TECHNICAL SPECIFICATION

FOR

FLUE GAS DESULPHURISATION SYSTEM

CUSTOMER : NATIONAL THERMAL POWER CORPORATION LTD.

PROJECT : BONGAIGAON TPP – 3X250 MW

APPLICATION : FLUE GAS DESULPHURIZATION

AIR QUALITY CONTROL SYSTEMS
BOILER AUXILIARIES PLANT
BHARAT HEAVY ELECTRICALS LIMITED
RANIPET – 632 406.

Contents **page no**

1.0 Intent of Specification

BHEL, Ranipet received an order from NTPC, for supply of FGD (Flue Gas Desulphurization) plant for the Boiler unit proposed to be located at Bongaigaon, Assam state of India. It is proposed to source FGD plant from Qualified FGD vendors, who are meeting 1.1 provenness criteria. Offers are invited from FGD vendors meeting required qualifications. Offers will be in 2 parts.

1.1 Provenness criteria

Excerpts from NTPC tender for provenness criteria on FGD system is furnished below. FGD vendor is to review the same & confirm compliance and also furnish the details of the system completely as per data sheets enclosed

Quote **"Wet Limestone based Flue Gas Desulphurisation system**

The bidder/his sub-vendor should have designed, engineered, manufactured, erected/ supervised erection and commissioned/supervised commissioning of atleast one(1) no. of Wet Limestone based Flue Gas Desulphurisation system having flue gas treatment capacity of not less than 800 T/hr, with design SO_x removal efficiency of atleast 85%, operating in a Pulverised Coal fired power plant in conjunction with Electrostatic Precipitator, which is in successful operation for atleast one (1) year as on october 2007 ."

2.0 scope of supply

The scope of the proposal for Engineering, Supply, Construction, Erection, Testing & Commissioning works of Flue gas desulphurization system for Bongaigaon Thermal Power Project (3x250 MW) shall be on the basis of a single point responsibility, completely covering the following activities and services in respect of all the equipment specified and covered under the specifications and read in conjunction with "Scope of Supply & Services", Sub-section-III, Part-A, Section-VI of Technical Specification.

a) Basic Design of FGD system from TP to TP (Terminal point)

b) Detailed design of all the equipment and systems under Vendor's scope.

c) Providing engineering drawings, data, operation and maintenance manuals, Compliance with statutory requirements.

d) Manufacturing including shop testing/type test.

e) Packing and transportation from the manufacturer's works to the site Reliability tests and guarantees tests after successful completion of facilities,

f) Furnishing of spares on FOR site basis.

g) Satisfactory completion of the contract.

The work to be carried out as per the above scope shall be all in accordance with the requirements, conditions, appendices, etc., stated in Section GCC, which shall be considered as a part of the Technical Specification (Section-VIA) as completely as if bound herewith.

Bidder is requested to carefully examine and understand the specifications and seek clarifications, if required, to ensure that they have understood the specification. The Bidder's offer should not carry any sections like clarifications, interpretations and/or assumptions. In the event of conflict between the Technical Specifications and the Conditions of Contract, the requirements as indicated in the technical specification shall govern, unless confirmed otherwise by the Employer/ purchaser in writing before the award of this contract, based on a written request from the Bidder for such a clarification.

2.1 Scope Matrix

It is proposed that FGD vendor utilize BHEL for sourcing & manufacturing items & services as suggested below. Vendor to review the list & submit alist of activities with the scope.

2.1.1 Scope of supply for FGD system (proposed)

	Description	Vendor	BHEL
A	**Along with offer**		
1	Preparation of Technical offer including Experience list, data sheets, guarantees, utilities, .	**X**	
2	Basic Design of total FGD system including preparation of Layout drawings, Data sheet of Systems & components under BHEL scope, P&ID, PFD, pipe rack system, preliminary loading data for submitting to NTPC	**X**	
3	Review & confirmation of Scope of supply under BHEL. Vendor to furnish complete list of items to be organized by BHEL. Any item left out , & required for completion of project, is to be supplied by vendor	**X**	
4	Submission of technical & Commercial Offer to BHEL	**X**	
B	**After order**		
1	Basic Design of FGD system including preparation of Layout drawings, P&ID, specification of Bought out components, Electrical & Mechanical schemes.	**X**	
2	Detailed design of Absorber to be manufactured by BHEL	**X**	
3	Assist BHEL in procuring Bought out components & systems	**X**	
4	Submission of Detailed structural Calculations & Loads to BHEL	**X**	
5	Obtain Approval of Customer of all drawings & documents	**X**	
6	Supply of Major Bought outs like (including all electricals & instrumentation but excluding HT motors) **Complete GGH system,** **Complete Limestone recirculation pump system,** **Complete wet Ball Milling system,** **Complete Belt filter system**	**X**	
7	Supply of internal components of scrubber (including proprietary items)	**X**	
9	Supervision of Erection, lining, Commissioning, Trial run, Handing over. Training of BHEL personal at vendor's works. –T**raining of NTPC/ BHEL engineers at site**	**X**	
10	Quality Management.	**X**	**X**
11	Preparation of Erection & O&M manual.	**X**	
12	Performance Guarantee test of FGD system	**X**	
13	Manufacture & supply by BHEL (FGD vendor to review & confirm)		**X**

	a) Structures & platforms, Ducts, Dampers, Expansion joints, Insulation b) Absorber casing based on the Detailed Design Drawings of vendor c) Procurement of Bought out items based on Specification by vendor d) Supply of Electrical systems including LTMCC, Cables, Earthing e) Control & Instrumentation including SO2 Measurement System f) PLC & accessories		
14	Complete Erection & Commissioning and Procurement of first fill of Lubricants, Consumables		**X**
15	Provision of Service water , Potable Water, Service Air, Instrument Air,		X

2.1.2 Terminal point – FGD system

The following terminal points have been considered for the proposed FGD plant:

- Limestone: At the inlet of the limestone silos.
- Gypsum: Gypsum discharge chute at the delivery of gypsum belt filter.
- Waste water pumps outlet pipe to be terminated at ash water pump house.
- Foundation bolt of equipment and supporting structures.
- Instrument air: One point near the FGD plant at suitable elevation and distance.
- Service Air: One point near the FGD plant at suitable elevation and distance.
- Process Water: One pipe connection near FGD plant.
- Input terminals of LT MCC , Gypsum MCC, Limestone System MCC
- Input terminals of FGD PLC for units 1, 2 and 3 & Common PLC. (UPS Supply)
- Input terminal of DC distribution Board.
- Terminal block of HT motors in FGD plant for HT Supply.

2.1.3 Exclusions – FGD system

The following equipment, materials and services are excluded from the scope of BHEL and shall be arranged by the NTPC.

- Limestone conveying upto the limestone silos.
- Gypsum handling and storage system beyond the vacuum belt filter.
- Civil work execution including foundation for the equipment and structures located outside the FGD plant buildings i.e. control room, limestone milling system building & gypsum dewatering building.
- Design and construction of earthing pits and connection of the FGD above ground earthing system to the power station earth grid.

- Ventilating equipment, Fire detection system, fire extinguishers, lighting fittings etc. for FGD control room and other areas of FGD plant.
- Illumination of FGD field equipments, FGD control room, approach roads to FGD equipments, analyzer room, Gypsum dewatering room, Lime stone handling room.
- Fire detection system for FGD field equipments.
- Air conditioning of FGD control room, Analyser room for areas where solid state control equipment will be located.
- UPS power supply (230 V; 50 Hz; 1 kVA) for FGD PLC / Common PLC/ control desk for Operator Work Station PC housed in FGD Control room.
- DC power supply for FGD MCC for unit 1, FGD MCC for unit 2, FGD MCC for unit 3, GYPSUM MCC, LIMESTONE MCC.
- Communication between employer's DDCMIS/ and FGD PLC.
- Service transformer for FGD MCC for unit 1, FGD MCC for unit 2, FGD MCC for unit , Gypsum Dewatering MCC, Limestone milling system MCC.
- LT bus-duct between service transformers and FGD MCC for unit 1, FGD MCC for unit 2, FGD MCC for unit 3, Gypsum Dewatering MCC, Limestone Milling System MCC.
- HT MCC for Absorber recirculation Pump, Oxidation air compressor, Vacuum Pump and Wet ball mill.
- HT Cables for above.
- HT cable trench /supports for above HT Cables.
- Interlocking of HTMCC / Service transformer with FGD MCC for unit 1, FGD MCC for unit 2, FGD MCC for unit 3, Gypsum Dewatering System MCC, Limestone slurry system MCC.
- Interlocking of HTMCC with space heater of motors of Absorber recirculation Pump, Oxidation air compressor, Vacuum Pump and Wet ball mill.
- Analyzers for SOx, NOx, CO in outlet duct.
- Opacity monitor.
- Electronic earth for FGD PLC.
- Vibration transducers along with necessary cables for Slurry recirculation pump and oxidation air compressor and their drives & Vibration monitoring system.
- Cables between bearing /winding RTD of drives junction box and Customer DDCMIS.
- Cables from HTMCC to FGD PLC/ Common PLC.
- Cables from customer DDCMIS to FGD PLC / Common PLC

2.2 FGD input parameters Data Sheet

1.	**Project**		
	Name		: NTPC / BONGAIGAON TPP - 3 x 250 MW
2.	**Climatic Condition**		: Refer Cl. 4.00.00, Page 2 of 13, Sub Section-V, Salient Design Data, Section VI, Part A of Enquiry Specification.
	Ambient Temperature	°C Guarantee/ Design	: 27 / 42
	Relative Humidity %	Guarantee/ Design	: 60 / 60
3.	**Boiler/Generator sets**		
	Number of Boilers		: 3 x 250 MW
	Steam Rate	t/hr	: 810
	Type of Boiler		: Two-pass, balanced draft
	Excess air to Boiler		: 20%
	Fuel Used		: Blended Indian Coal
4.	**Analysis of Coal**		: Refer Cl. 1.00.00, Page 1 of 13, Sub Section-V, Salient Design Data, Section VI, Part A of Enquiry Specification.
5.	**Fuel Oil for Startup/Stabilisation/Low Load Operation**		:Refer Cl. 2.00.00, Page 1 of 13, Sub Section-V, Salient Design Data, Section VI, Part A of Enquiry Specification.
6.	**Dust Removal System**		
	Type		: Electrostatic Precipitator
7.	**Lime Stone**		: Refer Cl. 6.00.00, Page 2 of 13, Sub Section-V, Salient Design Data, Section VI, Part A of Enquiry Specification. & amendment to spec
8.	**Process Water**		: Refer Cl. 9.00.00, Page 3 of 10, Sub Section-II, Project Synopsis, Section VI, Part A of Enquiry Specification.
9.	**FGD Selection Criteria**		Refer Sub Section-II M-04, Page 1 to 18, Section VI, Part-B and Amendment No.1 to Technical Specification.
10.	**Inlet dust burden**		Refer cl.3.03.02, Page 5 of 18, Sub Section-II M-04, Section VI, Part-B

11.	**Selection Data -**	
		Guarantee Point
	Boiler Load in MW_e	250
	Type of Coal	Design Coal
	Ambient Conditions	27°C Temp, 60% RH
	Flue gas flow, Nm^3/s at ID Fan Outlet (Wet Basis)	263.8
	Flue Gas Temperature, deg. C	160
	Density of Flue gas, kg/m^3	0.819
	Flue Gas Composition at ID Fan Outlet	
	SO_2 % by Vol (Wet Basis)	0.193
	SO_3	1.5% Conversion from SO_2
	Moisture % by Vol (Wet Basis)	10.571
	CO_2 % by Vol (Wet Basis)	10.912
	O_2 % by Vol (Wet Basis)	5.964
	N2 % by Vol (Wet Basis)	72.360
	HCl	Not Applicable
	HF	
	NH_3	
	NOx PPM	322
	CO PPM	100
	Dust mg/Nm^3	< 50
	Inlet SO_2 Concentration, mg/Nm^3 (Wet Basis)	5559.3
	SO_2 Removal Efficiency	95 % (Minimum) with 1.5 % GGH leakage

12.	**Selection Data - (Wet Basis) – DESIGN POINT**	
		Design Point
	Boiler Load in MW_e	BMCR
	Type of Coal	Worst Coal
	Ambient Conditions	42°C Temp, 60% RH
	Flue gas flow, Nm^3/s at ID Fan Outlet (Wet Basis)	303.3
	Flue Gas Temperature, deg. C	170
	Density of Flue gas, kg/m^3	0.784
	Flue Gas Composition at ID Fan Outlet	
	SO_2 % by Vol (Wet Basis)	0.203
	SO_3	1.5% Conversion from SO_2
	Moisture % by Vol (Wet Basis)	13.910
	CO_2 % by Vol (Wet Basis)	10.392
	O_2 % by Vol (Wet Basis)	5.751
	N2 % by Vol (Wet Basis)	69.744
	HCl	Not Applicable
	HF	
	NH_3	
	NOx PPM	308
	CO PPM	100
	Dust mg/Nm^3	< 50 (Refer Point No. 10, Page 1)
	Inlet SO_2 Concentration mg/Nm^3 (Wet Basis)	5775.3
	SO_2 Removal Efficiency	95%

13.	**Selection Data - ADDITIONAL operating point (Wet Basis)**	
	Boiler Load in MW_e	BMCR
	Type of Coal	Worst Coal
	Ambient Conditions	42°C Temp, 60% RH
	Flue gas flow, Nm^3/s at ID Fan Outlet (Wet Basis)	313.6
	Flue Gas Temperature, deg. C	170
	Density of Flue gas, kg/m^3	0.784
	Flue Gas Composition at ID Fan Outlet	
	SO_2 % by Vol (Wet Basis)	0.203
	SO_3	1.5% Conversion from SO_2
	Moisture % by Vol (Wet Basis)	13.912
	CO_2 % by Vol (Wet Basis)	10.394
	O_2 % by Vol (Wet Basis)	5.749
	N2 % by Vol (Wet Basis)	69.743
	HCl	Not Applicable
	HF	
	NH_3	
	NOx PPM	308
	CO PPM	100
	Dust mg/Nm^3	< 50 (Refer Point No. 10, Page 1)
	Inlet SO_2 Concentration, mg/Nm^3 (Wet Basis)	5776.2
	SO_2 Removal Efficiency	Not specified

14.	Selection Data – Auxiliary Power Consumption Guarantee Points	
		Guarantee Point 2
	Boiler Load in MW_e	200
	Type of Coal	Design Coal
	Ambient Conditions	27°C Temp, 60% RH
	Flue gas flow, Nm^3/s at ID Fan Outlet (Wet Basis)	202.1
	Flue Gas Temperature, deg. C	160
	Density of Flue gas, kg/m^3	0.824
	Flue Gas Composition at ID Fan Outlet	
	SO_2 % by Vol (Wet Basis)	0.205
	SO_3	1.5% Conversion from SO_2
	Moisture % by Vol (Wet Basis)	11.097
	CO_2 % by Vol (Wet Basis)	11.590
	O_2 % by Vol (Wet Basis)	5.062
	N2 % by Vol (Wet Basis)	72.045
	HCl	Not Applicable
	HF	Not Applicable
	NH_3	Not Applicable
	NOx PPM	344
	CO PPM	100
	Dust mg/Nm^3	< 50 (Refer Point No. 10, Page 1)
	Inlet SO_2 Concentration, mg/Nm^3 (Wet Basis)	5906.7
	SO_2 Removal Efficiency	-

* Auxiliary Power Guarantee Points are 250 MW – Design Coal and 200 MW – Design Coal

15.	**Material Selection Data – (Wet Basis) *****	
	Boiler Load in MW_e	BMCR
	Type of Coal	3.5% Sulphur Coal
	Ambient Conditions	27°C Temp, 60% RH
	Flue gas flow, Nm^3/s at ID Fan Outlet (Wet Basis)	253.8
	Flue Gas Temperature, deg. C	170
	Density of Flue gas, kg/m^3	0.808
	Flue Gas Composition at ID Fan Outlet	
	SO_2 % by Vol (Wet Basis)	0.277
	SO_3	1.5% Conversion from SO_2
	Moisture % by Vol (Wet Basis)	10.033
	CO_2 % by Vol (Wet Basis)	12.094
	O_2 % by Vol (Wet Basis)	4.610
	N2 % by Vol (Wet Basis)	72.986
	HCl	Not Applicable
	HF	Not Applicable
	NH_3	Not Applicable
	NOx PPM	360
	CO PPM	100
	Dust mg/Nm^3	< 50 (Refer Point No. 10, Page 1)
	Inlet SO_2 Concentration, mg/Nm^3 (Wet Basis)	7967.8
	SO_2 Removal Efficiency	-

*** The FGD system material selection shall however be capable of handling and providing successful performance with flue gases produced when burning any coal from the specified range and also the coal having sulphur content upto 3.5%. Bidder to note that the selection of the material shall not only be suitable for high sulphur content, but also chloride content in the process slurry.

