI ROAD NEW DELHI-	III	
		3M Electro and Communication India P.Ltd	Rajendra Place, DELHI		
		HARI CONSOLIDATED PVT.LTD.,NEW DELHI	JHANDEWALAN, NEW DELHI-Delhi		
		RAYCHEM RPG PRIVATE LIMITED	JANAKPURI NEW DELHI		
38	MICRO-PROCESSOR / MICRO-CONTROLLER	YAMUNA CABLE ACCESSORIES PVT. LTD.	Ambala Road, Jagadhri Yamunanagar-Haryana	II	
		ALLEN BRADLY	BANGALORE		
		SIEMENS	BANGALORE		
		GE	BANGALORE		
39	Battery	SCHENIDER	BANGALORE	III	
		EXIDE	Kolkata		
		HBL Power System	Hyderabad		
		AMAR RAJA	Tirupati		
		Amco saft	Bangalore		
		HBL Power System	Hyderabad		
		SAFT	France/Sweden		

C BOUGHTOUT ITEM (MECHANICAL)					
1	BUCKET ELEVATOR CHAIN	HEKO GMBH	GERMANY	II	
		Rud	GERMANY		
		Aumund	Chennai		for complete bucket elevator
2	BUCKET ELEVATOR SPROCKETS	HEKO GMBH	GERMANY	II	
		Rud	GERMANY		
		Aumund	Chennai		for complete bucket elevator
3	Knife Gate/Plate Valve (H/W Operated & Cylinder Optd)	DEZURIKK	CHENNAI	I	
			MUMBAI		upto 400NB 150 class
		FOURESS			
		VASS	CHENNAI		
		ORBINOX	COIMBATORE		
		JAASH	INDORE		upto 50 NB 800 Class: 350NB 150 class
4	Ball Valve	Precision Engg	Nasik	I	
		Microfinish Valves Ltd	Hubli		upto 50NB 800 class
		Weir BDK engg Industries	NEW DELHI		
		Flow chem. Industries	Ahemdabad		
		Audco	Chennai		(1) BALL VALVES: FCS/FSS - 1/2" to 2" #800 & CCS/CSS - 2.1/2" to 4" # 150 (2) BALL VALVES: GUN METAL VALVES SIZE 15 NB TO 80 NB - UPTO PN16.0
		Akay India	Hubli		
		A V Valves	Agra		Size up to 2" & #800 with MOC as FCS & FSS and for size from 65 NB to 150 NB & #150 with MOC as CCS and CSS.
		Asian Industrial valves & Instruments Ltd.	Chennai		Steel ball Valves upto 50NB, #800 and 65NB to 150NB. #150
		ATAM Valves	Jalandhar		
		GM ENGINEERING	Rajkot		CAST STEEL UPTO 200 MM, CLASS 150/300.
		Hawa Valves (India) Pvt. Ltd.	Navi Mumbai		
		INTERVALVE (INDIA) LTD.	Pune		FOR CARBON STEEL/STAINLESS STEEL UPTO SIZE 200NB.
		NILON VALVES PRIVATE LIMITED	Ahmedabad		
		LEADER VALVES LTD.	Jalandhar		FORGED CARBON & ALLOY STEEL BALL VALVES ,SCREWED TYPE BALL VALVES RATING 800 , SIZES UPTO 50 & CC& ALLOY STEEL BALL VALVES RATING 150 , SIZES 65 TO 200 FLANGED TYPE.
		DEMBLA VALVES LTD.	Thane		
		SURYA VALVES AND INSTRUMENTS MFG CO.	Chennai		
		UNIFLOW	Chennai		
		VALTECH INDUSTRIES	Mumbai		
		VAAS AUTOMATION	NEW DELHI		
		Belgaum Aqua Valve	Belgaum		

5	Metallic Expansion Bellow(Metallic)	METALLIC BELLOWS Flexatherm	CHENNAI	II	UPTO 20 TONNES
6	Rupture Disc	BS & B SAFETY SYSTEM	CHENNAI	II	
7	Electric Hoist	ARMSEL MHE PVT. LTD	Bangalore	II	CAPACITY UPTO 10 TONS. BOIs BHEL APP.SUB-VENDORS.
		Alpha Services	Bhiwadi		
		CONSOLIDATED HOISTS PVT LTD	Pune		
		CENTURY CRANE ENGINEERS PVT. LTD.	Faridabad		
		EDDY CRANES PVT. LTD.	Mumbai		
		Grip Engineers Pvt. Ltd.,	Faridabad		
		GLOBAL TECHNOLOGIES	Hydrabad		
		HERCULES HOISTS LTD.	Khalapur		UPTO 25.0 T CAPACITY.
		LIFTING EQUIPMENTS and ACCESSORIES	Delhi		
		Mangla Hoists Pvt Ltd	Delhi		
		MEEKA MACHINERY PVT. LTD.	Ahemdabad		UPTO 15 TONNES.
		REVA INDUSTRIES LTD.	Faridabad		
		ROCKWELL HOISTO CRANES PVT. LTD.	Bahadurgarh		
		SAFEX ENERGY PVT. LTD.	Ahemdabad		
		TUOBRO FURGUSON (INDIA) PVT LTD	Kolkata		
		TECHNO INDUSTRIES	Ahemdabad		
8	Mono Rail Hoist / Chain Pulley Block	HERCULES (INDEF)	MUMBAI	II	
		LEAP	NEW DELHI		
		TRACTEL	FARIDABAD		
		LIFTING EQUIPMENTS & ACCESSORIES	DELHI		
9	Horziental/Vertical Centrifugal Pump	KBL	Kirolskarwadi	I	
		M&P	Pune		
		Flowmore	Ghaziabad		
		Sulzer pumps india ltd.	Navi mumbai		
		Worthington	Ghaziabad		
		Bharat pumps & compressors ltd	Allahabad		
		Flowserve India Controls Pvt. Ltd.	Coimbatore		
		Jyoti ltd.	Vadodara		
	Vertical Centrifugal Pump	Kishore Pump	Pune		
		Sam Turbo	Coimbatore		
		KSB	Pune		
		Best and Crompton	Chennai		
		Voltas	Mumbai		
		V-Flo Pumps & Systems Co. Ltd.,	Beijing, China		

10	Pneumatic Actuator/Cylinder(Metallic)	SCHRADDER	MUMBAI	II	
		NUCON	HYDERABAD		
		Rotex	MUMBAI		
		VAAS	CHENNAI		
11	Fittings	M.S. Fittings	Kolkata	II	
		Metal Iloyds	Mumbai		
		True Forge	Faridabad		
		Tube Products	Baroda		
		NL Hazra	Kolkata		
		Gujrat Infra Pipes	Baroda		
		Edwards	USA		
		Pipefit Engineers	Baroda		
		Siddarth & Gautam	Faridabad		
		EBY	Mumbai		Upto 400 NB ERW Pipes as per IS 3589 and SAW as per IS 3589
12	MS/GI ERW Pipes	SAIL	Rourkela	II	NTPC approved sub-vendors and BHEL list
		Jindal	Ghazibad/Hissar	I	Upto 300 NB ERW Pipes as per IS 1239/3589
		Surya Roshni	Bahadur Garh	I	Upto 400 NB ERW Pipes as per IS 1239/3589 and SAW as per IS 3589
		TATA Tube	Jamshedpur	II	Upto 150 NB ERW Pipes as per IS 1239
		PSL	Chennai/Vizag/Ku	I	Spiral Weld SAW as per IS 3589
		Lalit Profile	Thane	I	Spiral Weld SAW as per IS 3589
		Samshi Pipes Industri	Vadodara	I	Spiral Weld SAW as per IS 3589
		Mukut Pipes	Rajpura	I	Longitudinal SAW (Single side weld) as per IS 3589
		Indus Tubes	G B Nagar	I	Upto 300 NB ERW Pipes as per IS 1239/3589
		Mann Ind	Indore	I	Spiral Weld SAW as per IS 3589
		Surendra Engg	Rajpura	I	Spiral Weld SAW as per IS 3589
		Pratibha Pipes & Struc	Thane	I	Spiral Weld SAW as per IS 3589
		JCO Gas Pipe	Chindwara	I	Spiral Weld SAW as per IS 3589
		Nukat Tanks and Vess	Tarapur		Longitudinal SAW (Single side weld) as per IS 3589
		DADU Pipes	Sikandrabad	I	Upto 300 NB ERW Pipes as per IS 1239/3589
		Good Luck Tubes	Sikandrabad	I	
		Advance Steel Tubes	Sahibabad	I	
		Bihar Tubes	Sikandrabad	I	
		Hi Tech Pipes	Sikandrabad	I	
		Ratnamani	Kutch/Ahmedabad	I	Upto 400 NB ERW Pipes as per IS 3589 and SAW as per IS 3589
		Maharashtra Seamless	Raigad	I	200-500 NB ERW Pipes as per IS 3589
		Welspun	Anjar/Bharuch		Upto 400 NB ERW Pipes as per IS 1239/3589 and SAW as per IS 3589
13	Seamless Pipes	ISMT	Ahmednagar/Bara	III	
		Maharashtra Seamless	Raigad		
14	S.S. Pipes (For small Quantity 500 m)	REMI	Mumbai	III	
		Ratmani	Ahmedabad		
		Apex Tubes	Behror		
		Choksi	Ahmedabad		
15	Steel Plate, Structural Steel and section for Fire water storage tank	SAIL	ANY PLANT	III	For small quantity: Authorised stockist/ dealer of approved listed makes for which TCs/IRs will be furnished
		Essar Steel			
		TISCO			
		RINL			
		Jindal			
		Lloyd			
		Ispat			
		Indian Iron & Steel Co. Ltd			

16	Bag Filter	ORIENT FAN (FORMERLY - ACCO)	KOLKATA	II	
		THERMAX	PUNE		
		FLAKT	MUMBAI		
		BATLIBOI	DELHI		
		DCL	HYDERABAD		
17	GEARED MOTOR	PBL	ANAND - V.V NAGAR	III	
		PREMIUM	PUNE		
		BONFIGLIOLI	CHENNAI		
		SEW	Germany		
		IC	AURANGABAD		
18	CI Gate/ Globe/NRV/SRV	H.Sarkar	Howrah	III	SIZE UPTO 300NB & PR.CL.
		A.V. VALVES LTD	Agra		
		Leader	Jalandhar		
		SURYA VALVES AND INSTR	Chennai		FOR GV UPTO 450NB, GLV UPTO 300NB AND CHECK VALVES UPTO 350NB
					(1) CARBON IRON GATE VALVES: 65 NB TO 450 NB (UPTO PN-16.0) (2) CARBON IRON GLOBE VALVES & NON RETURN VALVES: 65 NB TO 150 NB (UPTO PN-16.0)
		ATAM VALVES PVT. LTD.	JALANDHAR		1. CI Gate- CL125 & up to 900 NB, 2. CI Globe- CL125 & up to 450 NB, 3. CI SCNRV- CL125 & up to 600 NB.
		FLUIDLINE VALVES COMPA	Mumbai		
		G.M. DALUI AND SONS PVT.	Howrah		
19	GM valve	KBL	Kondhapuri	III	Additionally approved for FM approved Gate valve 50-250 NB
		Bankim	Kolkata		
					1) CI GATE VALVE SIZES 65NB-800NB, 2) CI GLOBE VALVE FOR SIZES 65NB-400 NB AND 3) CI SCNRV FOR SIZES 65 NB -600 NB
		VENUS PUMPS AND ENGG.	Kolkata		
		A.V. VALVES LTD	Agra		
		ATAM VALVES PVT. LTD.	Mumbai		GUN METAL GATE/GLOBE/NRV: 15 NB TO 50 NB (UPTO PN-16.0) & 15 NB TO 50 NB (UPTO #150)
		Leader	Jalandhar		
		VALTECH INDUSTRIES			GUN METAL SCREWED END TYPE , SCREWED IN BONNET , OUT SIDE SCREW & YOKE TPE , PN 16 , SIZES UPTO 50
20	GEAR BOX	SANT VALVES PVT. LTD.	Jalandhar	III	UP TO SIZE 100-NB ONLY.
		PBL	ANAND - V.V NAGAR		
		SHANTHI	COIMBATORE		
		PREMIUM	PUNE		
		BONFIGLIOLI	CHENNAI		
		IC	AURANGABAD		
		FLENDER			

