

NTPC LTD.
2X800 MW GADARWARA STPP,STAGE-I

TECHNICAL SPECIFICATION
OF
MILL REJECT HANDLING SYSTEM

SPECIFICATION NO.: PE-TS-395-160-A001



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



TITLE:
**TECHNICAL SPECIFICATION FOR
 MILL REJECT HANDLING SYSTEM**
2X800MW GADARWARA STPP,STAGE-I

BHEL DOCUMENTS NO.: PE-TS-395-160-A001

DEPT: MAX

REV. NO. 00 DATE: 04/10/2013

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INTENT OF SPECIFICATION

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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 special maintenance tools and tackles, Erection & Commissioning, structural & minor civil works as required Performance and guarantee testing and handing over of **Mill Reject Handling System** as per details in different sections of this specification for **2X800 MW GADARWARA SUPER THERMAL POWER PLANT AT GADARWARA, MP.**
- 1.2 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgment is not in full accordance herewith.
- 1.3 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.
- 1.4 The general term and conditions, instructions to tendered 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.
- 1.5 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 on account of the same. Normally, in case of any contradiction in requirements between section-C and section-D, the requirements in Sec-C shall govern. 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



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either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

- 1.6** Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.
- 1.7** 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.



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SECTION - B

PROJECT INFORMATION

CLAUSE NO.	PROJECT INFORMATION	ANNEXURE-I	एनटीपीसी NTPC
	INTRODUCTION		
1.00.00	BACKGROUND		
	Gadarwara Thermal Power Project (Gadarwara TPP) is being set up as a regional power project for the benefit of States/UTs of Western Region. This project is being set up in two stages. Each stage shall comprise of two units of 800 MW.		
1.01.00	Location and		
	<p>The site is located near villages Gangai & Umaraiya (about 9 Kms from Gadarwara town in Narsingpur district of Madhya Pradesh. The major cities Bhopal & Jabalpur are located at about 210 Kms & about 140 kms respectively from proposed project site. The nearest BG Railway Station, Gadarwara, on Jabalpur- Itarsi Section on central railway main Line is about 9 Kms from proposed project site.</p> <p>The nearest commercial airport, Bhopal and Jabalpur are located about 240 Kms and about 155 Kms respectively from site. The plant latitude and longitude are 22° 51' 42" N and 78° 52' 08" respectively.</p> <p>Vicinity plan of the proposed project is placed at Annexure –A-I</p>		
1.02.00	Land		
	About 1844 acres of land (Private Land- about 1480 acres and Govt. Land- about 364 acres) has been envisaged for the project. In-principle land availability clearance has been obtained from Govt. of Madhya Pradesh vide letter dated 19.05.08.		
1.03.00	Water		
	<p>The make-up water requirement is estimated as 4680 Cubic Meter/Hr with ash circulation system and about 5980 Cubic Meter/Hr with once through ash water system. The source of water for the Project is Narmada River at a distance of about 30 Kms from the project site.</p> <p>Govt. of Madhya Pradesh vide dated 19.05.08. has accorded water commitment from Narmada river for the project. CWC vide letter dated 27.07.12 have concurred water availability confirmation accorded by State Govt.</p>		
1.04.00	Capacity		
	<p>2 x 800 MW - Present proposal</p> <p>2 x 800 MW - In Future</p>		
GADARWARA SUPER THERMAL POWER PROJECT (2X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT INFORMATION PAGE 1 OF 9

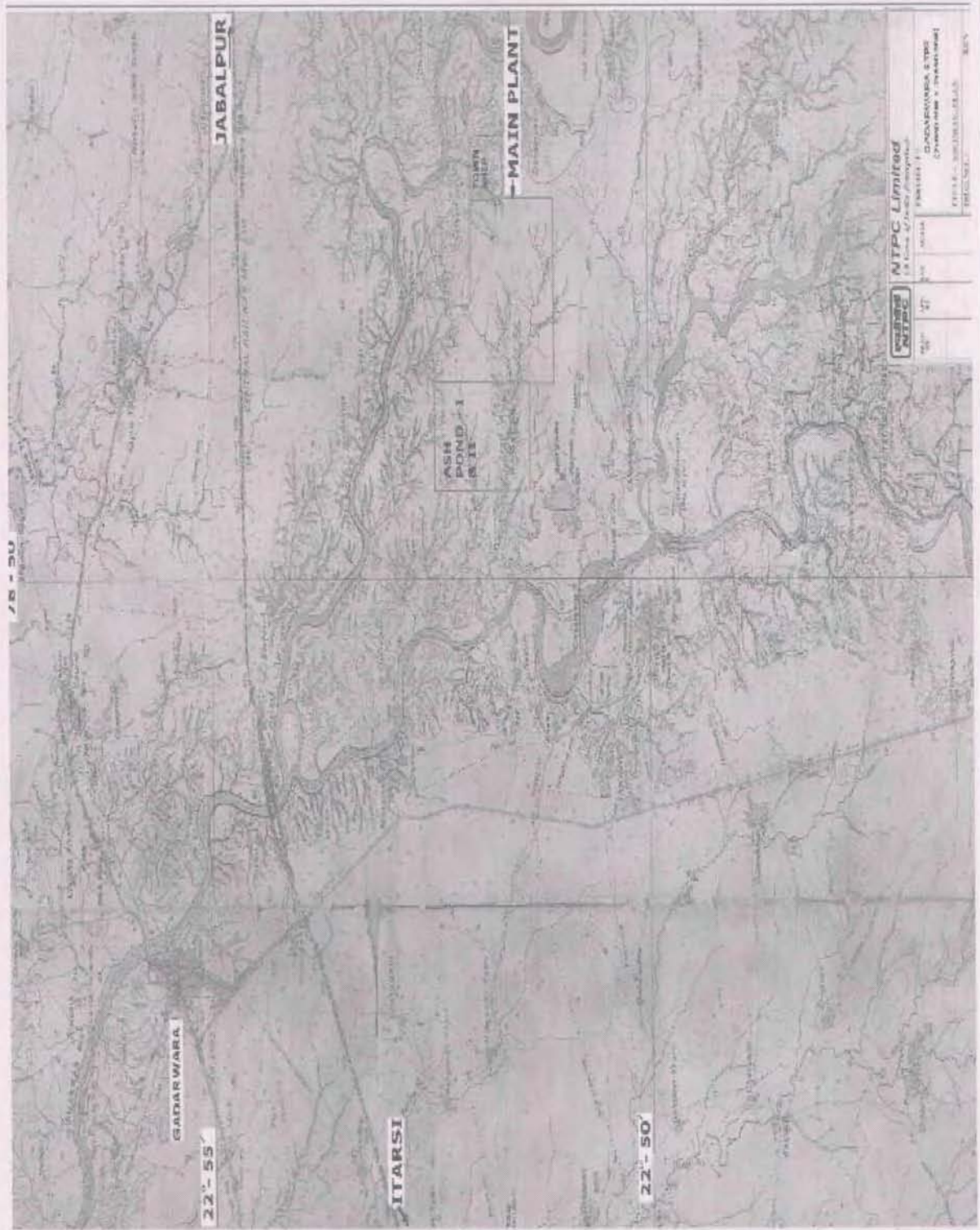
CLAUSE NO.	PROJECT INFORMATION	ANNEXURE-I	
1.05.00	Meteorological data Important meteorological data from nearest observatory at Narsinghpur is placed at Annexure-A-II .		
1.06.00	Plant Water Scheme The Plant water scheme is described below.		
1.06.01	Condenser Cooling (CW) Water System It is proposed to provide recirculating type CW system with induced draft type cooling towers. For the recirculating type CW system it is proposed to supply clarified water as make up. Raw water from the make-up water pump house shall be pumped to a Water Pretreatment Plant (PT - CW system). The treated clarified water shall be led to the cold water channel of CW system. Designed Clarified Water Analysis is given in this subsection. CW system shall be operated at a C.O.C of about 4.0. Chemical treatment programme (using acid dosing and scale cum corrosion inhibitors dosing) may be employed in addition to blow down of CW water to control the CW system chemistry in case CW system is required to be operated beyond 4.0 COC. CW blow down shall be drawn from the discharge of CW pumps and the same shall be led to a Service water Tank. For carrying circulating water from CW pump house to TG-area and from TG area to cooling tower, steel lined concrete encased duct would be provided. For interconnecting CW duct with CW pump, condenser and cooling towers, steel pipes would be used. Cooled water from cooling tower will be led to CW pump house through the cold water channel by gravity.		
1.06.02	Equipment Cooling Water (ECW) System (Unit Auxiliaries) The plant auxiliaries of Steam Generator and Turbine Generator shall be cooled by Demineralised (DM) water in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system. It is proposed to provide independent primary cooling water circuit for Steam Generator & auxiliaries and TG & its auxiliaries.		
1.06.03	Station Auxiliaries Cooling Water System The station auxiliaries such as Air compressors, Compressors of ash handling plant, Cooling water circuit of Air Conditioning system, compressor of mill reject system etc. shall be cooled by separate cooling water System using separate set of pumps and cooling towers.		
GADARWARA SUPER THERMAL POWER PROJECT (2X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT INFORMATION PAGE 2 OF 9



CLAUSE NO.	PROJECT INFORMATION	ANNEXURE-I	एन टी पी सी NTPC	
1.06.04	<p>Ash Water System</p> <p>It is proposed to operate ash water system in a closed circuit. The ash water from the ash dyke shall be recirculated after treating a part of the quantity in a side stream lime softening plant as the case may be. Make up to the ash water system (to compensate for the ash water system blow down and evaporation loss in ash dyke) shall be supplied from excess CW blow down water (Service water) and raw water supply from water source of the plant. In addition, provision shall be kept to supply treated water from Central Monitoring Basin of Liquid Effluent Treatment Plant.</p>			
1.06.05	<p>Other Miscellaneous Water Systems</p> <p>a) CW system blow down water shall be used for the plant service water requirement, dust suppression system of coal handling plant, makeup to the Ventilation system, ash slurry pumps sealing, sealing of Vacuum pumps (if applicable) of Ash Handling plant, make-up to fire water storage tanks and cooling water requirement of hydrogen generation plant. The service (wash water) water collected from various areas shall be treated using oil water separators, tube settlers, coal settling pits etc. as per requirement and treated water from liquid effluent treatment plant shall be recycled back to the service water system for re-use. The excess service water shall be led to central monitoring basin for disposal.</p> <p>b) Separate water Pre-treatment plants are proposed for Circulating Water (PT-CW) system, Demineralisation Plant (PT-DM) plant and potable (PT-Pot) water systems.</p> <p>c) The drinking water requirement of the plant and colony shall be provided from the above mentioned Water (PT-Pot) pretreatment plant.</p> <p>d) Steam Cycle make-up water, makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water and makeup to the hydrogen generation plant shall be provided from Demineralising plant.</p> <p>e) The quality of clarified water & DM water is given in this sub-section at Annexure-A-III.</p>			
1.07.00	<p>Criteria for Earthquake Resistant Design of Structures and Equipment</p> <p>All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed as per the criteria specified in sub-section-D1 of Section-VI (Part-A).</p>			
GADARWARA SUPER THERMAL POWER PROJECT (2X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A		PROJECT INFORMATION PAGE 3 OF 9

CLAUSE NO.	PROJECT INFORMATION	ANNEXURE-I	<div>एनटीपीसी NTPC</div>
1.08.00	<p>In case the acceleration criteria considered by the Bidder for the design of anchorage bolts of Steam Turbine and Generator with TG Deck in his bid is different with respect to above criteria, he shall indicate the same in his bid. The same will be discussed with the Bidder and finalized considering the following:</p> <p>a) The earthquake design acceleration for the steam turbine and generator acting at the centre of gravity depends upon the layout/configuration/size of TG deck supporting columns and beams which are to be jointly decided by NTPC and the bidder.</p> <p>b) As the data regarding Foundation GA & loading data to be furnished by Bidder may not be available at tender stage, the acceleration criteria proposed by the bidder can not be confirmed for acceptance at the award stage. The same can be confirmed after jointly finalizing the TG substructure arrangement by NTPC and Bidder.</p> <p>c) TG deck acceleration values will be limited to the design values adopted by Bidder by suitably increasing the size of the TG supporting columns/beams during detailed engineering.</p> <p>Accordingly Bidder has to make equipment/piping layout clearing the TG column/beams.</p>		
	<p>Criteria for Wind Resistant Design of Structures and Equipment</p> <p>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 sub-section-D1 of Section-VI (Part-A).</p>		
GADARWARA SUPER THERMAL POWER PROJECT (2X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT INFORMATION PAGE 4 OF 9

ANNEXURE-A-I



GADAWARA SUPER THERMAL POWER PROJECT (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT INFORMATION	PAGE 5 OF 9
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वर्तमान सांख्यिकी
CLIMATOLOGICAL TABLE

EXHIBIT - 1

स्टेशन: गदरवारा
STATION: Gadgarwara
स्थिति: 26° 11' N, 76° 11' E
समय: 5:30 AM
भू-भाग: 1900 M
आधार: 1901 TO 1980
BASED ON OBSERVATIONS FROM 1901 TO 1980

MONTH	STATION LEVEL PRESSURE	MEAN						EXTREMES		HUMIDITY		CLOUD		NO. OF WETTEST MONTHS		HIGHEST FALL IN AUGUST		MEAN WIND SPEED
		SEV. MAX	SEV. MIN	DAILY MAX	DAILY MIN	HIGHEST IN THE MONTH	LOWEST IN THE MONTH	HIGHEST AND DATE	LOWEST AND DATE	RELATIVE HUMIDITY	WIND SPEED	ALL CLOUD	DOWN TOTAL	NO. OF WETTEST MONTHS	HIGHEST FALL IN AUGUST			
JAN	878.0	24.8	9.8	24.8	8.2	30.9	2.0	34.0	08	74	19.6	1.3	2.4	11.0	1.2	40.0	0.0	2.4
FEB	877.8	24.8	10.0	24.8	8.2	34.4	4.0	37.8	24	64	19.2	1.4	2.7	17.2	1.2	39.4	0.0	3.0
MAR	878.5	20.2	13.2	20.2	11.1	34.4	4.0	37.8	24	50	18.5	1.3	2.8	12.1	1.1	38.0	0.0	3.8
APR	878.5	21.7	13.5	21.7	12.8	40.0	0.9	42.8	31	50	18.5	1.3	2.8	12.1	1.1	38.0	0.0	3.8
MAY	878.7	20.6	12.0	20.6	11.1	40.0	0.9	42.8	31	50	18.5	1.3	2.8	12.1	1.1	38.0	0.0	3.8
JUN	878.8	22.9	10.0	22.9	11.1	40.0	0.9	42.8	31	50	18.5	1.3	2.8	12.1	1.1	38.0	0.0	3.8
JUL	878.1	22.1	10.0	22.1	11.1	40.0	0.9	42.8	31	50	18.5	1.3	2.8	12.1	1.1	38.0	0.0	3.8
AUG	878.0	22.1	10.0	22.1	11.1	40.0	0.9	42.8	31	50	18.5	1.3	2.8	12.1	1.1	38.0	0.0	3.8
SEP	878.0	22.1	10.0	22.1	11.1	40.0	0.9	42.8	31	50	18.5	1.3	2.8	12.1	1.1	38.0	0.0	3.8
OCT	878.0	22.1	10.0	22.1	11.1	40.0	0.9	42.8	31	50	18.5	1.3	2.8	12.1	1.1	38.0	0.0	3.8
NOV	878.0	22.1	10.0	22.1	11.1	40.0	0.9	42.8	31	50	18.5	1.3	2.8	12.1	1.1	38.0	0.0	3.8
DEC	878.0	22.1	10.0	22.1	11.1	40.0	0.9	42.8	31	50	18.5	1.3	2.8	12.1	1.1	38.0	0.0	3.8
JAN	878.0	22.4	18.8	23.2	18.1	42.8	2.5	47.4	14	47	18.8	2.6	2.0	1108.2	82.0	1902.8	646.2	294.2
FEB	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
APR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAY	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUN	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUL	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
AUG	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
SEP	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
OCT	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
NOV	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
DEC	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JAN	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
FEB	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
APR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAY	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUN	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUL	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
AUG	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
SEP	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
OCT	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
NOV	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
DEC	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JAN	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
FEB	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
APR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAY	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUN	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUL	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
AUG	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
SEP	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
OCT	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
NOV	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
DEC	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JAN	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
FEB	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
APR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAY	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUN	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUL	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
AUG	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
SEP	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
OCT	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
NOV	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
DEC	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JAN	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
FEB	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
APR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAY	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUN	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUL	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
AUG	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
SEP	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
OCT	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
NOV	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
DEC	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JAN	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
FEB	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
APR	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
MAY	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUN	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
JUL	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
AUG	878.5	20.8	21.8						14	46	18.8	2.8	2.0	1108.2	82.0	1902.8	646.2	294.2
SEP	878.5	2																

बलवाक्यी सारणी
CUMULATIONAL TABLE

प्लान : 705197
स्टेशन : Narsinghpur

अथवा अथवा

Date		Time		Location		Observer		Remarks	
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

ANNEXURE-A-III

DESIGN CLARIFIED WATER ANALYSIS

Sl. No.	Constituent	as	mg per litre
1.	Calcium	CaCO ₃	102
2.	Magnesium	CaCO ₃	41
3.	Sodium	CaCO ₃	35
4.	Potassium	CaCO ₃	3
5.	Total Alkalinity	CaCO ₃	113
6.	P-Alkalinity	CaCO ₃	Nil
7.	Chloride	CaCO ₃	43
8.	Sulphate	CaCO ₃	25
9.	Silica (Reactive)	SiO ₂	16
10.	Iron	Fe	0.3 mg/l
11.	pH Value	-	6.8 - 8.5
12.	Turbidity	NTU	10

Note- Clarified water shall be used as make up water for cooling water system.