2.3 Salient Excerpts from tender amendment

S no	Enquiry specification		Amendment ref	
1	VI/B – II M-04	1/18&10/18	Clarification 6	Min Gypsum purity shall be 90%
2	VI A – V-	13/13		For design of limestone milling system, bond index of 13 shall be considered
3				Input limestone size: 1 inch max
4	VI A IIIA—04	2/6		The Gypsum---- of dual streams of primary & secondary dewatering equipment-----
5				2x100% limestone storage silos, 2x100% wet ball mills to suit 110% 0f max limestone requirement
6	VI B IIM04	3/18		Gas duct from GGH outlet to Absorber shall be made of S-1 Ten or equivalent
7				Duct from GGH outlet to by pass duct shall be of 9mm thick S-1 Ten or carbon steel with C 276 lining of mim 2mm thickness
8		10/18		Shall provide 2x 100% gypsum dewatering system

2.4 Documents to be submitted with offer

Part I

Cover A:

- ***Filled up format 3.A.3*** **– in 4.1 provenness data sheet**
- ***Experience list, latest customer certificate***
- ***Expression of interest to quote***

Cover B:

- Complete Technical offer including scope matrix, Exclusions, Scope under BHEL (proposed), Terminal Points, Services, Training, Guarantee clarifications if any, Deviations & clarifications & data sheet **as per 4.4**
- Drawings on plot plan, FGD scheme drawings, P&ID, Foundation load points, Loads(preliminary), etc
- Filled in Guarantee point & utility data sheet – **as per 4.2**
- Un priced commercial offer
- Optional offer if any

Part II

- Commercial offer including price
- Optional price for additional operating point as per **Table 13 of 2.2**
- Filled in Evaluation data sheet - **as per 4.3**

Schedule of Activities:

- Tender clarifications
- Pre Bid Meeting
- Offer submission
- Post bid meeting

NTPC BONGAIGAON (3 X 250 MW) FGD - SUMMARY TABLE OF SCOPE OF WORK				
Sl No	**Description of equipment**	**Basic Engineering**	**Detailed Engineering**	**Material Supply**
A	**A. Absorber and Flue Gas Duct**			
1	Absorber Casing and Structure-	FGD Vendor	FGD vendor	BHEL
1.1	GGH structures	FGD Vendor	BHEL	BHEL
1.2	INSULATION	FGD Vendor	BHEL	BHEL
1.3	LINING	FGD Vendor	BHEL	BHEL
1.4	FINISH PAINTING	FGD Vendor	BHEL	BHEL
2	Spray Pipes and Nozzles	FGD Vendor	FGD Vendor	FGD Vendor
3	Mist Eliminators	FGD Vendor	FGD Vendor	FGD Vendor
4	Absorber Internal Elements (Agitator, Support pipes, Emergency spray Nozzles,	FGD Vendor	FGD vendor	FGD Vendor
5	Packing, if applicable	FGD Vendor	FGD Vendor	FGD Vendor
6	Flue Gas Duct, Structure	FGD Vendor	BHEL	BHEL
7	Flue Gas Dampers	FGD Vendor	BHEL	BHEL
B	**Equipment and Machinery**			
1	Rotating Machines			
1.1	GGH and auxiliaries	FGD Vendor	FGD vendor	FGD vendor
1.2	Seal Air Fan	FGD Vendor	BHEL	BHEL
1.3	Service water pumps	FGD Vendor	BHEL	BHEL
1.4	Limestone slurry transport pumps	FGD Vendor	BHEL	BHEL
1.5	Wet Bowl Mills	FGD Vendor	FGD Vendor	FGD Vendor
1.6	Vacuum pumps	FGD Vendor	FGD Vendor	FGD Vendor
1.7	Belt Filter Assy	FGD Vendor	FGD Vendor	FGD Vendor
1.8	Absorber recuirculation pumps	FGD Vendor	FGD Vendor	FGD Vendor
1.9	Oxidation Compressors / Blowers	FGD Vendor	BHEL	BHEL
1,10	Gypsum Bleed Pumps	FGD Vendor	BHEL	BHEL
1.11	Belt Filter Washing Pumps	FGD Vendor	BHEL	BHEL
1.12	Agitators	FGD Vendor	BHEL	BHEL
1.13	Filtrate Pumps, Waste Water pumps	FGD Vendor	BHEL	BHEL

2	Static equipment like limestone silos, limestone slurry tanks, sumps, gypsum slurry tanks, etc.	FGD Vendor	BHEL	BHEL
3	Handling arrangement in various areas	FGD Vendor	BHEL	BHEL
4	Emergency Quenching Pipe and Nozzles	FGD Vendor	FGD Vendor	FGD vendor
NTPC BONGAIGAON (3 X 250 MW) FGD - SUMMARY TABLE OF SCOPE OF WORK				
Sl No	**Description of equipment**	**Basic Engineering**	**Detailed Engineering**	**Material Supply**
C	**Piping**			
1	Water piping, limestone slurry piping, gypsum slurry piping, air piping	FGD Vendor	FGD Vendor	BHEL
2	Valves and other parts connected to the	FGD Vendor	FGD Vendor	BHEL
3	Pipe Rack	FGD Vendor	BHEL	BHEL
4	Supports and other materials for Erection	BHEL	BHEL	BHEL
D	**Electrical/Instrumentation**			
1	Field Instruments	FGD Vendor	BHEL	BHEL
2	PLC, Control System	FGD Vendor	BHEL	BHEL
3	Electric Panels	FGD Vendor	BHEL	BHEL
4	Motors	FGD Vendor	BHEL	BHEL
5	Fire Alarm and fire fighting System	FGD Vendor	BHEL	BHEL
6	Lighting (Except Street lighting)	FGD Vendor	BHEL	BHEL
7	Telecommunication System	FGD Vendor	BHEL	
8	Air conditioning and ventilation system	FGD Vendor	BHEL	BHEL
9	Cables and other materials for Erection	FGD Vendor	BHEL	BHEL
E	**Civil and Building**			
1	Civil Work inlcuing equipment foundation	FGD Vendor	FGD Vendor	BHEL
2	Building Work involving buindings for milling system, gypsum dewatering, control room, etc	FGD Vendor	BHEL	BHEL
F	**Others**			
1	Lining at Site	FGD Vendor	Lining Vendor	BHEL
2	Painting and insulation at Site	BHEL	BHEL	BHEL
4	Erection / Commissioning Supervisors	FGD Vendor -	BHEL - Execution	BHEL - Execution
F	**Performance Guarantee**	FGD Vendor	FGD Vendor	FGD Vendor

NTPC Bongaigaon - 3 x 250 MW	
Flue Gas Desulphurization System	
Schedule of documentation supply by FGD Vendor (To be detailed during order stage)	
Sl. No	**Description of work**
I	**Basic System Design**
1	Sizing & selection of FGD system & Accessories. Submission of Sizing & selection Criteria.
2	Quality instructions for erection works for absorber and lining
3	Instruction of Performance test Procedure and list of Test instruments.
4	Absorber emergency tank sizing to be located at the top of absorber.
5	Lining Specification for Absorber and Duct and procedure for application including vendor list.
6	Conceptual interface block diagram and control logics for PLC
7	Sizing and criteria for oxidation sump.
8	Calculation basis for utilities as per guarantee schedule.
9	specification and Data Sheet of SO_2, pH monitors.
10	list of spares for 3 years operation for FGD plant.
11	Visit to Customer premises for approval of Layout drawings, P & ID and control philosophy etc.
II	**Supply**
1	Absorber internals including Mist Eliminator, Agitator, Aeration nozzles, Spray Nozzles and Spray Pipes manifold.
2	GGH, Recirculation pump, Limestone milling system,Gypsum Dewatering System.
3	Packing, if applicable.
4	Fasteners for above Items 1 & 2.
5	Commissioning spare Parts for above items.
NTPC Bongaigaon - 3 x 250 MW	
Flue Gas Desulphurization System	
Sl. No	**Description of work (To be detailed during order stage)**
III	**Technical Services**
1	customer's approval [conducted in India]. FGD Vendor shall visit India (BHEL/Customer) for meeting customer in obtaining approvals.
2	Erection and commissioning Supervision.
3	Instructions for Testing/Performance Guarantee Test and test procedure preparation. Official from FGD Vendor shall be present at site during performance testing of FGD at site.
4	Preparation and submission of Erection instructions and O & M Manual for FGD.
IV	**Check and Review of BHEL Drawings**
1	Drawings of Logic Diagram, absorber area and other areas of FGD for BHEL scope of work.
2	
3	

3.1 Civil & Structures

1.0 CODES, STANDARDS & REFERENCES

1.1.0 All the Indian standards referred to shall be the latest revision (including all amendments issued thereto) at the time of execution.

1.2.0 Reference to only some of the codes in this document and various clauses of design criteria shall not limit or restrict the scope or applicability of other relevant codes. It shall be ensured that all other codes relevant to a specific job, in addition to those already mentioned, are followed wherever applicable.

1.3.0 Following codes are shall be referred for use of load calculations and design of structures.

Code	Description
IS:875	Code of practice for design loads (other than earth-quake) for Buildings and structure (All parts)
IS:1911	Schedule of unit weights of building materials
IS:1893	Criteria for earth-quake resistant design of structure
IS:800	Code of Practice for general construction in steel
IS:802	Code of Practice for use of structural steel in over head transmission line towers: (all parts)
IS:806	Code of Practice for use of steel tubes in general building construction.
IS:808	Dimensions for hot rolled steel beam, column channel and angle section.
IS:813	Scheme of symbols for welding
IS:816	Code of Practice for use of metal arc welding for general construction in mild steel.
IS:1024	Code of practice for use of welding in bridges and structures subjected to dynamic loading.
IS:1161	Steel tubes for structural purpose.
IS:2062	Structural steel (Fusion welding quality)
IS:4000	High Strength bolts in steel structures- Code of Practice.
IS:7215	Tolerances for fabrication of steel structures
IS:8640	Recommendations for dimensional parameters for industrial building.
IS:9178	Criteria for design of steel bins for storage of bulk materials (all parts)
IS:9595	Recommendation for Metal arc welding of carbon and carbon manganese steel.
IS:12843	Tolerances for erection of steel structures.
IS:2210	Criteria for design of reinforced concrete shell structures & folded plates.
IS:456	Code of practice for plain and reinforced concrete

2.0 DESIGN CRITERIA

2.1.0 Load calculation for all the equipment and design of all the structure shall be in line with NTPC technical specification No CS-4610-101-2
   a) Section –VI, Part-B, Sub section –V , Civil works.
   b) Section –VI, Part-A, Sub section –IIIA-04 , Flue gas desulphurization system
   c) Section –VI, Part-B, Sub section –IIM-04 , Flue gas desulphurization system

2.2.0 Dead Load, Live Load, Wind Load and Seismic Load shall be computed as per above said technical specification, and as per latest IS codes as applicable. The worst of the loads arrived thus shall be adopted for design.

2.3.0 For design of steel structure wind and seismic shall not be considered to act simultaneously.

3.0 DOCUMENTS TO BE FURNISHED

Following documents are to be submitted for the approval of the OWNER, prior to commencement of fabrication. All drawing shall be standard sizes and shall be made in AUTOCAD. Hard and soft copies shall be furnished to OWNER.

3.1.0 Sizing of all equipments, design calculation for reactions and for the loads due to equipment.

3.2.0 Detailed design calculation for member sizing including load arrived at for the steel scrubber.

3.3.0 Design calculations to be furnished for all steel structure under bidder scope.

3.4.0 Loading data, anchoring bolt details, pocket details, equipment mounting details, opening details on floor, wall etc. for all equipments and structures.

3.5.0 Software used for the analysis and design of structures and equipment shall be furnished by the bidder. Detailed input and output of the software shall also be furnished.

3.2 Mechanical items

1.1 Complete LIMESTONE GRINDING SYSTEM

The bidder shall furnish complete details covering technical features, impact on guarantee parameters, cost implication etc.

Limestone slurry piping to each absorber, along with recirculation lines (if required), all isolation and control valves.

Each mill shall be complete with the following items, as a minimum requirement:

i. A bunker outlet gate

ii. A gravimetric limestone feeder along with its drive and all other auxiliaries

iii. 1 no. separator tank with agitator(s).

iv. 2x100% Mill circuit pump.

v. 1 set of hydro-cyclone

vi. A peripheral drive system with motor, speed reducer gearbox and other auxiliaries.

vii. An auxiliary motor for inching operation with speed reducer.

Vii Complete lubricating system with 1 no. lube oil tank.

ix. Lube oil pumps, coolers, duplex oil filters, connecting piping and necessary load & remote indicating instruments. Each lube oil pump and cooler shall have a 100% identical stand-by.

1. 2 Complete GYPSUM DEWATERING SYSTEM

Each set of dewatering equipment shall comprise of the following items as a minimum requirement:

a. One set of primary hydro-cyclones
b. One no. vacuum belt filter
c. One no. vacuum receiver
d. One no. vacuum pump
e. Complete piping and valves for the system along with wash water line.

1.3 SUMP PUMPS

The employer shall provide sumps of adequate capacity in each of the following area:

A. Each Absorber Area
B. Limestone Grinding and Slurry Preparation system
C. Gypsum dewatering system

1. 4 TOOLS & TACKLES& MANDATORY SPARES, COMMISSIONING SPARES

The vendor shall furnish a complete new set of all special tools and tackles, mandatory spares, commissioning spares of reputed make and model which are required for erection, ease in maintenance to have minimum down time, testing and calibration of all the equipments and systems to be provided by the vendor under this specification for the above mechanical items.

1.5 AGITATORS

All slurry tanks and sumps shall be provided with mechanical agitators with adequate redundancy as specified in the respective clauses. The design of the agitators shall be of proven type.
The shaft and blades of the agitators shall be of stainless steel or Nickel alloy suitable to the service condition. Alternatively, the blades can also be provided with rubber lining with a minimum life of 2 years

1.6 APPROACH AND HANDLING FACILITIES

Proper approach shall be provided for access to all equipments during normal operation and maintenance. Unless otherwise specified, platforms, staircase and ladders shall follow the stipulations in the civil section of this specification.

Equipments requiring monitoring during regular operation shall be approachable from the ground floor through staircase. Staircase with a minimum width of 1000 mm shall be provided for approach to elevated structures at above 5 m height from the nearest platform. Below this height a vertical ladder with a minimum clear width of 600 mm may also be acceptable.

3.3 Electrical & C&I spec

1.0 ELECTRICAL

1. The complete Electrical system design shall be as per NTPC specification

2. The vendor shall comply with all codes and standards given in NTPC specification enclosed.

3. The vendor shall provide basic design of electrical equipments.

4. The vendor shall submit detailed design calculation of electrical drives, number of HT and LT drives, cable sizing selection of HT and LT Motors.

5. Provide detailed list of engineering documents to be submitted to NTPC for approval / information.

6. Providing engineering drawings, Single line diagram of complete electrical system, Electrical layout drawings, control room layout drawings, Single line diagram of switchgear panel, cable schedule, operation and maintenance manuals, etc. for NTPC approval and obtain NTPC approval.

7. The vendor is responsible for the complete electrical system design of the FGD and its associated systems and shall clearly propose in his offer, the materials which he intends to supply and the materials which BHEL has to procure & supply.

8. For the materials which BHEL has to procure & supply, vendor shall provide detailed technical specification and BHEL will procure and supply based on the detailed technical specification provided by vendor. BHEL will forward the datasheets and drawings of those materials to vendor for approval.

9. The vendor shall be responsible for integration of all these materials / equipments at site and prove the performance of the system.

10. The vendor shall provide detailed presentation to BHEL, explaining the

    a. Basic concepts of the FGD system.
    b. Design philosophy
    c. Selection of Equipments
    d. Integration
    e. Testing
    f. Performance evaluation etc.

11. The vendor shall submit O&M manuals of FGD plants, supplied earlier by the vendor for BHEL reference purpose.

12. The vendor shall arrange to visit similar FGD plants supplied earlier for evaluation & understanding purpose.

13. The vendor shall make sufficient visits to BHEL/NTPC/SITE for obtaining necessary approvals from NTPC.

2.0 CONTROL & INSTRUMENTATION

1. The complete Control & Instrumentation system design shall be as per NTPC specification. The vendor shall comply with all codes and standards given in NTPC specification enclosed.

2. The vendor shall provide basic design of Control & Instrumentation system.

3. The vendor shall submit detailed P&ID diagram of the system, showing all the instruments with KKS tagging.

4. The vendor shall provide the list of instruments with range set point details etc.

5. Providing engineering drawings, Single line diagram of complete C&I system, interconnecting cable schedule, operation and maintenance manuals, etc. for NTPC approval and obtain NTPC approval.

6. The vendor is responsible for the complete control & instrumentation system design of the FGD and its associated systems and shall clearly propose in his offer, the materials which he intends to supply and the materials which BHEL has to procure & supply.

7. For the materials which BHEL has to procure & supply, vendor shall provide detailed technical specification and BHEL will procure and supply based on the technical specification. However, the responsibility of the performance of the equipments shall be with the vendor.