21	COUPLINGS	ELECON	ANAND - V.V NAGAR	III	
		FENNER	CHENNAI		
		FLUIDOMAT	KOLKATA		
22	BEARINGS	FAG	INDIA	III	
		SKF	INDIA		
		NTN	INDIA		
23	BEARINGS (B/E BOOT SECTION)	HEKO	GERMANY	III	
24	Paint	Asian Paints (I) Ltd.	Mumbai	III	
		Berger Paints India Ltd	Delhi		
		Goodlass Nerolac	Mumbai		
		Jenson & Nicholson (I) Ltd	Gurgaon		
		CDC carboline (I) Ltd.	Delhi		
		Shalimar Paints Ltd.	Gurgaon		
		Addison Paints Ltd	Chennai		
		Grand Polycoat	Mumbai		
		Bombay Paints	Mumbai		
		Jotun Paints	Pune		
25	PLUMMER BLOCKS	Hemple Paints	Singapore	III	
		WINCO	BANGALORE		
		MASTA	AHMEDABAD		
		COSMO	MUMBAI		
26	TRANSMISSION CHAIN	RENOLD	KARUR	III	
27	MAINTENANCE TOOLS BOX	BRANDED		III	
INSPECTION CATEGORY TYPE					
CAT-I The QAP for these items shall be approved by customer and joint inspection shall be done by Customer & BHEL as per approved QAP.					
CAT-II The QAP/Check List for these items shall be approved by BHEL and inspection shall be done by BHEL as per approved QAP/Check List. Approved QAP/Check list shall be given for Information to Customer.					
CAT-III These shall be COC (Certificate of Compliance) items. Only verification Test Certificates shall be done by BHEL.					
NOTE					
1) Bidder to note that Make of various items and inspection category indicated against each item is tentative and shall subject to approval of BHEL / Customer during detail engineering stage without any commercial implication at contract stage					
2) In case of imported components, makes of BOI shall be subject to BHEL/ customer approval during detail engineering stage without any commercial implication at contract stage.					

ANNEXURE-II

MADATORY SPARES

Sl.No.	Item Description	Qty	Unit	
MECHANICAL SYSTEM (A+B)				
A	Pneumatic Conveying System		LOT	CAT-I / II
1	Rupture Disc	5	Nos.	II
2	Metallic Expansion Bellow	5	Nos.	II
3	Torque Arm	5	Nos.	II
4	Striker Arm	5	Nos.	II
5	ACI Bends 45 Deg	10	Nos.	II
6	Bag Filter	10	Nos.	II
7	Rubber Hoses 1/2" NPT	25	Nos.	II
8	50 NB Poppet Valve	5	Nos.	II
B	Compressor-Reciprocating Compressor		LOT	
	HP Cylinders			
1	Small end bearing	2	Sets	I
2	Big end bearing	2	Sets	I
3	Piston ring(including all rings over piston)	4	Sets	II
4	Oil wiper ring	2	Sets	I
5	Suction Valve	2	Sets	I
6	Discharge valve	2	Sets	I
7	Packing set	2	Sets	I
	LP Cylinders			
8	Small end bearing	2	Sets	I
9	Big end bearing	2	Sets	I
10	Piston ring(including all rings over piston)	4	Sets	II
11	Oil wiper ring	2	Sets	I
12	Suction Valve	2	Sets	I
13	Discharge valve	2	Sets	I
14	Packing set	2	Sets	I
	Cross Head			
15	Throw away guide	1	No.	I
16	Crank shaft	1	No.	I
17	Main bearings	2	Sets	I
18	Piston LP	1	No.	I
19	Piston HP	1	No.	I
20	Connection rod	1 No.		I
21	Packing set	2	Sets	I
22	Sealing ring HP	2	Sets	I
23	Sealing ring LP	2	Sets	I
24	Spring decompressor	2	Sets	I
25	O' ring piston	2	Sets	I
26	Ring copper	2	Sets	I
27	Valve plate	4	Sets	II
28	Cushion plate	2	Sets	I
29	Spring plate	2	Sets	I
30	Tyre coupling	2	sets	I

CLAUSE NO.	LIST OF MANDATORY SPARES FOR MILL REJECT				एनटीपीसी NTPC
	Valves				
32	Check valve flap or Disc	1	Set	I	
33	Control Valve disc with internal assembly	1	Set	I	
34	Control Valve Gasket	2	Sets	I	
35	Control Valve Gland Packing	2	Sets	I	
36	Gate,globe,shuttle check valve	1 No. of each type		I	
37	Gasket & Seals of inter cooler	1	Set	I	
38	Gasket & Seals of after cooler	2	Sets	I	
	Oil Pump/Motor				
39	Oil Pump Complete assembly	1	Set	I	
40	Pump Impeller/Rotor with Shaft	1	Set	I	
41	Set of Bearingd	1	Set	I	
42	Set of Seals	1	Set	I	
	Shaft Driven Oil Pump				
43	Drive Gear with shaft	1	No.	I	
44	Driven gear with shaft	1	No.	I	
45	Driven Pump element	1	Set	I	
46	Oil Cooler Gasket & Seals	1	Set	I	
47	Moister Pump Element	2	Sets	I	
48	Oil filter with regulating valve assly.	1	Set	I	
C	C&I Mandatory spares		LOT		
I	C&I Mandatory spares		LOT		
1	Level Probe RF type(For Pyrite Hopper)	2	No.	I	
2	Level Probe RF type(For Bunker)	1	No.	I	
3	Pressure Switch(field)	3	No.	II	
4	Temperature Switch	2	No.	II	
5	Pressure Switch	2 nos of each type	No.	I	
6	Air filter cum regulator cum lubricator	2	No.	I	
II	Instrumentation Cables, Internal Wiring & Electrical Field				
1	Pre-fabrication cable of each type	10% of installed quantity		II	
2	Pre-fabricated cable connector of each type	10% or 1 no. each type and model,		II	
3	Other cables	5% of each type, pair and size of actual		II	
III	Microprocessor based/PLC based Control/Electronic based Control Panel (if applicable)				
1	Fully programmed controller & electronic modules of each type (as applicable)	10% or 1 No., whichever is more		II	
2	Power supply modules (if applicable)	10% or 1 No., whichever is		II	
IV	SOLENOID VALVES				
1	SOLENOID VALVES	10% or 2 nos. of each type and		II	
V	Power cylinders				
	Complete power cylinder assembly	10% or 1 no. each type and model,		II	
VI	Limit switch	10% or 1 no. each type and model,		II	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-F BID DOC. NO. CS-9585-001-2		MANDATORY SPARES CHAPTER - 13 MILL REJECT	
PAGE 2 OF 2					

Amendment No. 3 to Bid Data Sheets (BDS), Section –III

Sl. No.	Ref. Clause	Existing Provisions	Amended provisions
6.	Section-III, BDS Page 46 of 65	---	Add the following as new Sl. No. 7.0A before Sl. No. 7.0 under Item No. 9.1 of BDS: 7.0A Delivery Schedule of Mandatory Spares: a) <u>Category I Items</u> - 50 % Items to be supplied one month before scheduled Synchronization of the 1st Unit and Balance one month before scheduled Synchronization of the last Unit b) <u>Category II Items</u> -25% of each items to be supplied one month before scheduled Synchronization of U#1 and U#2 respectively and balance 50 % to be supplied one month before scheduled Synchronization of U#3. Category I & Category II Items shall be as enclosed at Annexure-I to this Amendment.

Package: EPC Package	Page 2 of 2
Project: Patratu STPS Expansion, Phase-I (3x800 MW)	
Doc. No: CS-9585-001-2-AMDT.20	

ANNEXURE-III

SURFACE PREPARATION & PAINTING

EPC PACKAGE FOR
PATRATU SUPER THERMAL POWER STATION EXPANSION
PHASE -I (3X 800MW)

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC. NO.: CS:9585-001-2

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			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO. CS-9585-001-2 75 of 167		SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING Page 1 of 9

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
1.06.04	as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats. 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.		
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 - Aluminium paint to IS 2339. PS9* - Heat resistant Aluminium paint to IS-13183 Gr.-1 PS13 - Rust preventive fluid by spray, dip or brush. PS14 - weldable primer-Deoxaluminate 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=40.0(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 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		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO. CS-9585-001-2 76 of 157	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING Page 2 of 9

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
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 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.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO. CS-9585-001-2 77 of 457	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 3 of 9

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, Equipments etc.	SP3/SP4	PS 5	2	25	-	-	-	PS 4	3	35	155											
														PS 9*	1	20	-	-	-	PS9*	1	20	40
3	30	70																					

4	Piping hangers/ supports (other than (3) above. (un-insulated)	SP4 (SP6 - for cleaning of weld joints after erection.)	PS 5	1	40	PS 4	1	40	PS 17	1	40	120
	Valves											
5.	Cast/Forge d	Design temperature < or equal to 60 degC	PS4/P S9	1	40	Polya mide Epoxy	1	100	PS17	1	40	180
		Design temperature above 60 degC and up to 200 degC	PS 9*	1	20	-	-	-	PS9*	1	20	40
		Design temperature above 200 degC	PS9*	1	20	-	-	-	PS9*	1	20	40
6.	All auxiliary Structural Steel components for pipe supports	Outside TG building and in SG envelope	Inorga nic Ethyl Zinc Silicat e	1	75	PS18	1	75	a))Epoxy coat b)Final coat of paint PS17	2 1	35 30	250

		Within building	TG	SP4*	-do-	1	35	PS18	1	35	a)) Epoxy coat	2	25	150
											b) Final coat of paint PS17	1	30	
7.	Weld Edges			SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	25
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 for all inner parts of the hangers shall be at least in full compliance to Corrosion category C3 as per EN ISO12944.														
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) For valves below 65NB and temperature upto & including 545 Deg.C, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint.

C) LOW PRESSURE PIPING														
1	All Pipes, components, Equipments etc.	fittings / valves,	SP3/SP5	PS3/PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per NTPC Colour 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.												



- 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.