CLAUSE NO.	PROJECT INFORMATION	ANNEXURE-I	<div>एनटीपीसी NTPC</div>																		
	<div>ANNEXURE – A-III</div> <div>ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER</div> <table><tr><td>Sl.No.</td><td>Characteristics</td><td>Value</td></tr><tr><td>1.</td><td>Silica (Max.)</td><td>0.01 ppm as Sio2</td></tr><tr><td>2.</td><td>Iron as Fe</td><td>Nil</td></tr><tr><td>3.</td><td>Total hardness</td><td>Nil</td></tr><tr><td>4.</td><td>pH value</td><td>6.8 -7.3</td></tr><tr><td>5.</td><td>Conductivity</td><td>Not more than 0.1micro mho/cm excluding the effects of free CO2</td></tr></table>			Sl.No.	Characteristics	Value	1.	Silica (Max.)	0.01 ppm as Sio2	2.	Iron as Fe	Nil	3.	Total hardness	Nil	4.	pH value	6.8 -7.3	5.	Conductivity	Not more than 0.1micro mho/cm excluding the effects of free CO2
Sl.No.	Characteristics	Value																			
1.	Silica (Max.)	0.01 ppm as Sio2																			
2.	Iron as Fe	Nil																			
3.	Total hardness	Nil																			
4.	pH value	6.8 -7.3																			
5.	Conductivity	Not more than 0.1micro mho/cm excluding the effects of free CO2																			
GADARWARA SUPER THERMAL POWER PROJECT (2X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT INFORMATION PAGE 9 OF 9																		



ANNEXURE-WL(GADARWARA)

CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT

All structures shall be designed for wind forces in accordance with IS:875 (Part-3) and as specified in this document. See Annexure – B for site specific information.

Along wind forces shall generally be computed by the Peak (i.e. 3 second gust) Wind Speed method as defined in the standard.

Along wind forces on slender and wind sensitive structures and structural elements shall also be computed, for dynamic effects, using the Gust Factor or Gust Effectiveness Factor Method as defined in the standard. The structures shall be designed for the higher of the forces obtained from Gust Factor method and the Peak Wind Speed method.

Analysis for dynamic effects of wind must be undertaken for any structure which has a height to minimum lateral dimension ratio greater than "5" and/or if the fundamental frequency of the structure is less than 1 Hz.

Susceptibility of structures to across-wind forces, galloping, flutter, ovalling etc. should be examined and designed/detailed accordingly following the recommendations of IS:875(Part-3) and other relevant Indian standards.

It should be estimated if size and relative position of other structures are likely to enhance the wind loading on the structure under consideration. Enhancement factor, if necessary, shall suitably be estimated and applied to the wind loading to account for the interference effects.

Damping in Structures

The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for:

- | | |
|-----------------------------------|--|
| a) Welded steel structures | : 1.0% |
| b) Bolted steel structures | : 2.0% |
| c) Reinforced concrete structures | : 1.6% |
| d) Steel stacks | : As per IS:6533 & CICIND Model Code whichever is more critical. |

ANNEXURE-B

SITE SPECIFIC DESIGN PARAMETERS

The various design parameters, as defined in IS: 875 (Part-3), to be adopted for the project site shall be as follows:

- a) The basic wind speed " V_b " at ten metres above the mean ground level : 39 metres/second
- b) The risk coefficient " K_1 " : 1.06
- c) Category of terrain : Category-2

Note: Notwithstanding the values of the above mentioned parameters, the design wind pressure so computed at any point shall not be taken less than 1500 N/Sq. metre for all classes of structures, i.e. A, B & C, as defined in IS: 875 (Part-3).

ANNEXURE-EQ (GARDARWARA)

Gadarwara Thermal Power Project

CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT

All structures and equipment shall be designed for seismic forces adopting the site specific seismic information provided in this document and using the other provisions in accordance with IS:1893 (Part 1):2002 and IS:1893 (Part 4):2005. Pending finalization of Parts 2, 3 and 5 of IS:1893, provisions of part 1 shall be read along with the relevant clauses of IS:1893:1984, for structures other than the buildings and industrial structures including stack-like structures.

A site specific seismic study has been conducted for the project site. The peak ground horizontal acceleration for the project site, the site specific acceleration spectral coefficients (in units of gravity acceleration 'g') in the horizontal direction for the various damping values and the multiplying factor (to be used over the spectral coefficients) for evaluating the design acceleration spectra are as given at Annexure-I.

Vertical acceleration spectral values shall be taken as 2/3rd of the corresponding horizontal values.

The site specific design acceleration spectra shall be used in place of the response acceleration spectra, given at figure-2 in IS:1893 (Part 1) and Annex B of IS:1893 (Part 4). The site specific acceleration spectra along with multiplying factors specified in Annexure-I includes the effect of the seismic environment of the site, the importance factor related to the structures and the response reduction factor. Hence, the design spectra do not require any further consideration of the zone factor (Z), the importance factor (I) and response reduction factor (R) as used in the IS:1893 (Part 1 and Part 4).

Damping in Structures

The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for:

- | | | |
|-----------------------------------|---|----|
| a) Steel structures | : | 2% |
| b) Reinforced Concrete structures | : | 5% |
| c) Reinforced Concrete Stacks | : | 3% |
| d) Steel stacks | : | 2% |

Method of Analysis

Since most structures in a power plant are irregular in shape and have irregular distribution of mass and stiffness, dynamic analysis for obtaining the design seismic forces shall be carried out using the response spectrum method. The number of vibration modes used in the analysis should be such that the sum total of modal masses of all modes considered is at least 90 percent of the total seismic mass and shall also meet requirements of IS:1893 (Part 1). Modal combination of the peak response quantities shall be performed as per Complete Quadratic Combination (CQC) method or by an acceptable alternative as per IS:1893 (Part 1).

In general, seismic analysis shall be performed for the three orthogonal (two principal horizontal and one vertical) components of earthquake motion. The seismic response from the three components shall be combined as specified in IS:1893 (Part 1).

For buildings, if the design base shear (V_B) obtained from modal combination is less than the base shear (\bar{V}_B) computed using the approximate fundamental period (T_a) given in IS:1893:Part 1 and using site specific acceleration spectra with appropriate multiplying factor, the response quantities (e.g. member forces, displacements, storey forces, storey shears and base reactions) shall be enhanced in the ratio of \bar{V}_B / V_B . However, no reduction is permitted if \bar{V}_B is less than V_B .

For regular buildings less than 12m in height, design seismic base shear and its distribution to different floor levels along the height of the building may be carried out as specified under clause 7.5, 7.6 & 7.7 of IS:1893 (Part 1) and using site specific design acceleration spectra. The design horizontal acceleration spectrum value (A_h) shall be computed for the fundamental natural period as per clause 7.6 of IS:1893 (Part 1) using site specific spectral acceleration coefficients with appropriate multiplying factor given in Annexure-I. Further, the spectral acceleration coefficient shall get restricted to the peak spectral value if the fundamental natural period of the building falls to the left of the peak in the spectral acceleration curve.

Design/Detailing for Ductility for Structures

The site specific design acceleration spectra is a reduced spectra and has an in-built allowance for ductility. Structures shall be engineered and detailed in accordance with relevant Indian/International standards to achieve ductility.

ANNEXURE – I

SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT

The various site specific seismic parameters for the project site shall be as follows:

- | | | |
|----|---|----------|
| 1) | Peak ground horizontal acceleration (MCE) | : 0.18 g |
| 2) | Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra | |
| a) | for ordinary moment resisting steel frames designed and detailed as per IS:800 | : 0.0525 |
| b) | for braced steel frames designed and detailed as per IS:800 | : 0.039 |
| c) | For special moment resisting RC frames designed and detailed as per IS:456 and IS:13920 | : 0.0315 |
| d) | for steel chimney | : 0.079 |
| e) | for design of structures not covered under 2 (a) to 2 (d) above and under 3 below | : 0.0525 |
| 3) | Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted | : 0.105 |

Note: g = Acceleration due to gravity

The horizontal seismic acceleration spectral coefficients are furnished in subsequent pages.

ANNEXURE – I

HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS (In units of 'g')

Time Period (Sec)	Damping Factor (as a percentage of critical damping)	
	2%	5%
0	1	1
0.03	1	1
0.04	1.287	1.178
0.05	1.564	1.337
0.06	1.835	1.482
0.07	2.101	1.618
0.08	2.361	1.746
0.09	2.618	1.866
0.1	2.871	1.982
0.105	2.996	2.037
0.11	3.121	2.092
0.115	3.245	2.145
0.12	3.368	2.198
0.123	3.442	2.229
0.127	3.500	2.270
0.13	3.500	2.300
0.135	3.500	2.500
0.14	3.500	2.500
0.145	3.500	2.500
0.15	3.500	2.500
0.2	3.500	2.500
0.25	3.500	2.500
0.3	3.500	2.500
0.35	3.500	2.500
0.4	3.500	2.500
0.43	3.500	2.500
0.45	3.500	2.500
0.48	3.500	2.500
0.49	3.369	2.500
0.5	3.302	2.500
0.52	3.175	2.212
0.555	2.975	2.072
0.56	2.948	2.054
0.565	2.922	2.035
0.57	2.896	2.018
0.575	2.871	2.000
0.58	2.847	1.983
0.585	2.822	1.966

ANNEXURE - I

HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS (In units of 'g')

Time Period (Sec)	Damping Factor (as a percentage of critical damping)	
	2%	5%
0.59	2.798	1.949
0.595	2.775	1.933
0.6	2.752	1.917
0.65	2.540	1.769
0.7	2.359	1.643
0.75	2.201	1.533
0.8	2.064	1.438
0.85	1.942	1.353
0.9	1.834	1.278
0.95	1.738	1.211
1	1.651	1.150
1.05	1.572	1.095
1.1	1.501	1.045
1.15	1.436	1.000
1.2	1.376	0.958
1.25	1.321	0.920
1.3	1.270	0.885
1.35	1.223	0.852
1.4	1.179	0.821
1.45	1.139	0.793
1.5	1.101	0.767
1.55	1.065	0.742
1.6	1.032	0.719
1.65	1.001	0.697
1.7	0.971	0.676
1.75	0.943	0.657
1.8	0.917	0.639
1.85	0.892	0.622
1.9	0.869	0.605
1.95	0.847	0.590
2	0.826	0.575
2.05	0.805	0.561
2.1	0.786	0.548
2.15	0.768	0.535
2.2	0.750	0.523
2.25	0.734	0.511
2.3	0.718	0.500
2.35	0.703	0.489
2.4	0.688	0.479

ANNEXURE – I

HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS (In units of 'g')

Time Period (Sec)	Damping Factor (as a percentage of critical damping)	
	2%	5%
2.45	0.674	0.469
2.5	0.660	0.460
2.55	0.647	0.451
2.6	0.635	0.442
2.65	0.623	0.434
2.7	0.611	0.426
2.75	0.600	0.418
2.8	0.590	0.411
2.85	0.579	0.404
2.9	0.569	0.397
2.95	0.560	0.390
3	0.550	0.383
3.05	0.541	0.377
3.1	0.533	0.371
3.15	0.524	0.365
3.2	0.516	0.359
3.25	0.508	0.354
3.3	0.500	0.348
3.35	0.493	0.343
3.4	0.486	0.338
3.45	0.479	0.333
3.5	0.472	0.329
3.55	0.465	0.324
3.6	0.459	0.319
3.65	0.452	0.315
3.7	0.446	0.311
3.75	0.446	0.307
3.8	0.435	0.303
3.85	0.423	0.299
3.9	0.413	0.295
3.95	0.402	0.291
4	0.392	0.288



TITLE:

**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM**

2X800MW GADARWARA STPP,STAGE-I

BHEL DOCUMENTS NO.: PE-TS-395-160-A001

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SPECIFIC TECHNICAL REQUIREMENTS



TITLE:

**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM****2X800MW GADARWARA STPP, STAGE-I**

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1.0 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, Erection & Commissioning, structural & minor civil works as required, Performance and guarantee testing and handing over of 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.

1.1 SCOPE OF SUPPLY

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

- a) 18 nos. of pneumatic Cylinder operated plate/ knife gate valve (200 Nb) with open and close limit switches at mill outlet/pyrite hopper inlet.
- b) 18 nos. of pyrite hoppers complete with sizing grid, flexible/expansion joint at its inlet, rupture disc, by pass chute, oversize material chute, water spray nozzles & supporting structures.
- c) 36 nos. (2 Nos. per pyrite hopper) of Level probes for pyrite hoppers.
- d) 18 nos. of Temperature Switches for pyrite hoppers.
- e) 18 nos. of pneumatic operated plate/knife gate valve (200 Nb) at pyrite hopper outlet for pyrite hopper isolation with open and close limit switches for interlock.
- f) 18 nos. of pneumatic operated plate/knife gate valve (200 Nb) at oversize discharge chute of pyrite hopper provided with open & close limit switches for interlock with pyrite hopper inlet knife gate valve.
- g) 18 nos. of pneumatic Cylinder operated plate/knife gate valve (200 Nb) at by pass chute of pyrite hopper provided with open & close limit switches for interlock with pyrite hopper inlet knife gate valve.
- h) 18 nos. of transporter vessel / denseveyor complete with pneumatically operated dome/ material handling valve, Alloy CI outlet bend, local control panel etc.
- i) 18 sets of MS ERW Heavy grade pipe for mill reject conveying from denseveyor/ transporter vessel to Mill Reject Storage bunker.
- j) One lot of Alloy CI bends (400BHN).
- k) 4 sets or as per layout requirement of terminal boxes with up stand on bunker top for terminating the reject conveying pipes.
- l) Two (2) nos. mill reject bunker along with structure, complete with SS-304 lining and lever operated bunker discharge gate with canvas chute at bunker outlet, staircase, operating & maintenance platform, hand railing, bag filter, level probe(RF type level Probe), pressure relieve valve, chain pulley block with traveling trolley and monorail arrangement etc.