8. Programmable logic controller (PLC):

The number of PLC's for the complete FGD and its associated systems shall be as per NTPC specification enclosed.

In case, if vendor proposes BHEL to procure and supply PLC, then the vendor shall give detailed technical specification of the complete PLC system for FGD and associated systems for procurement of PLC.

The detailed specification shall contain the following as minimum.

a. Basic description of FGD and associated sytems
b. Basic PLC design of PLC and associated systems.
c. PLC specification.
d. Memory requirement
e. Number of Analog & Digital I/O's.
f. Redundancy features
g. Logic sequence applicable for this project.
h. Ladder diagram applicable for this project.
i. Instrument schedule applicable for this project.
j. Drive schedule applicable for this project.
k. Set points applicable for this project.
l. Alarm/Trip points applicable for this project.
m. Interlocks applicable for this project.

Vendor shall inform BHEL for any interface requirements such as boiler load signal, ID Fan signal etc, DCS interface details which is required for the satisfactory performance of the PLC. BHEL will co-ordinate with concerned agencies and obtain those details and forward it to vendor.

The vendor shall be responsible for integration of all these materials at site and prove the performance of the system.

3. 4 GGH Specification

The Gas to Gas heater design shall be as per the Customer specification and the selection data given by the FGD system designer.

In addition to the above the following requirements shall also be met by the GGH supplier.

1) Scope of supply & Exclusions:

A) Supplier's scope shall cover **Complete GGH** flange to flange including sub-systems, Start-up Spares and Special tools as given below.

a) Complete GGH including Rotor, Rotor seals, Heating elements, Housing, Connecting plates, Rotor drive including Air motor, Guide bearing, Support Bearing (Spherical roller thrust bearing), retractable combination Cleaning devices (water and steam) with local control panel, low leakage system, rotor stoppage alarm, Erection and O&M manuals etc.

b) Air sealing system including fan with motor, Mounting skid, electric heater and piping.

c) Purge / Scavenging system including fan with motor, duct work, dampers etc.

d) High-pressure water pump with motor etc for Multi media cleaning device.

e) Motor starters, controls, instruments, cables, conduits etc.

f) Flake glass/ Hast alloy lining including application at site.

g) Special tools including Hydraulic jacks.

h) Erection and start-up spares.

i) Supervision of both Erection and commissioning. (No of days required and per-day rate to be indicated).

j) Any other items required for completeness of the GGH equipment except the items covered in the exclusions.

B) Vendor to quote for the Mandatory Spares for GGH if called for in the Customer specification.

C) Exclusions:

a) Insulation and lagging material.

b) Walkways, platforms and ladders.

c) Support steel.

d) Element handling hoists.

2) The following documents shall be submitted along with the offer.

a) Performance data sheet for GGH.

b) Filled in guarantee values as per Table-I.

c) Scope of supply / Deviations.

d) Vendor to fill the data sheets as given in the customer specification.

e) Equipment data sheet for GGH indicating the materials of construction for various parts like rotor, post, elements, various seals, housing, connecting plates, sector plates etc and size of equipment, rotor rpm, element details, cleaning device

details, type of lining, lining material, area & thickness of lining, area & thickness of insulation etc.

f) Equipment data sheets for sub-systems including i) High pressure pump and motor, ii) Seal air system fan, motor and electric heater, iii) Purge system fan, motor and dampers etc. Vendor shall indicate type/model, make, quantity, Kw, rpm, weight, pressure etc.

g) Equipment drawing with overall dimensions and the inlet and outlet flange connection details.

h) Utility requirements i.e. consumption of power, compressed air, instrument air, water, steam, etc as per Table-II.

i) Complete P & I diagram showing all the components / instruments with necessary write-up and control logic and electrical drive list.

j) Loading details (static and dynamic) indicating the loading points for GGH and all auxiliary equipment of GGH for carrying out the civil works.

k) Complete weight schedule of the GGH equipment and auxiliaries.

l) List of special tools and Start-up spares.

m) List of essential spares for 3 years operation.

n) Manufacturing quality plan.

o) Painting scheme indicating items to be painted, type of paint, no of coats, coating thickness etc.

p) List of lubricants with quantity for initial filling.

q) Any other details pertaining to GGH.

3) General

a) Supplier shall use the MKS units in their offer documents.

b) The motors shall be suitable for the power supply of 415V, 3phase, 50Hz and other equipments to suit 230V, 1phase, 50Hz.

c) Erection manuals and O&M manuals shall be submitted after the award of the contract.

d) Filled-in data sheets for LT Motors, Pump, and Blowers/fans etc shall be submitted after the award of the contract.

e) The minimum material requirement for the following components shall be as given below:

- Rotor & Baskets: Corten or higher grade material.
- Rotor casing: Carbon steel + lining.
- Connecting ducts: Carbon steel + lining.
- Heating element: Enameled on de-carburized steel.

f) Seal air fan skid shall be suitable for mounting at GGH elevation on steel structures.

g) All the drawings required for the erection and maintenance of the equipments supplied shall be furnished after the award of the contract.

h) All the drawings and documents shall be supplied both in hard and soft copies.

i) All the bought-out items supplied shall be of reputed make and shall confirm to applicable international standards.

j) Despatchable units/ Shipping component details indicating quantity, weight and size shall be submitted after the award of the contract.

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4) Guarantee Parameters

Vendor shall guarantee the equipments performance, auxiliary power consumption and utility consumption as per Table-I.

Table - I

Schedule of Guarantees for GGH

Sl No	Parameters	Guaranteed Value per GGH
01	Outlet temperature of treated gas, ºC	:
02	Outlet temperature of untreated gas, ºC	:
03	Leakage from Untreated to treated side in Kg/hr.	:
04	a) GGH Power Consumption for Main drive motor (at the inlet of motor), Cleaning device motors etc in Kw (list to be furnished in Utility requirements)	
	b) Power consumption for other equipments like Seal air fan motor, electric heater for seal air, purge system fan motor, high pressure pump motor etc in Kw (list to be furnished in Utility requirements)	:
	c) Total power in KW	:
05	Steam consumption in kg/hr at pressure in ata and temp in deg C.	
06	Compressed Air consumption, Nm^3/hr @ pr	:
07	Instrument Air consumption, Nm^3/hr @ pr	:
08	Water Consumption, m^3/hr @ pr a) On Line b) Off Line	
09	Duration of Guarantee for the complete GGH system	: 18 months from Commissioning

Table-II

Schedule of Utilities required for GGH

Sl No	Requirements	No / GGH	
Equipment			**Qty / GGH**
Service water at low Pressure 5 kg / cm^2 (g)			**m^3 / hr**
01	Water Washing - Hot & Cold End		
Service water at high Pressure ____ kg/cm^2(g)			**m^3 / hr**
02	Water Washing - Hot & Cold End		
Service air at 6.33 kg / cm^2 (g)			**N m^3 / min**
03	Auxiliary drive - Air Motor		
Steam at ___ kg/cm^2 (g) & ____ °C superheat			**kg / hr**
04	Cleaning devices - Hot & Cold End		
	(Cleaning Duration : ___ minutes per pass)		
Electrical			**Rating**
L T Motors : 415 V, 3 Ph, 50 Hz, AC			**KW**
05	Main Drive Motor		
06	Cleaning device Motors – Hot & cold end		
07	Seal Air Fan Motor		
08	Purge System Fan Motor		
09	High Pressure Pump Motor		
Other Equipment : 230 V, 1 Ph, 50 Hz, AC			**KW**
10	Light Assembly		
11	Rotor Stoppage Alarm		
12	Solenoid Valve		
13	Seal air electric heater		

3.5 Quality requirements

Sl no	Item description	Quality requirements
01.	**Mill**	• Raw materials ,chemical & mechanical ,UT& MPI/LPI - For Shaft ,couplings, pinion bottom races & other rotating parts • Wear resistance parts chemistry, hardness ,microstructure and UT/RT after SR, • Butt welds RT & MPI • Dimensions • Run test • Casting /forgings UT/RT • Assy & functional check • Gear Box ,Oil temperature ,Noise, Vibration
02.	**Feeders**	• Raw materials chem.& mechanical • Welds MPI • Routine test as per IS • Raw materials TC for Casing, pulley, Shafts • Calibration check on feeders • Dimensional check and Functional check • Noise/Vibration etc
03.	**Piping ,Valve**	• Hydro test of valves (Body & Seat leak test) • Fundamental check • NDT on valves as per relevant IS • Raw Materials TC verification
	Tank/Vessels	
04.	**Atmospheric Tank**	• All welds DP test • Hydro test of tanks • Raw materials TC • Dimensional check
05.	**Pump**	• UT-on shaft forgings(equal to greater than40 mm diameter) • MPI/DP on impeller /shaft welds • Hydro test of pump casing • Pump rotating parts Static / Dynamic balancing • Performance test of pumps • Raw materials chemical & mechanical • Pump Performance Test • Noise , Vibrations
06.	**Structures, Ducts, Hoppers**	• All materials chemistry & mechanical plate > 40 mm UT • Welds: Butt welds 100% RT/ UT (t >32 mm) • 10% RT (Pl t <25>32) • 10%MPI/LPI (t < 25 mm)
07.	**Actuator**	• Approval of suppliers QP • Raw Materials • Dimensions • Assy & Performance • Vendor QP approval required
08.	**GGH**	• Approved supplier QP • Raw materials chem. & mech, soundness forgings & castings *RT/UT • Welding NDT (Butt welds: UT/RT: Fillet Welds:

		PT/MT as applicable) • Dimensions • Assy checks • Vendor QP approval required
09.	Absorber	• Raw materials chem. & mech • Nozzle raw materials, dimensions & performance check • Lining materials chem. & mech • Hydro Test • Weld NDT(Butt welds: UT/RT: Fillet Welds: PT/MT as applicable) • Vendor QP approval required
10.	Agitators	• Raw materials TC • Dimension check • Assy functional check • Bought items TC verification as spec • Vendor QP approval required
11.	Slurry Pumps	• Approved QAP • Pump raw materials • Hydro test of pump casings • Performance test of pumps • Vendor QP approval required
12.	Hydro cyclone	• Approved vendor QP • Raw materials TC • Dimensions • Functional checks • Vendor QP approval required
13.	Vacuum belt filter	• Raw materials • Functional checks • BOI TC verification as P.O. • Vendor QP approval required
14.	Vacuum Pumps	• Raw materials • Pump performance check • Vacuum ability check • Vendor QP approval required
15.	Horizontal centrifugal pumps	• Raw materials • Hydro test of casing • Performance test of pumps • Vendor QP approval required

Note:

1. Customer / client inspection requirement will be communicated during technical discussion with FGD vendor
2. Additional quality requirements if any will be communicated during technical discussion with FGD vendor

STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR (ESP) PACKAGE FOR BONGAIGAON THERMAL POWER PROJECT (3 X 500 MW)
BID DOCUMENT NO. CS-4610-101-2
(Experience List of Bidder/His Sub Vendor - Applicable to all the Bidders)

We, hereby furnish the data on proveness criteria for critical equipment, auxiliaries, systems, and Bought Out Item (such as PA, ID and FD Fans, Coal Pulverizes, Raw Coal feeders, Air Preheaters, Mill Reject Handling System, ID Fan motor, Auxiliary boiler and Gas to Gas Heat Exchangers, Wet-Limestone Grinding mills, Lime stone slurry pumps for the flue Gas Desulphurisation system, Power cycle piping, C&I equipment/systems, Electrostatic Precipitator, Electrostatic Precipitator Transformer Recitifier Set, Wet-Limestone based flue Gas, Desulphurisation system) which have been manufactured and supplied by us (manufactured / sub-vendors) and these are in successful operation in atleast one (1) coal fired plant for a period not less than one (1) year on date of bid opening. The details of type and minimum equipment rating of such equipment are given below :

S. No.	Item Description	Station-I	Station-II
K.	**Wet Lime stone Based Flue Gas Desulphurisation system (FGD)**		
1.00.00	Name of the station and location		
1.01.00	Client name and his address		
	Fax No.		
	e-mail id		
	website address		
1.01.01	Name and Designation of the responsible person in client's organisation		
1.01.02	Name of the manufacturer & address		
1.01.03	Contract No. & Date		
1.01.04	Capacity in MW of Unit		
1.01.05	Starting date of work		
1.01.06	Scheduled date of completion		

1.01.07	Actual date of completion		
1.01.08	Date of Commissioning of FGD system/Package		
1.01.09	Whether the FGD system/equipment are in successful operation as on date of bid opening	Yes / No	Yes / No
1.01.10	Whether the FGDs operating in conjunction with pulverized coal fired steam generator. FGD flue gas treatment capacity	Yes / No	Yes / No
1.01.11	Type of FGD supplied in the reference plant		
	- Wet lime stone based system. - Whether Efficiency of FGD is more than 85% - Actual guaranteed dust Sox removal efficiency FGD	Yes / No Yes / No Yes / No	Yes / No Yes / No Yes / No
1.01.12	Scope of work executed by us for the aforesaid FGD set includes the following:		
	a) Designed b) Engineered c) Manufactured d) Erected*/supervised Erection e) Commissioned*/Supervised Commissioned*	Yes / No Yes / No Yes / No Yes / No Yes / No	Yes / No Yes / No Yes / No Yes / No Yes / No
1.01.13	Whether the we limestone based flue gas sulphurisation system has been in successful operation for a period not less than one (1) year as on date of bid opening .	Yes / No	Yes / No

S. No.	Item Description	Station-I	Station-II
L.	**LIMESTONE GRINDING MILLS**		
i)	Name of the station and location		
ii)	Client name and his address		
	Fax No.		
	e-mail id		
	website address		
iii)	Name of the manufacturer & address		
iv)	Date of commission of the Limestone mill		
	(a) (b) (c)		
v	Details of units		
	(a) Capacity in MW of Unit (b) Type & No.Of Absorber tanks per unit (c) No. of limestone mill for FGD per unit/all FGDs of complete station (as applicable)		
(vi)	Brief Technical particulars of the Limestone mill (a) Type		

S. No.	Item Description	Station-I	Station-II
	(b) Size & Model no.		
	(c) Capacity (Tonnes/hr.) (i) Capacity of limestone mill for the reference plant (Tonnes/hr.)under following associated conditions: (bidder to fill in below) a. Limestone fineness (….% through ….mesh) b. Limestone input (….% upto ….mm) c. Bond index of Limestone fineness (…. ….)		
	(ii) Capacity of limestone mill for the reference plant (Tonnes/hr.)under following associated conditions a. Limestone fineness 90% through 325.mesh) b. Limestone input size up to 25 min c. Bond index of Limestone (iii) Bidder to enclose all relevant correction curve for variation in the mill capacity of the reference plant w.r.t parameters indicated at (ii) above		

S. No.	Item Description	Station-I	Station-II
	(d) Details of materials for mill component for the reference plant. (i) Material & Wear Life of water parts Material - Material of liners - Material grinding balls - Wear life of liners - Consumption of grinding balls. (e) Details of limestone quality for the project 1. CaO ————% 2. bond index (.....)		
	(vii) Whether the limestone mill is in successful operation for a period not less than one (1) year as on the date of bid opening	Yes / No	Yes / No

S. No.	Item Description	Station-I	Station-II
M	**GAS TO GAS HEAT EXCHANGER (GGH)**		
i)	Name of the station and location		
ii)	Details of units		
	a) Capacity of each unit (MW) b) No. of Gas to Gas Heat Exchangers per unit/FGD Plant.		
iii)	Client name and his address		
	Fax No.		

	e-mail id		
	website address		
iv)	Name of the manufacturer & address		
v)	Date of commission of the GGH		
(vi)	Brief Technical particulars of the Limestone mill (a) Type (b) Model (c) Size		
	(d) Type of Medium (if any being used for application) & quantity entering GGH(T/hr.) (e) Hot Gas quantity entering GGH(T/hr.) (f) Coal Gas Quantity entering GGH(T/hr.) (g) GGH element material (h) GGH element material life		
(vii)	Whether the GGH is in successful operation for a period not less than one (1) year as on the date of bid opening	Yes / No	Yes / No
N.	**LIME STONE SLURRY PUMPS**		
i)	Name of the station and location		
ii)	No.of units & capacity in MW of unit		
iii)	No.of pumps per unit/FGD plant		
iv)	Client name and his address		
	Fax No.		

	e-mail id		
	website address		
v)	Name and Designation of the responsible person in client's organisation		
vi)	Name of the manufacturer & address		
vii)	Contract No. & Date		
viii)	Starting date of work		
ix)	Scheduled date of completion		
x)	Actual date of completion		
xi)	Date of Commissioning of system/Package		
xii)	Whether the system/equipment are in successful operation as on date of bid opening		
xiii)	Brief scope of work		
xiv)	Brief Technical Particulars (each type) of the - Type & Model - Capacity & Duty condition - Head		
xv)	Whether the Limestone slurry pumps is in successful operation for a period not less than 1 (one) year as on the date of bid opening	Yes / No	Yes / No