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	BID DOC. NO. CS-9585-001-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	TECHNICAL REQUIREMENTS	SUB-SECTION -A-12 Surface Preparation & Painting	Page 9 of 9
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TITLE
3 X 8000 MW PATRATU STPP
MILL REJECT SYSTEM (CONVEYOR TYPE)
SPECIFIC TECHNICAL REQUIREMENTS

SPECIFICATION NO. PE-TS-434-160-A101
 SECTION - I
 REV 0
 Sub Section -IA Date APRIL19
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ANNEXURE-IV
ERECTION & COMMISIONING SPARES

SL. No.	Particulars	Qty.	UOM
1	Conveyor		
i)	Chain links & Flight or equivalent for main conveyor	21	Pitch
ii)	Chain connecting pin & Circlips or equivalent for main conveyor	21	Nos.
iii)	Chain links & Flight or equivalent for Transverse conveyor	21	Pitch
iv)	Chain connecting pin & Circlips or equivalent for Transverse conveyor	21	Nos.
2	Bucket Elevator		
i)	Chain or equivalent	21	Pc.
ii)	Bucket	21	Nos.
iii)	Connector	21	Set
3	Solenoid assembly for Valve	6	Nos.
4	Limit Switches	6	Nos.
5	Push Button	2 Nos. Each Type	
6	MCB	10% of total quantity	
7	Any additional item specific to offered design by bidder	1	lot

MAINTENANCE TOOLS & TACKLES

SL. NO.	Constituent	Unit	Value
1.	Complete spanner sets	2	Nos.
2.	Grease gun	2	Nos.
3.	Multi meter	2	Nos.
4.	Pneumatic spanner (suitable for all sizes of fasteners)	2	Nos.
5.	Electrical winch with sling (Suitable for withdrawal of horizontal conveyor assembly during maintenance)	1	No.
6.	Any other item specific to offered design by bidder	1	lot


TITLE

3 X800 MW PATRATU STPP
MILL REJECT SYSTEM (CONVEYOR TYPE)
SPECIFIC TECHNICAL REQUIREMENTS

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ANNEXURE – V
DRAWINGS / DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT

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

S.N.	Bhel DrgNo	Drg Title	Schedule schedule-week no. after date of LOI
1	PE-V0-434-160-A101	DESIGN PHILOSOPHY AND SYSTEM SIZING CALCULATION OF MILL REJECT SYSTEM (CONVEYOR TYPE)	3
2	PE-V0-434-160-A102	GA drawing of Pressure relief valve for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
3	PE-V0-434-160-A103	GA of Bag Filter along with data sheet for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
4	PE-V0-434-160-A104	Electrical Load List for MILL REJECT SYSTEM (CONVEYOR TYPE)	5
5	PE-V0-434-160-A105	Flow diagram/P&ID of MILL REJECT SYSTEM (CONVEYOR TYPE)	3
6	PE-V0-434-160-A106	Instrument Schedule for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
7	PE-V0-434-160-A107	Detailed BOM for MILL REJECT SYSTEM (CONVEYOR TYPE)	20
8	PE-V0-434-160-A108	PG Test Procedure for MILL REJECT SYSTEM (CONVEYOR TYPE)	20
9	PE-V0-434-160-A109	MRHS Layout drawing including air and water piping layout	6
10	PE-V0-434-160-A110	Sub-vendor list along with inspection category for MILL REJECT SYSTEM (CONVEYOR TYPE)	3
11	PE-V0-434-160-A111	WELDING PROCEDURE SPECIFICATION for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
12	PE-V0-434-160-A112	QAP OF STRUCTURAL STEEL / PLATES for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
13	PE-V0-434-160-A113	QAP OF PYRITE HOPPER, TERMINAL BOX for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
14	PE-V0-434-160-A114	QAP OF CHAIN AND CHAIN CONVEYOR for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
15	PE-V0-434-160-A115	QAP OF BUCKET ELEVATOR for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
16	PE-V0-434-160-A116	QAP of LOCAL CONTROL PANEL for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
17	PE-V0-434-160-A117	GA drawing for Pyrite Hopper with Data Sheet and civil load data & foundation location details for MILL REJECT SYSTEM (CONVEYOR TYPE)	4
18	PE-V0-434-160-A118	QAP OF SECTOR GATE for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
19	PE-V0-434-160-A119	QAP OF KNIFE GATE for MILL REJECT SYSTEM (CONVEYOR TYPE)	10



TITLE 3 X800 MW PATRATU STPP MILL REJECT SYSTEM (CONVEYOR TYPE) SPECIFIC TECHNICAL REQUIREMENTS	SPECIFICATION NO. PE-TS-434-160-A101	
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20	PE-V0-434-160-A120	GA drawing of chain conveyor with Data Sheet and civil load data & foundation location details for MILL REJECT SYSTEM (CONVEYOR TYPE)	4
21	PE-V0-434-160-A121	QAP OF RUPTURE DISC for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
22	PE-V0-434-160-A122	GAD for Silo (G.A with tentative location) with DS and civil load data & foundation location details for MILL REJECT SYSTEM (CONVEYOR TYPE)	5
23	PE-V0-434-160-A123	QAP OF EXPANSION BELLOW for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
24	PE-V0-434-160-A124	QAP OF BAG FILTER for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
25	PE-V0-434-160-A125	GAD of Bucket elevator with DS & civil load data & foundation location details for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
26	PE-V0-434-160-A126	QAP OF GEARED MOTOR for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
27	PE-V0-434-160-A129	GA & TDS of Electric Hoist for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
28	PE-V0-434-160-A130	QAP OF VALVES for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
29	PE-V0-434-160-A132	GA drawing for Sector Gate with Data Sheet for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
30	PE-V0-434-160-A133	QAP OF INSTRUMENTS for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
31	PE-V0-434-160-A135	GA drawing for Knife gate valve along with data sheet for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
32	PE-V0-434-160-A136	QAP OF SUMP PUMP WITH MOTOR for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
33	PE-V0-434-160-A138	GA of Metallic Expansion Bellow with data sheet for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
34	PE-V0-434-160-A139	GA of Rupture Disc with data sheet for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
35	PE-V0-434-160-A140	GA of Sump Pump along with data sheet and wiring diagram for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
36	PE-V0-434-160-A141	Block Logic Diagram/Control Scheme of the MRHS with HMI screen for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
37	PE-V0-434-160-A142	GA and data sheet of C&I Instruments for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
38	PE-V0-434-160-A143	Data sheet of Geared Motor (For All Motors)for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
39	PE-V0-434-160-A144	Technical data sheet of cable tray for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
40	PE-V0-434-160-A146	GA & interconnection wiring details for Pyrite Hopper LCP, Drag Link Chain Conveyor, Bucket Elevator, Silo LCP. for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
41	PE-V0-434-160-A148	Painting Schedule for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
42	PE-V0-434-160-A149	Pipe and valve schedule for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
43	PE-V0-434-160-A150	Cable Schedule - Signal and Control for MILL REJECT SYSTEM (CONVEYOR TYPE)	10

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44	PE-V0-434-160-A151	O & M for MILL REJECT SYSTEM (CONVEYOR TYPE)	24
45	PE-V0-434-160-A152	QAP OF PIPES for MILL REJECT SYSTEM (CONVEYOR TYPE)	6

Notes:

1. The above drawing list is tentative and shall be finalized with the successful bidder after placement of order. While some of the drawings indicated above may not be applicable, some additional drawings may also be required based on scope of work.
2. Drawings shall be prepared in Auto-Cad latest edition. Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified elsewhere in the specification.
3. Only manual calculation with authentic supporting literature (e.g. extracts of hand Book/ standard/codes) shall be acceptable. All design calculations and drawings shall be in SI system only.
4. All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.:-
 - a) All drawings and documents shall indicate the list of all reference drawings including general arrangement.
 - b) All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view; all major self-manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.
 - c) Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names.
 - d) All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.
 - e) Drawings/ documents to be submitted for purchasers review/ approval shall be under Revision A, B, C... etc. while drawings /documents to be submitted thereafter for customer's approval after purchaser's approval shall be under R-0, 1, 2, 3etc.
 - f) Drawings and documents not covered above but required to check safety of machines/ system, shall be submitted during detailed engineering stage without any commercial implication.
 - g) All drawings shall include "B.O.M" and indicate quantity, material of construction, make along with IS/BS No., Technical parameters, dimensions, hardness, machining symbol and tolerance, requirement of radiography and hydraulic tests, painting details, elevation, side view, plan, skin section and blow-up view for clarity.
 - h) All drawings shall be prepared as per BHEL's title block and shall bear BHEL's drawing No.
 - i) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel

	TITLE 3 X800 MW PATRATU STPP MILL REJECT SYSTEM (CONVEYOR TYPE) SPECIFIC TECHNICAL REQUIREMENTS	SPECIFICATION NO. PE-TS-434-160-A101	
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to BHEL’s/ Customer’s/ Consultant’s office for across the table resolution of issues and to get documents approved in the stipulated time. j) Bidder to follow the following the drawing submission schedule: k) 1st submission of drawings from date of LOI as per the submission schedule. l) Every revised submission incorporating comments – within 7 days. m) Bidder to submit revised drawings complete in all respects incorporating all comments. 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 for across the table discussions/ finalizations/ submissions of drawings.			

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Annexure-VI

Check List for Operation & Maintenance Manual

Project name :

Project number :

Package Name :

PO reference :

Document number :

Revision number :

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	Cover page				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	Index				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	Description of Plant/System				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				

4.0	Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	Operation Guidelines for plant personal/user/operator				
5.1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5.2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5.3	Do's & Don't of the equipments.				
5.4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5.5	Parameters to be monitored with normal values and limiting values				
5.6	Trouble shooting with causes and remedial measures				
5.7	Routine operational checks, recommended logs & records				
5.8	Changeover schedule if more than one auxiliary for the same purpose is given				
5.9	Painting requirement and schedule				
5.10	Inspection, repair , Testing and calibration procedures				
6.0	Maintenance guidelines for plant personal				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				

6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	Statutory and other specific requirements considerations.				
8.0	List of reference documents				
9.0	Binding as per requirement				



TITLE
3X800 MW PATRATU STPP PHASE-I
MILL REJECT SYSTEM (CONVEYOR TYPE)
SPECIFIC TECHNICAL REQUIREMENTS

SPECIFICATION NO. PE-TS-434-160-A101
REV 00
Section IA

SECTION – IA
ANNEXURE-VII
PERFORMANCE GUARANTEE

CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES	एनटीपीसी NTPC		
1.00.00 1.00.01	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-02, Part-B) at super heater outlet at rated parameters. The term "TMCR" (Turbine maximum continuous rating) appearing in the technical specification shall mean 800 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 160 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.			
	PERFORMANCE GUARANTEES			
	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 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, installation and removal of the test instrumentation, shall be included in the bid price. e) It is the responsibility of the contractor to perform the Performance			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID Doc. No.- CS-9585-001-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 1 OF 98

CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES	एनटीपीसी NTPC		
	Guarantee/Acceptance test as specified in this subsection. The performance tests will be performed using only the normal number of Employer supplied operating staff. Contractor, vendor or other subcontractor personnel shall only be used for instructional purposes or data collection. 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. g) All instruments required for performance testing shall be of the type and accuracy required by the code and prior to the test, the contractor shall get these instruments calibrated in an independent test Institute approved by the Employer. All test instrumentation required for performance tests shall be supplied by the contractor and shall be retained by him upon satisfactory completion of all such tests at site. All calibration procedures and standards shall be subjected to the approval of the Employer. The protecting tubes, pressure connections and other test connections required for conducting guarantee test shall conform to the relevant codes. h) Tools and tackles, thermowells (both screwed and welded) 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 agreed procedure. The PG test procedure including demonstration tests shall be submitted 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. 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 one months from the date of conductance of Performance test. However, preliminary test reports shall be submitted to the Employer after completing each test run. The P&G test procedures shall be submitted for equipments/ system & subsystem under Contractor's scope for all Guarantees under category I, II & III as mentioned below, as per latest International codes / standard including correction curves, meeting the specification requirements along with sample calculations & detailed activity plan of preparation (including test instrumentation), conductance and evaluation of Guarantees. j) The contractor shall submit for Employer's approval the detailed Performance Test procedure containing the following:			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID Doc. No.- CS-9585-001-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 2 OF 98	

CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES	एनटीपीसी NTPC		
	a) Object of the test. b) Various guaranteed parameters & tests as per contract. c) Method of conductance of test and test code. d) Duration of test, frequency of readings & number of test runs. e) Method of calculation. f) Correction curves. g) Instrument list consisting of range, accuracy, least count, and location of instruments. h) Scheme showing measurement points. i) Sample calculation. j) Acceptance criteria. k) 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 but are achieved within the Acceptable Shortfall Limit specified at clause 1.01.02 of this subsection, Employer will accept the equipment/system/plant after levying liquidated damages as per clause 1.01.02 of this sub-section. If, however, the demonstrated guarantee(s) continue to be more than the stipulated Acceptable Shortfall Limit, even after the above modifications/replacements within ninety (90) days or a reasonable period allowed by the Employer, after the tests have been completed, the Employer will have the right to either of the following: i) For Category-I Guarantees Reject the equipment/system/plant and recover from the Contractor the payments already made OR			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID Doc. No.- CS-9585-001-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 3 OF 98

CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES	एनटीपीसी NTPC		
	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 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 Reject the equipment / system/plant & recover from the Contractor the payments already made. OR 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.			
1.01.00	GUARANTEES UNDER CATEGORY - I			
1.01.01	The performance guarantees which attract liquidated damages (LD) are as follows: i) Unit Heat Rate a) Unit Heat rate in kcal/kWhr under rated steam conditions at 160 mm Hg (abs) condenser pressure with zero (0%) make up at 800 MW unit load (i.e. 100% of rated load). b) Unit Heat rate in kcal/kWhr under turbine throttle main steam pressure of 210 Kg/cm² (abs) and turbine throttle main steam temperature / reheat steam temp. at turbine inlet of 600 deg C / 600 deg C at 160 mm Hg (abs) condenser pressure with zero make up at 600 MW unit load (i.e. 75% of rated load) .			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID Doc. No.- CS-9585-001-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 4 OF 98

CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES	एनटीपीसी NTPC		
1.01.02	xiii) Limestone Consumption Rate Limestone consumption of FGD system in kg/hr under guarantee point conditions (refer clause no. 1.05.20.01 related to FGD sizing criteria, Sub-Section-A-02, Part-B (Mechanical), Section-VI). xiv) Unit Auxiliary Power Consumption Unit auxiliary power consumption comprising of all Unit Auxiliaries shall be guaranteed in line with the requirements stipulated in clause 1.01.08.01 of this sub section. Power consumption of all unit auxiliaries (except Air Cooled Condenser Fans) shall be taken for continuous unit operation at 800 MW (i.e. 100% rated load) under rated steam conditions and at condenser pressure of 160 mm Hg (abs) with 0% make-up. Power consumption of Air Cooled Condenser Fans shall be taken at 840 MW (i.e. 105% rated load) under rated steam conditions, guaranteed condenser pressure and ambient temperature of 38 deg.C. xv) Auxiliary Power Consumption for Station Auxiliaries Station auxiliary power consumption comprising of all station Auxiliaries required for continuous station operation at 3 x 800 MW (i.e. 100% rated load of all the units) under rated steam conditions and at condenser pressure of 160 mm Hg (abs) with 0% make-up shall be guaranteed in line with the requirements stipulated in clause 1.01.08.02 of this sub section. Notes: (a) The 16000 hrs, as mentioned above for SCR/ Hybrid system efficiency and catalyst life, shall be based on actual running hours of operation of SCR system counted from the date of successful completion of 'Initial Operation' of unit or start of operation of SCR system on sustainable basis, whichever is later. (b) Power consumption of each of the pump/fan/compressors/ Conveyors etc. wherever mentioned shall be measured with its own drive at the switchgear end.			
	AMOUNT OF LIQUIDATED DAMAGES APPLICABLE FOR CATEGORY-I GUARANTEES If the performance guarantee(s) specified at clause 1.01.01 are not met by the Contractor even after the modifications and/or replacements mentioned at clause 1.00.01 of this Sub-section but are achieved within the stipulated Acceptable Shortfall Limit as indicated in this clause, Employer will accept the equipment/system/plant after levying liquidated damages as indicated here under, however, if the demonstrated guarantee(s) continue to be more than the stipulated Acceptable Shortfall Limit, the Employer may at his discretion reject the			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID Doc. No.- CS-9585-001-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 7 OF 98

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	equipment/system and recover the payment already made or accept the equipment/system only after levying liquidated damages against the Contractor, at the rates listed herein, and such liquidated damages shall be deducted from the Contract Price: <table><tr><th>S. No</th><th>Guarantee</th><th>Rate of Liquidated Damages (LD)</th><th>Acceptable Shortfall with LD</th></tr><tr><td>i)</td><td>For Increase in the Guaranteed Unit Heat rate</td><td></td><td></td></tr><tr><td>a)</td><td>At 100% TMCR (800 MW) Unit Load</td><td>US \$ 322,952 (US Dollar Three hundred twenty two thousand nine hundred fifty two only) per 1 Kcal/Kwhr increase in heat rate</td><td>(+) 2.5% of the guaranteed Unit heat rate</td></tr><tr><td>b)</td><td>At 75% TMCR (600 MW) Unit Load</td><td>US \$ 242,214 (US Dollar two hundred forty two thousand two hundred fourteen only) per 1 Kcal/Kwhr increase in heat rate</td><td>(+) 2.5% of the guaranteed Unit heat rate</td></tr><tr><td>ii)</td><td>For deficiency in Turbine Generator Output</td><td>US \$ 1097 (US Dollar one thousand ninty seven only) per 1 KW shortfall in TG output</td><td>(-) 2.0% of the guaranteed turbine generator output.</td></tr><tr><td>iii)</td><td>For deficiency in condenser pressure</td><td>US \$ 657,355 (US Dollar Six hundred fifty seven thousand three hundred fifty five only) per 1 mm Hg increase in condenser pressure</td><td>(+) 2.5% of the guaranteed condenser pressure</td></tr><tr><td>iv)</td><td>Steam Generator Capacity For shortfall in the guaranteed steam generating capacity in T/h at rated steam parameters at superheater outlet &</td><td>US \$ 137,021 (US Dollar One hundred thirty seven thousand twenty one only) for every 1 T/hr short fall in steam output from the guaranteed value.</td><td>(-) 1.0% of the guaranteed steam generator capacity</td></tr></table>				S. No	Guarantee	Rate of Liquidated Damages (LD)	Acceptable Shortfall with LD	i)	For Increase in the Guaranteed Unit Heat rate			a)	At 100% TMCR (800 MW) Unit Load	US \$ 322,952 (US Dollar Three hundred twenty two thousand nine hundred fifty two only) per 1 Kcal/Kwhr increase in heat rate	(+) 2.5% of the guaranteed Unit heat rate	b)	At 75% TMCR (600 MW) Unit Load	US \$ 242,214 (US Dollar two hundred forty two thousand two hundred fourteen only) per 1 Kcal/Kwhr increase in heat rate	(+) 2.5% of the guaranteed Unit heat rate	ii)	For deficiency in Turbine Generator Output	US \$ 1097 (US Dollar one thousand ninty seven only) per 1 KW shortfall in TG output	(-) 2.0% of the guaranteed turbine generator output.	iii)	For deficiency in condenser pressure	US \$ 657,355 (US Dollar Six hundred fifty seven thousand three hundred fifty five only) per 1 mm Hg increase in condenser pressure	(+) 2.5% of the guaranteed condenser pressure	iv)	Steam Generator Capacity For shortfall in the guaranteed steam generating capacity in T/h at rated steam parameters at superheater outlet &	US \$ 137,021 (US Dollar One hundred thirty seven thousand twenty one only) for every 1 T/hr short fall in steam output from the guaranteed value.	(-) 1.0% of the guaranteed steam generator capacity
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID Doc. No.- CS-9585-001-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 8 OF 98																												

CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES																			
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NOTE: i) Each of the liquidated damages specified above shall be independent and these liquidated damages shall be levied concurrently as applicable. ii) If the contract currency is other than US dollars, then the liquidated damages shall be in equivalent amount in contract currency based on Bill selling exchange rate of State Bank of India prevailing on the date of award of contract. iii) All these liquidated damages for short fall in performance shall be deducted from the contract price as detailed in accompanying General Conditions of																				
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID Doc. No.- CS-9585-001-2		SUB-SECTION-IV FUNCTIONAL GUARANTEES PAGE 11 OF 98																

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1.01.03	Contract (GCC)/ Special Conditions of Contract (SCC) iv) Contractor's aggregate liability to pay liquidated damages for failure to attain the functional guarantee shall not exceed twenty five percent (25%) of the Contract Price. v) The LD values and acceptable shortfall limits are applicable on per unit basis except for the value 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. UNIT HEAT RATE Tests for Turbine Cycle Heat Rate and Efficiency of Steam Generator shall be conducted simultaneously but independently and Unit Heat Rate is to be computed as follows: Unit Heat rate in kcal/kWhr under rated steam conditions at 160 mmHg(abs) Condenser pressure with zero make up at 800 MW unit load (i.e. 100% of rated load): $= \frac{\text{THR (100\%)}}{\text{SG_EFF(100\%)}}$ Unit Heat rate in kcal/kWhr under rated steam conditions at 160 mmHg(abs) Condenser pressure with zero make up at 600 MW unit load (i.e. 75% of rated load): $= \frac{\text{THR (75\%)}}{\text{SG_EFF(75\%)}}$ Where THR (100%) : Turbine Cycle Heat rate in kcal/kWhr under rated steam conditions at 160 mmHg(abs) Condenser pressure with zero make up at 800 MW unit load (i.e. 100% of rated load). (To be calculated as per clause 1.01.03.01 of this sub-section) SG_EFF(100%): Efficiency of the Steam Generator at 800 MW unit load (i.e. 75% of rated load) with 27 degree Celsius ambient temperature and 60% RH, while firing the design coal, at rated steam parameters, rated coal fineness and rated excess air. (To be calculated as per clause 1.01.03.03 of this sub-section). The efficiency shall be based on Heat Input GCV of coal. THR (75%) : Turbine Cycle Heat rate in kcal/kWhr under rated steam conditions at 160 mmHg(abs) Condenser pressure with zero make up at 600 MW unit load (i.e. 75% of rated load). (To be calculated as per clause 1.01.03.01 of this sub-section)		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID Doc. No.- CS-9585-001-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 12 OF 98

CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES	एनटीपीसी NTPC		
1.01.06.05	Further, during the performance test of the Electrostatic Precipitator, if the contractor establishes that the average of three tested outlet dust burden (Do) values (uncorrected) are either equal to or less than 14 mg/Nm ³ at ESP outlet before FGD system inlet, then the contractor shall also be deemed to have successfully met the guaranteed ESP efficiency.			
1.01.07	METHOD OF COMPUTING TEST EFFICIENCY OF FGD The performance tests shall be carried out in accordance with ASME PTC 40 (1991) code. The details of the test shall, however be mutually agreed upon between the employer and the contractor.			
1.01.08	AUXILIARY POWER CONSUMPTION The respective auxiliary power consumption for unit and the station are to be calculated in isolation to calculate the respective guaranteed power consumption as is illustrated hereunder:			
1.01.08.01	Unit Auxiliary Power Consumption The unit auxiliary power consumption shall be calculated using the following relationship. $P_{au} = P_u + TL \text{ (Unit)}$ P_{au} = Guaranteed Unit Auxiliary Power Consumption. P_u = Power consumed by the auxiliaries of the unit under test. TL = Losses of the Generator Transformer and Unit Transformers supplied by bidder based on works test reports and the criteria specified under the Clause 1.01.08.02 (j) under the subheading Transformers The power consumption (P_u) of entire unit auxiliaries fed from unit transformers shall be measured at the incomers of respective unit boards. Suitable correction for auxiliaries not in service at the time of this measured power consumption like MDBFP etc, shall be done on as per the technical specification. If GCB scheme is adopted, suitable corrections for station auxiliaries shall be done. While guaranteeing the auxiliary power consumption the bidder shall necessarily include all continuously operating unit auxiliaries. The auxiliaries to be considered shall include but not be limited to the following: (a) Turbine Unit Oil purifier. (b) Turbine Unit control oil purifier.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID Doc. No.- CS-9585-001-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 24 OF 98