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**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM****2X800MW GADARWARA STPP, STAGE-I**

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- m) 2 nos. (1W+1S) non lubricated reciprocating type skid mounted air compressor with drive motor, local control panel, instruments and all other accessories.
- n) Four (4) nos. air receivers (i.e. two no. per unit) complete with drain traps, safety relief valve, instruments and all accessories.
- o) Four (4) Nos. fixed type sump pump complete with suction (min 5 m long) & discharge hose (min 10 m long) for pumping out water drains from local pit to nearest plant drain, control panel, instruments and all other accessories.
- p) 1 lot of piping , fittings, valves & instruments for conveying air, instrument air, cooling water for dome valve top plate (if applicable), cooling water quenching in the pyrite hopper, cooling water for air compressor etc
- q) 1 lot of Local Control Panel/pneumatic panels/JBs (1 no. for each pyrite hopper) properly mounted on rack. (supplier's scope)
- r) 1 lot of insulation & cladding, if required, to maintain surface temperature of pyrite hopper within 60° C
- s) All structures including pipe cum cable rack required for supporting of various pipes in bidder's scope. Bidder may take support from existing mill bunker bay structures wherever possible.
- t) All insert plates, embedment plates, foundation bolts/ anchor bolts etc. required for bidder's equipment.
- u) Initial charge of all lubricants and fluids.
- v) Electrical and C&I scope as per enclosure elsewhere in the specification.
- w) One set of Erection & commissioning spares as required for the complete system.
- x) One set of mandatory spares as per annexure VII for all 2 units.
- y) One set of special maintenance tools & tackles, if any. 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 a steel toolbox.
- z) All counter- flanges with nuts, bolts and gaskets at all the terminal points.
- aa) Relevant scope of supply as per GTR, GCC & SCC.
- bb) Any other instrument, item required for making the installation complete in all respect within battery limits and for satisfactory operation of the system, unless specifically EXCLUDED from scope under Clause No. 2.0 below.
- cc) DCS based control system as specified in C&I specification. (DCS is not in bidders scope)

1.2 SCOPE OF SERVICES

Scope of services shall include but not necessarily limited to the following:

- a) Unloading, Storage, handling and transportation at site
- b) Minor civil work like pinning, chipping of foundation, grouting etc.



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- c) Pre-Commissioning work such as flushing, hydraulic testing etc. Necessary instrumentation for pre-commissioning activities shall be arranged by the successful bidder at their own cost.
- d) Erection & Commissioning of Mill Reject Handling System.
- e) Inspection & testing, PG test/Functional Guarantee (FG) test
- f) Painting of all equipment within the battery limit
- g) Electrical scope of services as per enclosure elsewhere in the specification
- h) Preparation of Civil input drawings & documents for foundation details (including load data, GA, foundation pocket details etc.) of storage bunkers/silos, compressors, air receivers, pipe rack and pit / trench details for denseveyor / transporter vessel and reject conveying pipes.
- i) Review of Civil drawings prepared by NTPC/BHEL based on civil input drawing furnished by the successful bidder.
- j) Preparation of all necessary drawings/data/ documents for obtaining necessary approval of statutory authorities on behalf of the customer. Necessary fee for obtaining such approval shall also be borne by the bidder.
- k) Relevant scope of services as per GTR, GCC, ECC & SCC.
- l) 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. 2.0 below.

2.0 EXCLUSION

- a) Civil work for Mill Reject Handling system including
 - i) Road approach for various facilities related to Mill Reject Handling System.
 - ii) Denseveyor/ Transporter vessel foundation
 - iii) Pit & Trench as required in mill bay
 - iv) Mill Reject compressor & Air receiver foundation
 - v) Mill Reject bunker foundation
 - vi) Various cable trenches, pipe pedestals & pipe rack foundation.

However, location, sizing and loads and any other input related to above as applicable for above shall be given by the successful bidder within 8 weeks of placement of LOI.

- b) Fire Protection system for compressor house
- c) Lighting of Mill bay, Compressor house & bunker area
- d) Electrical exclusion as per Electrical scope sheet enclosed elsewhere in the specification
- e) Relevant exclusion as per GTR, GCC, SCC & ECC.

3.0 SERVICES TO BE PROVIDED BY THE CUSTOMER



TITLE:

**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM****2X800MW GADARWARA STPP, STAGE-I**

BHEL DOCUMENTS NO.: PE-TS-395-160-A001

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- (A) Instrument air: Tapping terminated with an isolation valve for Instrument air shall be provided at first column of each bunker bay at pressure of 5-7 Kg/Sq cm.
- (B) **Service water:** Tapping terminated with an isolation valve for service water shall be provided at first column of each bunker bay at pressure of 2.5-3 Kg/Sq cm.
- (C) **Auxiliary Cooling Water:** Water: Supply and return water Tapping terminated with an isolation valve for ACW circuit. Equipment water shall be provided at 5m from compressor House at a pressure of 5 Kg/sq cm (Approx). Pressure drop shall be of 10 MWC across the compressor.

4.0 TERMINAL POINT

Mill Reject inlet towards : Mill reject spout (tramp iron) as per details indicated in pyrite hopper side 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 : Mill reject bunker outlet with canvas chute. Bidder shall road tanker terminate his work with the canvas chute and lever operated discharge gate.

Cooling water (ACW) : At Inlet & Outlet header at distance of 5m from MRS compressor house (Location)

Service Water : At First Col of each mill bay

Instrument Air : At First Col of each mill bay.

5.0 PERFORMANCE /FUNCTIONAL GUARANTEES & LIQUIDATED DAMAGES**PG /FG test shall comprise of****Category – I Guarantees (Liquidated damages are applicable for these guarantees).**

- i) Guaranteed auxiliary power consumption for each conveying air compressor at its rated duty point (refer Annex-V of suggestive price format- Vol III)
If the contractor is not able to demonstrate the guarantees, CLIENT/ BHEL will have the right to Reject the equipment / system / plant and recover the payments already made or accept the equipment / system after levying liquidated damages.

Category – III Guarantees

- i) Continuous effective discharge and conveying at the rated capacity of the mill rejects without spillage or blockage in the system.
- ii) Capacity and discharge pressure of each air compressor



TITLE:

**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM****2X800MW GADARWARA STPP, STAGE-I**

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- iii) Particulate emission rate from bag filters less than 50 mg/nm^3 of air shall be demonstrated at site
- iv) Vibration and noise level of each compressor and any other rotating equipment shall be demonstrated at site.

All the plant, equipment and systems covered under this specification shall perform continuously without exceeding the noise level over the entire range of output and operating frequency.

Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 651 or BS 5969 or IS 9779.

The equivalent 'A' weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment / machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA

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

In case during test 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. However, if the contractor is not able to demonstrate the guarantees, even after the above modifications/replacements within a reasonable period allowed by CLIENT/BHEL, after the tests have been completed, CLIENT/BHEL will have the right to Reject the equipment / system / plant and recover 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 Client/BHEL.

6.0 ERECTION, PRE-OPERATIONAL TESTING/STARTUP & COMMISSIONING PROCEDURE

This shall be as furnished by the successful bidder during detail engineering for customer's review and acceptance.



TITLE:

**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM****2X800MW GADARWARA STPP, STAGE-I**

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7.0 PAINTING / CORROSION PROTECTION REQUIREMENT

Successful bidder shall furnish detailed Painting Schedule for Mill Reject System (based on painting schedule attached with specification elsewhere) for customer / client approval during detail engineering

8.0 LAYOUT REQUIREMENTS

Piping and equipment installation shall be according to the regulations and recommendations of recognized Indian / International Standards, Codes and Statutes, as and where applicable, practice in vogue (to be supported with back up document to the satisfaction of customer)

The mill reject compressors will be located in Main Plant Compressor room. Area required for locating the same shall be indicated by the bidder in their bid.

9.0 EQUIPMENT DESIGN CRITERIA

9.0.1 The minimum design criteria to be followed for various equipment shall be as per requirements indicated under Annexure-II, standard technical specifications & Data Sheet-A for Mill Reject Handling System. In case of *any contradictory requirement* in specification of particular equipment, the requirement given in section C shall prevail over those indicated in Section-D. Further in case of any contradictory requirement within the same section and clarifications not having been sought by the bidders wrt the same within the stipulated period, the most stringent requirement as per interpretation of the customer will prevail. Successful bidder will furnish detailed data sheets/ specifications/design calculations for various equipment for customer / 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.

9.0.2 Technical details (constructional features, MOC etc) of non-lubricated reciprocating conveying air compressor, if being offered by any of the bidders, shall be finalized during detail engineering and the same shall be subject to customer's /client's acceptance without any commercial implication.

9.0.3 Properties of Mill Rejects to be considered for sizing /selection /design of various equipments shall be as follows:

Normal size	:	(-) 25 mm (about 80% of total reject)
Maximum size to be handled pneumatically	:	40 mm (about 10% of total reject)
Maximum size rejected by mill	:	50 mm (about 10% of total reject)
Temperature °C (Normal/Design)	:	180/200 (**)
Bulk density	:	1.6 T/m ³ for volumetric calculation
	:	2.4 T/m ³ for structural calculation

(**) Note: Mill Reject System design shall also consider the presence of occasional burning coal particles along with the rejects, which would increase the reject temperature.



TITLE:

**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM****2X800MW GADARWARA STPP,STAGE-I**

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

10.0 QUALITY PLANS, INSPECTION & TESTING PROCEDURE

All QPs / CLs 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.

11.0 DRAWINGS/ DOCUMENTS REQUIRED WITH THE BID

The drawings and documents to be submitted with the bid shall strictly be as per clause 15.0.1 below. Any documents other than those indicated therein will not be reviewed and will not form part of contract.

12.0 DRAWINGS/ DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

The tentative list of drawings and documents required during detail engineering shall be minimum as per clause 15.0.2 below. The list, however, will be finalized with the successful bidder prior to start of detail engineering.

13.0 DRAWING/DOCUMENT DISTRIBUTION SCHEDULE

Refer Volume III – Annexure VI.

Drawing/document submission shall be done in soft through NTPC C-folder (Refer Annexure VIII). For final distribution, 20 print sets and 3 CDs are required.

14.0 DRAWINGS ENCLOSED WITH THE SPECIFICATION

The following drawings/ sketches enclosed will form part of the specification.

- a) Flow Diagram - Mill Reject Handling System
- b) Main Equipment Plan
- c) General Arrangement of HP 1203 MILL (with planetary gear box)

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.

15.0.1 LIST OF DRAWINGS / DOCUMENTS TO BE FURNISHED ALONG WITH OFFER

Refer Volume III – Annexure VI

15.0.2 LIST OF DRAWING/DOCUMENTS TO BE FURNISHED AFTER PLACEMENT OF LOI

Refer Volume III – Annexure VII

16.0 SPECIFIC C&I REQUIREMENT



TITLE:

**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM****2X800MW GADARWARA STPP,STAGE-I**

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- 16.0.1 The bidder will terminate all signals from instruments/sensors on each pyrite hopper/ transporter vessel on local control panel/ pneumatic panel dedicated to each pyrite hopper/ transporter vessel. Analogues & binary signals shall be terminated on separate Terminal boxes for wiring to SG C&I. Alternatively bidder may provide JB's for each pyrite hopper/denseveyor. In such case, separate JB's shall be provided for terminating analogue & binary signals.
- 16.0.2 The bidder will terminate all signals from local & field instruments /sensors related to compressor on compressor control panel. Analogues & binary signals shall be terminated on separate terminal boxes for wiring to SG C&I. Alternatively bidder may provide JB's properly mounted on rack and local to the compressor for terminating field & local signals from compressor control panel. In such case, separate JB's shall be provided for terminating analogue & binary signals.
- 16.0.3 Signals from mill reject bunker, air receivers, service water & instrument air line shall be directly connected to SG C&I.


SUB-SECTION-II:M4

MILL REJECT HANDLING SYSTEM

LARA SUPER THERMAL POWER PROJECT (2x800MW) /
DARLIPALI SUPER THERMAL POWER PROJECT -I (2 x 800MW) /
GAJMARA SUPER THERMAL POWER PROJECT -I (2x 800MW) /
KUDGI SUPER THERMAL POWER PROJECT -I (3 x 800MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2

CLAUSE NO.	TECHNICAL REQUIREMENTS		<div>एनटीपीसी NTPC</div>	
	MILL REJECT HANDLING SYSTEM			
1.00.00	MILL REJECT HANDLING SYSTEM			
	<p>Dense phase pneumatic conveying system shall to 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 lines in storage 'SILO'. Each unit shall be provided with an independent 'SILO' having a collection capacity of 16 hours. The transmitting vessel shall operate on level probe mode with timer back-up.</p> <p>100% standby capacity compressor shall be provided by the bidder. The capacity of the compressors shall be selected considering all the working mills of all units operating simultaneously for the worst coal condition.</p>			
2.00.00	MILL REJECT HANDLING SYSTEM OF PNEUMATIC TYPE MEETING THE FOLLOWING REQUIRMENT SHALL BE PROVIDED.			
	SI.No.	System Parameter	Pneumatic Handling System	
	1.	Duty	Continuous	
	2.	Number of mill reject storage bins and capacity	(a)	One (1) no. for each unit
			(b)	16 hours storage capacity considering all the working mills of the unit for worst coal condition
	3.	Number of mills working per boiler	As specified by Boiler/ Mill manufacturer	
	4.	Design value of 1% of the mill capacity for the worst coal rejects	condition.	
	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/outlet** valves of mill reject discharge hopper	Pneumatically operated knife edge gate valve.	
	10.	Inlet valve of the vessel	Plate valve/dome valve/butterfly valve/cone valve.	
	11.	Sizing grid	40 mm x 40 mm	
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART-B SUB-SECTION-II:M4 MILL REJECT HANDLING SYSTEM
PAGE 1 OF 2				


CLAUSE NO.	TECHNICAL REQUIREMENTS		
	12.	Emergency ** discharge chute with manually operated knife edge gate valves	Yes
	13.	Piping	MS IS:3589
	14.	Bends/Fittings Laterals	Alloy CI to hardness 400 BHN
	*	In case the bidder expects higher size from pyrite hopper outlet then suitable capacity crusher shall be provided to bring down the size of reject to (-) 40 mm for pneumatic type system offered, which shall be base offer.	
	**	The wearing parts of all the valves shall be provided with abrasion resistant material of hardness of 350-400 BHN.	
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-B SUB-SECTION-II:M4 MILL REJECT HANDLING SYSTEM
		PAGE 2 OF 2	

SUB-SECTION - III-A4

MILL REJECT HANDLING SYSTEM

**KUDGI SUPER THERMAL POWER PROJECT
STAGE-I (3x800 MW)
STEAM GENERATOR PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO. : CS-9573-102-2**


CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	MILL REJECT HANDLING 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 of a pneumatic 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	<p>The scope of supply for mill reject handling system shall include but not limited to the following:</p> <p>(a.) One (1) no. pyrite hopper <i>with</i> discharge chute, emergency chute work etc. for each mill as required.</p> <p>(b.) One (1) no. pneumatically operated isolation gate for inlet and one (1) no. manual isolation gate at outlet of each pyrite hoppers complete with compressed air pipe work, solenoid valves & supporting arrangement for each pyrite hopper.</p> <p>(c.) Conveying pipe work 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.</p> <p>(d.) Mill reject storage silos, one (1) no. for each unit in steel construction each having an effective storage capacity of sixteen (16) hrs. considering all the working mills 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.</p> <p>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.</p> <p>(e.) Suitable spray quenching system, to cool the mill reject in pyrite hoppers.</p> <p>(f.) Two (2) nos. air receivers of adequate capacity for each unit with all accessories, Interconnecting piping, support etc.</p> <p>(g.) Two nos. (1 no. operation + 1 no. stand by) air compressors for 2 x 800 MW project /Three (3) nos. (2 nos. operating + 1 no. standby) for 3 x 800 MW project (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.</p> <p>(h.) Necessary lifting devices of adequate capacity to handle the mill reject handling equipment.</p> <p>(i.) Complete control & instrumentation as specified in C&I section.</p> <p>(j.) Necessary electrical equipment as specified.</p> <p>(k.) Civil structural works associated with mill reject handling system including foundation bolts, pockets, grouting and underpinning etc.</p>			
KUDGI SUPER THERMAL POWER PROJECT STAGE-I (3X800 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9573-102-2	PART-A SUB SECTION-III: A4 MILL REJECT HANDLING SYSTEM	PAGE 1 OF 1

SUB-SECTION - VI


GUARANTEES


**GAJMARA SUPER THERMAL POWER PROJECT
STAGE-I (2X800MW)
STEAM GENERATOR PACKAGE**


**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO. : CS-9566-102-2**


CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES			
	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES FOR SHORTFALL IN PERFORMANCE AND PERFORMANCE GUARANTEE TESTS			
1.00.00	GENERAL			
1.01.00	The term "Performance Guarantees" wherever appears in the Technical Specifications shall have the same meaning and shall be synonymous to "Functional Guarantees". Similarly the term "Performance Tests" wherever appears in the Technical Specifications shall have the same meaning and shall be synonymous to "Guarantee Test(s)".			
1.02.00	The term BMCRC (Boiler Maximum Continuous Rating) appearing in the Technical Specification shall mean the maximum continuous steam output of Steam Generator (i.e. 2550 T/Hr) at superheater outlet at rated parameters.			
2.00.00	PERFORMANCE GUARANTEES / PERFORMANCE TESTS			
2.01.00	General Requirements			
2.01.01	The Contractor shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment covered in these specifications.			
2.01.02	The guaranteed performance parameters furnished by the Bidder in his offer, shall be without any tolerance values whatsoever. All margins required for instrument inaccuracies and other uncertainties shall be deemed to have been included in the guaranteed figures.			
2.01.03	The Contractor shall conduct performance test and demonstrate all the guarantees covered herein under Category I, II & III. The various tests which are to be carried out during performance guarantee tests 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.			
2.01.04	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 contract price.			
2.01.05	The performance tests shall be performed using only the normal number of Employer supplied operating staff. Contractor, vendor or other subcontractor personnel shall be used only 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.			
2.01.06	It shall be responsibility of the Contractor to make the plant ready for the performance guarantee tests.			
2.01.07	Test Instrumentation, Flow Measurement and their Calibration 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 subject 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. 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.			
GAJMARA SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9566-102-2	PART-A SUB SECTION-VI FUNCTIONAL GUARANTEES	PAGE 1 OF 20


CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES		
	<div><div></div><div>एनटीपीसी NTPC</div></div>		
	<p>The Performance test shall be carried out as per the agreed procedure. The detailed 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 90 days from the date of Notification of Award.</p>		
2.01.08	<p>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.</p>		
2.01.09	<p>The contractor shall submit for Employer's approval the detailed Performance Test procedure containing the following:</p> <div><div>(a)</div><div>Object of the test</div></div> <div><div>(b)</div><div>Various guaranteed parameters & tests as per contract.</div></div> <div><div>(c)</div><div>Method of conductance of test and test code.</div></div> <div><div>(d)</div><div>Duration of test, frequency of readings & number of test runs.</div></div> <div><div>(e)</div><div>Method of calculation.</div></div> <div><div>(f)</div><div>Correction calculations & curves.</div></div> <div><div>(g)</div><div>Instrument list consisting of range, accuracy, least count, and location of instruments.</div></div> <div><div>(h)</div><div>Scheme showing measuring points.</div></div> <div><div>(i)</div><div>Sample calculation</div></div> <div><div>(j)</div><div>Acceptance criteria.</div></div> <div><div>(k)</div><div>Any other information required for conducting the test.</div></div>		
	<p>The Performance test shall be carried out as per the agreed procedure.</p>		
2.01.10	<p>Test Reports</p> <p>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 month from the date of conductance of Performance test. Preliminary test reports shall be submitted to the Employer after completing each test run. Four (4) hard copies and two (2) soft copies on CD-ROM of each test report of final conducted test on each equipment/plant/system shall be submitted to Employer for approval.</p>		
2.01.11	<p>The performance guarantee test will be carried out within three months after the successful completion of Initial Operation of facilities or as per the time frame specified for a particular equipment/ plant/ system in the Technical specifications. Delay in conductance of the test beyond this period will not be normally permitted by the EMPLOYER. In the event of EMPLOYER agreeing to conductance of such tests after three months, for reasons not attributable to the EMPLOYER, as assessed by the Employer, no factor for ageing shall be considered for computing performance of the equipment.</p>		
GAJMARA SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9566-102-2	PART-A SUB SECTION-VI FUNCTIONAL GUARANTEES
			PAGE 2 OF 20


CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES			
2.01.12	Performance Guarantee Tests on the equipments/systems not covered in this Sub-section shall be carried out as per the procedure/test codes specified in respective detailed specifications, Sub-sections in Part-B, Section-VI.			
2.01.13	<p>In case during performance guarantee test(s) 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. In case the specified performance guarantee(s) are still not met by the contractor even after modification and/or replacement but are achieved within the Acceptable Shortfall Limit as specified at clause 3.00.00 of this sub-section, Employer will accept the equipment/system/plant after levying liquidated damages as per clause 3.00.00 of this sub-section. However, if, the demonstrated guarantee(s) continue to be beyond 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 (at Employer's discretion):</p> <p>(i) For Category-I Guarantees</p> <p>Reject the equipment / system / plant and recover from the Contractor the payments already made</p> <p style="text-align: center;">OR</p> <p>Accept the equipment /system/ plant after levying Liquidated Damages. The liquidated damages for shortfall in performance indicated in clause 3.00.00 of this sub-section shall be levied separately for each unit. The rates indicated in clause 3.00.00 of this sub-section are on per unit basis. The liquidated damages shall be pro-rated for the fractional parts of the deficiencies. Such Liquidated Damages shall be deducted from contract price. The performance guarantees coming under this category shall be called 'Category-I' Guarantees.</p> <p>(ii) For Category-II Guarantees</p> <p>Reject the equipment / system/ plant 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.</p> <p>(iii) For Category-III Guarantees</p> <p>Reject the equipment /system / plant and recover from the Contractor the payments already made.</p> <p style="text-align: center;">OR</p> <p>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 guaranteed performance. These parameters/capacities shall be termed as "Category-III" Guarantees.</p>			
GAJMARA SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9566-102-2	PART-A SUB SECTION-VI FUNCTIONAL GUARANTEES	PAGE 3 OF 20


CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES				
3.00.00	AMOUNT OF LIQUIDATED DAMAGES (LD) APPLICABLE FOR CATEGORY-I GUARANTEES				
	The rate of liquidated damages and acceptable shortfall limits for different Category - I guarantees shall be as under and such liquidated damages shall be deducted from the Contract Price.				
	Sl.No	Guarantee	Rate of Liquidated Damage (LD)	Acceptable Shortfall Limit with LD	
	i)	Steam Generator Efficiency For shortfall in guaranteed Steam Generator efficiency in percentage points under conditions stipulated in clause 6.01.00 (i) and (ii) of this Sub-Section and elsewhere in this specification at : a. 105% TMCR (VVO unit load)	US \$ 402,176/- (US Dollar Four hundred two thousand one hundred seventy six only) for every 0.1% point shortfall in guaranteed efficiency.	(-) 0.5% points from the guaranteed efficiency	
		b. 100% TMCR (800 MW unit load)	US \$ 1,532,099/- (US Dollar One million five hundred thirty two thousand ninty nine only) for every 0.1% point shortfall in guaranteed efficiency.	(-) 0.5% points from the guaranteed efficiency	
ii)	Steam generator capacity For shortfall in the guaranteed steam generating capacity in T/Hr at rated steam parameters at superheater outlet & rated steam temperature at reheater outlet (with any combination of mill working as per Employer's choice), the coal being fired from within range specified	US \$ 641,321/- (US Dollar Six hundred forty one thousand three hundred twenty one only) for every 1 T/hr short fall in steam output from the guaranteed value.	(-) 1.00% of guaranteed steam generator capacity		
iii)	Feed water pressure required at Economizer inlet (at FW terminal point) For increase in feedwater pressure from the gauranteed value at Feed water terminal point near Economiser inlet for main steam flow corresponding	US\$ 111,936/- (US Dollar One hundred eleven thousand nine hundred thirty six only) for every 1 Kg/cm ² (abs) increase in Feed water	(+) 5kg/cm2 (absolute) from the guaranteed value		
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CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES 			
	Sl.No	Guarantee	Rate of Liquidated Damage (LD)	Acceptable Shortfall Limit with LD
		to 100% TMCR (800 MW) Unit Load	pressure guaranteed at Feed water Terminal near Economiser inlet.	
	iv)	Reheater attemperation spray water flow For every 1 (one) T/Hr increase in spray flow over guaranteed value while firing design coal and maintaining rated RH outlet steam temperature at 100% TMCR (800 MW)	US\$ 180,819/- (US Dollar One hundred eighty thousand eight hundred nineteen only) for every 1 (One) Ton/hr increase in spray water flow over guaranteed value at 100% TMCR (800 MW unit load).	(+) 20% of guaranteed reheater spray water flow.
	v)	Coal Pulverizer wear parts warranty Life of coal pulverizer wear parts in hours of operation.	To be calculated as per clause 10.00.00 of this Sub-Section	(-) 500 hours
	vi)	Auxiliary Power Consumption For increase in the auxiliary power consumption in KW guaranteed as per the requirements of clause 6.01.00 (vii) of this Sub-Section at : 100% TMCR (800 MW unit load)	US \$ 2,845/- (US Dollar Two thousand eight hundred forty five only) for every KW increase in the power consumption from the guaranteed value.	(+) 1% of the guaranteed auxiliary power consumption
	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 Contract (GCC)/ Special Conditions of Contract (SCC) iv) Contractor's aggregate liability to pay Liquidated Damages (LD) 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 for per unit basis.			
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CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES		
4.00.00	SPECIFIC AND LIMITING REQUIREMENTS FOR STEAM GENERATOR EFFICIENCY		
4.01.00	Guaranteed Steam generator efficiency shall be calculated as per the requirements of BS EN 12952-15:2003 (by loss method) and as per stipulations of Clause 9.00.00 of this Sub-Section.		
4.02.00	The guaranteed efficiency quoted by the Bidder shall comply with following limiting parameters with design coal firing :		
	a. Excess air at economizer outlet at 100% TMCR load) 20% (min.)		
	b. Corrected flue gas temperature at air preheater outlet (at 100% TMCR) 125 degree C or as predicted by the Bidder whichever is higher		
	c. Unburned fuel at all guaranteed efficiency load at 100% TMCR load 1.0% (min.)		
	Bidder/Contractor to note that no credit shall be given in the bid evaluation or in the evaluation of the results of the guarantee tests for performance predictions/ guarantees etc. if the values considered by the Bidder/Contractor for parameters indicated at a), b) & c) above are lower than those specified above.		
4.03.00	For the purposes of guarantees the ambient air temperature and relative humidity shall be taken as 27 degree Celsius and 60% respectively.		
4.04.00	Unless otherwise specified, the guarantees shall be based on design coal firing with coal/ ash analysis as given in Table-1, Sub-Section-V of Part-A of Technical Specification.		
5.00.00	AUXILIARY POWER CONSUMPTION (PA)		
	The unit auxiliary power consumption shall be calculated using the following relationship.		
	$P_a = P_u + T_L$		
	P_a = Guaranteed Auxiliary Power Consumption.		
	P_u = Power consumed by the auxiliaries of the unit under test.		
	T_L = Losses of the transformers supplied by bidder based on works test reports.		
	While guaranteeing the auxiliary power consumption the bidder shall necessarily include all continuously operating auxiliaries under this package. The auxiliaries to be considered shall include but not be limited to the following :		
	UNIT AUXILIARIES (to be considered for calculating P_u)		
	(a) Mills.		
	(b) PA Fans.		
	(c) FD Fans.		
	(d) ID Fans.		
	(e) Air Heaters.		
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CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES 
<p>6.00.00</p> <p>6.01.00</p>	<p>(f) Coal Feeders.</p> <p>(g) Steam Generator Startup Water Recirculating Pump (if in operation)</p> <p>(h) Seal Air Fans.</p> <p>(i) Lube oil pumps for fans, Air heaters, Mills, etc.</p> <p>(j) Scanner air fans.</p> <p>(k) Pressurising pumps of fuel oil system</p> <p>(l) DM Cooling Water Pumps of ECW System</p> <p>(m) Summation of Power consumption of one instrument air compressor, one Air drying plant and one service air compressor</p> <p>(n) Gas Recirculation fan (if applicable)</p> <p>(o) Compressor of Mill Reject System.</p> <p>- 50 % of power consumption of the working compressor for (2x800 MW) - 66 % of power consumption of the working compressor for (3x800MW)</p> <p>(p) Power consumption of any other continuously operating auxiliaries for unit operation at different guarantee point loads.</p> <p>Note : The bidder shall furnish a list of equipments to be covered under auxiliary power consumption, which shall be subject to Employer's approval.</p> <p>GUARANTEES UNDER CATEGORY-I</p> <p>The Performance Guarantees which attract Liquidated Damages (LD) are as follows :</p> <p>(i) Efficiency of the Steam Generator at 105% TMCR (Valve wide operation unit 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 demonstrated as per clause 9.00.00 of this sub-section). The guaranteed efficiency shall be based on GCV of coal.</p> <p>(ii) Efficiency of the Steam Generator at 100% TMCR (800 MW unit 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 demonstrated as per clause 9.00.00 of this sub-section). The guaranteed efficiency shall be based on GCV of coal.</p> <p>(iii) Steam Generating Capacity Steam generating capacity in T/hr of steam at rated steam parameters at superheater outlet & rated steam temperature at reheater outlet (with any combination of mills working as per Employer's discretion) with the coal being fired from within the range specified in Table-1, Sub section V, Part A, Section VI.</p> <p>(iv) Feed water pressure required at Economiser inlet (at FW terminal point) Guaranteed Feed water pressure at Economiser inlet for main steam flow corresponding to 100% TMCR (800 MW unit load) shall be demonstrated.</p>
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CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES			
	<div><div><div>(v) Reheater attemperation spray water flow</div><div>The following shall be guaranteed and tested:</div><div>Reheater Spray flow while firing design coal and maintaining rated RH outlet steam temperature at 100% TMCR (800 MW unit load).</div></div><div><div>(vi) Coal Mill Wear Parts Warranty</div><div>Life of coal pulveriser wear parts, in hours of operation, for the entire range of coal characteristics specified. (to be demonstrated as per clause 10.00.00 of this sub-section).</div></div><div><div>(vii) Auxiliary Power Consumption</div><div>Auxiliary Power Consumption at 100% TMCR (800 MW) unit load.</div><div>The total auxiliary power consumption for all the steam generator auxiliaries, Equipment cooling water pumps, Mill Reject Handling system, compressed air system etc. required for continuous unit operation at 100% TMCR (800 MW unit load) under rated steam conditions and with ambient air temperature of 27 degree Celsius & RH of 60%, shall be guaranteed in line with the requirements stipulated in clause 5.00.00 of this sub-section.</div><div>Note: Power consumption of each of the pump/fan/compressors/coal pulverizer /heater etc. wherever mentioned shall be measured with its own drive.</div></div></div>			
7.00.00	GUARANTEES UNDER CATEGORY-II			
7.01.00	The Performance Guarantees, conformance to which are mandatory are as follows :			
7.01.01	<div><div>NOx emission</div><div>Contractor shall guarantee that maximum total NOx emission from the unit shall not be more than 260 grams of NOx (from thermal as well as fuel) per giga joule of heat input to the boiler during the entire operating range of steam generator for the range of coals specified.</div><div>The emission shall be measured during steam generating capacity test. The bidder shall furnish the methodology of measurement and demonstration of variations w.r.t. load up to 50% of total load.</div></div>			
8.00.00	GUARANTEES UNDER CATEGORY-III			
	<div>The parameters/capabilities to be demonstrated for various systems/ equipments shall include but not be limited to the following:</div>			
8.01.00	<div><div>Noise</div><div>All the plant, equipment and systems covered under this specification shall perform continuously without exceeding the noise level over the entire range of output and operating frequency specified in Part-C of Section-VI of the Technical Specification.</div><div>Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 651 or BS 5969 or IS 9779.</div></div>			
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CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES							
8.02.00	<p>Sound pressure shall be measured all around the equipment at a distance of 1.0 m horizontally from the nearest surface of any equipment/ machine and at a height of 1.5 m above the floor level in elevation.</p> <p>A minimum of 6 points around each equipment shall be covered for measurement. Additional measurement points shall be considered based on the applicable standards and the size of the equipment. The measurement shall be done with slow response on the A - weighting scale. The average of A-weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 micro bar, shall not exceed the guaranteed value. Corrections for background noise shall be considered in line with the applicable standards. All the necessary data for determining these corrections, in line with the applicable standards, shall be collected during the tests.</p>							
	<p>STEAM GENERATOR AND AUXILIARIES</p>							
	<p>(i) Coal Pulverizer capacity at rated fineness</p>							
	<p>Performance testing shall be conducted on coal pulverizers toward establishing their guaranteed capacity meeting the specification requirement. Corrections may be applied for the variation in coal characteristics i.e. HGI & Total Moisture of test coal with respect to specified design coal.</p> <p>Capacity demonstration test shall be carried out for the following conditions:</p> <p>(a) The Contractor shall demonstrate capacity output on one coal pulverizer (of Employer's choice) of each Steam Generator for establishing its capacity at 100% mill loading, at rated pulverized coal fineness with specified design coal with new set of grinding elements.</p> <p>(b) Further, Contractor shall also demonstrate capacity output on four coal pulverizers (of Employer's choice) of each Steam Generator, not less than the 90% of guaranteed value of (a) above, at 100% mill loading with the originally installed grinding elements in nearly worn-out condition or at the end of guaranteed wear life of grinding elements, whichever is earlier.</p> <p>Capacity test as mentioned at a & b above shall be demonstrated at the following conditions occurring simultaneously during testing:</p>							
	<table><tr><td>Rated pulverised coal fineness</td><td>i. not less than 70% through 200 mesh and</td></tr><tr><td></td><td>ii. not less than 99% through 50 mesh screen</td></tr><tr><td>Test Coal</td><td>Any available coal from the specified range</td></tr></table>	Rated pulverised coal fineness	i. not less than 70% through 200 mesh and		ii. not less than 99% through 50 mesh screen	Test Coal	Any available coal from the specified range	
Rated pulverised coal fineness	i. not less than 70% through 200 mesh and							
	ii. not less than 99% through 50 mesh screen							
Test Coal	Any available coal from the specified range							
<p>In case the Contractor successfully demonstrates the guaranteed capacity of coal pulverizers as stated above, remaining coal pulverizers of corresponding steam generator will also be considered to have successfully met the above capacity guarantee requirement. However, in the event of any of the coal pulverizers not meeting the guarantee test, all the coal pulverizers of corresponding steam generator will have to be tested by the contractor to demonstrate guaranteed capacity.</p> <p>During the demonstration of the mill capacity output, manufacturer's operating instructions will be followed and mill will be operated with the specified range of coals without any such readjustment that requires a shutdown of the mill or reduction of the load and/or any replacement of any mill wear parts.</p>								
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	<p>For the purpose of testing to demonstrate the capacity, if HGI (grindability) and total moisture vary from those given in coal characteristics, the above pulverizer measured capacity shall be corrected using the capacity correction curves furnished by the Contractor and approved by the Employer. HGI versus coal pulverizer capacity curve shall be furnished for HGI variation upto a value above which the capacity remain constant.</p> <p>(ii) No fuel oil support shall be required above 30% BMCR</p> <p>Contractor shall guarantee that oil support for flame stabilization shall not be required beyond 30% of BMCR load when firing the coals from the range identified. The Contractor shall demonstrate that with any combination of mills/ adjacent mills in service (to Employer's choice) the Steam Generator does not require any oil firing for stable and efficient boiler operation at and above 30% BMCR loads.</p> <p>(iii) Capability while firing upto 30% imported coal</p> <p>Contractor shall demonstrate the capability of Steam generator and its auxiliaries while firing upto 30% imported coal (indicated in Table-5,Sub-section-V,Part-A,section-VI) blend with coal as indicated in Table-1 ,sub section-V ,Part-A of Section-VI for atleast 72hrs as specified in clause no. 1.03.01 (e), sub section-II:M-1 , Part-B of Section-VI.</p> <p>(iv) Run back capabilities</p> <p>Refer Sub-Section-II M1, Part-B, Section VI of Technical Specifications.</p> <p>(v) Rate of change of load and sudden load change withstand capability</p> <p>Refer Sub-Section-II M1, Part-B, Section VI of Technical Specification..</p> <p>(vi) Furnace Exit Gas Temperature (FEGT)</p> <p>The Contractor shall conduct a comprehensive thermal performance test (TPT) (on one unit only). Through such TPT the Contractor, by indirect measurement, shall demonstrate that the Furnace Exit Gas Temperature (FEGT) does not exceed the specified maximum temperature limit, with coal pulverizer combinations to Employer's choice and all other requirement in line with sub-section-II:M-1, Part-B of Technical Specifications. The demonstration shall be done by backward calculations method, after having measured/tested/calculated the economizer outlet gas temperature (average), excess air (average), unit heat load (based on turbine flow and reheater flow), characteristics of coal being actually fired during testing, heat absorption in different stages of heat transfer equipments (based on steam/water temperature and pressure measurements) etc. FEGT for the specified design and worst coals shall be calculated using the measured FEGT (with test coal) as above and using computer modeling technique for necessary conversion of the results to the specified design and worst coals. The FEGT demonstration using computer modeling technique shall involve following steps:</p> <p>(a) Development of a computer field model (FM) (backward) using above measured/computed field data. This will be used to calculate the surface effectiveness factor (SEF) for each of heat transfer banks including furnace water walls with test coal.</p> <p>(b) The above field model shall have to be validated by various tests (loads, coal pulverizer combination etc. with test coal) to ensure SEFs for each bank are consistent (within $\pm 5\%$) for all tests.</p>		
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	<div><div>(c) Using above SEFs, for each heat transfer bank contractor's original boiler design model will be changed to make it GAJMARA STPP Stage-I specific.</div><div>(d) The validity of the above model shall be checked for each test by feeding the test coal both from backward direction FM and the calibrated "GAJMARA STPP Stage-I Specific" model as per step-(c) above. The model validity is established if the results for flue gas temperature profile in the boiler, zonal assumptions etc. are identical in both the 'BACKWARD' and 'FORWARD DIRECTION'.</div><div>(e) The validated "GAJMARA STPP Stage-I Specific" model shall have "Fuel Switching" capability i.e. it shall be able to appropriately vary the furnace absorption with changes in the coal properties. Validation of the above fuel switching capability will also have to be established to the satisfaction of NTPC.</div><div>(f) Having established and demonstrated FUEL SWITCHING capability, the contractual FEGT can be demonstrated by using the SITE SPECIFIC calibrated model as per step-(d) and plugging in the specified coal(s).</div><div>The detailed procedure and the correction curves for the above test shall be to Employer's approval.</div><div>(vii) Steam Temperature Imbalance The Contractor shall demonstrate that at SH and RH outlets (in case of more than one outlet) the temperature imbalance between the outlets does not exceed 10 deg C under all loads including transients.</div><div>(viii) Air Preheater air in leakage Contractor shall demonstrate that the air-heater air-in-leakage and maximum drift in air leakage do not exceed the guaranteed or specified value (whichever is lower) as per sub-section-II:M-1, Part-B of Technical specifications. Above requirement needs to be complied with recirculation of flue gas from downstream of ESP.</div></div>		
8.03.00	Power Cycle Piping Actual hanger readings under cold and hot condition (at rated parameters) to match with those of design cold and hot hanger readings for MS/CRH/HRH/HP & LP bypass piping system.		
8.04.00	Passenger & Goods Elevator : Over load tests, travel and hoist speed checks.		
8.05.00	Mill Reject System Continuous effective discharge and conveying at the rated capacity of the mill rejects without spillage or blockage in the system.		
8.06.00	Equipment Cooling Water System (i) Capacity, head & power consumption of all the pumps with the respective job (own) motors to be demonstrated at shop. For the pumps which are included under "Unit Auxiliaries for calculation of Pu" as defined elsewhere the power consumption value (at rated duty point) during shop testing shall be considered for computation.		
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MILL REJECT HANDLING SYSTEM**

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ANNEXURE – I
DATASHEET – A



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DATASHEET-A (MILL REJECT SYSTEM)

S. No.	Items/Description	GADARWARA STPP
1	Type of mill reject system	Dense phase Pneumatic Pressure Conveying
2	Material handled	Coal Mill reject
3	No of mills/Unit	9
4	Reject generation design rate	0.9 TPH
5	Mill layout	Side Mill Arrangement
6	Elevation of Mill Reject Spout (wrt FFL in Mill Area)	2.9 M from 0.0M elevation
7	Type of Mills	HP 1203 with static classifier with Planetary Gearbox
8*	Silo Location	Refer Layout
9	Compressor Location	Refer Layout
10	Water spray system (Pyrite quenching)	Required
11	No of compressors	2x100% (1W+1S), non-lubricated reciprocating type compressor.(Each sized to cater air requirement of two units at design rating for system)
12	Sump Pumps	4 Nos.Fixed Type (1 per mill bay).
13	Type of control/ Main control panel location	DCS based control system (BHEL scope of supply)
14	Pneumatic/ local control panel	Yes with DOP of IP 55
15	Mandatory spares	Applicable
NOTE	* Silo location is tentative only and final location may vary by 10% which shall be finalized during detail engg.	



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ANNEXURE – II
EQUIPMENT DESIGN/SELECTION CRITERIA



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EQUIPMENT DESIGN/SELECTION CRITERIA

S. No.	Equipment	Design/Selection/Sizing Criteria
01	Conveying Air Compressor	<p>Each compressor shall be selected to meet the following requirements:</p> <ol style="list-style-type: none"> Each Compressor shall be sized such that it can cater air requirement of two units. A margin of 50 % shall be considered over and above the required/ calculated/ minimum compressor capacity arrived for conveying of total reject generated. Guaranteed reject conveying rate 900 kg/hr per mill. RH – As per project information (Climatological table) Air Temperature - As per project information (Climatological table) Height above MSL- As per project information. Noise level- Shall be limited to 85dBA at a distance of 1.0 m in horizontal direction from the nearest surface of the machine and at a height of 1.5 m from the floor level in elevation. Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with calibrated integrating sound level meter meeting the requirement of IEC 651 or BS: 5969 or IS 9779.
02	Air Receiver	<p>As per IS 2825</p> <p>Capacity: The air receiver capacity shall be selected to convey one complete cycle with a minimum margin of 25% provided over and above the arrived air receiver capacity.</p>
03	Pyrite Hopper & Accessories	<ol style="list-style-type: none"> Number of outlet – Three (3) Capacity – 2-3 times denseveyor / transporter vessel capacity. MOC for plates – MS as per IS 2062 Gr. A (min), min 10 mm thk with sizing grid. Explosion vent <ol style="list-style-type: none"> Rupture Disc type (One no. per hopper) Rupture Disc Bursting Pressure – 0.5 kg /cm² (g) Sizing Grid Details – Shall be made from minimum 10 mm dia./thk MS bars/flats with opening suitable for entrapping reject larger than 40 mm in size. Surface Temperature – The surface temperature of the equipment shall be maintained within 60 °C. Insulation, if required, to achieve the same shall be provided by the bidder without any commercial implication. Water Spraying arrangement with Solenoid Valve – Yes Valves <ol style="list-style-type: none"> Inlet valve – Pneumatically Operated KGV with expansion joint. Maintenance valve – Pneumatically operated KGV



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		<p>3) Over size chute – Pneumatically Operated KGV</p> <p>4) Emergency chute – Pneumatically operated KGV</p> <p>f) Min. instruments required</p> <p>1) Two nos. of level switches (High/High-High)</p> <p>2) One (1) no. of temperature switch</p>
04	Denseveyor (transporter vessel) & its Accessories	<p>a) MOC</p> <p>1) Denseveyor – Mild Steel IS – 2062, Gr B</p> <p>2) Dome Valve / Inlet Valve – Refer S.No.08 below</p> <p>b) Quantity of material to be conveyed per hour by each denseveyor – Refer Datasheet-A</p> <p>c) Capacity of denseveyor - To suit the conveying rate with 85% filling</p> <p>d) Any cooling envisaged for dome valve – Bidder to decide</p> <p>e) Air supply pressure available – Bidder to decide</p> <p>f) Distance over which material is to be conveyed and the lift – Refer Layout Drawing</p>
05	Bunker & its Accessories	<p>a) Effective Storage Capacity – 130T (min)</p> <p>b) Number of outlet - One</p> <p>c) Minimum free board – 500 mm</p> <p>d) Bunker Plate – 10 mm thk. MS Plate conforming to IS 2062 Gr A/B</p> <p>e) Liner – 3 mm SS 304 Liner in complete bunker</p> <p>f) Minimum Valley Angle - 60 Degrees</p> <p>g) Discharge Gate</p> <p>i. Size – 400 mm x 400 mm (clear open) (min)</p> <p>ii. Type – Twin Sector, Manually operated.</p> <p>iii. MOC – CI to IS 210/ MS 10 mm thick (min) to IS 2062 (Gr. A min) with 8 mm thick SAILHARD/TISCRAAL LINER on inner surface. Min 400 BHN.</p> <p>h) Level probe (high) shall be as per C&I specification requirement.</p> <p>i) Counter weight type Pressure relief valve designed for max. pressure subjected.</p> <p>Bag Filter</p> <p>Each Bag filter shall be sized considering simultaneous firing of one normal and one emergency cycle.</p> <p>a) Material of Filter Cloth – suitable for prolonged operation up to a temperature of 200°C without losing its collection efficiency & durability.</p> <p>b) Air to Cloth Ratio – 1.5 m/min (Further 10 % additional bags shall be provided)</p> <p>c) Bag – MS, IS 2062, Gr. A (min), 3.0 mm thick (min)</p> <p>d) Bag Cage – MS, IS 1079 galvanized.</p> <p>e) Outlet Air Quality – 50 mg/nm³ (max)</p> <p>f) Bag Cleaning Mechanism – Automatic and shall comprise of solenoid valves, air nozzles, adjustable solid state timer, pressure switches, piping and fittings etc.</p> <p>g) Test on bag filter casing : In case bag filter is assembled in casing at site, smoke/ bubble test shall be carried out on the bag filter casing to ensure that the casing is free of welding defect. However, if assembly of bag filter & casing is done at shop, relevant NDT shall be carried</p>