 # Bidder to strike off which ever is not applicable

4.2 Data sheet on utilities & Guarantees (FGD vendor to submit along with Technical offer)

S no	Description	BHEL offer to NTPC	Guarantee Condition	Design condition	Additional operating condition
	Category I Guarantee - Attachment 10 A				
1	SO2 removal efficiency of FGD system % (under Guarantee point conditions stipulated in Table 11 of 2.2 FGD input parameters data sheet of Enquiry spec)	95 with 1.5% GGH leakage			
	Category III Guarantee - Attachment 10 B				
5	Noise – All the plant, equipment and systems covered under this specification shall perform continuously with out exceeding the noise level as specified over the entire range of output and operating frequency specified as per clause 8.01.00 of sub section VI of part A, section VI & clause 14.00.00 of part C of section VI	< 85 db			
6	Pressure drop mmWC (under Design point conditions stipulated in Table 12 of 2.2 FGD input parameters data sheet of Enquiry spec & also **xviii of Attachment 10 B (rev 1)**)	320 mm wc			
7	FGD system outlet temperature to suit stack inlet Temperature of 100 deg C (under Design point conditions stipulated in Table 12 of 2.2 FGD input parameters data sheet of Enquiry spec & also **xix of Attachment 10 B (rev 1)**)				
8	Life of Limestone mills wear parts as per clause 8.02.00 (xxiii) (i) sub section VI part A of the technical specification - Guarantee	8000 HRS			
9	Capacity of each Limestone mill as per clause 8.02.00 (xxiii) (ii) sub section VI part A of the technical specification - Guarantee	40 TPH			
10	Limestone mill ball consumption as per **clause 5.04.06 sub section – II M4 of part B of the Technical specification**	700 g/T OF LIMESTONE			
11	Capacity of Vacuum Belt filters as per clause 8.02.00 (xxiv) sub section VI part A of the technical specification - Guarantee	55 TPH			
12	Purity of Gypsum filtered out of vaccum belt filters % as per clause 8.02.00 (xxv) sub section VI part A of the technical specification - Guarantee	90% with 10 % moisture			
13	GGH leakage	Less than 1%			
	Utility parameters				

14	Service Air m3/h				
15	Instrument Air m3/h				
16	Service / Process Water m3/h				
17	Cooling Water m3/h				
18	Potable water				
19	Steam t/h				
20	Waste water				

Note:

1. All utilities are to be furnished with the following operating conditions
   - Normal operation
   - Intermittent operation
   - During shutdown
   - During maintenance
   - During emergency

4.2 Evaluation Data sheet (FGD vendor to submit along with price offer)

S no	Description	Guarantee Condition	Design condition	Additional operating condition
	Category I Guarantee - Attachment 10 A			
1	Limestone Consumption of FGD system KG/hr (under Guarantee point conditions stipulated in Table 11 of 2.2 FGD input parameters data sheet of Enquiry spec & SO2 removal efficiency of not less than 95% with 1.5% GGH leakage) **Per Boiler / for all 3 Boilers**	**AAAA**		
2	Aux Power Consumption – 100 % TMCR KWh/ Boiler – (under Guarantee point conditions stipulated in Table 11 of 2.2 FGD input parameters data sheet of Enquiry spec to be measured as a system as per NTPC spec)	**AAAA**		
3	Aux Power Consumption – 80 % TMCR – KWh (under Guarantee point 2 conditions stipulated in Table 14 of 2.2 FGD input parameters data sheet of Enquiry spec to be measured as a system as per NTPC spec)	**AAAA**		

Note:

1. **AAAA – Evaluation parameters**

CLAUSE NO.	BIDDER'S NAME
	CHAPTER-I : FGD **TECHNICAL INFORMATION / DATA TO BE SUBMITTED ALONGWITH THE BID**
1.00.00	**GENERAL TECHNICAL INFORMATION / DATA DRAWINGS FOR FLUE GAS DESULPHURIZATION SYSTEM**
1.01.00	**Performance Data for FGD**
1.01.01	Characteristic/Correction Curves for Absorber i) Gas flow rate vs SO2 removal efficiency ii) Inlet SO2 concentration vs SO2 removal efficiency iii) Inlet dust concentration vs Dust Removal efficiency iv) Gas Flow Rate vs Pressure Drop v) Inlet Gas Temperature vs. Stack Inlet Temperature vi) Gas Flow Rate vs. Stack Inlet Temperature vii) Gas Flow Rate vs. Water Consumption viii) Inlet Gas Temperature vs. Water Consumption ix) Characteristic curves for the Limestone Pulverizer a) Variation of pulverizer capacity with Limestone Bond Index (other conditions to be defined) b) Variation in Pulverizer Capacity with Limestone Output Fineness (other conditions to be defined)

CLAUSE NO.	BIDDER'S NAME
	c) Energy consumption per tonne through put of pulverizer for varying pulverizer output x) Characteristic curves of the Recirculation Slurry pumps xi) Characteristic curves of the Limestone Slurry pumps xii) Characteristic curves of the Gypsum Bleed pumps xiii) Characteristic curves of the Mist Eliminator Wash Water Pumps xiv) Characteristic curves of the Process Water pumps xv) Characteristic curves of the Filter Water pumps xvi) Characteristic curves of the Vacuum pumps xvii) Characteristic curves of the Sump pumps xviii) Characteristic Curves for Hydro-cyclones
1.02.00	**Supplementary Data for FGD System** i) A complete list of all the equipment requiring the following shall be furnished indicating parameters continuous requirements and the maximum requirement together with schematic diagrams a) Cooling water b) Service air c) Instrument air

CLAUSE NO.	BIDDER'S NAME

d) Number and electrical rating of AC power supply feeders at available voltage for each control instrumentation system in Bidder's scope

ii) Schedule of power consumption .....

iii) Complete schedule of motors giving voltage, phase, KW rating (calculated and installed capacity), service factor etc.

iv) Recommended mode of erection sequence and other relevant particulars in respect of installation of :

a) Structural Steel

b) Rotating Equipment

c) Static Equipment

d) Others

v) Detailed recommended procedures for welding and erection

vi) A comparison and history of all FGDs in service of similar design and size to that proposed including descriptions of operating difficulties.

vii) A complete list of local instruments, sensing devices and control equipment covered in the proposal with type, make, accuracy, range, details, dial size etc. in the Bidder's scope.

viii) Schedule of control valves giving type and make of valves and actuators, size, body and trim material etc. stroke length, stroking time and full technical particulars of valves and their actuators and associated accessories

CLAUSE NO.	BIDDER'S NAME
	ix) Schedule of dampers and vanes with full particulars of dampers and their actuators, (for powered dampers) such as type of actuator, make, torque rating, stroke and stroking time, electrical rating/ pneumatic consumption limit and torque switch position transmitter details x) List of special maintenance tools included in the proposal xi) List of insert panels, control cabinets and local control panels included in the proposal with GA drawings, mounting and output details xii) List of field mounted junction boxes included in the proposal. xiii) List and details of instruments & control items supplied loose for mounting on control panels, including details like type. make, cutout & drawings etc. xiv) Temperature sensors calibration standards xv) List of annunciations giving suggested set values of parameters List of inputs provided for Data Acquisition System xvi) Particulars of prefabricated & other special cables included in Bidder's scope xvii) Write up on FGD internals including spray system, oxidation system, mist eliminators, supporting structures, etc. xviii) Write up on Absorber Auxiliaries like Slurry recirculation pumps, oxidation compressors, gypsum bleed pumps, agitators etc .....

CLAUSE NO.	BIDDER'S NAME
	xix) Write up on operating procedures and control philosophy
	xx) Write up on interlocks and protections
	xxi) Detailed calculations for working out of FGD inlet gas flow, gas temperature, inlet SO2 concentration, SO2 removal efficiency, water evaporation, stack inlet temperature, limestone feed and gypsum bleed. .....
	xxii) Detailed sizing calculation for GGH, slurry recirculation pumps, oxidation air compressors, gypsum bleed pumps, oxidation tank capacity .....
	xxiii) Details of manufacturing and erection tolerances for FGD internals.
	xxiv) Write up on Limestone Grinding System including mills and all auxiliaries like mill circuit pumps, separator tank, agitators, hydro-cyclones etc
	xxv) Write up on Gypsum Dewatering System including Vacuum Belt Filters, hydro-cyclones and all auxiliaries like vacuum receiver, vacuum pump, vacuum breaker, agitators, etc
	xxvi) Write up on Waste Water Treatment System including all auxiliaries like hydro-cyclones, pumps, neutralization system, etc
	xxvii) Write-up on Handling System for Heavy equipments as per specification
1.03.00	**Drawings**
	i) General arrangement drawing (Plan and elevation) with appropriate dimensions

CLAUSE NO.	BIDDER'S NAME

ii) Layout of FGD structural steel columns. These shall indicate the size of members and main dimensions, with design loadings and all lifting facilitate for purposes of maintenance.

iii) Arrangement of platforms, walkways and galleries

iv) Schematic diagram indicating terminal points and instrumentation & controls included in Bidder's scope and suggestive scheme for flue gas system, limestone grinding system and gypsum dewatering system indicating, pipe duct size (OD's and ID's) operating parameters, maximum fluid velocities, water balance, insulation thickness and material specification etc.

v) Location plan - Details of location and arrangement scheme of columns embedment and fixing details, size of pedestals, levels blockouts & anchor bolts. and channels indicating scope of supply by equipment supplier

vi) Loading on foundations : .....
Axial load, bending moments and shear forces transmitted to foundations of following loading combinations separately.

a) Dead load

b) Live load

c) Wind load

d) Seismic load

vii) Complete bracing arrangements for FGD supporting structures and combinations of (+v) and (-v) forces for the seismic or wind (whichever is governing)

viii) Percentage of live load considered for calculating wind and seismic forces

CLAUSE NO.	BIDDER'S NAME		
	ix) Recommended size and general arrangement of FGD control room in plan and sections along with its location plan.		
	x) Schedule of heat load for air conditioning		
	xi) Gas distribution system	.....	
	xii) Absorber, Slurry spray system, mist eliminator and washing system including support details		
	xiii) Oxidation Tank and oxidation nozzle including support details and location of agitators, level indicators and other instruments		
	xiv) Weather proof enclosure and lifting		
	xv) Schematic diagram controls and diagrams		
	xvi) Interconnecting wiring diagrams		
1.04.00	**Predicted Performance**	**Guarantee point Design coal (Blended)**	**Design point Worst coal (Blended)**
	i) Coal fired (kg/hr.)		
	ii) Gas Flow at Inlet to GGH (kg/hr.)		
	Gas Flow at Inlet to GGH (m3/hr.)		
	Gas Flow at Inlet to GGH (Nm3/hr.)		
	iii) Gas Temperature at Inlet to GGH (oC)		
	iv) Gas Pressure at Inlet to GGH (mmwc)		
	v) Gas Flow at Inlet to Absorber (kg/hr.)		
	Gas Flow at Inlet to Absorber (m3/hr.)		
	Gas Flow at Inlet to Absorber (Nm3/hr.)		

CLAUSE NO.	BIDDER'S NAME
	vi) Gas Temperature at Inlet to Absorber (oC) vii) Gas Pressure at Inlet to Absorber (mmwc) viii) Gas Flow at Absorber Outlet (kg/hr.) Gas Flow at GGH Cold Gas Outlet (m3/hr.) Gas Flow at GGH Cold Gas Outlet (Nm3/hr.) ix) Gas Temperature at Absorber Outlet (oC) x) Gas Flow at GGH Cold Gas Outlet (kg/hr.) Gas Flow at GGH Cold Gas Outlet (m3/hr.) Gas Flow at GGH Cold Gas Outlet (Nm3/hr.) xi) Gas Temperature at GGH Cold Gas Outlet xii) Gas Pressure at GGH Cold Gas Outlet (mmwc) xiii) Gas Flow at Stack Inlet (kg/hr.) Gas Flow at Stack Inlet (m3/hr.) Gas Flow at Stack Inlet (Nm3/hr.) xiv) Gas Temperature at Stack Inlet (oC) xv) Gas Pressure at Stack Inlet (mmwc) xvi) GGH leakage (kg/hr) xvii) GGH leakage (% of inlet hot gas flow)

CLAUSE NO.	BIDDER'S NAME
	xviii) Inlet SO2 concentration (mg/Nm3) xix) Outlet SO2 concentration (mg/Nm3) xx) SO2 removal efficiency (%) xxi) Inlet Dust Burden (mg/Nm3) xxii) Outlet Dust Burden (mg/Nm3) . xxiii) Limestone Consumption (kg/hr) xxiv) Ca/S Molar Ratio (Based on Inlet Gas SO2) xxv) Gypsum Produced (kg/hr) xxvi) Oxidation Air Flow (kg/hr.) xxv) Excess Air over stoichiometric requirement (%) xxvi) Water Consumption (m3/hr) a) Mist Eliminator Wash Water b) Make-up Water c) Limestone feed d) Gypsum Carry over e) Waste Water xxvii) Recirculation Slurry Flow (m3/hr) xxviii) Recirculation Slurry Solid Concentration (% w/w) xxix) L/G Ratio xxx) Surry pH xxxi) Limestone Slurry Solid Concentration (% w/w) xxxii) Gypsum Bleed Solid Concentration (% w/w)

CLAUSE NO.	BIDDER'S NAME					
	xxxiii)	SO_2 removal efficiency with one spray level out of service (for multiple levels of spray) OR SO_2 removal efficiency with one spray pump out of service (for single level spray)				
	xxxiv)	Waste Water Analysis				
	xxxv)	Lime consumption for waste water neutralization (kg/hr.)				
2.00.00	**EQUIPMENT DATA**					
2.01.00	**Gas Ducts**		**GGH Hot Gas Inlet**	**GGH to Absor-ber**	**Absor-ber to GGH**	**Absor-ber Bypass Duct**	**GGH to stack**
	i)	Cross Sectional Area (m2)	.....	.....	.....	.....	.....
	ii)	Dimensions (m x m x m)	.....	.....	.....	.....	.....
	iii)	Material / Thickness (mm) of Duct	.....	.....	.....	.....	.....
	iv)	Material / thickness (mm) of Lining	.....	.....	.....	.....	.....
	v)	Method of lining (Lining / Cladding / Wallpaper)	.....	.....	.....	.....	.....
	vi)	Estimated Life of liners (hrs.)	.....	.....	.....	.....	.....
	vii)	Max. Velocity through ducts at 100% BMCR (DC/WC/BC whichever gives the max. velocity) (m/s)	.....	.....	.....	.....	.....
2.02.00	**Guillotine Gates**		**Inlet Gate**		**Outlet Gate**		**Bypass Gate**
	i)	Manufacturer	.....		.....		.....
	ii)	Size (m x m)	.....		.....		.....

CLAUSE NO.	BIDDER'S NAME			
	iii) Material / Thickness of			
	a) Plate	.....	.....	.....
	b) Frame	.....	.....	.....
	c) Seals	.....	.....	.....
	iv) Actuator Type	.....	.....	.....
	v) Actuator Rating (KW)	.....	.....	.....
	vi) Sealing Efficiency (without Seal Air fans) (%)	.....	.....	.....
	vii) No. of Seal Air Fans provided	.....	.....	.....
	viii) Sealing Efficiency with Seal Air fans (%)	.....	.....	.....
	ix) Seal Air Fan Flow / Head (M3/hr./mmwc)	.....	.....	.....
2.03.00	**Absorber**			
	i) Manufacturer	.....		
	ii) Manufacturer's model number	.....		
	a) Absorber Cross Sectional Area (m2)	.....		
	b) Absorber Dimension (mxmxm) (Width x Depth x Height) or (Dia x Height)	.....		
	c) Oxidation Tank Dimension (mxmxm) (WidthxDepthxHeight) or (Dia x Height)	.....		
	d) Height between support level to top of support steel (m)	.....		
	iv) Number of spray levels (Working + Stand-by)	.....		
	v) Number of spray nozzles per spray level per boiler	.....		