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1.01.08.02	b) Energy meter reading will be taken before starting the collection efficiency test and after completion of collection efficiency test. c) Before starting collection efficiency test, switch off all the TR sets, all hopper heaters, all insulator heaters/pent house fans (if applicable) and rapping systems serving to one pass (ESP-A) temporally and note down energy meter readings for period t1 i.e. E1. The power consumption shall be $W2=E2/t1$. d) During the collection efficiency test the total energy fed in to ESP MCC of one pass (say ESP-A) will be measured during entire period of collection efficiency test i.e. E2. Total time period (t2) of test shall be noted. The power consumption shall be $W2=E2/t2$. During the test all hopper heaters of all ESP passes will be in ON condition and set point temperature shall be kept 5 degree Celsius above the flue gas temperature. e) Measured power consumption for one ESP pass (say ESP-A) = $(W2-W1)$ f) Measured Electrostatic Precipitator power of one unit = Power of (ESP-A + ESP-B + ESP-C + ESP-D + ESP-E + ESP-F). Station Auxiliary Power Consumption The station auxiliary power consumption shall be calculated using the following relationship. $P. Stn = Pau. Stn + T_L - Stn$ $Pau. Stn = \sum (P_i \times D_i)$ Where, $P. Stn$ = Power consumed by the station auxiliaries $Pau. Stn$ = Total Power Consumption, while running at 100% design load for all the auxiliaries of the station supplied by bidder. P_i = Power consumed by each station auxiliary. D_i = Duty factor to be considered for each station auxiliary. $T_L - Stn$ = Transformer Losses of the station/standby/startup transformers for meeting the station auxiliary power supply and that of any other transformer supplied by the bidder based on work test report.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID Doc. No.- CS-9585-001-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 28 OF 98	

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	Losses of all transformers included in bidder's scope, based on the works test reports as per the criteria specified under Clause 1.01.08.02 (j) under the subheading Transformers, associated with station auxiliary power supply distribution system (excluding those included in Unit system like GT, UT etc.) shall be included. While guaranteeing the station auxiliary power consumption the bidder shall necessarily include all the station auxiliaries <u>running at full load</u> with duty factors as have been defined at the ensuing para of this chapter. The station auxiliaries that shall be running during the guarantee test for calculating " Pau. Stn " shall include but not be limited to the following: (Where duty factor is not indicated the same is to be considered as 1.0) a) Plant & Instrument air compressors & Air drying plant Power consumption of:- <table><tr><td>i)</td><td>Instrument Air compressor</td><td>2 Nos.</td><td>Duty Factor =0.6</td></tr><tr><td>ii)</td><td>Plant Air compressor</td><td>2 Nos.</td><td>Duty Factor = 0.33</td></tr><tr><td>iii)</td><td>Air Drying plant (Heaters) (if applicable)</td><td>2 Nos.</td><td>Duty Factor =0.5</td></tr><tr><td>iv)</td><td>Air Drying plant (Blowers) (if applicable)</td><td>2 Nos.</td><td>Duty Factor = 1.0</td></tr></table> Power consumption at rated duty point for compressors to be arrived based on shop test and power consumption at rated duty point for Air Drying plant to be arrived based on site test. b) Air Conditioning System & Ventilation System Power consumption at motor input terminals of working units (i.e. excluding stand-by) at its rated duty point of Chilling machines, Chilled water Pumps, Condenser water Pumps, Air handling unit (AHU) fans, for the Air conditioning system of main plant building, Ash handling control room, Ash handling VFD room, FGD control room, ESP control room of each units, switchyard (GIS building), service building, administrative building and Canteen building. Power consumption at rated duty point for Air cooled & water cooled chiller shall be based on site test and for other drives like chilled water pumps, Condenser water Pumps & AHU fans shall be based on shop test.				i)	Instrument Air compressor	2 Nos.	Duty Factor =0.6	ii)	Plant Air compressor	2 Nos.	Duty Factor = 0.33	iii)	Air Drying plant (Heaters) (if applicable)	2 Nos.	Duty Factor =0.5	iv)	Air Drying plant (Blowers) (if applicable)	2 Nos.	Duty Factor = 1.0
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AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUBS EC.	PAGE NO.	CLAUSE NO.		
109	A	IV	PAGE 32 OF 98	1.01.08.02	Station Auxiliary Power Consumption g) Mill Reject System Compressor : Duty Factor 1.0 shall be 66% of Power Consumption of the working compressor) Or Station Auxiliary Power Consumption g) Mill Reject System Compressor: Duty Factor 1.0 Mill reject mechanical type Conveying system : Duty Factor 1.0	Station Auxiliary Power Consumption g) Mill Reject System Compressor: Duty Factor 1.0 Or Mill reject mechanical type Conveying system : Duty Factor 1.0
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PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW) EPC PACKAGE BIDDING DOCUMENT NO.: CS-9585-001-2				AMENDMENT NO. CS-9585-001-2-AMDT-09		Page 39 of 171

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1.03.11	Guaranteed capacity in T/Hr of the following: Apron Feeders Paddle Feeders Crushers Stacker Reclaimer Wagon tippler with side arm charger Vibrating Screening feeders Travelling Tripper Performance tests and the procedure for performance testing of complete coal handling plant shall be as per Annexure-II Mill Reject System - Continuous effective discharge and conveying at the rated capacity of the mill rejects without spillage or blockage in the system. - Following shall be demonstrated at shop for compressor - Capacity and discharge pressure of each air compressor - Following shall be demonstrated at site for compressor - Parallel operation of air compressors, if applicable - Vibration and noise level of air compressors													
1.03.12	Ash Handling Plant <table border="1"> <thead> <tr> <th>S. No</th><th>DESCRIPTION</th><th>PERFORMANCE PARAMETERS</th><th>GUARANTEE</th><th>REMARKS</th></tr> </thead> <tbody> <tr> <td>A.</td><td>Bottom ash system, Economizer ash, APH ash</td><td>For continuous dry type bottom ash removal system employing mechanical conveyors, the system shall be guaranteed to meet the following performance: Continuous effective removal, crushing and discharge of bottom ash generated during various modes of boiler operation to the storage silo and conveying from silo to ash mound by ash conveyors.</td><td></td><td>Continuous effective discharge shall be established by no stagnation of ash at any point in the complete system.</td></tr> </tbody> </table>	S. No	DESCRIPTION	PERFORMANCE PARAMETERS	GUARANTEE	REMARKS	A.	Bottom ash system, Economizer ash, APH ash	For continuous dry type bottom ash removal system employing mechanical conveyors, the system shall be guaranteed to meet the following performance: Continuous effective removal, crushing and discharge of bottom ash generated during various modes of boiler operation to the storage silo and conveying from silo to ash mound by ash conveyors.		Continuous effective discharge shall be established by no stagnation of ash at any point in the complete system.			
S. No	DESCRIPTION	PERFORMANCE PARAMETERS	GUARANTEE	REMARKS										
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID Doc. No.- CS-9585-001-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 45 OF 98										

CLAUSE NO.	GUARANTEE TEST PROCEDURE 										
	ANNEXURE – IIA FORMAT FOR SUBMISSION OF GUARANTEE TEST PROCEDURE <table border="1"> <thead> <tr> <th>Clause No. as per LOA/ Tech. Specs.</th> <th>Provision of LOA / Tech. Specs.</th> <th>Name and Methodology of Test proposed by Vendor</th> <th>NTPC comments on the tests proposed by vendor</th> </tr> </thead> <tbody> <tr> <td style="height: 450px;"></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			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				
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CLAUSE NO.	GUARANTEE TEST PROCEDURE 		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-A Bidding Doc No CS-9585-001-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 87 OF 98

CLAUSE NO.	GUARANTEE TEST PROCEDURE																												
	APPENDIX-IV 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) : <table border="1"> <thead> <tr> <th rowspan="2">Sl. No.</th> <th rowspan="2">Measure ment Terminal Location</th> <th rowspan="2">Time</th> <th rowspan="2">Votage (Volts)</th> <th rowspan="2">Curren t (amps)</th> <th colspan="2">kw Reading M.F.</th> <th rowspan="2">Total (W1+W2) MF kw</th> <th rowspan="2">Remarks</th> </tr> <tr> <th>W1</th> <th>W2</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>									Sl. No.	Measure ment Terminal Location	Time	Votage (Volts)	Curren t (amps)	kw Reading M.F.		Total (W1+W2) MF kw	Remarks	W1	W2									
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CLAUSE NO.	GUARANTEE TEST PROCEDURE																				
	APPENDIX-V GUARANTEE TEST PROFORMA VIBRATION LEVEL MEASUREMENTS Project: Package : Date : Time : Details of vibration Level Meter - Make - Model & Sl.No. - Date of calibration with name of Test House <table border="1"> <thead> <tr> <th rowspan="2">Sl.No.</th> <th rowspan="2">Equipment</th> <th rowspan="2">Pick *Point</th> <th colspan="3">Vibration level Amplitude/Velocity</th> </tr> <tr> <th>Horizontal Micron/ mm/ sec.</th> <th>Vertical micron/ mm/sec.</th> <th>Axial Micron / mm/sec.</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> * Reading shall be taken at all the bearings of motor, gear box and driven equipment. In case of conveyor galleries, vibrations shall be measured at min. three locations, at midpoint of stringer between two short supports. NTPC Contractor						Sl.No.	Equipment	Pick *Point	Vibration level Amplitude/Velocity			Horizontal Micron/ mm/ sec.	Vertical micron/ mm/sec.	Axial Micron / mm/sec.						
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CLAUSE NO.	GUARANTEE TEST PROCEDURE																
APPENDIX-VI 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 <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">SI.No</th> <th style="width: 20%;">Equipment with location</th> <th style="width: 20%;">Equipment load/capacity</th> <th style="width: 20%;">Measurement* point no.</th> <th style="width: 15%;">Sound level dBA.</th> <th style="width: 15%;">Remarks</th> </tr> </thead> <tbody> <tr> <td style="height: 150px;"></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> NTPC Contractor * For each equipment location, a Projected Plan Diagram shall be made and the location of measurement points shall be identified.						SI.No	Equipment with location	Equipment load/capacity	Measurement* point no.	Sound level dBA.	Remarks						
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3X800 MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A Bidding Doc No CS-9585-001-2		SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 93 OF 98												

ANNEXURE-VIII

LOW PRESSURE PIPING

EPC PACKAGE FOR
PATRATU SUPER THERMAL POWER STATION EXPANSION
PHASE -I (3X 800MW)

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC. NO.: CS:9585-001-2

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	<u>LOW PRESSURE PIPING</u>			
1.00.00	EQUIPMENT SIZING CRITERIA			
1.01.00	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			
		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
	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:			
	(i) Carbon steel pipe	100		
	(ii) Ductile Iron.	140		
	(iii) Rubber lined steel pipe	120		
	(iv) Stainless steel pipe	100		
	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.			
	(b) Compressed Air Application			
	Compressed air	15.0 m/sec.(under Average Pressure & Temp. conditions)		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-9585-001-2	SUB-SECTION-A-10 (LOW PRESSURE PIPING)	PAGE 1 OF 20