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		<p>out as per approved MQP for checking the soundness of weld.</p> <p>h) Chain Pulley Block over bag filter: Shall have 25% margin over weight of bag filter, but in no case the capacity shall be lower than 1.0 T, same shall be as per IS 3832</p>
06	Lines for Various Services	As per the LP Piping Specifications given under Annexure VI
07	Knife Gate/Plate Valve (pyrite hopper inlet, oversize discharge, emergency discharge, hopper isolation/main tenance)	<p>Operation: Manual/Pneumatic – As per flow diagram.</p> <p>Material of Construction</p> <p>Body – CI to IS 210 Gr FG 260</p> <p>Gate/Plate – SS (ASTM A 240 type 304) with wearing parts provided with abrasion resistant material of hardness 350-400 BHN</p> <p>Size – 200 NB (min) for all valves</p> <p>(All knife gate valve shall be provided with open & close limit switches for interlock and control)</p> <p>Deflection cone : Required before the pyrite hopper inlet knife gate valve</p>
08	Dome Valve/ Swing Disk Inlet Valve	<p>Material of construction</p> <p>Body – CI to IS 210 Gr. FG 260</p> <p>Dome – Alloy CI with hardness as 225 BHN with leak proof seat.</p> <p>Shaft – SS 304</p> <p>Disk – SS 304/ Alloy CI, hardness of 500 BHN (min)</p>
09	Conveying pipe bend	<p>MOC & Hardness – Alloy CI, 400 BHN min with min 2% Ni</p> <p>End connection- Flanged</p>
10	Fittings, Flanges, Fasteners & Gaskets	As per the LP Piping Specifications given under Annexure VI
11	Valves for Air & Water Lines	As per the LP Piping Specifications given under Annexure VI
12	Sump Pumps	<p>Capacity – To meet system requirement but not less than 10 m³/hr</p> <p>MOC</p> <p>i. Casing & suction bell – 2.5 % Ni-CI to IS 210, FG260</p> <p>ii. Impeller – 2.5 % Ni-CI to IS 210 , FG260</p> <p>iii. Shaft/Sleeves – EN-8</p>
13	Hand Operated Chain Pulley Block with Geared Trolley	<p>i. Capacity (In Kg) - To suit the heaviest equipment lifting on silo top</p> <p>ii. Service condition - Class II outdoor</p> <p>iii. No. of CPB – Min.two Nos.</p> <p>iv. Lift (m) - To suit the requirement/16 m (min.)</p> <p>v. Type of suspension- Traveling Trolley</p> <p>vi. Head Room - As per Vendor data</p> <p>vii. Type of gear in CPB - Spur Gear</p> <p>viii. Type of bearing - Ball/Roller</p> <p>ix. Grade of Load Chain - Alloy Steel /Gr. 80.</p>



TITLE:

**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM****2X800MW GADARWARA STPP,STAGE-I**

BHEL DOCUMENTS NO.: PE-TS-395-160-A001

VOLUME **II-B**

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- | | | |
|--|--|---|
| | | x. Grade of Hand Chain - Steel / Gr. 30 |
| | | xi. Factor of Safety - As per Relevant IS |



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ANNEXURE – III


MANUFACTURING QUALITY PLANS AND CUSTOMER INSPECTION REQUIREMENT

SUB-SECTION-VII:QM5

MILL REJECT HANDLING SYSTEM

LARA SUPER THERMAL POWER PROJECT (2x800MW) /
DARLIPALI SUPER THERMAL POWER PROJECT -I (2 x 800MW) /
GAJMARA SUPER THERMAL POWER PROJECT -I (2x 800MW) /
KUDGI SUPER THERMAL POWER PROJECT -I (3 x 800MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2

CLAUSE NO.	QUALITY ASSURANCE			
1.00.00	PNEUMATIC CONVEYING SYSTEM			
1.01.00	PIPING, VALVES, STRAINERS AND FITTINGS			
	<p>(a) All pipes and fittings shall be tested as per applicable code.</p> <p>(b) All valves shall be hydraulically tested for body, seat and back seat (if applicable) as per relevant Standard. Check valves shall also be tested for leak tightness test at 25% of the specified seat test pressure. Valves shall be offered in unpainted condition only.</p> <p>(c) Functional checks of the valves for smooth opening and closing shall also be done.</p> <p>(d) Strainer body shall be hydraulically tested. One of each type and size of Strainer shall be tested for Pressure drop v/s flow rate, if not tested earlier.</p>			
1.02.00	PRESSURE AND STORAGE VESSELS:			
	<p>(a) Atmospheric Tank</p> <p>(i) All weld joints shall be DP tested and complete tanks shall be water fill tested.</p> <p>(ii) All atmospheric storage tanks fabricated and erected at site shall be subjected to all tests (Hydro, NDT and Vacuum) according to design code as applicable.</p> <p>(b) Pressure Vessel</p> <p>(1) NDT on weld joint shall be as per respective code requirements or the minimum as specified as below:</p> <p>(i) 100% DPT on root run of butt weld, nozzle welds and finished fillet welds.</p> <p>(ii) 10% DPT on all finished butt welds</p> <p>(iii) 10% RT (covering all T/cross joints) of butt welds</p> <p>(2) Butt Welds of dished ends shall be stress relieved and subjected to 100% RT.</p> <p>(3) Each finished vessels shall be hydraulically tested to 150% of the design pressure for a duration of 30 minutes.</p>			
1.03.00	PACKAGE AIR COMPRESSOR			
	In addition to Hydraulic tests of pressure parts, performance test of the compressor shall be done for FAD, pressure, power consumption, as per relevant code. Noise and vibration shall also be measure.			
1.04.00	BAG FILTERS:			
1.04.01	Leakage test shall be carried out for casing and other pressure parts			
1.04.02	Pulsing and sequential test on bag filter cages shall be done.			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-B SUB-SECTION-VII:QM5 MILL REJECT HANDLING SYSTEM	PAGE 1 OF 2

CLAUSE NO.	QUALITY ASSURANCE	<div>एनटीपीसी NTPC</div>	
1.05.00	MANO RAIL HOIST/CHAIN PULLEY BLOCKS:		
1.05.01	Chain pulley blocks shall be tested as per IS:3832		
1.05.02	UT & MPI/DPT shall be done on gear blank, pinion shaft, axles.		
1.05.03	Proof Load Test on hooks shall be carried out followed by DPT.		
1.05.04	100% Radiography on weld joints under tension and 25% radiography on compression butt joints followed by 100% DPT shall be done for rope drum, girder, end carriage etc.		
1.05.05	Complete hoists shall be tested for load and overload test as per IS:3177		
1.06.00	VENTILATION SYSTEM:		
1.06.01	Shop Run Test for all Centrifugal Fans to check noise, temp. rise & vibration.		
1.06.02	Performance test on one fan of each type for capacity, pressure, efficiency and power consumption.		
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-B SUB-SECTION-VII:QM5 MILL REJECT HANDLING SYSTEM
		PAGE 2 OF 2	

Sl/Contractor :-		Manufacturing Quality Plan				Project:- Package :- Mill Rejects System Client :-				
Manufacturer :-		Item :- Rupture Disc QAP No. :- LOI Nos:-				Contractor :- M/s BHEL				
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	Materials -> Rupture Disc Material	Physical & Chemical Properties	Major	Chemical Analysis, YTS & UTS	1 per Heat	ASTM A240 Type - 304 / Appvd Data Sheet / Drg.	ASTM A240 Type - 304 / Appvd Data Sheet	MTC	✓ V 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 ✓ P W W	
Manufacturer / Sub Vendor		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 & K -> Client P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document No.:-		
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

SI/Contractor :-		Manufacturing Quality Plan				Project:-				
Manufacturer :-		Item:- CHAIN PULLY BLOCK				Package :- Mill Rejects System				
		QAP No. :-				Client :-				
		LOI Nos:-								
		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
1	Materials									
->	Load Chain	Mech. Properties Breaking Load Test, Proof Load test	Major	Review of Mtr's Test Certificate	1 per Lot	IS:6216 /Appr. Drg / Appr. Data sheet	IS:6216 /Appr. Drg / Appr. Data sheet	✓	PV	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	✓	PV	V
->	Gear & Pinion	Chemical Composition	Major	Lab Analysis	1 per Heat	IS:4432/Appr. Drg / Data sheet	IS:4432/Appr. Drg / Data sheet	✓	PV	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	✓	PV	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	✓	P	V
		DPT after Load Test	Major	DPT	100%	ASTM E-165	ASTM E-165 / No Defects	✓	P	V
3	Final Inspection									
->	Assembly	Operation Check	Major	Visual	100%	Smooth Operation / IS 3832 Appr. Drg / App. Data Sheet	Smooth Operation / IS 3832 Appr. Drg / App. Data Sheet	✓	P	W
		Functional Test	Major	Visual	100%			✓	P	W
		Load Test & Over Load Test	Major	Load Test	100%			✓	P	W
		Overall Dimensions Visual (After Load Test)	Major	Measurement	100%			✓	P	W
			Major	Visual	100%	IS 3832	IS 3832	✓	P	W
		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								
		P->Perform, V-> Verification, W-> Witness								
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				


S/Contractor :- Manufacturer :-		Manufacturing Quality Plan Item :- Bag Filter (Without Enclosure) 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	D	M	C	K
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
2.2	Welding	Hydro Test for 30 Minutes	Major	DPT on Final Weld	100%	ASTM E-165	No Defect	IR	✓	P	V**	V
2.3			Major	Leakage	100%	Appr. Data sheet	No Leakage	IR	✓	P	V**	V
											** -> DPT & Hydro -Test of Manifold to be witnessed by vendor	

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	
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	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	✓ ✓ ✓	W W W	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 Solenoid 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.											
Manufacturer / Sub Vendor SIGNATURES		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.:-			
						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 :- ACI Bonds 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	D	M	C	K
1	Raw Material											
1.1	Scrap Receipt	Chemical	Major	Lab Analysis	Random Sample / Lot	Mfg's Std	Mfg's Std	Mfg's Log Sheet	-	P	-	-
1.2	Ferro Alloys	Chemical	Major	Lab Analysis	Random Sample / Lot	Mfg's Std	Mfg's Std	Mfg's Log Sheet	-	P	-	-
2	Final Inspection											
2.1	Product Analysis	Chemical Analysis	Major	Chemical	1 / heat	Mfg's Standard	Mfg's Standard	MTC	✓	P	V**	V
2.2	Leakage	Hydro Test	Major	Pressure Test	100%	Approved Drg / Data Sheet	No Leakage	IR	✓	P	W*	W*
2.3	Dimension	Dimension	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓	P	W*	W*
2.4	Hardness	Hardness	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR/TC	✓	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 :- 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		
1	Raw Material / Bought Out's							TYPE	D	M	C	K
1.1	Body	Chemical & Mechanical	Major	Foundry TC	1 per Heat	Relevant IS / Appr. Drg / Data Sheet	Relevant IS / Appr. Drg / Data Sheet	TC	✓	PV	V	V
1.2	Gate	do	Major	Lab Analysis	1 per lot	do	do	Mill / Lab TC	✓	PV	V	V
1.3	Stem (For Manual Valve)	do	Major	Lab Analysis	1 per batch	do	do	do	✓	PV	V	V
1.4	Pneumatic Cylinder (For Pneu. Valve)	Visual & Functional	Major	Mfr's TC Review	100%	Smooth Operation	Smooth Operation	Mfr's TC	✓	PV	V	V
2	In - Process Inspection											
2.1	Body, Gate	Dimensional	Major	Measurement	100%	Mfr's Drawing	In-Process Insp. Record	-		P	V	V
2.2	Body Shell Test	Leak Tightness	Major	Hydro Static Test #	100%	Approved Drg / Data Sheet	No Leakage	IR	✓	P	V	V
3	Final Inspection											
3.1	Assembled Valve	Dimension	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓	P	W	W
3.2	do	Function	Major	Operation	100%	Smooth Operation	Smooth Operation	IR	✓	P	W	W
3.3	do	Seat Leakage	Major	Hydro Static Test #	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓	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 :-		Manufacturing Quality Plan				Project:- Package :- Mill Rejects System Client :-				
Manufacturer :-		Item :- Compressor QAP No. :- LOI Nos:-				Contractor :- M/s BHEL				
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	Cylinder	Chemical & Mechanical	Major	Mfr's TC	1 per Heat or Lot	Relevant IS / Appr. Drg / Data Sheet	Relevant IS / Appr. Drg / Data Sheet	TC	✓ P/V	V
1.2	Frame Head	do	Major	do	do	do	do	do	✓ P/V	V
1.3	Outer Head	do	Major	do	do	do	do	do	✓ P/V	V
1.4	Crank Shaft	do	Major	do	do	do	do	do	✓ P/V	V
1.5	Connecting Rod	do	Major	do	do	do	do	do	✓ P/V	V
1.6	Temp. Switch	Mfr's TC	Major	Visual Review	100%	do	do	do	✓ V	V
1.7	Control Panel	Mfr's TC	Major	Visual Review	100%	do	do	do	✓ V	V
2	In-Process Inspection									
2.1	Cylinder, Frame Head & Outer Head	Leak Tightness	Major	Hydro Static Test	100%	Appr drg. / Data Sheet	No Leakage	IR	✓ P	V
2.2	After Cooler	Leak Tightness	Major	Hydro Static Test	100%	Approved Drg / Data Sheet	No Leakage	IR	✓ P	V
3	Final Inspection									
3.1	After Cooler	Dimension / Visual	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓ P	W
3.2	Control Panel	Dimension / Visual	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓ P	W
3.3	Compressor Assly	Nozzle Test (Mech. Run Test)	Major	Performance	100%	Approved Drg / Data Sheet / BS 1571 Part-2	Approved Drg / Data Sheet	IR	✓ P	W
		LEGENDS:-				For Client Use:-				
		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								
Manufacturer / Sub Vendor		Contractor				Name & Signature of Approving Authority with Seal				
SIGNATURES						Document No.:-				
Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final										

SI/Contractor :-		Manufacturing Quality Plan				Project:- Package :- Mill Rejects System Client :-	
BHEL		Item :- Sump Pump QAP No. :- LOI Nos.:-				Contractor :- M/s BHEL	
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms
1	2	3	4	5	6	7	8
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
1.2	Impeller	do	Major	do	do	do	do
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
1.4	Shaft Sleeve	Chemical Hardness	Major	Chem. Comp. Hardness	do	do	do
2	In - Process Inspection						
2.1	Casing	Soundness of Casting / Leakage	Major	Hydro Static Test	100%	Appr drg. / Data Sheet / IS 5120	No Leakage
2.2	Impeller	Residual unbalance	Major	Dyanamic / Static Balancing	100%	Approved Drg / Data Sheet / ISO 1940 Gr. 5.3	ISO 1940 Gr. 5.3
Consultant :-							Remarks
Format of Records							Agency for Checking
9							10
TYPE							D M C K
TC							✓ P/V V V
do							✓ P/V V V
do							✓ P/V V V
do							✓ P/V V V
IR							✓ P V V
IR							✓ P V 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	K	
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	Noise - 85 db max. & Vibration - 50 microns max.
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													
M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT													
P->Perform, V-> Verification, W-> Witness													
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													