CLAUSE NO.	BIDDER'S NAME		
	vi)	Number of redundant spray nozzles per level	.....
	vii)	No. of slurry pumps per spray level	.....
	viii)	Maximum slurry flow (m3/hr)	.....
	ix)	L/G Ratio	.....
	x)	No. of agitators	.....
	xi)	No. of redundant agitaors	.....
	xii)	No. of oxidation nozzles	.....
	xiii)	No. of redundant oxidation nozzles	.....
	xiv)	Guaranteed SO2 removal efficiency (%)	.....
	xv)	Dust Removal Efficiency (%)	.....
	xvi)	Guaranteed pressure drop across Gas System (mmwc)	.....
	xvii)	Guaranteed Stack Inlet Temperature (oC)	.....
	xviii)	Limestone Consumption (kg/hr)	.....
	xix)	Gas velocity through Absorber (M/sec)	.....
	xx)	Gypsum Residence time (sec) in oxidation Tank	.....
	xxi)	Aspect ratio	.....
	xxii)	Proposed standard for conducting the performance tests	.....
	xxiii)	SO2 removal efficiency with one spray level out of service (for multiple levels of spray) OR SO2 removal efficiency with one spray pump out of service (for single level spray)	

CLAUSE NO.	BIDDER'S NAME

xxiv)	SO_2 removal efficiency with max. SO_2 concentration (from the range of specified coals) (%)			
xxv)	Slurry pH under conditions xxiv)			
xxvi)	Limestone consumption under conditions xxiv) (kg/hr.)			
xxvii)	Gypsum flow under conditions xxiv) (kg/hr.)			
xxviii)	Material / Thickness (mm) of		Base Material	Lining
	a)	Absorber and lining		
	b)	Wet Dry Interface and lining		
	c)	Oxidation Tank and Lining		
	d)	Absorber Inlet Duct and Lining		
	e)	Absorber Outlet Duct and Lining		
	f)	Mist Eliminators		
	g)	Mist Eliminator Was Water Header and Nozzles		
	h)	Spray Headers		
	i)	Spray Nozzles		
	j)	Oxidation Nozzles		
	k)	Oxidation headers		
	l)	Internal Supporting members of absorber, spray piping, mist eliminators etc.		
xxix)	Type of lining for absorber and ducts (Lining / Cladding / Wallpaper)			
xxx)	Design pressure (mmwc)		.....	
xxxi)	Design temperature (deg C)		.....	

CLAUSE NO.	BIDDER'S NAME
	xxxii) Max. temperature with stand capacity and duration (oC)
	xxxiii) Number of inspection doors .....
	xxxiv) Dimensions of access openings of inspection doors (mm x mm)
	xxxv) Emergency Storage tank Capacity (hrs. of operation)
	xxxvi) Spray Nozzle
	a) Make / Model
	b) Type
	c) Spray cone angle
	xxxvii) Oxidation Nozzles
	a) Make / Model
	b) Type
	xxviii) Spray Header Diameter (mm)
	xxix) Oxidation Header Diameter (mm)
	xxx) Distance between two consecutive spray levels (mm)
2.04.00	**Gas-Gas heater**
2.04.01	Regenerative Gas Gas heater
	i) Manufacturer
	ii) Type
	iii) No. of GGH per boiler
	iv) Mounting
	v) Flue gas temperature at GGH Cold Gas Outlet (oC) (Corrected) (TMCR/50% TMCR)

CLAUSE NO.	BIDDER'S NAME

vi) Acid dew point for Dirty Gas and Clean Gas (Furnish curves)

vii) Material Specification and thickness (mm)

a) Cold end elements

b) Intermediate elements

c) Upper hot element

d) Shaft

e) Seals

f) Sector Plate

g) Casing

h) Rotor

	No. of Baskets	Height of elements (mm)	Description	Thickness (mm)

viii) Elements thickness/height (mm/mm) details for GGH

a) Cold end elements

b) Intermediate elements

c) Upper hot element

ix) Areas of elements

a) Hot end (M2)

b) Intermediate (M2)

c) Cold end (M2)

x) Total effective heating surface (m2)

CLAUSE NO.	BIDDER'S NAME

		Design Coal	Worst Coal
xi)	Pressure drop at 100% BMCR (mmwc)		
	a) Hot Gas Side		
	b) Cold Gas Side		
xii)	Type of radial seals	.	
	a) Hot end		
	b) Cold end		
xiii)	Type of circumferential seals		
xiv)	Type of axial seals		
xv)	Net free area for		
	a) Hot Gas flow (M2)		
	b) Cold Gas flow (M2)		
xvi)	Electric motor drive		
	c) Motor speed (rpm)		
	d) Motor nameplate rating (kW)		
xvii)	Speed reducer		
	a) Type		
	b) Speed ratio		
	c) Shaft power (kW)		
	d) Manufacturer		
xviii)	Emergency drive		
	a) Type		
	b) Shaft power (kw)		

CLAUSE NO.	BIDDER'S NAME

c) Speed (rpm)

d) Pressure (kg/cm2) (abs) and flow requirement of air (m3/sec)

xix) Bearings

a) Manufacturer

b) Type

c) Type of lubrication

d) Lube oil circulation ratio

xx) Bearing Cooling Water requirement (m3/hr)

a) Quantity (M3/hr)

b) Inlet pressure (Kg/cm2)

c) Pressure drop (kg/cm2)

d) Temperature rise (deg. C)

xx) Construction features

a) Seal plate adjustment external (Yes/No)

b) Automatic Seal Plate Adjustment (Yes/No)

c) Coupling : Flexible (Yes/No)

d) Lubrication :Forced (Yes/No)

e) Rotor guide bearing :Hot end (Yes/No)

f) Drive : Motor/Manual (Yes/No)

xxi) Accessories provided

a) Lube oil pumps (Yes/No)

b) Oil coolers (Yes/No)

c) Oil filters (Yes/No)

CLAUSE NO.	BIDDER'S NAME		
	d)	Oil tanks	(Yes/No)
	e)	Oil pumps	(Yes/No)
	f)	Support legs & foundation bolts	(Yes/No)
	g)	Coupling guards	(Yes/No)
	h)	Solenoid valve (air motor)	(Yes/No)
	i)	Air pressure adjusting device	(Yes/No)
	j)	Relief valve	(Yes/No)
	k)	Pressure gauges	(Yes/No)
	l)	Temperature gauges	(Yes/No)
	m)	Differential pressure gauges	(Yes/No)
	n)	Sight flow fittings	(Yes/No)
	o)	Main drive motor	(Yes/No)
	p)	Air motor	(Yes/No)
	q)	Valves (Yes/No)	
	r)	Barring device	(Yes/No)
	s)	Recommended maintenance tools	(Yes/No)
xxii)	Seal Air Fans (if provided)		
	a)	Make/Model	
	b)	Rated Flow (mmwc)	
	c)	Rated Head (mmwc)	
	d)	Rated Power (KW)	
	e)	Motor Rating (MW)	
xxiii)	GGH Leakage with Seal Air Fans in service (%)		
xxiv)	GGH leakage without seal air fan in service (%)		

CLAUSE NO.	BIDDER'S NAME		
	xxv) Reference drawing Nos.		
2.04.02	Heat Pipe Type GGH (as applicable)		
	i) No. of GGH		
	ii) Type		
	iii) Make/Model		
	iv) Manufacture		
	v) Mounting		
	vi) Heat Carrying Fluid		
	vii) Tube Pressure (kgf/cm2)		
	viii) Tube Circulation Ratio		
	ix) Circulation Type (Neutral/Pumped)		
	x) Heat Transfer Area		
	a) Hot Gas Side (m2)		
	b) Cold Gas Side (m2)		
	xi) Fin Details	Hot Gas	Cold Gas
	a) Type		
	b) Pitch (mm)		
	c) Height (mm)		
	d) Material		
	e) Thickness (mm)		
	xii) Tube Side Details		
	a) Tube Material		
	b) Thickness (mm)		
	c) Arrangement (In line/staggered)		
	d) Pitch (Transverse/Axial)		

CLAUSE NO.	BIDDER'S NAME
	e) Length (mm) f) Number xiii) Dimensions (m x m x m) (W x D x H) xiv) Net Free Area (m2) xv) Flue Gas Temperature at GGH Cold Gas Outlet (oC) xvi) Heat Transfer Coefficient (W/m2 - oC) xvii) Acid Dew Point for Dirty Gas & Clean Gas (Furnish Curves) (oC) xviii) Casing Material / Thickness (mm) xix) Circulation Pump (if applicable) a) Number b) Number Working c) Type d) Make / Model e) Rated Flow (m3/hr.) f) Rated Head (mWCi) g) Rated Power(KW) h) Design Pressure (kgf/m2) i) Design Temperature (oC) j) Pump Speed (rpm) k) NPSH available / required (mWCI) l) Power Consumption at Design Point/Guarantee Point (KW) m) Motor Rating (KW) n) Type of Casing

CLAUSE NO.	BIDDER'S NAME
	o) Casing Material
	p) Shaft Material
	q) Impeller Material
	r) Cooling Water Flow (m3/hr.)
	xx) Make-up Source
	xxi) Make-up Consumption (m3/hr.)
	xxii) On-load Cleaning Device
	xxiii) Off-load Cleaning Device
	xxiv) Reference Drg. No.
2.04.03	**GGH Cleaning**
	i) On load cleaning
	a) Type of blower
	b) (Single/multiple
	c) nozzle)
	d) Type of drive (sweep action/ retractable)
	e) Pressure of steam jet (Kg/cm2) (abs)
	f) No. of blowers
	g) Blower head material
	h) Blowing Medium
	i) Blowing pressure
	j) (Kg/cm2) (abs)
	k) Location

CLAUSE NO.	BIDDER'S NAME	
	ii) Off load cleaning	**Water jet/Air Jet**
	a) Provision made for	
	b) off load cleaning	
	c) Type of drive	
	d) Medium used (water/air)	
	e) Pressure of water/air	
	f) required (kg/cm2)(abs)	
	g) Quantity of water/air	
	h) required (m3/hr)	
	iii) Material of construction for the cleaning device	
	a) Links	
	b) Seal plates	
	c) Soot blower lance	
	d) Water jet wash head	
	e) Worm gear	
	f) Swivel joint	
	g) Nozzles (steam/water)	
	h) Air motor impeller	
	i) Air motor casing	
	j) Air motor shaft	
	k) Coupling	
	iv) Pump (if provided)	
	a) Make / Model	
	b) Flow (m3/hr.)	
	c) Pressure (kgf/cm2)	

CLAUSE NO.	BIDDER'S NAME
2.05.00	**Slurry Recirculation Pumps** **(To be indicated for each level)**
	i) No. of pumps
	ii) No. of stand-by pumps
	iii) Manufacturer
	iv) Model
	v) Type
	vi) Rated Capacity
	a) Flow (m3/hr.)
	b) Head (mWCl)
	c) Power (KW)
	d) Efficiency (%)
	e) Slurry Concentration (% w/w)
	vii) Max. Slurry Concentration (% w/w)
	viii) Margin
	a) Flow (%)
	b) Head (%)
	ix) Motor Rating (KW)
	x) Motor Details (volts/H2)
	xi) Speed (rpm)
	xii) Synchronous Motor speed (rpm)
	xiii) Critical Speeds (rpm)
	xiv) Impeller
	a) Impeller type
	b) Impeller Diameters (mm)
	c) Shaft Material/Diameter (mm)

CLAUSE NO.	BIDDER'S NAME
	d) Material / Thickness of Impeller (mm)
	e) Lining Material / Thickness (mm)
	xv) Casing Type
	xvi) Casing Material/Thickness (mm)
	xvii) Casing Liner Materials/ Thickness (mm)
	xviii) Life of Impeller/Casing Liners (hrs.)
	xix) Weight of Rotating Parts (kg)
	xx) Weight of Static Parts (kg)
	xxi) Type of Seal
	xxii) Seal Water Flow (m3/hr)
	xxiii) Cooling Water Flow (m3/hr)
	xxiv) Bearings
	a) Number
	b) Type
	xxv) Type of Coupling
	xxvi) Reference Drg. Nos.
2.06.00	**Absorber Tank Agitators**
	a) No. of Agitators in each absorber
	b) No. of redundant agitators in each absorber
	c) Make / Model
	d) Type

CLAUSE NO.	BIDDER'S NAME
	e) Speed (rpm)
	f) Drive Mechanism
	g) Shaft Material
	h) Material/Thickness of Impeller / Lining (mm)
	i) Power Consumption (KW)
	j) Motor Rating (rpm)
	k) Motor Speed (rpm)
2.07.00	**Oxidation Air Compressors**
	i) No. of compressors
	ii) No. of stand-by compressors
	iii) Manufacturer
	iv) Model
	v) Type
	vi) Rated Capacity
	a) Flow (m3/hr)
	b) Head / Discharge Pressure (mmWCl/kgf/m2)
	c) Power (KW)
	d) Efficiency (%)
	vii) Margin
	a) Flow (%)
	b) Head (%)
	viii) Design Ambient Conditions (Temperature / Relative Humidity) (oC / %)
	ix) Motor Rating (KW)

CLAUSE NO.	BIDDER'S NAME
	x) Motor Details (Volts/H2) xi) Speed (rpm) xii) Synchronous Motor speed (rpm) xiii) Critical Speeds (rpm) xiv) Impeller a) Impeller type b) Diameter (mm) c) Shaft Material /Diameter (mm) d) Material / Thickness of Impeller (mm) xv) Casing Type xvi) Casing Material / Thickness (mm) xvii) Casing Liner Materials / Thickness (mm) xviii) Weight of Rotating Parts (kgs.) xix) Weight of Static Parts (kgs.) xx) Type of Seal xxi) Cooling Water Flow Requirement (m3/hr) xxii) Bearings a) Number b) Type c) Lubrication xxiii) Type of Coupling xxiv) Reference Drg. Nos.

CLAUSE NO.	BIDDER'S NAME		
2.08.00	**Slurry Pumps**	**Limestone Slurry Pump**	**Gypsum Bleed Pump**
	i) No. of pumps for each unit		
	ii) No. of stand-by pumps for each unit		
	iii) Manufacturer		
	iv) Model		
	v) Type		
	vi) Rated Capacity		
	a) Flow (m3/hr)		
	b) Head (mWC)		
	c) Power (KW)		
	d) Efficiency(%)		
	e) Slurry Concentration (% w/w)		
	vii) Max. Slurry Concentration (% w/w)		
	viii) Margin		
	a) Flow (%)		
	b) Head (%)		
	ix) Motor Rating KW		
	x) Motor Details (volts/H2)		
	xi) Speed (rpm)		
	xii) Synchronous Motor speed (rpm)		
	xiii) Critical Speeds (rpm)		
	xiv) Impeller		
	a) Impeller type		
	b) Diameters (mm)		

CLAUSE NO.	BIDDER'S NAME	
	c) Shaft Material /Diameter (mm)	
	d) Material/Thickness of Impeller (mm)	
	e) Lining Material/Thickness (mm)	
	xv) Casing Type	
	xvi) Casing Material/Thickness (mm)	
	xvii) Casing Liner Materials/Thickness (mm)	
	xviii) Life of Impeller/Casing Liners (hrs.)	
	xix) Weight of Rotating Parts (kgs.)	
	xx) Weight of Static Parts (kgs.)	
	xxi) Type of Seal	
	xxii) Seal Water Flow (m3/hr)	
	xxiii) Cooling Water Flow (m3/hr)	
	xxiv) Bearings	
	a) Number	
	b) Type	
	xxv) Type of Coupling	
	xxvi) Reference Drg. Nos.	
2.09.00	**Limestone Grinding and Slurry Preparation system**	**(To be filled for Base Offer and Alternate Offer Separately)**
2.09.01	**Bunker shut off gates**	
	i) Manufacturer	.....
	ii) Type	.....
	iii) Material of the gates	.....

CLAUSE NO.	BIDDER'S NAME	
	iv) Motor rating (KW)	.....
2.09.02	**Down spout**	
	i) Manufacturer	.....
	ii) inside diameter (mm)	.....
	iii) Thickness (mm)	.....
	iv) Height (mm)	.....
	v) Material	.....
	vi) Off set between feeder outlet and centre line of Limestone bunker, if any	.....
2.09.03	**Raw Limestone feeders**	
	i) Manufacturer	.....
	ii) Type	.....
	iii) Feeder size	.....
	iv) Normal capacity (tonnes/hr)	.....
	v) Maximum capacity (tonnes/hr)	.....
	vi) Method of output control	.....
	vii) Speed pulser allowable VA burden	
	viii) Feeder belt width (mm)	.....
	ix) Auxiliary power consumption (KW)	.....
	At 100% BMCR (DC / WC)	
	At 100% TMCR (DC / WC)	
	At 100% BMCR (Best Coal in Range)	
	x) Type of Drive	.....
2.09.04	**Raw coal weighers**	
	i) Manufacturer	.....