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC																																											
1.04.00	The pipes shall be sized for the worst (i.e. maximum flow, temp. and pressure values) operating conditions.																																												
1.05.00	Based on the inside dia. so established, thickness calculation shall be made as per ANSI B 31.1 OD and 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 B 36.19 as the case may be.																																												
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	High points in piping system shall be provided with vents along with valves as per the system requirement. Low points shall be provided with drains along with drain valves as per the system requirement. Drain lines shall be adequately sized so as to clear condensate in the lines. Material for drain and vent lines shall be compatible with that of the parent pipe material.																																												
1.09.00	Material of construction for pipes carrying various fluids shall be as specified elsewhere.																																												
1.10.00	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.																																												
1.11.00	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.																																												
1.12.00	Threaded joints shall be provided with Teflon sealant tapes.																																												
1.13.00	Following types of valves shall be used for the system/service indicated. <table><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><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></table>	SYSTEM	TYPES OF VALVES							Butterfly	Gate	Globe	Check	Ball	Plug	Water	x	x	x	x	x		Air		x	x	x	x		Drains & vents		x	x	x			Fuel oil (if any)		x	x	x	x	x		
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1.14.0	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.																																												
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-9585-001-2	SUB-SECTION-A-10 (LOW PRESSURE PIPING)	PAGE 2 OF 20																																									

CLAUSE NO.	TECHNICAL REQUIREMENTS			
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 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.			
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.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-9585-001-2	SUB-SECTION-A-10 (LOW PRESSURE PIPING)	PAGE 3 OF 20

CLAUSE NO.	TECHNICAL REQUIREMENTS																				
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.																				
2.03.00	Material																				
2.03.01	Alternate materials offered by Bidder against those specified. shall either be equal to or superior to those specified, The responsibility for establishing equality or superiority of the alternate materials offered rests entirely with the Bidder and any standard code required for establishing the same shall be in English language.																				
2.03.02	No extra credit would be given to offers containing materials superior to those specified. Likewise no extra credit would be given to offers containing pipe thickness more than specified.																				
2.03.03	All materials shall be new and procured directly from the manufacturers. Materials procured from traders or stockists are not acceptable.																				
2.03.04	All materials shall be certified by proper material test certificates. All material test certificates shall carry proper heat number or other acceptable references to enable identification of the certificate that certifies the material.																				
2.03.05	Material of construction for pipes carrying various fluids shall be as follows:																				
	<table><thead><tr><th>SI No</th><th>Type of Fluid</th><th>Material</th></tr></thead><tbody><tr><td>1.</td><td>i) Ordinary Water (Raw Water, Clarified Water, etc.) ii) Equipment cooling water including Both primary & secondary circuit (DMCW pH-corrected & ACW drain water)</td><td>IS-2062 Gr.-E-250B/ASTM A-36/ASTM A-53 type 'E'Gr.B/IS-3589 Gr. 410 /IS-1239 Heavy.</td></tr><tr><td>2.</td><td>i) Demineralised water, ii)Alkaline solution (ECW system chemical dosing)</td><td>Stainless Steel to ASTM A312, Gr. 304 welded for sizes 65 mm NB and above. Stainless steel to ASTM A312, Gr. 304 sch.40s seamless for sizes 50mm and below</td></tr><tr><td>3.</td><td>i) Drinking (potable) water ii)Compressed air (Instrument & service air)</td><td>ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent.</td></tr><tr><td>4.</td><td>(Condensate) spill water</td><td>ASTM A 106 Gr. B</td></tr><tr><td>5.</td><td>Effluents from Neutralization pit</td><td>MSRL</td></tr></tbody></table>	SI No	Type of Fluid	Material	1.	i) Ordinary Water (Raw Water, Clarified Water, etc.) ii) Equipment cooling water including Both primary & secondary circuit (DMCW pH-corrected & ACW drain water)	IS-2062 Gr.-E-250B/ASTM A-36/ASTM A-53 type 'E'Gr.B/IS-3589 Gr. 410 /IS-1239 Heavy.	2.	i) Demineralised water, ii)Alkaline solution (ECW system chemical dosing)	Stainless Steel to ASTM A312, Gr. 304 welded for sizes 65 mm NB and above. Stainless steel to ASTM A312, Gr. 304 sch.40s seamless for sizes 50mm and below	3.	i) Drinking (potable) water ii)Compressed air (Instrument & service air)	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent.	4.	(Condensate) spill water	ASTM A 106 Gr. B	5.	Effluents from Neutralization pit	MSRL		
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-9585-001-2	SUB-SECTION-A-10 (LOW PRESSURE PIPING)	PAGE 4 OF 20																	

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
2.03.06	In water lines, pipes upto 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 upto 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 upto 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. 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			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:CS-9585-001-2	SUB-SECTION-A-10 (LOW PRESSURE PIPING)	PAGE 5 OF 20

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	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.			
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/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. 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 & out side) after welding with zinc rich electrode, 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. Any site welding done on galvanized pipes shall be done with zinc-rich special electrodes and the welded surfaces whether inside or outside shall be coated with zinc-silicate paste. Seal welding of flanges with zinc-rich electrode 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 (with zinc-rich special electrodes) 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			
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2.06.02	galvanic protection has been impaired due to welding of pipe-to-pipe joint. Thus the last erection joint shall be flanged joint. 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.		
2.07.00	Bends/elbows/mitre bends/ Tees/ Reducers & other fittings		
2.07.01	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. 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 upto 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. Welding of flanges in tension is not permitted.		
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2.08.02	All flanges and-flanged drilling shall be to ANSI B 16.5/BS EN-1092 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. (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.			
2.09.03	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			
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	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 thickness of the finished protective coating shall be 4.0 mm minimum.			
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 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.			
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2.12.02	(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 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.			
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2.12.04	Standards and Codes				
	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.			
	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.					
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	(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/sluice 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 radiused 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. (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.			
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2.13.01	(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	
	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 valves are also acceptable in place of Gun metal valves.				
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2.14.00	Air Release Valve (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.			
2.15.00	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 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.			
2.15.02	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			
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2.15.03	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. 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.		
2.16.00	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.			
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	(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 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 covers as required and also platform suitably located.			
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2.17.03	(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 drg. 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.		

	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)	450 Cu.m (for 800MW units),	
	1.03	Size (Dia & Height)/Plate Thickness	9mx8.2m 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 type indicator (Guide wire, Float and Housing of Stainless steel - 316 Gr. construction)	
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	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. 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		
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	a superior quality braided cotton or synthetic fibre 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.			
2.19.00	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)	
	(b)	Strainer Element	Stainless steel (AISI 316)	
	(c)	End connection	Screwed upto 50 mm Nb, and Flanged above 50 mm Nb	
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2.19.02	Duplex type (a) The strainers shall be basket type and of duplex construction. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least four (4) times the internal area of the connecting pipe. The mesh of strainer element shall be commensurate with the actual service required. Pressure drop across the strainer in new condition shall not exceed 4.0 MWC at full flow. (b) Wire mesh (if applicable) of the strainers shall be suitably reinforced. The material of construction of various parts shall be as follows. Body IS: 318, Gr. 2 up to 50 mm Nb, and IS:210, Gr. FG 260 or ASTM-A-515 Gr. 75/IS-2062 Gr. E-250B and internally epoxy-painted above 50 mm NB. Strainer element Stainless steel (AISI 316) End connection Screwed up to 50mm Nb, and Flanged above 50 mm Nb. Gasket shall be of full face type (c) The strainer will have a permanent stainless steel tag fixed on the strainer body indicating the strainer tag number and service and other salient data. (d) The size of the strainer and the flow direction will be indicated on the strainer body casting. (e) Thickness of the strainer element should be designed to withstand the pressure developed within the strainer due to 100% clogged condition exerting shut-off pressure on the element.			
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ANNEXURE-IX