S/Contractor :-		Manufacturing Quality Plan				Project:-							
Manufacturer :-		Item :-EXPANSION BELOW				Package :- Mill Rejects System							
QAP No. :-		QAP No. :-				Client :-							
LOI No:-		LOI No:-											
Contractor :- M/s BHEL		Contractor :- M/s BHEL				Consultant :-							
Quantum of Check		Quantum of Check				Format of Records							
Type of Check		Type of Check				Agency for Checking							
Classification		Classification				Remarks							
Characteristics		Characteristics											
3		3											
4		4											
5		5											
6		6											
7		7											
8		8											
9		9											
10		10											
11		11											
1	Raw Material												
1.1	Belongs	physical & Chemical	Major	Lab Analysis	1 per Heat	AS204 TP304/ Approved Drg.	AS204 TP304/ Approved Drg.	MTC	✓	V	V	V	
1.2	Flanges/ End Pipe	physical & Chemical	Major	Lab Analysis	1 per lot	IS 2062 / Approved Drg.	IS 2062 / Approved Drg.	MTC	✓	V	V	V	
2	In - Process Inspection												
2.1	Belongs & Pipe	Dimension	Major	Measurement	100%	Approved Drg.	Approved Drg.	IR	✓	P	V	V	
	** For Bellows	Soundness	Of major	DPT ** (Before & After Forming)	100%	ASTM E- 165	ASTM E- 165	IR	✓	P	V	V	
3	Final Inspection												
3.1	Assembly	DP Test of Fillet Weld of Bellows to Pipe & Pipe to Flange	Major	visual	100%	ASTM E-165	ASTM E-165	IR	✓	P	W	V	
3.2	Testing	Dimensions pressure	Major Critical	Measurement Hydraulic	100%	Approved Drg	Approved Drg	IR	✓	P	W	W	
					100%	EJMA D.3.2.1/ Data sheet	EJMA D.3.2.1/ Approved Drg.	IR	✓	P	W	W	
		Spring Rate Test (Axial)	Critical	Stiffness Test	100%	EJMA / Data Sheet	EJMA / Data Sheet	IR	✓	P	W	W	
		Deflection	Critical	Deflection Test	100%	EJMA / Data Sheet	EJMA/ Data Sheet	IR	✓	p	W	W	
3.30	Painting	Visual/ Measurement	Major	DFT	100%	Approved Painting Schedule	Approved Painting Schedule	IR	✓	p	-	-	
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													
Manufacturer / Sub Vendor		Contractor		Contractor		Contractor		Contractor		Contractor		Contractor	
SIGNATURES		SIGNATURES		SIGNATURES		SIGNATURES		SIGNATURES		SIGNATURES		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

Manufacturer's Name & Address :			MANUFACTURING QUALITY PLAN				Project :				
Item : MS Plates & Structures			QP No. : Rev. No. : 0		BHEL Ref. :		Contract No. :				
Sub-System :			Date : Page No. : 1 of 1		Contractor : BHEL		SUB-CONTRACTOR-				
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	10	11	12
RAW MATERIAL											
1	Steel Plates	Chemical composition and Mechanical test	Major	Review of correlated MTC	One/heat	IS:2062	IS:2062	Mfgr. TC	3	2.1	
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
Refer Note Below											
LEGEND :								BHEL Doc. No.			
1 - BHEL / CUSTOMER								P - Agency Performing the Test			
2 - VENDOR								W - Agency Witnessing the Test			
3 - Manufacturer								V - Agency Verifying the Test			
CR - Critical Characteristics											
MA - Major Characteristics											
MI - Minor Characteristics											
MANUFACTURER/ SUBCONTRACTOR		CONTRACTOR						REVIEWED BY		NAME & SIGNATURE OF APPROVING AUTHORITY	
SIGNATURE											

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 :-			Manufacturing Quality Plan				Project:- Package :- Mill Rejects System Client :-						
Mfr:-			Item :- Terminal Box QAP No. :- LOI Nos:-				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	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	- - MTC MTC	- - P P PV PV V V	- - - - - -	- - - - - -	- - - - - -	
2 In - Process Insp.													
2.1	Welders Qualification & Welding	WPS / PQR / WFO Welding Defects	Major	Procedure / Qualification DPT on Root run DPT on Final run Measurement	100% 100% 10% 100% 100%	ASME sec - IX ASTM E-165 ASTM E-165 Mfr/Appr. Drg	ASME sec - IX ASTM E-165 ASTM E-165 Mfr/Appr. Drg	WPS / PQR IR IR IR	PV PV PV PV P	V V W W -	V V W W -	Welders to be approved by BHEL / KPCL	
2.2	Flange Machining and Drilling	Dimensions	Major	Joint set up. PCD, Orientation	100%	Mfr/Appr. Drg	Mfr/Appr. Drg	IR	P	-	-	-	If Applicable
2.3	Connection - pipe to flange, pipe to body	Fit up	Major	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	IR	P	-	-	-	
2.4	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	IR	P	-	-	-	
3 Final Inspection													
3.1	Final Assembly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	PV	W	W	W	
3.2	Painting	Finish / DFT	Major	Visual Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	PV	W	W	-	Painting before disp.
4 QA Documentation													
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	PV	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													
Manufacturer / Sub Vendor			Contractor			Name & Signature of Approving Authority with Seal							
SIGNATURES													

SI/Contractor :-		Manufacturing Quality Plan Item :- Bunker Discharge Gate QAP No. :- LOI Nos.:-			Project:- Package :- Mill Rejects System Client :-		
Mfg:- Works:-		Contractor :- M/s BHEL			Consultant :-		
Sl. No.	Components / Operations	Characteristics / Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms
1	2	3	4	5	6	7	8
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	App. Drg. / Data Sheet / IS Standard
1.2	Shaft	Physical Check Chemical Check UT II Dia > 50 mm	Major	TS & Elongation Chemical Comp. Internal defect Visual	1/Heat 1/Heat 100%	do	do
1.3	Cylinder / Actuator	Visual / Specification	Major	Visual	100%	do	do
2	In - Process Insp.						
2.1	Welders & Welding	WPS / PQR / WPS / PQR / 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
3	Final Inspection						
3.1	Final Asstly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet
3.2	Operation with job / shop actuator	Opening & Closing of Gate	Major	Visual	100%	Proper Working	Smooth Operation
3.3	Painting	Finish / DFT	Major	Visual Measurement	100%	App. Painting Schedule	App. Painting Schedule
4	QA Documentation						
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan
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							
Manufacturer / Sub Vendor		Contractor		Name & Signature of Approving Authority with Seal			
SIGNATURES				Document No.:-			

S/Contractor :-			Manufacturing Quality Plan				Project:-					
Mfr:- Works:-			Item :- Pressure Relief Valve				Package :- Mill Rejects System					
			QAP No. :-				Client :-					
			LOI Nos:-				Consultant :-					
			Contractor :- M/s BHEL									
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%	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	-	-	P	-	-
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%	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	V	V
2.2	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard		-	-	P	-	-
3	Final Inspection											
3.1	Final Assy	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	✓	P/V	W	W
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	-	P/V	W	-
4	QA Documentation											
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	-	P/V	V	V
			LEGENDS:-				For Client Use:-				Document No.:-	
			Records identified by ✓ shall be essentially included in QA documentation. TC-Test Certificate, IR - Insp. Report									
Manufacturer / Sub Vendor			Contractor				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					



TITLE:
**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM**

2X800MW GADARWARA STPP,STAGE-I

BHEL DOCUMENTS NO.: PE-TS-395-160-A001

VOLUME **II-B**

SECTION -C

REV. NO. 00

DATE: 04/10/2013

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ANNEXURE – IV
SUB-VENDOR LIST

2x800 MW GADARWARA STPP - MILL REJECT HANDLING SYSTEM					
VENDOR LIST					
Sl. No	ITEM/SERVICE	QAP/ INSP.CAT.	Scope of supply/manufacturer	Place	Remarks by BHEL
I	SELF MFG ITEMS				
1	Pyrite Hopper	I	SELF MANUFACTURER		
2	Conveying vessel	I	SELF MANUFACTURER		
3	Local Control Panel with accessories	I	SELF MANUFACTURER		
4	Mill Reject Conveying fittings/Bends	I	SELF MANUFACTURER		
5	Vessel inlet Valve(Pneumatic operated)	I	SELF MANUFACTURER		
6	Bunker Discharge Gate (Sector Gate)	I	SELF MANUFACTURER		
7	Pressure Relief Valve	I	SELF MANUFACTURER		
II	BOUGHT OUT ITEMS				
A	MECHANICAL				
1	Terminal Box	I	BHEL/ NTPC APPROVED FABRICATORS	INDIA	
		I	PARKARE	DELHI	
		I	UNITED ENGG WORKS	NASIK	
2	AIR RECEIVER	I	INTEGRATED ENGINEERS	PUNE	
		I	TEMASME VESELLEX	NOIDA	
		I	DIAMOND FABRICATIONS	PUNE	
3	DRAIN TRAP	III	SPIRAX MARSHAL	MUMBAI	
		III	GREAVES COTTON	MUMBAI	
		III	TRIDENT	COIMBOITORE	
		II	LEADER	JULLANDHAR	
		II	BANKIM	HOWRAH	
4	Gate, Globe, Check valves/ NRV - C.I	II	H SARKAR	HOWRAH	
		II	KBL	PUNE	
		II	AV VALVES	AGRA	Upto 300 NB
		III	LEADER	JULLANDHAR	
5	Gate, Globe, Check valves/ NRV - G.M	III	BOMBAY METALS & ALLOYS (GG)	MUMBAI	
		III	SANT VALVES	JULLANDHAR	
		I	FOURESS	MUMBAI	
6	Knife Gate/Plate Valve (H/W Operated & Cylinder Optd)	I	VASS	CHENNAI	
		I	(ORBINOX)	COIMBATORE	
		III	PRECISION ENGG	MUMBAI	
7	Ball Valves	III	Weir BDK	HUBLI	
		III	LEADER	JULLANDHAR	
		III	FLOW CHEM	GUJRAT	
		III	LEADER	JULLANDHAR	
8	Safety Relief Valve	III	SPIRAX MARSHAL	PUNE	
		III	KAYSTONE(TYCO FLOW CONTROL)	HALOL	
		III	BHEL	TRICHY	

9	M.S.G.I / ERW PIPES	I	JINDAL	GHAZIABAD	UPTO 350 NB
		I	SURYA ROSHINI	BAHADURGARH	
		II	SAIL	ROURKELA	
		I	WELSPUN	ANJAR	
		I	INDUS	GB NAGAR	UPTO 300NB
		II	TISCO	JAMSHEDPUR	UPTO 150NB
		I	MAHARASHTRA SEAMLESS	MAHARASHTRA	200NB TO 400NB IS 3589
10	Metallic Expansion Below(Metallic)	I	METALLIC BELLOW'S	CHENNAI	
		I	SUR INDUSTRIES	KOLKATA	
		I	LONESTAR	CHENNAI	
11	Rupture Disc	II	BS & B SAFETY SYSTEM	CHENNAI	
		II	hercules (INDEF)	mumbai	
12	Chain pulley Block (1 Ton)	II	TRACTEL	FARIDABAD	
		II	LIFTING EQUIPMENTS & ACESSORIES	DELHI	
13	Conveying Air Compressor (Reciprocating Type)	I	KIRLOSKAR PNEUMATIC	PUNE	
		I	INGERSOLL RAND	AHMEDABAD	
		II	KSB PUMP	PUNE	
		II	MATHER & PLATT	PUNE	
		II	SAM	COIMBOITORE	
14	Sump Pump (Water Service)	II	FLOW MORE	GHAZIABAD	
		II	B & C	CHENNAI	
		II	KIRLOSKAR	PUNE	
		II	WORHTINGTON	GHAZIABAD	
		III	SCHRADDER	MUMBAI	
15	Pneumatic Actuator/Cylinder(Metallic)	III	NUCON	HYDERABAD	
		III	ROTEX	MUMBAI	
		III	VAAS	CHENNAI	
16	Tools and Tackles	III	BRANDED		
		III	SAIL		
		III	JSW STEEL LTD		
17	Steel Plate/ Structure/ Section/ SS liner	III	JINDAL STEEL & POWER LTD		
		III	TISCO		
		III	ESSAR		
		III	IISCO		
		III	LLOYDE		
		III	RINL		
18	Grating	III	INDIANA	PUNE	
		II	ACCO	KOLKATA	
19	Bag Filter	II	THERMAX	PUNE	
		II	BATLIBOI	DELHI	

B		ELECTRICAL & INSTRUMENTATION					
1	Motor (LT)	I	MARATHON		KOLKATA	Refer Note 3	
		I	SIEMENS		MUMBAI		
		I	NGEF		BANGALORE	Upto 15KW, refer note 3	
		I	KEC		BANGALORE/HUBLI	HUBLI upto 90 kw, refer note 3	
		I	CGL		AHMED NAGAR	Refer note 3	
2	Air Filter/Lubricator/Regulator	I	ABB		FARIDABAD/BANGLORE	Faridabad upto 55kw, Bangalore above 55kw & upto 200kw, refer note 3	
		I	BBL		MUMBAI	upto 100kw refer note 3	
		III	SHAVONORGAN		MUMBAI/BANGLORE		
3	Level Probes(RF)	III	PLACKA		CHENNAI		
		II	EIP ENVIRO LEVEL CONTROL		NOIDA		
		II	E&H		GERMANY / AURANGABAD		
		III	FLOW STAR		FARIDABAD		
		III	HC		MUMBAI		
4	Annunciator	III	PECON		AHEMDABAD		
		III	PROCON		CHENNAI		
		III	NUCON		HYDERABAD	For Nucon Cylinder only	
5	Solenoid Valves	III	JEFFERSON		ARGENTINA		
		III	HARION		GERMANY/ AURANGABAD		
		III	ASCO(I)		CHENNAI		
		III	SCHRADDER DUNCAN LTD.		MUMBAI	For Schrader Duncan cyl only	
		III	AVCON CONTROLS		MUMBAI		
6	Pressure Switch ,DP Switch/ Temp. Switch	III	ROTEX AUTOMATION		BARODA/VV NAGAR		
		II	SWITZER		CHENNAI	Except 900 series	
		II	GAUGE BOURDON (FOR PRESSURE SWITCH)		PANVEL	Not for temp switch	
		II	TRAFAG		RANIPET		
			INDFOS IND		GHAZIABAD		
7	Pressure Gauge & DP Gauge	II	ASHCROFT		USA /GERMANY		
		II	ASHCROFT		GHAZIABAD		
		III	GAUGES BOURDON INDIA		PANVEL		
		III	AUXITROL		UK		
		III	MANOMETER INDIA		MUMBAI		
		III	BUNDENBURG		UK		
		III	AN INSTRUMENTS		KOLKATA		
		III	GOA THERMOSTATIC		GOA		
		III	GUCK INDIA		MUMBAI		
		III	WIKA		PUNE		
8	Temperature Gauge	III	SWITZER (DP INDICATOR)		CHENNAI		
		III	H GURU (SI)		BANGALORE		
		III	WIKA		PUNE		
		III	AN INSTRUMENTS		KOLKATA		
		III	GENERAL INST		MUMBAI /GOA		
		III	BUDENBURG		UK		
		III	H GURU (SI)		BANGALORE		