CLAUSE NO.	BIDDER'S NAME	
	ii) Model Number	.....
	iii) Method of measurement	.....
	iv) Range of measurement (kg/hr)	.....
2.09.05	**Downspout from feeder outlet to pulverizer**	
	i) Manufacturer	.....
	ii) inside diameter (mm)	.....
	iii) Thickness (mm)	.....
	iv) Material	.....
	v) Height (mm)	.....
	vi) Off set between feeder outlet and centre line of limestone bunker, if any (m)	.....
2.09.06	**Limestone Pulverizers**	
	A. Design Data :	
	i) Manufacturer	
	ii) Type and model	
	iii) Total Number of mills	
	iv) Mill maximum capacity (kg/hr)	
	v) Size of raw limestone at mill inlet (mm)	
	vi) Bond Index of Limestone	
	vii) Fineness of pulverized coal through 325 mesh (%)	
	viii) Pulverizer Speed (rpm)	
	ix) Total Limestone consumption (kg/hr) with all units working at	

CLAUSE NO.	BIDDER'S NAME

x) 100% BMCR (DC/WC/Best of Range)

xi) 100% TMCR (DC/WC/Best of Range)

Number of mills working with all units working at

100% BMCR (DC/WC/Best of Range)

100% TMCR (DC/WC/Best of Range)

xii) Mill loading of working mills (% of maximum capacity) when no of mills as per (I) are operating

xiii) Mill Power Consumption

xiv) Mill Main Motor Rating (KW)

xv) Main Motor (Voltage/H2/rpm)

xvi) Overall dimensions

xvii) Total weight including motor

xviii) Solid Concentration (w/w %) in mill

xix) Method of Classification

xx) Ball Consumption (kg per ton of limestone)

B. Constructional Features

i) Material / Thickness of Mill Wear Liners

ii) Guaranteed Wear Life of Wear Liners

iii) Estimated labour (in man hours) for replacement of wear liners)

CLAUSE NO.	BIDDER'S NAME

iv) Material / Diameter (mm) of Ball

C. Type of drive transmission

a) Make / Model of Gearbox

b) Speed Ratio

D. Type of coupling

E. Pulverizer lube oil system

a) No. of lube oil pumps per pulverizer

b) No. of lube oil pumps working

c) No. of oil coolers per pulverizer

d) No. of oil coolers per working

F. Auxiliary Motor Rating (KW)

G. Mill speed with Auxiliary Motor (rpm)

H. Mill Separator Tank

i) Capacity (m3)

ii) Material/Thickness (mm)

iii) Lining Material/Thickness (mm)

iv) No. of Agitators

I. Mill circuit Pump

i) No. per mill

ii) No. of stand-by pumps

iii) Make/Model

iv) Impeller Type

v) Material/Thickness (mm) of Impeller and lining

CLAUSE NO.	BIDDER'S NAME

vi) Casing Type

vii) Material/Thickness (mm) of Casing/Lining

viii) Rated Flow Head (m3/hr / mWCI)

ix) Slurry Solid concentration (w/w %)

J. Agitators

i) No./Make/Model

ii) Type

iii) Speed (rpm)

iv) Drive Mechanism

v) Shaft Material

vi) Material / Thickness (mm) of Impeller / Lining

vii) Power Consumption

viii) Motor Rating (KW)

ix) Motor Speed (rpm)

K. Hydro-cyclone

i) Make / Model

ii) Number working

iii) Flow Capacity (m3/hr)

iv) Inlet Solid Concentration (% w/w)

v) No. of Hydro-cyclone in each set

vi) No. of spare hydro-cyclone in each set

CLAUSE NO.	BIDDER'S NAME
	vii) Under flow Volume (m3/hr) Solid Concentration (% w/w) viii) Overflow Volume (m3/hr) Solid Concentration (% w/w) ix) Size / Material / Thickness (mm) of base / Lining a) Feed Chamber b) Apex Stopper c) Cone Casing d) Under flow pipe e) Overflow pipe x) Pressure Drop at rated capacity (mmWCI) xi) Design Pressure
2.10.00	**Limestone Slurry Preparation Tank** i) No. of Tank ii) Capacity (m3) iii) Slurry Solid concentration (w/w%) iv) Tank Capacity at 100% BMCR (DC/WC/Best of range) (hrs.) v) Dimensions (WxDXH) vi) Material / Thickness (mm) vii) Lining Material / Thickness (mm) viii) No. of Agitators

CLAUSE NO.	BIDDER'S NAME
	ix) No. of Redundant Agitators
2.10.01	**Limestone Slurry Tank Agitators**
	i) No. of Agitators in each Tank
	ii) No. of redundant agitators in each tank
	iii) Make / Model
	iv) Type
	v) Speed (rpm)
	vi) Drive Mechanism
	vii) Shaft Material
	viii) Material / Thickness (mm) of Impeller / Lining
	ix) Power Consumption (KW)
	x) Motor Rating (rpm)
	xi) Motor Speed
2.11.00	**Gypsum Dewatering System**
	i) No. of Streams
	ii) No. of Streams Stand-by
	iii) Primary Hydro-cyclone
	a) Make / Model
	b) Number working
	c) Flow Capacity (m3/hr)
	d) Inlet Solid Concentration (% w/w)
	e) No. of Hydro-cyclone in each set

CLAUSE NO.	BIDDER'S NAME

f) No. of spare hydro-cyclone in each set

g) Under flow

Volume (m3/hr)

Solid Concentration (% w/w)

h) Overflow

Volume (m3/hr)

Solid Concentration (% w/w)

i) Size (mm) / Material / Thickness (mm)

Feed Chamber

Apex Stopper

Cone Casing

Under flow pipe

Overflow pipe

j) Pressure Drop at rated capacity (mmWCI)

k) Design Pressure (kgf/cm2)

iv) Vacuum Belt Filters

a) Manufacturer

b) Model

c) Dimensions (W x L x H) (m x m x m)

d) Cloth Width (m)

e) Cloth Length (m)

f) No. Working / Stand-by

CLAUSE NO.	BIDDER'S NAME

g) Capacity (Guaranteed)

Gypsum (Dry) (kg/hr)

Gypsum (Slurry) (m3/hr)

h) Inlet Flow
Volume (m3/hr)
Solid Concentration (% w/w)

i) Gypsum Flow (Dry) kg/hr

j) Moisture Removed (%)

k) No. of stages of cake
washing / water flow (m3/hr)

l) No. of stages of cloth
washing / water flow (m3/hr)

m) Design Pressure of Vacuum
Chamber (kgf/cm2/a)

n) Operating Pressure of Vacuum
Chamber (kgf/cm2/a)

o) Material / Thickness (mm)

Casing

Cloth

Gypsum Discharge Hopper

Vacuum Box

p) Life of Cloth (hrs.)

q) Type /Material of Carrying Belt

r) Type / Material of Sealing Belt

s) Life of Carrying Belt (hrs.)

t) Life of Sealing Belt (hrs.)

u) Automatic Cloth Tensioning
Mechanism Provided YES/NO

CLAUSE NO.	BIDDER'S NAME
	v) Vacuum Receiver Tank a) No. of Tank b) Capacity (m3) c) Dimensions (Dia x Height) (mm x mm) d) Material / Thickness (mm) e) Lining Material / Thickness (mm) vi) Vacuum Pumps a) Make / Model b) Type c) No. of Pumps for each Vacuum Belt Filter d) Rated Capacity Flow/ Head/ Power (m3/hr/mWCl/KW) e) Power Consumption (KW) f) Pump Speed (rpm) g) Motor Rating (KW) h) Motor Speed (rpm) i) Margins (Flow / Head) (% / %) j) Operating Pressure (kgf/cm2/a) k) Design Pressure (kgf/cm2/a) l) Material / Thickness (mm) of Base/Lining Casing Shaft Impeller

CLAUSE NO.	BIDDER'S NAME				
	m) Type of Seal				
	n) Sealing Water Flow (m3/hrs)				
	o) Bearing				
	No. of Bearings				
	Type of Bearings				
	p) Type of coupling				
	q) Whether Silencer Provided at Outlet	YES/NO			
	vii) Filtrate Tank				
	a) No. of Tank				
	b) Capacity (m3)				
	c) Dimensions (WxDXH)				
	d) Material / Thickness (mm)				
	e) Lining Material/Thickness				
2.12.00	**Slurry Pipes**		**Recircula-tion Slurry**	**Limestone Slurry**	**Gypsum Slurry**
	i. Pipe size (mm)				
	ii. Type of Joints				
	a) Pipe to Pipe/Pipe to Fittings				
	b) Fittings				
	iii. Material / Thickness (mm) of Pipe				
	iv. Material Thickness of lining				
	v. Estimated Life of liners (hrs.)				
	vi. Slurry Solid concentration (w/w %)				
	vii. Slurry Settling Velocity (m/s)				

CLAUSE NO.	BIDDER'S NAME
	viii. Pipe Velocity (m/s)
2.13.00	**Secondary Waste Water Hydro-cyclone Feed Tank**
	a) No. of Tank
	b) Capacity (m3)
	c) Dimensions (WxDXH) (m x m x m)
	d) Material / Thickness (mm)
	e) Lining Material / Thickness (mm)
2.13.01	**Secondary Waste Water Hydro-cyclone Feed Pump**
	a) No.
	b) No. of stand-by pumps
	c) Make / Model
	d) Impeller Type
	e) Material / Thickness (mm) of Impeller and lining
	f) Casing Type
	g) Material/Thickness of Casing/Lining
	h) Rated Flow/Head (m3/hr./mWCl)
	i) Slurry Solid concentration (w/w %)
2.13.02	**Secondary Waste Water Hydro-cyclone**
	a) Make / Model
	b) Number (working + standby)
	c) Flow Capacity (m3/hr.)
	d) Inlet Solid Concentration (% w/w)
	e) No. of Hydro-cyclone in each set

CLAUSE NO.	BIDDER'S NAME
	f) No. of spare hydro-cyclone in each set g) Under flow Volume (m3/hr.) Solid Concentration (% w/w) h) Overflow Volume (m3/hr.) Solid Concentration(% w/w) i) Size (mm)/ Material / Thickness (mm) of base / Lining a) Feed Chamber b) Apex Stopper c) Cone Casing d) Under flow pipe e) Overflow pipe j) Pressure Drop at rated capacity (mmwc) k) Design Pressure (kgf/cm2)
2.14.00	**Waste Water Tank** i) No. of Tank ii) Capacity (m3) iii) Dimensions (WxDXH) (m x m x m) iv) Material / Thickness (mm) v) Lining Material / Thickness (mm)

CLAUSE NO.	BIDDER'S NAME
2.14.01	**Waste Water Pump** i) No. ii) No. of stand-by pumps iii) Make / Model iv) Impeller Type v) Material / Thickness (mm) of Impeller and lining vi) Casing Type vii) Material / Thickness (mm) of Casing / Lining viii) Rated Flow Head (m3/hrs/mWCl) ix) Slurry Solid concentration (w/w %)
2.15.00	**Sump Pump (for absorber area, limestone grinding area and gypsum dewatering area sumps)** i) No. ii) No. of stand-by pumps iii) Make / Model iv) Impeller Type v) Material / Thickness (mmWCl) of Impeller and lining vi) Casing Type vii) Material/Thickness of Casing/ Lining viii) Rated/Flow Head ix) Slurry Solid concentration (w/w %)

CLAUSE NO.	BIDDER'S NAME
2.16.00	**Absorbent Auxiliary Slurry Sump**
	i) Capacity (m3) Recommended
	ii) Slurry Solid concentration (w/w %)
	iii) No. of Agitators
	iv) No. of Redundant Agitators
2.17.00	**Absorbent Auxiliary Slurry Sump Agitators**
	i) No. of Agitators in Sump
	ii) No. of redundant agitators
	iii) Make / Model
	iv) Type
	v) Speed (rpm)
	vi) Drive Mechanism
	vii) Shaft Material
	viii) Material / Thickness (mm) of Impeller / Lining
	ix) Power Consumption
	x) Motor Rating (KW)
	xi) Motor Speed (rpm)
2.18.00	**Absorbent Auxiliary Slurry Sump Pumps**
	i) No. of pumps
	ii) No. of stand-by pumps
	iii) Manufacturer
	iv) Model
	v) Type

CLAUSE NO.	BIDDER'S NAME
	vi) Rated Capacity a) Flow (m3/hr) b) Head (mWCl) c) Power (KW) d) Efficiency (%) e) Slurry Concentration (% w/w) vii) Max. Slurry Concentration (% w/w) viii) Margin a) Flow (%) b) Head (%) ix) Motor Rating (KW) x) Motor Details (volts/Hz) xi) Speed (rpm) xii) Synchronous Motor speed (rpm) xiii) Critical Speeds (rpm) xiv) Impeller a) Impeller type b) Diameters (mm) c) Shaft Material /Diameter (mm) d) Material / Thickness (mm) of Impeller e) Lining Material / Thickness (mm) xv) Casing Type

CLAUSE NO.	BIDDER'S NAME
	xvi) Casing Material / Thickness (mm)
	xvii) Casing Liner Materials / Thickness (mm)
	xviii) Life of Impeller / Casing Liners (hrs.)
	xix) Weight of Rotating Parts (kgs.)
	xx) Weight of Static Parts (kgs.)
	xxi) Type of Seal
	xxii) Seal Water Flow (m3/hr)
	xxiii) Cooling Water Flow (m3/hr)
	xxiv) Bearings
	a) Number
	b) Type
	xxv) Type of Coupling
	xxvi) Reference Drg. Nos.
2.19.00	**INSULATION AND CLADDING**
	i) Area to be insulated per unit (m2)
	a) GGH Hot Gas Inlet Duct
	b) Absorber Inlet Duct
	c) Absorber
	d) Absorber Outlet duct
	e) GGH Cold Gas Inlet Duct
	f) Absorber Bypass Duct
	g) Stack Inlet Duct
	h) Total

CLAUSE NO.	BIDDER'S NAME		
	ii)	Material	.....
	iii)	Insulating material standard	.....
	iv)	Thickness (mm)	.....
	v)	Density (Kg/M3)	.....
	vi)	Thermal conductivity (Kcal/m/hr/ deg.C) at mean temperature of	
		a) 50 deg. C	
		b) 100 deg. C	
		c) 150 deg. C	
		d) 200 deg. C	
	vii)	Resistive to micro organism	(Yes/No)
	viii)	Incombustibility (Yes/No)	.....
	ix)	Material of skin casing	.....
	x)	Thickness of skin casing	.....
3.00.00	**EQUIPMENT WEIGHT (TOTAL) (in tons)**		
	i)	FGD System	.....
		a) Structural Steel	.....
		b) Absorber and Oxidation Tank casing	.....
		c) Slurry Spray Nozzles and Headers	.....
		d) Oxidation air nozzles and Headers	.....
		e) Mist Eliminators	.....
	ii)	Ducts & Gates	.....
	iii)	Recirculation Slurry Pumps and piping	.....

CLAUSE NO.	BIDDER'S NAME

iv) Oxidation Compressors and piping .....

v) Gypsum Bleed pump and piping .....

vi) Limestone Slurry Pumps and piping .....

vii) Limestone Grinding System .....

a) Feeders

b) Mills

c) Hydro-cyclones and pumps

d) Tanks

e) Structural Steels

viii) Slurry Tank Agitators .....

ix) Gypsum Dewatering System .....

a) Hydro-cyclones

b) Vacuum Belt Filters

c) Vacuum Receivers & Pumps

d) tructural Steel

x) Slurry Pipes & Valves

xi) Galleries, stair ways and walkways .....

xii) Thermal insulation and Cladding .....

xiii) Control and Instrumentation .....

xiv) Others .....

xv) Total estimated weight .....

CLAUSE NO.	BIDDER'S NAME
4.00.00	**DATA FOR REFERENCE PLANTS (USE ONE SEPARATE SHEET FOR EACH REFERENCE PLANT)**
4.01.00	**Power Plant details**
	i) Unit rating (MW)
	ii) Commissioning Date
4.01.01	**Absorber Design**
	i) Design flue gas flow (m3/sec)
	ii) Design flue gas temperature (deg C)
	iii) No. of Absorbers per boiler
	iv) No. of spray levels (working + stand-by) in each absorber
	v) L/G Ratio at Design Point
	vi) Gas velocity at design flow (m/s)
	vii) Minimum redundancy in slurry recirculation pumps
	viii) Height of Absorber (m)
	ix) Guaranteed power consumption (KW)
	x) Max. Inlet Dust Burden (mg/Nm3)
	xi) Guaranteed Outlet Dust burden (mg/Nm3)
4.01.02	**Design fuel**
	i) Fuel Type
	ii) Ash Content (%)
	iii) Moisture Content (%)

CLAUSE NO.	BIDDER'S NAME	
	iv) Gross Calorific value (Kcal Kg)	
	v) Sulphur content (%) in coal	
4.01.03	**SO2 Removal Efficiency**	
	i) Guaranteed efficiency (%)	
	ii) Acceptance test efficiency (%)	
4.02.00	**Availability Data**	
5.00.00	**PROPOSED SUB-CONTRACTORS**	
	i) FGD System	.....
	ii) Structural Steel	.....
	iii) Absorber and Oxidation Tank casing	.....
	iv) Slurry Spray Nozzles	.....
	v) Oxidation air nozzles	.....
	vi) Mist Eliminators	.....
	vii) Ducts	.....
	viii) Gates	.....
	ix) Recirculation Slurry Pumps	.....
	x) Oxidation Compressors	.....
	xi) Gypsum Bleed and Limestone Slurry Pumps	.....
	xii) Limestone Grinding System	.....
	a) Feeders	
	b) Mills	
	c) Hydro-cyclones	
	d) Tanks	

CLAUSE NO.	BIDDER'S NAME
	xiii) Slurry Tank Agitators .....
	xiv) Gypsum Dewatering System .....
	a) Hydro-cyclones
	b) Vacuum Belt Filters
	c) Vacuum Receivers
	d) Vacuum Pumps
	xv) Slurry Pipes .....
	xvi) Slurry Valves .....
	xvii) Galleries ad stair ways .....
	xviii) Internal walk ways .....
	xix) Thermal insulation .....
	xx) Cladding .....
	xxi) Instruments .....