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	AS APPLICABLE			
1.00.00	INTRODUCTION This part covers technical requirements which will form an integral part of the Contract. The following provisions shall supplement all the detailed technical specifications and requirements brought out in Section-VI, the Technical Specification and the Technical Data Sheets.			
2.00.00	BRAND NAME Whenever a material or article is specified or described by the name of a particular brand, manufacturer or vendor, the specific item mentioned shall be understood to be indicative of the function and quality desired, and not restrictive; other manufacturer's products may be considered provided sufficient information is furnished to enable the Employer to determine that the products proposed are equivalent to those named.			
3.00.00	BASE OFFER & ALTERNATE PROPOSALS The Bidder's proposal shall be based upon the use of equipment and material complying fully with the requirements specified herein. It is recognized that the Contractor may have standardized on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered, provided the base offer is in line with technical specifications and such proposals meet the specified design standards and performance requirement and are acceptable to the Employer. Sufficient amount of information for justifying such proposals shall be furnished to Employer alongwith the bid to enable the Employer to determine the acceptability of these proposals.			
4.00.00	COMPLETENESS OF FACILITIES			
4.01.00	Bidders may note that this is a turnkey contract. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure a completely engineered plant shall be provided.			
4.02.00	All equipments furnished by the Contractor shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation of the equipment and for the safety of the operating personnel, as required by applicable codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions. All same standard components/ parts of same equipment provided, shall be interchangeable with one another.			
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4.03.00	For the C&I systems, the Contractor shall be required to provide regular information about future upgrades and migration paths to the Employer.			
5.00.00	CODES & STANDARDS			
5.01.00	In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India as well as of the locality where they will be installed, including the following : a) Indian Electricity Act b) Indian Electricity Rules c) Indian Explosives Act d) Indian Factories Act and State Factories Act e) Indian Boiler Regulations (IBR) f) Regulations of the Central Pollution Control Board, India g) Regulations of the Ministry of Environment & Forest (MoEF), Government of India h) Pollution Control Regulations of Department of Environment, Government of India i) State Pollution Control Board. (j.) Rules for Electrical installation by Tariff Advisory Committee (TAC). (k.) Building and other construction workers (Regulation of Employment and Conditions of services) Act, 1996 (l.) Building and other construction workers (Regulation of Employment and Conditions of services) Central Rules, 1998 (m.) Explosive Rules, 1983 (n.) Petroleum Act, 1984 (o.) Petroleum Rules, 1976, (p.) Gas Cylinder Rules, 1981			
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5.02.00	(q.) Static and Mobile Pressure Vessels (Unified) Rules, 1981 (r.) Workmen's Compensation Act, 1923 (s.) Workmen's Compensation Rules, 1924 (t.) NTPC Safety Rules for Construction and Erection (u.) NTPC Safety Policy (v.) Any other statutory codes / standards / regulations, as may be applicable. Unless covered otherwise in the specifications, the latest editions (as applicable as on date of bid opening), of the codes and standards given below shall also apply : a) Bureau of Indian standards (BIS) b) Japanese Industrial Standards (JIS) c) American National Standards Institute (ANSI) d) American Society of Testing and Materials (ASTM) e) American Society of Mechanical Engineers (ASME) f) American Petroleum Institute (API) g) Standards of the Hydraulic Institute , U.S.A. h) International Organization for Standardization (ISO) i) Tubular Exchanger Manufacturer's Association (TEMA) j) American Welding Society (AWS) k) National Electrical Manufacturers Association (NEMA) l) National Fire Protection Association (NFPA) m) International Electro-Technical Commission (IEC) n) Expansion Joint Manufacturers Association (EJMA) o) Heat Exchange Institute (HEI) p) IEEE standard			
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5.03.00 5.04.00 5.05.00 5.06.00 5.07.00 5.08.00 6.00.00 6.01.00	q) JEC standard Other International/ National standards such as DIN, VDI, BS, GOST etc. shall also be accepted for only material codes and manufacturing standards, subject to the Employer's approval, for which the Bidder shall furnish, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned elsewhere in the specification together with the complete word to word translation of the standard that is normally not published in English. As regards highly standardised equipments such as Steam Turbine and Generator, National /International standards such as JIS, DIN, VDI, ISO, SEL, SEW, VDE, IEC & VGB shall also be considered as far as applicable for Design, Manufacturing and Testing of the respective equipment. However, for those of the above equipment not covered by these National / International standards, established and proven standards of manufacturers shall also be considered. In the event of any conflict between the codes and standards referred to in the above clauses and the requirement of this specification, the requirement of Technical Specification shall govern. Two (2) English language copies of all national and international codes and/or standards used in the design of the plant and equipment shall be provided by the Contractor to the Employer within two calendar months from the date of the Notification of Award. In case of any change in codes, standards & regulations between the date of bid opening and the date when vendors proceed with fabrication, the Employer shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Contractor to bring to the notice of the Employer such changes and advise Employer of the resulting effect. A detailed list of standards apart from those mentioned in the respective detailed specifications in other parts of Section-VI to which all equipment/systems/civil works should conform as indicated in this Part C and elsewhere in the specification. EQUIPMENT FUNCTIONAL GUARANTEE The functional guarantees of the equipment under the scope of the Contract is given in Section-VI Part - A & B of Technical Specifications. These guarantees shall supplement the general functional guarantee provisions covered under Defect liabilities Section-IV, General Conditions of Contract.		
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
6.02.00	Liquidated damages for shortfall in meeting functional guarantee(s) during the performance and guarantee tests shall be assessed and recovered from the Contractor as specified elsewhere in this specification.			
7.00.00	DESIGN OF FACILITIES/ MAINTENANCE & AVAILABILITY CONSIDERATIONS			
7.01.00	DESIGN OF FACILITIES All the design procedures, systems and components proposed shall have already been adequately developed and shall have demonstrated good reliability under similar conditions elsewhere. The Contractor shall be responsible for the selection and design of appropriate equipments to provide the best coordinated performance of the entire system. The basic requirements are detailed out in various clauses of the Technical Specifications. The design of various components, assemblies and subassemblies shall be done so that it facilitates easy field assembly and dismantling. All the rotating components shall be so selected that the natural frequency of the complete unit is not critical or close to the operating range of the unit.			
7.02.00	MAINTENANCE AND AVILABILITY CONSIDERATIONS Equipment/works offered shall be designed for high availability, low maintenance and ease of maintenance. The Bidder shall specifically state the design features incorporated to achieve high degree of reliability/ availability and ease of maintenance. The Bidder shall also furnish details of availability records in the reference plants stated in his experience list. Bidder shall state in his offer the various maintenance intervals, spare parts and man-hour requirement during such operation. The intervals for each type of maintenance namely inspection of the furnace, inspection of the entire hot gas path and the minor and major overhauls shall be specified in terms of fired hours , clearly defining the spare parts and man-hour requirement for each stage. Lifting devices i.e. hoists and chain pulley jacks ,etc. shall be provided by the contractor for handling of any equipment or any of its part having weight in excess of 500 Kgs during erection and maintenance activities. Lifting devices like lifting tackles, slings, etc. to be connected to hook of the hoist / crane shall be provided by the contractor for lifting the equipment and accessories covered under the specification.			
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
8.00.00	DOCUMENTS, DATA AND DRAWINGS TO BE FURNISHED BY CONTRACTOR			
8.01.00	Bidders may note that this is a turnkey contract. Each of the plant and equipment shall be fully integrated, engineered and designed to perform in accordance with the technical specification. All engineering and technical services required to ensure a completely engineered plant shall be provided in respect of mechanical, electrical and power systems, control & instrumentation, civil & structural works. The Contractor shall furnish engineering data /drawings in accordance with the schedule of information as specified in Technical Data Sheets and Technical Specification. A comprehensive engg and quality coordination procedure shall be finalized with the successful bidder covering salient features as described in this section of specifications.			
8.02.00	The number of copies/prints/CD-ROMs/manuals to be furnished for various types of document is given in Annexure-VI to this Part-C, Section-VI of the Technical Specification.			
8.03.00	The documentation that shall be provided by the Contractor is indicated in the various sections of specification. This documentation shall include but not be limited to the following:			
8.03.01	A) BASIC ENGINEERING DOCUMENTATION Prior to commencement of the detailed engineering work, the Contractor shall furnish a Plant Definition Manual within 12 weeks from the date of the Notification of Award. This manual shall contain the following as a minimum: i) System description of all the mechanical, electrical, control & instrumentation & civil systems. ii) Technology scan for each system / sub-system & equipment. iii) Selection of appropriate technology / schemes for various systems/ subsystems including techno-economic studies between various options. iv) Optimisation studies including thermal cycle optimisation. v) Sizing criteria of all the systems, sub-systems/ equipments/ structures/ equipment foundations alongwith all calculations justifying and identifying the sizing and the design margins.			
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	vi) Schemes and Process & Instrumentation diagrams for the various systems/ sub-system with functional write-ups. vii) Water Balance diagram. viii) Operation Philosophy and the control philosophy of the Main Plant and other plants. ix) General Layout plan of the power station incorporating all facilities in Bidder's as well as those in the Employer's scope. This drawing shall also be furnished in the form of CD-ROMs to the Employer for engineering of areas not included in bidder's scope. x) Basic layouts and cross sections of the main plant building (various floor elevations), boiler, fuel oil area, transformer yard, switchyard and other areas included in the scope of the bidder. xi) Documentation in respect of Quality Assurance System as listed out elsewhere in this specification. The successful bidder shall furnish within three (3) weeks from the date of Notification of Award, a list of contents of the Plant Definition Manual (PDMs) including techno-economic studies, which shall then be mutually discussed & finalised with the Employer. B) DETAILED ENGINEERING DOCUMENTS i) General layout plan of the station. ii) Layouts, general arrangements, elevations and cross-sections drawings for all the equipment and facilities of the plant. iii) Flow diagram, process and instrumentation diagrams along with write up and system description. iv) Start up curves for boiler and both turbines and boiler combined together as a unit for various start ups, viz. cold, warm and hot start up. v) Piping isometric, composite layout and fabrication drawings. vi) Piping engineering diagrams, pipe and fittings schedules, valve schedules, hanger and support schedules, insulation schedules.		
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	vii) Technical data sheets for all bought out and manufactured items. Contractor shall use the Employer's specifications as a base for placement of orders on their sub vendors. viii) Detailed design calculations for components, system, piping etc., wherever applicable including sizing calculations for all auxiliaries like mills, fans, BFPs, CEPs, Heaters/ Deaerators, Condensers, vacuum pumps etc. ix) Boiler pressure part schedule and sizing calculations. Boiler performance data and boiler design dossier. x) Transient, hydraulic and thermal stress analysis of piping and system wherever applicable & input and output data alongwith stress analysis isometrics showing nodes.. xi) Thermal cycle information (heat balance diagrams, boiler performance calculations, condenser and heat exchanger thermal calculations etc.). xii) Characteristic Curves/ Performance Correction Curves. Hydraulic & Mechanical design calculations for condensers & heaters. xiii) Comprehensive list of all terminal points which interface with Employer's facilities, giving details of location, terminal pressure, temperature, fluid handled & end connection details, forces, moments etc. xiv) Power supply single line diagram, block logics, control schematics, electrical schematics, etc. xv) Protection system diagrams and relay settings. xvi) Cables schedules and interconnection diagrams. xvii) Cable routing plan. xviii) Instrument schedule, measuring point list, I/O list, Interconnection & wiring diagram, functional write-ups, installation drawings for field mounted instruments, logic diagrams, control schematics, wiring and tubing diagrams of panels and enclosures etc. Drawings for open loop and close loop controls (both hardware and software). Motor list and valve schedule including type of actuator etc. xix) Alarm and annunciation/ Sequence of Event (SOE) list and alarms & trip set points.			
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8.03.02	xx) Sequence and protection interlock schemes. xxi) Type test reports, insulation co-ordination study report and power system stability study report. xxii) Control system configuration diagrams and card circuit diagrams and maintenance details. xxiii) Detailed DDCMIS system manuals. xxiv) Detailed flow chart for digital control system. xxv) Mimic diagram layout, Assignment for other application engg. xxvi) Civil and Structural works drawings and documents for all structures, facilities, architectural works, foundations underground and overground works and super-structural works as included in the scope of the bidder civil calculation sheets including structural analysis and design alongwith output results. xxvii) Underground facilities, levelling ,sanitary, land scaping drawings. xxviii) Geotechnical investigation and site survey reports (if and as applicable). xxix) Model study reports wherever applicable. xxx) Functional & guarantee test procedures and test reports. xxxi) Documentation in respect of Quality Assurance System, and Documentation in respect of Commissioning, as listed out elsewhere in this specification. The Contractor's while sumitting the above documents/ drawings for approval/ reference as the case may be, shall mark on each copy of submission the reference letter alongwith the date vide which the submissions are made. INSTRUCTION MANUALS The Contractor shall submit to the Employer, draft Instruction Manuals for all the equipments covered under the Contract by the end of one year from the date of his acceptance of the Letter of Award. The Instruction manuals shall contain full details required for erection, commissioning, operation and maintenance of each equipment. The manual shall be specifically compiled for this project. After finalisation and approval of the Employer the Instruction Manuals shall be submitted as indicated in Annexure-IV. The Contract shall not be considered to be completed		