		III	GOA THERMOSTATIC	GOA	
		III	WAREE	MUMBAI	
9	Pulse Jet Valves	III	ASCO	CHENNAI	
		III	MANIK	CHENNAI	
10	Cable Lug	III	DOWELLS	MUMBAI	
		III	BILLET (3D)	VALSAD	
		III	CHETNA	NASIK	
11	Limit Switch	III	SIEMENS	MUMBAI	
		III	JAIBALAJI	NEWDELHI	
12	Junction Boxes & Earthing Material ROD, FLAT etc.		NTPC / BHEL APPROVED VENDOR		Main contractor approved sources with galvanizing at NTPC accepted sources
	INSTRUMENT CABLE / SIGNAL CABLE	III			
		II	DELTON CABLES	BANGALORE	
13		II	PARAMOUNT CABLES	FARIDABAD	
		II	POLYCAB	DAMAN	
		II	UNIVERSAL CABLES	SATNA	
		II	NICCO	KOLKATA	
		II	CORDS	BHIWADI	
		II	INCAB	PUNE	
	Cable Tray	II	IMJ ENGG	DELHI /BHIWADI	
14		II	JAMUNA METALS	DELHI / SONEPAT	
		II	INAR PROFILES	ANAKAPALLI	
		II	INDIANA	MUMBAI	
		II	TECHNO	CHANDIGARH	
		II	INDUSTRIAL PERFORATION	KOLKATA	
	Cable Gland	III	COMMET	MUMBAI	
15		III	SUNIL & CO.	KOLKATA	
		III	ARUN ENGG.	KOLKATA	
		III	QUALITY PRECISION	KOLKATA	
	Local panel/ LPBS	I	CONTROL DEVICES	KOLKATA	
		I	PYROTECH	UDAIPUR	
		I	C&S	NOIDA/ HARDWAR	
16		I	INDUST CONTROLS & APPLIANCES	MUMBAI	
		I	POSITRONICS	BARODA	
		I	SWITCHING CIRCUIT	KOLKATA	
		I	JACKSON	GR. NOIDA	
		I	JOLLY ENGG.	KOLKATA	
17	FRP JUNCTION BOXES	III	BHEL/NTPC approved sources	India	
	LEVEL INDICATOR / GAUGE	III	SBEM PVT LTD	PUNE	
18		III	PUNE TECHTROL	PUNE	
		III	LEVCON	KOLKATA	
		III	SIGMA	MUMBAI	
		III	DK INSTRUMENTS	KOLKATA	

	<p>LEGENDS</p> <p>1. QP/ INSPN CATEGORY :</p> <p>CAT-I : For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.</p> <p>CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP.</p> <p>CAT -III : For these items main supplier approves the quality plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.</p> <p>UNIT/WORKS : Place of manufacturing Place of Main Supplier of multi units/works</p>
	<p>NOTE-1</p> <p>For steel following modalities to be adopted</p> <p>a) Steel plate, structural steel and section shall be procured from main producers like SAIL/ TISCO/ ISSCO/ RINL/ JINDAL/ ESSAR/ ISPAT/ LLOYD'S STEEL/ JSW.</p> <p>b) Material will be delivered directly from manufacturer's plant/ stock yard/ godown to NTPC project site.</p> <p>c) Correction of material with MTC will be done by main contractor before delivery and correlated MTC along with deelivery challan will be NTPC-RIO for issuance of MDCC.</p> <p>NOTE-2</p> <p>It that the same Qulaity Plans as approved for main equipment and identified in the vendor list shall be applicable for the type of control measure i.e. make /test/ check the procuremeent of mandatory spares. However, for those spares which are not covered in the approved QP, main supplier shall furnish Certificate of Conformance (COC) along with guarantee and interchangeability certificate shall be generated by the main item manufacturer, for which the spares are made.</p> <p>NOTE-3</p> <p>A) LESS THAN 30 KW:-</p> <p>Acceptance of motor less than 30 KW is based on COC of the manufacturer & the contractor confirming as follows:</p> <p>It is here confirmed that the above mentioned motor/ motors was / were manufacture taking care of NTPC specific requirements regarding ambient temp. , voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing/ data sheet</p> <p>B) 30 KW AND ABOVE & UPTO 50 KW:-</p> <p>Acceptance of Motor rating between 30 KW & 50 KW is based on NTPC review of Routine Test inspection report as per IS 326 witnessed by main contractor along with COC of the manufacturer & the contractor confirming as follows: It is hereby confirmed that the above mentioned motor / motors was /were manufactured taking care of NTPC specific requirements regarding ambient temperature, voltage and frequency variations, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing / data sheet.</p>



TITLE:
**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM**

2X800 MW GADARWARA STPP,STAGE-I

BHEL DOCUMENTS NO.: PE-TS-395-160-A001

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ANNEXURE – V
PAINTING SCHEDULE

CLAUSE NO.	TECHNICAL REQUIREMENTS			
13.02.0	Making use of valves/control valves supplied by others and installed on the contractor's piping system during hydraulic testing shall be subjected to the acceptance of the respective valve supplier otherwise hydraulic cap/blanking arrangement as required shall be used.			
13.03.0	Cutting/welding/edge preparation and re-welding required for blanking, temporary piping connection and/or for replacements by spool pieces including reinstallation of components/piping systems after hydraulic testing shall be the responsibility of contractor.			
13.04.0	The water for hydraulic test shall be made alkaline by addition of suitable chemicals. After the test, the Steam Generator and high pressure external piping shall be suitably drained and preserved.			
13.05.0	All blank flanges, removable plugs, temporary valves, pipes & fittings, spools, other accessories and services required for carrying out hydraulic testing of pipings shall be furnished by the Contractor. The pressurization equipment including water piping needed for the above test shall also be furnished by the Contractor. Any defect noticed during the testing shall be rectified and the unit shall be retested by the Contractor.			
13.06.0	In case branch off/tap off piping (in other's scope) from contractor's piping scope are not ready or not erected at the time of hydro testing of contractor's piping then the contractor to supply/use necessary blanking arrangement as required at these branch off/tap off locations as required to complete the hydro testing.			
13.07.0	The hydraulic test shall be considered successful only on certification to that effect by the concerned inspecting authority as per the provision of the IBR and the Project Manager.			
14.00.00	SPECIFICATION FOR SURFACE PREPARATION & PAINTING			
14.01.00	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.			
14.02.00	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.			
14.03.00	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.			
14.04.00	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..			
14.05.00	SURFACE PREPARATION			
14.05.01	All surfaces to be painted shall be thoroughly cleaned of oil, grease and other foreign matter. Surfaces shall be free of moisture and contamination from chemicals and solvents.			
14.05.02	The following surface 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.			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/9573-102-2	PART-B SUB-SECTION-II:M3 PCP & LPP	Page 24 of 53

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	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 Phosphating SP6 Emery sheet cleaning/Manual wire brush cleaning.			
14.06.00	APPLICATION OF PRIMER/PAINT			
14.06.01	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.			
14.06.02	Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.			
14.06.03	Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.			
14.06.04	Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.			
14.06.05	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 to IS-12744. PS9 - Aluminum paint to IS 2339. PS9* - Heat resistant Aluminum paint to IS-13183 Gr.-I (for temperature 400 °C - 600 °C) , IS-13183 Gr.-II (for temperature 200 °C - 400 °C) and IS-13183 Gr.-III (for temperature upto 200 °C) PS13 - Rust preventive fluid by spray, dip or brush. PS14 - weldable primer-Deoxaluminat or equivalent. PS16 - High Build Epoxy CDC mastic `15□ PS17 - Aliphatic Acrylic Polyurethane CDE134 , %V=40.0(min.) PS18 - Epoxy based TiO2 pigmented coat PS19 - Epoxy based Zinc phosphate primer (92% zinc in dry film (min.), %VS=35.0(min.). PS20 - Epoxy based finish paint.			
14.06.06	All weld edge preparation for site welding shall be applied with one coat of weldable primer.			
14.06.07	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.			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/9573-102-2	PART-B SUB-SECTION-II:M3 PCP & LPP	Page 25 of 53

14.07.00 Primer/Painting Schedule

Sl.No	Description	Surface Preparation	Primer Coat		Intermediate Coat		Finish Coats		Total Min. Painting DFT (Microns)	Colour Shade	
			System	Coat	Min. DFT / coat (Microns)	System	Coat	Min. DFT/ Coat (Microns)			
1.	All insulated Pipings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.	SP3/SP4	PS 9*	1	20	-	-	PS9*	1	20	40
2.	All uninsulated Piping, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.	SP3/SP4	PS 5	2	25	-	-	PS 4	3	35 \$	155 \$
	Design temperature <60 °C	SP3/SP4	PS 9*	1	20	-	-	PS 9*	1	20	40
	Design temperature 60 °C- 200 °C	SP3/SP4	PS 9*	1	20	-	-	PS 9*	1	20	40
	Design temperature > 200 °C	SP3/SP4	PS 9*	1	20	-	-	PS 9*	1	20	40
3	Constant Load Hanger (CLH), Variable Load Hanger (VLH) and other supports	SP4*	PS19	1	40	-	-	PS17	1	30	70
4.	Valves										

As per NTPC Colour shade/ coding scheme

LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/9573-102-2	PART-B SUB-SECTION-II:M3 PCP & LPP	Page 26 of 53
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Cast /Forged	Design temperature <60°C	SP1/SP2/SP3	PS9	1	20				PS 9	1	20	40	
5.	Design temperature 60 °C-200 °C	SP1/SP2/SP3	PS9*	1	20		-		PS9*	1	20	40	
	Design temperature > 200 °C	SP1/SP2/SP3	PS9*	1	20		-		PS9*	1	20	40	
	Outside TG building and in SG envelope	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a)Epoxy coat b)Final coat of paint PS17	2 1	35 30	250	
	Within TG building	SP4*	-do-	1	35	PS18	1	35	a)Epoxy coat b)Final coat of paint PS17	2 1	25 30	150	
6.	Weld Edges	SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	-	
\$ The first 2 finished coats (total min.DFT of 70 microns) shall be done at shop and the 3 rd finish coat (min.DFT 35 Microns) shall be applied at site.													

LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMAR STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/9573-102-2	PART-B SUB-SECTION-II:M3 PCP & LPP	Page 27 of 53
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14.00.00 Testing Requirements:

The detailed testing requirements for power cycle piping and its components are given in the subsection for Quality Assurance(QA) .The requirements pertaining to testing given in this subsection if in variance with that given in QA subsection, then the more stringent of the two shall be followed.

LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/9573-102-2	PART-B SUB-SECTION-II:M3 PCP & LPP	Page 28 of 53
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COLOUR AND CODING SCHEME								
Sl. No.	Equipment Description	Ground Colour		Identification Tag/Band			Legend	Remarks
		Colour	RAL	Colour	ISC No.	Equivalent RAL No.		
1	Air Receiver	Blue	5012	White		9010		
2	Motor	Blue	5012					Enamel Paint to be used
3	Pneumatic panel for Transport Vessel	Blue & Grey	5012 9002					Front & Rear panels in Grey.End Panels sides in Blue
4	Conveying Air Compressor/After Cooler	Blue	5012	White		9010		Identifying legends to be used
5	Compressor panel, main control panel	Grey	9002					
6	Rupture Disc,Bag filter casing ,Bunker Discharge gate, Pressure Relief Valve, Terminal box	Grey	9002					
7	Structural steel works including mill rejects storage bunker	Blue & Grey	5012 9002					Primary strl members(columns & beams) in Blue Secondary members in Grey
8	Compressed air piping, Valves & Fittings.	Grey	9002	Sky Blue	101		PA	
9	Mill rejects convey piping valves & fittings, ACI Bends	Grey	9002	White		9010		
10	Service water lines, valves & fittings	Grey	9002	Sea Green	217		RW/ SW	
11	DMCW water lines, valves & fittings	Grey	9002	Sea Green	217		DMW	
12	Chain Pulley Block with Monorail	Golden Yellow	1004					
13	Hook	Signal Red	3001					
Note: Above are subject to final approval of NTPC								



TITLE:
**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM**


2X800 MW GADARWARA STPP,STAGE-I

BHEL DOCUMENTS NO.: PE-TS-395-160-A001	
VOLUME II-B	
SECTION -C	
REV. NO. 00	DATE:04/10/2013
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ANNEXURE – VI
LOW PRESSURE PIPING SPECIFICATION

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एन टी पी सी NTPC</div>																																						
	<div>LOW PRESSURE PIPING</div> <div>EQUIPMENT SIZING CRITERIA</div> <div>1.00.00</div> <div>1.01.00</div> <div>1.02.00</div> <div>1.03.00</div> <div>a) Water Application</div> <table><thead><tr><th colspan="2"></th><th colspan="3">Water Velocity in m/sec</th></tr><tr><th></th><th>Pipe Size</th><th>Below 50 mm</th><th>50-150 mm</th><th>200 mm & above</th></tr></thead><tbody><tr><td>(a)</td><td>Pump suction</td><td>-----</td><td>1.2-1.5</td><td>1.2-1.8</td></tr><tr><td>(b)</td><td>Pump discharge and recirculation</td><td>1.2-1.8</td><td>1.8-2.4</td><td>2.1-2.5</td></tr><tr><td>(c)</td><td>Header</td><td>-----</td><td>1.5-2.4</td><td>2.1-2.4</td></tr></tbody></table> <div>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.</div> <div>WILLIAM & HAZEN formula shall be used for calculating the friction loss in piping systems with the following "C" value:</div> <table><tbody><tr><td>(i)</td><td>Carbon steel pipe</td><td>100</td></tr><tr><td>(ii)</td><td>C.I Pipe/ Ductile Iron.</td><td>100</td></tr><tr><td>(iii)</td><td>Rubber lined steel pipe</td><td>120</td></tr><tr><td>(iv)</td><td>Stainless steel pipe</td><td>100</td></tr></tbody></table> <div>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.</div> <div>b) Compressed Air Application</div> <div>Compressed air15.0 m/sec.(under Average Pressure & Temp. conditions)</div>			Water Velocity in m/sec				Pipe Size	Below 50 mm	50-150 mm	200 mm & above	(a)	Pump suction	-----	1.2-1.5	1.2-1.8	(b)	Pump discharge and recirculation	1.2-1.8	1.8-2.4	2.1-2.5	(c)	Header	-----	1.5-2.4	2.1-2.4	(i)	Carbon steel pipe	100	(ii)	C.I Pipe/ Ductile Iron.	100	(iii)	Rubber lined steel pipe	120	(iv)	Stainless steel pipe	100		
		Water Velocity in m/sec																																						
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LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-B SUB-SECTION-II:M3 PCP & LPP	PAGE 29 OF 53																																				

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>																																													
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.																																														
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				
SYSTEM	TYPES OF VALVES																																														
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Air		x	x	x	x																																										
Drains & vents		x	x	x																																											
Fuel oil (if any)		x	x	x	x	x																																									
1.14.00	Recirculation pipes along with valves, breakdown orifices etc. shall be provided for important pumping systems as indicated in respective process and instrumentation diagrams (p&ids). The recirculation pipe shall be sized for minimum 30%design flow of single pump operation or the recommended flow of the pump manufacturer whichever is higher.																																														
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-B SUB-SECTION-II:M3 PCP & LPP	PAGE 30 OF 53																																											

CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.00.00	TECHNICAL SPECIFICATION			
2.01.00	GENERAL <p>Specific technical requirements of low-pressure piping, fittings, supports, valves, specialties and tanks etc. have been covered under this Sub-section. It includes details pertaining to design and material of construction for piping, fittings, valves, equipment, etc. cleaning/surface preparation application of primer and painting on over ground piping. It also includes detailed technical requirement of laying underground/buried piping including water proofing/anti corrosive protection. It also covers design, engineering, manufacturing, fabrication, technical details of piping, valves, specialties, piping hangers / supports, tanks etc.</p>			
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.			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-B SUB-SECTION-II:M3 PCP & LPP	PAGE 31 OF 53

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>		
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.B/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.B 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	<p>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.</p> <p>Bidder/Contractor shall note that pipes offered as per a particular code shall conform to that code in all respects i.e. Dimension, tolerances, manufacturing methods, material, heat treatment, testing requirements, etc. unless otherwise mentioned elsewhere in the specification.</p>			
2.03.09	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	Piping layout			
2.04.01	Piping shall be grouped together where practicable and routed to present a neat appearance.			
2.04.02	Piping routing shall be such as to provide sufficient clearance for removal and maintenance of equipment, easy access to valves, instruments and other accessories. The piping shall not encroach on the withdrawal space of various equipments.			
2.04.03	Over head piping shall have a normal minimum vertical clearance of 2.5 meters above walkways and working areas and 8m above roadways/railways. When several pipe lines are laid parallel, flanged joints must be staggered. Welded and flanged joints should as far as possible be located at one third span from supports. if the support is situated right under the			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-B SUB-SECTION-II:M3 PCP & LPP	PAGE 33 OF 53