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
129.	VI-B	IIM-01	74 of 104	15.02.04 (i)	(i) Guillotine Gate type: at locations in cl.no.15.02.01 (a), (b), (c), (d), (f) and (g) above	(i) " Guillotine Gate type: at locations in cl.no.15.02.01 (a), (b), (c), (f) and (g) above. (d) will be guillotine gate • or bi-plane damper depending on lay-out.	Refer resolution to Sl. No. 93
130.	VI-B	IIM-01	74 of 104	15.02.04 (ii)	(ii) Bi-plane damper: at location indicated in cl.no.15.02.01 (e) above	(ii) Bi-plane damper: at location indicated in cl.no.15.02.01 (d) and (e) above depending on lay-out.	Refer resolution to Sl. No. 93
131.	VI-B	IIM-01	74 of 104	15.02.05	The dampers mentioned in Clause 15.02.04 (i), (ii) above shall have a guaranteed gas tightness efficiency (on flow) of not less than 99.95% .....without...seal air	The dampers mentioned in Clause 15.02.04 (i), (ii) above shall have a guaranteed gas tightness efficiency (on flow) as follows: • With seal air 100%; • Without seal air 99.3%	BHEL agreed that: i) BHEL shall continue efforts to improve gas tightness efficiency of gates/dampers so as to meet specified requirements. ii) Gas tightness efficiency for the purpose of guarantee to be demonstrated at shop shall be 99.8 to 99.95% for all gates (except PA gate). iii) For PA gate the tightness efficiency shall be minimum 99.6%. iv) For bi-plane dampers, the guaranteed efficiency shall not be less than 99.5%.

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
132.	VI-B	IIM-01	75 of 104	15.02.15 (a)	**Guillotine dampers** The damper sealing efficiency shall be 99.95% on flow without seal air, however with seal air it shall be 100%	For the guillotine gate, the guaranteed gas tightness efficiency (on flow) will be as follows: • With seal air 100%; • Without seal air 99.3%	Refer Sl No. 131
133.	VI-B	IIM-01	76 of 104	15.02.15 (b) (12)	**Multilouver Dampers** The damper sealing efficiency shall be 99.5% on flow without seal air, however with seal air it shall be 100%	For the bi-plane dampers, the guaranteed gas tightness efficiency (on flow) will be as follows: • With seal air 100%; • without seal air 99.3%	Refer Sl No. 131

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
134.	VI-B	VII - Q M-01	12 of 14	1.02.10 (b)	Gas tight dampers shall be subjected to shop leakage test to demonstrate the guaranteed tightness for minimum one damper of each type and size offered	Considering that the dampers are of proven design and have been supplied to various projects (including many NTPC projects), **no shop Leak tightness tests are envisaged** Gate, Biplane dampers and Louver dampers are not considered for leak tightness test.	BHEL explained that withdrawal of test requirement on dampers will help in expediting the project schedule. The type test charges for each size/type/rating of dampers are already covered in Schedule-8B of type test charges. However, BHEL agreed to NTPC for exercising its option of conducting tests during contract stage.
135.	VI-B	II-M-04	4 of 18	2.03.03	The design of the gates shall ensure 99.95% leak tightness without seal air along the duct as well as from the duct to atmosphere.	For the guillotine gate, the guaranteed gas tightness efficiency (on flow) will be as follows: • With seal air 100%; • Without seal air 99.3%	Refer Sl No. 131

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.			
136.	VI-B	II-M-04	4 of 18	2.03.05	The blade and other components.... shall be made of SS317L.....	Suitable material will be selected considering the flow medium and operating conditions.	BHEL informed that material of gate components shall be selected to suit the operating conditions & meeting the specification requirements. BHEL shall furnish the details of the gate during detail engg.
137.	Section-VI PART-B	Sub-section-II : M-04	3 of 18	2.03.02	The gate in the bypass duct shall be of quick opening type to allow bypass to come into operation in case of emergency .	Guillotine gate will be provided in the bypass duct in line with specification. The operating time of gate (opening or closing) will be of the order of 3 minutes.	BHEL clarified that emergency quenching tank with cooling capacity for 15 min. from 300°C has been provided and bypass gate shall be opened after 5 minutes. Based on the above, BHEL requested NTPC to accept the proposal. NTPC agreed.

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
138.	VI-A	IV	7 OF 9	1.11.01	Incoming power supply terminals of LTMCC , ESP MCC/ACP , FGD MCC	For FGD system for all three units we are providing Five LTMCC located in common control room ie.. FGDMCC for Unit1 , FGDMCC for Unit2, FGDMCC for Unit3, Gypsum MCC and Lime stone MCC. NTPC shall arrange 415 V power supply at the input terminals of these MCC.	BHEL's deviation is clarification in nature & is noted.
139.	VI-A	IV	7 OF 9	2.07.00 2.08.00	Air Conditioning system Ventilation system	As per tender Air conditioning and Ventilation of FGD Control room, analyzer room, Gypsum dewatering room , Lime stone handling room is in NTPC scope. The recommended control room layout drawing will be submitted during detailed engineering.	The scope is noted. BHEL confirmed that preliminary heat load and area to be air conditioned and ventilated will be furnished by mid January 2008. The final details will be furnished as per Engineering Information Schedule.

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SU BSE C.	PAGE NO.	CLAUSE NO.			
140.	VI-A	III B	4 OF 4	10.05.00	Complete above ground grounding and equipment grounding system . .	As per tender below ground earthing (Underground earth mat) for FGD plant also is in NTPC scope in line with Cl 2.14.00 Section VI , part A Sub Section IV Terminal points , page 9 of 9.	BHEL's deviation is of the nature of clarification and is acceptable.
141.	VI-A	III B	4 OF 4	10.06.00	Complete lighting system for skids , tanks , sheds etc for FGD system	To maintain uniformity we request NTPC to include the lighting system of skids , tanks , sheds etc for FGD system in their scope .	NTPC insisted that complete lighting for FGD system to be done by BHEL inline with specification requirements. BHEL agreed and has withdrawn the deviation.

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.			
142.	VI-A	III B	4 OF 4	10.06.00	Complete lighting system for skids , tanks , sheds etc for FGD system	As per tender Complete lighting system for skids , tanks , sheds for FGD system is included in BHEL scope. However illumination of FGD control room, analyzer room , Gypsum dewatering room , Lime stone handling room is excluded in line with Cl 2.13.00 Section VI , part A Sub Section IV Terminal points , page 9 of 9.	NTPC insisted that complete lighting for FGD system to be done by BHEL inline with specification requirements. BHEL agreed and has withdrawn the deviation.

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
143.	VIA	III C	7/8	9.02.00 (7)	Flue Gas Desulphurization (FGD) : PLC Based system	We have offered a PLC based system, as per tender for FGD plant control as per details given in our technical offer. In case, NTPC desires to have the DDCMIS system for the FGD plant also, the same can be offered with additional price, as shown in the remarks column.	PLC based system with OWS system & peripherals etc as per NTPC specification shall be provided by BHEL.
144.	VIA	IV	9/9	2.15.04	Uninterrupted power supply system for steam generator area	As per tender UPS supply for FGD PLC and OWS control desk is in NTPC scope. The UPS rating shall be informed later.	BHEL stated that their proposed FGD system is a standalone system of unique suppliers which is based on 240 V AC supply and therefore 240 V AC UPS shall be required. Also the UPS load is higher. NTPC shall provide source of UPS from which BHEL shall tap up the supply and provide 3-ph UPS, cablings etc and mini UPS for OWS system required for the FGD system equipments/items as well as OWS system & peripherals. NTPC pointed out that the system/items shall be as per the NTPC (QA) approved vendor list and the additional price included by BHEL in their offer includes the type test /routine test costs.

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
145.	VI B	IV I-09	9 OF 15	3.02.00	PLC shall be provided with necessary interface hardware and software for dual optic fibre connectivity and interface with station wide LAN	As per tender the necessary cables for communication between FGD PLC and customer's LAN/DDCMIS is not in BHEL scope.	BHEL confirmed that they shall provide the PLC system with necessary hardware & software for connectivity with Employer's DDCMIS including interface with stationwide LAN for signals that are required by NTPC. Terminal points will be as per NTPC specifications.
146.	VIE	Drg No 4610-101-P01-A-021/Rev A				As per tender the cables between Bearing /Winding RTD JB to HTMCC is in NTPC scope. However the cables between Bearing /Winding RTI to junction Box shall be in BHEL scope.	For FGD system control/monitoring/operation shal be in its own independent system. However any signal required for other systems shall be taken by BHEL for that system. Terminal points will be as per NTPC specification.

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
147.	VIE	Drg No 4610-101-P0M-A-006 /Rev 0 sh 1 of 3			VT for Slurry recirculation pumps and Oxidation air compressor	As the vibration analyzer for the project is in NTPC scope , to maintain uniformity we request NTPC to procure Vibration Transducers, Junction Box and cables	Employer shall provide the vibration monitoring system including vibration sensors, JB. BHEL shall provide vibration pads in both X-Y directions.
148.	Sec VI, Part -B	Sub Sec-II M 04	3 of 18	2.03.01 & 02	The arrangement guillotine type gates...bypass duct. The gate ...emergency.	We have envisaged the type of gates as guillotine with 99.3% sealing with out seal air & 100% with seal Air.	BHEL confirmed that the gate shall be designed for a sealing efficiency of 99.6% without seal air and 100% with seal air.

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.			
149.	Sec VI, Part -B	Sub Sec-II M 04	6 of 18	4.01.00 (ii)	In case...operation elsewhere.	Generally each spray level is provided with a dedicated recirculation pump. FGD designs offer 2-3 level of sparys in absorber design as also the single spray level. In view of this, to meet the requirement, we have considered 4 recirculation pumps per absorber.	BHEL informed that they are yet to finalize the FGD vendor. However, they confirmed that redundancy requirements in spray level / recirculation pumps as per the stipulations of the specification shall be maintained in case spray type FGD is offered. This issue shall be further discussed during detail engineering.

Page-91 of 205

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AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
150.	Sec VI, Part -B	Sub Sec-II M 04	17of 18	10.03.00	The isolation valves...knife gaet valve...scheme.	Normally in case of recirculation area, in case of any pump stoppage the gate needs to quickly close without leakages in the slurry lines. In case of knife gate valves, there may be leakages after few operation due to wearing of components. In such applications, we propose to provide butterfly valves that are widely provided in FGD plants.	BHEL agreed to withdraw the deviation.

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.			
151.	Sec VI, Part -B	Sub Sec-II M 04	7 of 18	4.03.02 (b)	Flow : Minimum 2.5 times the stoichiometric rerequirement....above cond ions.	Some of the FGD designers have developed special oxidation nozzle arrangements wherein the oxidation is achieved by using only 1.5 times the stoichiometric requirement, In view of the above, this may be considered as a range from 15 to 1.5.	BHEL informed that oxygen requirement varies depending on the type of oxidation system selected by the vendor. NTPC stated that BHEL shall furnish the details of the oxidation system proposed by them & details of the plants with similar system after finalization of FGD system. The matter shall be discussed during detail engineering.
152.	Drg no: 4610-101-POM-A-006, sh 1of 3,Rev 0				Specifies 2 no of SO2 Analyser both at inlet and outlet	We have offered 1 no. each of SO2 Analyser both at inlet and outlet of GGH	BHEL stated that one number of SO2 analyser cum transmitter at inlet and at outlet are sufficient for the FGD system and 2 nos each at inlet and outlet are not required. NTPC noted. BHEL shall supply the spare as per NTPC specifications.

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
153.	VIB	II M 04	3 of 18	2.02.04	The gas duct from gas to gas heater(GGH) outlet to absorber .....from GGH to stack	We are providing from GGH to bypass duct in FGD scope in line with Clause 1.01.01 Section VI A Subsection IV Page 1 of 10. Bypass Damper & Gas duct in by pass & up to chimney is considered in Boiler scope	BHEL confirmed that all ducting are in their scope. NTPC noted.
154.	VIB	II M 04	8 of 18	4.05.03	Provision shall be made for automatic spray of quenching water....For this purpose an emergency water tank shall be provided for each absorber.	During abnormal rise in temperature in inlet to GGH ,operation of GGH will be continued upto 5 mts and this will reduce the GGH outlet temperature ,hence emergency tank capacity will be provided for ten minutes .	BHEL clarified that emergency cooling spray system will be designed to cool the gas from 300°C to 110°C. The tank is designed for 10 min. cooling of gases 200°C (at the outlet of GGH) to 110°C, BHEL agreed to provide cooling capacity for 30 min. to cool gases from 200°C to 110°C, at extra cost indicated in the bid. BHEL clarified that in case gas temp. is 300°C, the tank capacity shall be sufficient for 15 min.

14/15

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIPEMENT	DEVIATION	RESOLUTION
	SEC/ PART	SU BSE C.	PAGE NO.	CLAUSE NO.			
155.	VIB	II M 04	3/18	2.01.00	Short time excursion temperature: 300 deg C	It is proposed to bypass FGD with in 5 mts of sensing high temp. Setting range of temp will be decided in consultation with NTPC	NTPC agreed.
156.	VIB	II M 04	10 of 18	5.04.01 iii	Input limestone size: 1 inch (min)	Input size : For Capacity of limestone mill, size of limestone is considered as 1 inch or less	NTPC agreed.
157.	VIA	VI	13 of 32	8.01.00	Noise level measurement...	For Limestone mill & Oxidation Blower, measurement is to be carried out outside Building	BHEL / FGD vendor will supply sound hoods around limestone mills and oxidation blowers so that sound measured at 1 m outside of the sound hood is restricted to 90 dB.
158.	VI-C	GT R	23 of 39	09.02.09	All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME section IX/BS-4870.....	Welders and procedures are qualified as per AWS D1.1 for all products except rotor parts of fans, which is as per ASME Sec IX. No fresh test will be done. Records may be reviewed by NTPC.	Shall be followed as per approved Reference Quality Plan between BHEL & NTPC.
	VI-C	GT R	23 of 39	09.02.10	All brazers, welders and welding operators employed on.... Shall be qualified as per ASME section-IX....		Shall be followed as per approved Reference Quality Plan between BHEL & NTPC.

15/15

13.	SEC	VI	FGD –Guarantee point and Design point.	The Guarantee point flue gas flow of FGD is less than ESP Guarantee point flue gas flow	BHEL clarified that 25% excess air has been considered for calculation of ESP guarantee point flow while only ~~may~~ 20% excess air has been considered for FGD systems in line with spec. NTPC agreed
	PART	B			
	SUB SEC	IIM-04			
	PAGE NO	1/18			
	CLAUSE NO	1.02.00-AMENDMENT			
	BIDDER'S REFERENCE				
	SEC	XVIII			
	PART	VOLUME IIA			
	SUB SEC	FGD			
	PAGE NO	260			
	CLAUSE NO	2.0			

SN	NTPC SPEC REFERENCE	SPEC. REQUIREMENT	DEVIATION	COMMENTS

14.	SEC	VI	(i) The absorber outlet duct shall be made of SS317 LMN / Alloy 31 or better material. (ii) The duct from GGH outlet to stack shall be Carbon steel with C276 lining of minimum 2mm thickness.	Duct work on the discharge side of FGD absorber up to FGD bypass duct will be lined with GRP lining or any other recommended material after taking approval from NTPC.	Refer S. No. 94 of Declared Deviations (Annexure I) for duct from FGD outlet damper to bypass duct and the bypass duct to chimney. For duct from absorber to GGH outlet damper, BHEL proposed GRP lined duct. NTPC agreed.
	PART	B			
	SUB SEC	IIM-04			
	PAGE NO.	8/18; 3/18			
	CLAUSE NO	4.05.08-AMENDMENT; 2.02.04-AMENDMENT			
	BIDDER'S REFERENCE				
	SEC	XVIII			
	PART	VOLUME IIA			
	SUB SEC	FGD-Duct work			
	PAGE NO.	265			
	CLAUSE NO.	4.2			

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SN	NTPC SPEC REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
16.	SEC	VI	-----	The Bidder has explained that each slurry tank will have one dedicated Limestone slurry pump for each unit and one standby pump. However the total no. of slurry pumps have been kept as 6 nos.	BHEL agreed to comply with specification requirements. The issue shall be discussed after finalization of FGD under Jt. mtg. detail engineering
	PART	B			
	SUB SEC	IIM-04			
	PAGE NO.	-			
	CLAUSE NO	-			
	BIDDER'S REFERENCE				
	SEC	XVII			
	PART	VOLUME IIA			
	SUB SEC	FGD			
	PAGE NO.	266			
	CLAUSE NO.	4.7			

207

SN	NTPC SPEC REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
17.	SEC	VI	---------	The inputs required for employer supplied equipments, packages, systems etc. are not clear in the BID document; a. Limestone and Gypsum handling inputs, b. Electrical inputs, c. Civil inputs, d. Other related inputs (water, air, C&I etc.).	The input requirements for the FGD system interface shall be discussed and finalized between NTPC and BHEL during the finalization of Engineering Information Schedule (EIS).
	PART	B			
	SUB SEC	IIM-04			
	PAGE NO.	-			
	CLAUSE NO	-			
	BIDDER'S REFERENCE				
	SEC	XVIII			
	PART	VOLUME IIA			
	SUB SEC	FGD			
	PAGE NO.	257			
	CLAUSE NO.	-			