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	for purposes of taking over until the final Instructions manuals have been supplied to the Employer. The Instruction Manuals shall comprise of the following. A) ERECTION MANUALS The erection manuals shall be submitted atleast three (3) months prior to the commencement of erection activities of particular equipment/system. The erection manual should contain the following as a minimum. a) Erection strategy. b) Sequence of erection. c) Erection instructions. d) Critical checks and permissible deviation/tolerances. e) List of tool, tackles, heavy equipments like cranes, dozers, etc. f) Bill of Materials g) Procedure for erection and General Safety procedures to followed during erection/installation. h) Procedure for initial checking after erection. i) Procedure for testing and acceptance norms. j) Procedure / Check list for pre-commissioning activities. k) Procedure / Check list for commissioning of the system. l) Safety precautions to be followed in electrical supply distribution during erection. B) OPERATION & MAINTENANCE MANUALS a) The manual shall be a two rim PVC bound stiff sided binder able to withstand constant usage or where a thicker type is required it shall have locking steel pins, the size of the manual shall not be larger than international size A3. The cover shall be printed with the Project Name, Services covered and Volume / Book number Each section of the manual shall be divided by a stiff divider of the same size as the holder. The dividers shall clearly state the section number and title. All written instructions within the manual not provided by the		
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	manufacturers shall be typewritten with a margin on the left hand side. b) The arrangement and contents of O & M manuals shall be as follows : 1) <u>Chapter 1 - Plant Description</u> : To contain the following sections specific to the equipment/system supplied (a) Description of operating principle of equipment / system with schematic drawing / layouts. (b) Functional description of associated accessories / controls. Control interlock protection write up. (c) Integrated operation of the equipment alongwith the intended system. (The is to be given by the supplier of the Main equipment by taking into account the operating instruction given by the associated suppliers). (d) Exploded view of the main equipment, associated accessories and auxiliaries with description. Schematic drawing of the equipment alongwith its accessories and auxiliaries. (e) Design data against which the plant performance will be compared. (f) Master list of equipments, Technical specification of the equipment/ system and approved data sheets. (g) Identification system adopted for the various components, (it will be of a simple process linked tagging system). (h) Master list of drawings (as built drawing - Drawings to be enclosed in a separate volume). 2) <u>Chapter 2.0 - Plant Operation</u>: To contain the following sections specific to the equipment supplied (a) Protection logics provided for the equipment alongwith brief philosophy behind the logic, Drawings etc. (b) Limiting values of all protection settings. (c) Various settings of annunciation/interlocks provided.		
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	(d) Startup and shut down procedure for equipment alongwith the associated systems in step mode. (e) Do's and Don'ts related to operation of the equipment. (f) Safety precautions to be take during normal operation. Emergency instruction on total power failure condition/lubrication failure/any other conditions. (g) Parameters to be monitored with normal value and limiting values. (h) Equipment isolating procedures. (i) Trouble shooting with causes and remedial measures. (j) Routine testing procedure to ascertain healthiness of the safety devices alongwith schedule of testing. (k) Routine Operational Checks, Recommended Logs and Records (l) Change over schedule if more than one auxiliary for the same purpose is given. (m) Preservation procedure on long shut down. (n) System/plant commissioning procedure. 3) <u>Chapter 3.0 - Plant Maintenance</u>- To contain the following sections specific to the equipment supplied. (a) Exploded view of each of the equipments. Drawings alongwith bill of materials including name, code no. & population. (b) Exploded view of the spare parts and critical components with dimensional drawings (In case of Electronic cards, the circuit diagram to be given) and spare parts catalogue for each equipment. (c) List of Special T/ P required for Overhauling /Trouble shooting including special testing equipment required for calibration etc. (d) Stepwise dismantling and assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained etc. Clearance to be maintained etc.		
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8.03.03	(e) Preventive Maintenance schedules linked with running hours/calendar period alongwith checks to be carried out. (f) Overhauling schedules linked with running hours/calendar period alongwith checks to be done. (g) Long term maintenance schedules (h) Consumables list alongwith the estimated quantity required during normal running and during maintenance like Preventive Maintenance and Overhauling. (i) List of lubricants with their Indian equivalent, Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at longer intervals to ensure trouble free operation and quantity required for complete replacement.. (j) Tolerance for fitment of various components. (k) Details of sub vendors with their part no. in case of bought out items. (l) List of spare parts with their Part No, total population, life expediency & their interchangeability with already supplied spares to NTPC. (m) List of mandatory and recommended spare list along with manufacturing drawings, material specification & quality plan for fast moving consumable spares. (n) Lead time required for ordering of spares from the equipment supplier, instructions for storage and preservation of spares. (o) General information on the equipment such as modification carried out in the equipment from its inception, equipment population in the country / foreign country and list of utilities where similar equipments have been supplied. After finalization and approval of the Employer, the O & M Manuals shall be submitted as indicated in Annexure-VI. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals (both erection and O & M manuals have been supplied to the Employer. If after the commissioning and initial operation of the plant, the instruction manuals (Erection and /or O &M manuals) require modifications/additions/ changes, the same shall be incorporated and the updated final instruction manuals shall be submitted by		
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	ii) All documents submitted by the Contractor for Employer's review shall be in electronic form (soft copies) along with the desired number of hard copies as per Annexure-VI of Part-C. The soft copies shall be uploaded by the vendors in C-folders, a Web-based system of NTPC ERP, for which a username and password will be allotted to the new vendor by NTPC. Similarly, the vendor can download the drawings/documents, approved/ commented by NTPC, through above site. The soft copies of identified drawings/documents shall be in pdf format, whereas the attachments/reply to the submitted document(s) can be in .doc, .xls, .pdf, .dwg or .std formats. iii) Final copies of the approved drawings along with requisite number of hard copies shall be submitted as per Annexure-VI of Part-C. iv) Contractor shall prepare the model of all the facilities located in Main Power Block area, covering Transformer Yard, TG building (including all facilities), Boiler area, ESP area, chimney area and any other facility located in Main Plant Block area in an integrated & intelligent 3D software solution using rule based, data centric 3D design software with equipment drawings, data sheets, intelligent P&ID correlated with intelligent 3D Model, BOQ, schematics and logic diagrams etc. attached to the respective equipment / systems in the aforesaid 3D model. All piping layouts, equipment layouts, floor plans, ducting layout (Air/flue gas, A/C, Ventilation etc.), General Arrangement drawings of major buildings, structural arrangement drawings and RCC layout drawings shall necessarily be extracted from the aforesaid 3D model and submitted for employer's review along with the 3D review model to enable NTPC to review and approve these drawings. Contractor shall prepare and provide 3D design review model (network ready, which shall include visual interference check, walk-through animation, video simulation for major equipment placement and removal, visual effect, photo realism etc.), which is extracted from intelligent 3D model and shall make a presentation of the same every 3 months from LOA to enable NTPC to review the progress of engineering or as & when required by employer. After the completion of engineering of respective area i.e. TG building/ Boiler/ ESP etc., the corresponding complete 3D review model shall be handed over to the employer for its reference.		
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	b) All documents/text information shall be in latest version of MS Office/MS Excel/PDF format as applicable. c) All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail indicating the type, size, arrangement, weight of each component for packing and shipment, the external connection, fixing arrangement required, the dimensions required for installation and interconnections with other equipments and materials, clearance and spaces required between various portions of equipment and any other information specifically requested in the drawing schedules. d) Each drawing submitted by the Contractor (including those of subvendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, notings, markings and writings on the drawing shall be in English. All the dimensions should be in metric units. e) The drawings submitted by the Contractor (or their subvendors) shall bear Employer's drawing number in addition to contractor's (their sub-vendor's) own drawing number. Employer's drawing numbering system shall be made available to the successful bidder so as to enable him to assign Employer's drawing numbers to the drawings to be submitted by him during the course of execution of the Contract. The Contractor shall also furnish a "Master Drawing List" which shall be a comprehensive list of all drawings/ documents/ calculations envisaged to be furnished by him during the detailed engineering to the Employer. Such list should clearly indicate the purpose of submission of these drawings i.e. "FOR APPROVAL" or "FOR INFORMATION ONLY". Similarly, all the drawings/ documents submitted by the Contractor during detailed engineering stage shall be marked "FOR APPROVAL" or "FOR INFORMATION" prior to submission. Further, space shall be identified on each drawing for Approval stamp and electronic signature. f) The furnishing of detailed engineering data and drawings by the Contractor shall be in accordance with the time schedule for the project . The review of these documents/ data/ drawings by the Employer will cover only general conformance of the data/ drawings/ documents to the specifications and contract, interfaces with the equipments provided by others and external connections & dimensions which might affect plant layout. The review by the Employer should not be construed to be a thorough review of all dimensions, quantities and details of the equipments, materials, any devices or items indicated or the accuracy of the information submitted. The review and/ or		
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	approval by the Employer/ Project Manager shall not relieve the Contractor of any of his responsibilities and liabilities under this contract. g) After the approval of the drawings, further work by the Contractor shall be in strict accordance with these approved drawings and no deviation shall be permitted without the written approval of the Employer. h) All manufacturing, fabrication and execution of work in connection with the equipment / system, prior to the approval of the drawings, shall be at the Contractor's risk. The Contractor is expected not to make any changes in the design of the equipment /system, once they are approved by the Employer. However, if some changes are necessitated in the design of the equipment/system at a later date, the Contractor may do so, but such changes shall promptly be brought to the notice of the Employer indicating the reasons for the change and get the revised drawing approved again in strict conformance to the provisions of the Technical Specification. i) Drawings shall include all installations and detailed piping layout drawings. Layout drawings for all piping of 65 mm and larger diameter shall be submitted for review/ approval of Employer prior to erection. Small diameter pipes shall however be routed as per site conditions in consultation with site authority/ representative of Employer based on requirements of such piping indicated in approved/ finalised Flow Scheme/ Process & Instrumentation Diagrams and/or the requirements cropping up for draining & venting of larger diameter piping or otherwise after their erection as per actual physical condition for the entire scope of work of this turnkey package. Assessing & anticipating the requirement and supply of all piping and equipment shall be done by the contractor well in advance so as not to hinder the progress of piping & equipment erection, subsequent system charging and its effective draining & venting arrangement as per site suitability. j) As Built Drawings After final acceptance of individual equipment / system by the Employer, the Contractor will update all original drawings and documents for the equipment / system to “as built” conditions and submit no. of copies as per Annexure VI. k) Drawings must be checked by the Contractor in terms of its completeness, data adequacy and relevance with respect to Engineering schedule prior to submission to the Employer. In case drawings are found to be submitted without proper checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission. The contractor shall make a visit to site to see the existing facilities and understand the layout			
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8.04.00	completely and collect all necessary data/ drawings at site which are needed as an input to the engineering. The contractor shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well as interface engineering & integration of systems, facilities, equipment & works under Employer's scope and submit all necessary drawings/ documents for the same. l) The Contractor shall submit adequate prints of drawing / data / document for Employer's review and approval. The Employer shall review the drawings and return soft copy to the Contractor authorizing either to proceed with manufacture or fabrication, or marked to show changes desired. When changes are required, drawings shall be re-submitted promptly, with revisions clearly marked, for final review. Any delays arising out of the failure of the Contractor to submit/rectify and resubmit in time shall not be accepted as a reason for delay in the contract schedule. m) All engineering data submitted by the Contractor after final process including review and approval by the Project Manager/ Employer shall form part of the contract documents and the entire works covered under these specification shall be performed in strict conformity with technical specifications unless otherwise expressly requested by the Project Manager in writing. ENGINEERING INFORMATION SUBMISSION SCHEDULE Prior to the award of Contract, a Detailed Engineering Information Submission Schedule shall be tied up with the Employer. For this, the bidder shall furnish a detailed list of engineering information alongwith the proposed submission schedule. This list would be a comprehensive one including all engineering data / drawings / information for all bought out items and manufactured items. The information shall be categorised into the following parts. i) Information that shall be submitted for the approval to the Employer before proceeding further, and ii) Information that would be submitted for Employer's information only. The Master Drawing List(MDL) shall be updated periodically and submitted to the employer, highlighting the changes made in MDL. The schedule should allow adequate time for proper review and incorporation of changes/ modifications, if any, to meet the contract without affecting the equipment delivery schedule and overall project schedule. The early submission of drawings and data is as important as the manufacture and delivery of equipment and hardware and this shall be duly considered while determining the overall performance and progress.		
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8.05.00 8.05.01 8.05.02 8.05.03	Engineering Co-ordination Procedure The following principal coordinators will be identified by respective organizations at time of award of contract : NTPC Engineering Coordinator (NTPC EC) : Name : _____ Designation : _____ Address : _____ a) Postal : _____ b) Telegraphic / e-Mail : _____ c) FAX : _____ TELEPHONE : _____ Contractor's/ Vendor's Engineering Coordinator (VENDOR EC): Name : _____ Designation : _____ Address : _____ a) Postal : _____ b) Telegraphic / e-Mail : _____ c) FAX : _____ TELEPHONE : _____ All engineering correspondence shall be in the name of above coordinators on behalf of the respective organizations. Contractor's/Vendor's Drawing Submission and Approval Procedure : a) All data/information furnished by Vendor in the form of drawings/ documents/catalogues or in any other form for NTPC's information/ interface and or review and approval are referred by the general term "drawings". b) The 'Master drawings list' indicating titles, Drawing Number, Date of submission and approval etc. shall be finalised mutually between Contractor and Employer before the award of contract. This list shall be updated if required at suitable interval during detailed engineering.		
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