SN	NTPC SPEC REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
18.	SEC	VI	As per specification FGD is to be designed for IDB of 200 mg/Nm^3.	While Bidder has indicated IDB to FGD less than 50 mg/Nm^3. Bidder has not indicated the dust removal efficiency of the absorber.	BHEL confirmed that the FGD system designed for an inlet dust burden of 200 mg/Nm^3. However, in case IDB exceeds 50 mg/Nm^3, gypsum purity will be lower than 90% by a max. of 1%. NTPC stated that no correction in gypsum punty on account of variation in IDB (with n-1 ESP fields in service) shall be allowed, as ESP is also in BHEL scope. BHEL agreed. BHEL further confirmed that the absorber is designed for a minimum dust removal of 50%.
	PART	B			
	SUB SEC	IIM-04			
	PAGE NO.	-			
	CLAUSE NO	-			
	BIDDER'S REFERENCE				
	SEC	VI			
	PART	VOLUME III			
	SUB SEC	DM3			
	PAGE NO	9/51			
	CLAUSE NO.	1.04.00 xxi)			

209

SN	NTPC SPEC REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
19.	SEC	VI	-------	GGH has been designed to achieve an outlet temperature of 80°C at TMCR against the spec requirement of 80deg C at 50% TMCR.	BHEL confirmed that GGH has been designed to achieve an outlet temp. of 80°C at 50% TMCR in line with specification. Further, GGH outlet temp. at guarantee point condition will be 100°C.
	PART	B			
	SUB SEC	IIM-04			
	PAGE NO.	-			
	CLAUSE NO	-			
	BIDDER'S REFERENCE				
	SEC	VI			
	PART	VOLUME III			
	SUB SEC	DM3			
	PAGE NO.	14/51			
	CLAUSE NO.	2.04.01 v)			

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
20.	SEC	VI	For FGD systems, expansion joints of proven design and shall be field proven for similar application. The expansion joints shall have a minimum guaranteed life of 20,000 hrs.	Bidder has proposed metallic type expansion joints. Life of the expansion joints has not been indicated.	BHEL confirmed that proven type of expansion joints, in line with standard practice of the FGD vendor shall be supplied BHEL further confirmed that the expansion joints shall be designed for a minimum guaranteed life of 20000 hrs.
	PART	B			
	SUB SEC	II-M-04			
	PAGE NO.				
	CLAUSE NO	2.02.07			
	BIDDER'S REFERENCE				
	SEC	II			
	PART	A			
	SUB SEC	XVIII			
	PAGE NO				
	CLAUSE NO.	4.2			

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
21.	SEC	VI	FGD systems & material selection shall be capable of handling & providing successful operation with the range of coals and also the coal having sulphur upto 3.5%. Absorber material shall be guaranteed for a min. life of 20,000 hrs.	Bidder has not confirmed the FGD capability for the stipulated conditions. Life of the absorber material has not been indicated.	BHEL confirmed that the FGD system & materials are capable of handling & providing successful operation with range of coals having sulphur upto 3.5%. BHEL further confirmed that the life of the absorber shall not be less than 20000 hrs under all conditions of operation, stipulated in the spec.
	PART	B			
	SUB SEC	II-M04			
	PAGE NO.				
	CLAUSE NO	1.02.00 Amndt-1& 4.05.06 Amndt-1			
	BIDDER'S REFERENCE				
	SEC	II			
	PART	A			
	SUB SEC	XVIII			
	PAGE NO.				
	CLAUSE NO.				

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
22.	SEC	VI		Technical write-up for gypsum de-watering system not consistent with proposed scheme as per Bidder's drg.	BHEL informed that the scheme of gypsum dewatering system shall be finalized after finalization of FGD vendor. BHEL further confirmed that the dewatering system shall be designed to meet the guaranteed capacity with <10% moisture & guaranteed purity.
	PART	E			
	SUB SEC				
	PAGE NO.				
	CLAUSE NO				
	BIDDER'S REFERENCE				
	SEC	II			
	PART	A			
	SUB SEC	XVIII			
	PAGE NO.				
	CLAUSE NO.				

213

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
23	SEC	VI	Technical data sheet for FGD system & auxiliaries.	Bidder has not furnished most of the data as per data sheet & has indicated that the same shall be furnished during details engg.	BHEL agreed to furnish all the required data during detail engineering
	PART	F			
	SUB SEC	DM:3			
	PAGE NO.				
	CLAUSE NO				
	BIDDER'S REFERENCE				
	SEC	III A			
	PART	DM:3			
	SUB SEC				
	PAGE NO.				
	CLAUSE NO				

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
24	SEC	VI	Predicted performance of FGD absorber.	Bidder has not furnished the performance data of the absorber at Design Point condition & under this condition like with one pump spray level out of service.	BHEL agreed to furnish the performance data under all stipulated conditions during detail engineering.
	PART	F			
	SUB SEC	DM:3			
	PAGE NO.				
	CLAUSE NO.				
	BIDDER'S REFERENCE				
	SEC	III			
	PART	A			
	SUB SEC	DM:3			
	PAGE NO.				
	CLAUSE NO.				

215

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
25.	SEC	VI	FGD system shall be designed for design inlet gas gas temperature of 200 deg. C.	Bidder has indicated a max. inlet gas temp. of 200 deg. C for 30 min. for the absorber.	BHEL clarified that under normal operating conditions, gas inlet temperature to absorber shall be 110°C. Further, the absorber lining can withstand a continuous operating temperature of 150°C. In case, gas temperature goes above 150°C, emergency quenching spray shall be put in service. BHEL further confirmed that the FGD system is suitable for continuous operation with gas temp. of 200°C at GGH inlet.
	PART	F			
	SUB SEC	II-M04			
	PAGE NO.				
	CLAUSE NO	2.01.00			
	BIDDER'S REFERENCE				
	SEC	III			
	PART	A			
	SUB SEC	DM:3			
	PAGE NO.				
	CLAUSE NO.				

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
26.	SEC	VI	Gas duct – 7mm thick steel with lining.	Gas duct thickness – 6mm.	BHEL agreed to comply with specification requirement.
	PART	B			
	SUB SEC	II:M04			
	PAGE NO.	3			
	CLAUSE NO	2.02.04			
	BIDDER'S REFERENCE				
	SEC	III			
	PART	A			
	SUB SEC	DM:3			
	PAGE NO.				
	CLAUSE NO.	2.01.00			

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
27.	SEC	VI	Max. FG velocity – 13 m/s.	Max. gas velocity – 11-15 m/s.	BHEL agreed to comply with specification requirement
	PART	B			
	SUB SEC	II:M04			
	PAGE NO.				
	CLAUSE NO	2.02.01			
	BIDDER'S REFERENCE				
	SEC	III			
	PART	A			
	SUB SEC	DM:3			
	PAGE NO.				
	CLAUSE NO				

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
28.	SEC	VI	Blade & other components in the gas path in bypass duct & at GGH outlet (cold gas) shall be made of SS317L or better material.	Outlet gate frame – carbon steel.	~~BHEL to revert back.~~ BHEL agreed to comply with the ~~BTG~~ Spec.
	PART	B			
	SUB SEC	II.M04			
	PAGE NO.	4			
	CLAUSE NO	2.03.05			
	BIDDER'S REFERENCE				
	SEC	III			
	PART	A			
	SUB SEC	DM:3			
	PAGE NO.				
	CLAUSE NO.	2.02.00			

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
29.	SEC	VI		Pulverizer max. capacity is indicated as 36 tph. However as per A11-10B, guarantees under Cat-III, pulverizer max. capacity has been indicated as 40 tph. Bidder has not furnished the lime stone requirement & predicted performance data of the absorber at design point.	BHEL confirmed that limestone pulverizers shall be designed to meet the guaranteed output of 40 tph. Further, BHEL shall furnish the necessary calculations to meet 10% margin at Design Point conditions. Limestone pulverizer shall be selected to meet the above requirement.
	PART	B			
	SUB SEC	II:M04			
	PAGE NO.				
	CLAUSE NO	6.04.01 Amdt.			
	BIDDER'S REFERENCE				
	SEC	III			
	PART	A			
	SUB SEC	DM:3			
	PAGE NO.				
	CLAUSE NO.	2.09.06			

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
30.	SEC	VI	A min. of 10% spare hydro-cyclones shall be provided for each set of pulverizer hydro-cyclones.	No. of spare hydro-cyclones not indicated.	BHEL agreed ~~Bidder~~ to comply with specification requirements.
	PART	B			
	SUB SEC	II:M04			
	PAGE NO.				
	CLAUSE NO	6.04.04			
	BIDDER'S REFERENCE				
	SEC	III			
	PART	A			
	SUB SEC	DM:3			
	PAGE NO				
	CLAUSE NO.	2.09.06 (k)			

221

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
31.	SEC			FGD guarantee point Inlet SO2 concentration indicated as 5559.3 mg/Nm3 in tech. write-up (Vol-II) & 5597.5 mg/Nm3 in data sheet (Vol-III).	BHEL confirmed that SO_2 inlet concentration at guarantee point condition * is 5559.3 mg/Nm^3. BHEL agreed to furnish FGD sizing calculation to support the above value. However, no correction apart from those allowed by spec shall be applicable for FGD efficiency guarantee.
	PART				
	SUB SEC				
	PAGE NO.				
	CLAUSE NO				
	BIDDER'S REFERENCE				
	SEC	II/III			
	PART	A/A			
	SUB SEC	XVII/DM3			
	PAGE NO.				
	CLAUSE NO.				

*(based on Boiler Design parameter furnished as Below-VI, Part-A, Sub-Section-A Table No. 2(3))

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SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
32.	SEC		Limestone consumption at guarantee point.	In the data sheet (Vol-III) bidder has indicated a figure of 11000 kg/hr (for one absorber) against a value of 10500 kg/hr indicated in guarantees under Cat-I (Att-10A).	BHEL confirmed that limestone consumption under Guarantee Point shall be 10500 kg/hr as indicated in Guarantee Schedule.
	PART				
	SUB SEC				
	PAGE NO.				
	CLAUSE NO				
	BIDDER'S REFERENCE				
	SEC	I/III			
	PART	B (Sup)/A			
	SUB SEC	Att-10A/DM3			
	PAGE NO.				
	CLAUSE NO.				

223

SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	COMMENTS
33	SEC		Proveness Criteria specified at Cl 3.00.00 Part A of Technical Specifications.	Provenness data of some of equipments like PA fan, ID fan, and vendor's QR data related to FGD , GGH, limestone grinding Mills, Limestone slurry pumps etc are not meeting specification requirement.	BHEL agreed to provide required data during detailed engineering inline with the technical specifications.
	PART				
	SUB SEC				
	PAGE NO.				
	CLAUSE NO				
	BIDDER'S REFERENCE				
	SEC	I/III			
	PART	B (Sup)/A			
	SUB SEC	Att-10A/DM3			
	PAGE NO.				
	CLAUSE NO.				

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SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	RESOLUTION
	SUB SEC	V			
	PAGE NO.	11 0f 40			
	CLAUSE NO	3.04.04			
	BIDDER'S REFERENCE				
	SEC	II			
	PART	A			
	SUB SEC	9			
	PAGE NO.	IX-2			
4.0	SEC	VI	All Civil, Structural & Architectural works (excluding foundations) required for entire FGD system including associated buildings &	9.0 Exclusions The following equipment, materials & services are excluded from the scope of BHEL & shall be arranged by the purchaser	Refer resolution to S. No. 204 of Declared Deviation (Annexure I)
	PART	A			
	SUB SEC	IIID			

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SN	NTPC SPEC. REFERENCE		SPEC. REQUIREMENT	DEVIATION	RESOLUTION
	PAGE NO.	Clause 1.01.18 (Page 2 0f 4)	facilities as detailed under sub section IIIA-04 of section VI part A is included in the scope of the bidder. Bidder's scope shall also include all supporting structural works for ducting, piping, cabling, etc. The terminal point for civil works for FGD system shall be as indicated in drg. no. 4610-101-POC-A-002. Protective linings in the sumps, trenches, pits, etc. constructed by the employer shall be supplied and provided by the bidder.	9.3 Civil work execution including foundation for the equipment & structures located outside the FGD plant building i.e. control room, limestone milling system building & gypsum dewatering building 9.26 All civil works in FGD plant (BHEL scope: Control room, LS Room, Gypsum room)	
	CLAUSE NO				
	BIDDER'S REFERENCE				
	SEC	II			
	PART	A			
	SUB SEC	XVIII			
	PAGE NO.	XVIII-20			

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Page 1 of 1SN	NTPC SPEC. REFERENCE	SPEC. REQUIREMENT	DEVIATION	COMMENTS
1	SEC PART SUB SEC PAGE NO CLAUSE NO BIDDER'S REFERENCE SEC PART SUB SEC PAGE NO. CLAUSE NO.	**NTPC Spec. requirement:** 1. General Layout Plan Drg. No. 4610-999-POC-F-001 As per above drawing Control Room for FGD is located behind the Chimney across the road. 2. Equipment Layout Plan at EL. 0.00M Drg. No. 4610-999-POM-A-001 Rev. B Space for FGD is located between Chimney and ID Fan and placed symmetrically along boiler centre line.	**BHEL Proposal:** Layout of FGD, Drg. No. 3-FW-190-00009 Rev. 00 and GA of Boiler and its Aux. - Sectional Plan. Drg. No. 0-BP-000-02758 Rev. 0 In Line with above drawings 1. The Common Control Room for 'all three FGDs' are located between ID Duct for Unit # 1 & # 2, between Chimney and ID Fan. 2. BHEL has placed the FGD on the right side of ID Duct.	BHEL agreed to comply specification requirements.

BID DOC. NO. : CS-4610-101-2	BIDDER : BHEL	PROPOSAL (UNDECLARED) DEVIATIONS ANNEXURE II	Page Page 1 of 1

SR NO	ITEM	QP /INS-PN CAT *	QP NO. 4610-101-2	QP SUB-MISSION SCHEDU-LE	QP APPL SCHED ULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDU LE	SC APPL SCHED ULE	REMARKS
21	EMITTING ELECTRODE FOR ESP	I	QVM-Q-120			NAGAPPASPRINGS	RANIPET	A			
		I				SIVA SPRINGS	MADURAI	A			
		I				KWALITY COILS	MADURAI	A			
22	COLLECTING ELECTRODE FOR ESP	I	QVM-Q-121			BHEL	RANIPET	A			
23	COLUMNS OF ESP SUPPORTING STRUCTURES	I	QVM-Q-122			BHEL APPD SUBCONTRACTORS	RANIPET	A			
24	ROOF BEAMS	I	QVM-Q-123			BHEL SUBCONTRACTORS(NIPC APPROVED)	RANIPET	A			
25	COLLECTING/ EMMITTING ELECTRODE SUSPENSION ASSY	I	QVM-Q-124			BHEL APPD SUBCONTRACTORS	RANIPET	A			
26	ELECTRICLLY OPERATED HOIST FOR ESP-3 TON CAPACITY	III				BHEL APPD SUBVENDORS		A			
27	GATES	I	QVM-Q-126			BHEL/ APPD SUB CONTR		A			
28	DAMPERS	I	QVM-Q-127			BHEL/ APPD SUB CONTR		A			
29	LRB MATTRESS	I	QVM-Q-128			LLOYD INSULATION,CHENNAI	BHILAI	A			
		I				ROCKWOOL INDIA LTD,	MEDAK-AP	A			
		I				MINWOOL ROCK FIBRES LTD	,RAJNANDGAON,BHILAI.	A			
		I				LAPINUS ROCKWOOL LTD,	GWALIOR	A			
30	Gas to Gas Heat Exchanger	I						*			* As per Sub-QR list, see Note1
31	Wet Limestone based Flue Gas Desulphurisation System	I						*			* As per Sub-QR list, see Note1

Signature

ENGINEERING DIV / QAI

SR - NO	ITEM	QP /INS- -PN CAT *	QP NO. 4610-101-2	QP SUB- MISSION SCHEDU -LE	QP APPL SCHED ULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB- SCHEDU LE	SC APPL SCHED ULE	REMARKS
32	Wet Limestone Grinding Mill	1						*			* As per Sub-QR list, see Note1
33	Limestone Slurry Pumps	1						*			* As per Sub-QR list, see Note1

Note1: L2 vendors shall be timely proposed for NTPC approval after finalisation of L1 vendor.

*** Inspection and testing requirements are covered under respective main equipments.

Signature

ENGINEERING DIVISION

AGREED RESOLUTION FOR DECLARED TECHNICAL DEVIATIONS

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	DEVIATION	RESOLUTION
	VOL./ PART	SEC.	PAGE NO.	CLAUSE NO.			
52.	VI/C	GTR	16 of 39 16 of 39	8.08.00 8.08.02	Training of Employer's Personnel Training for Employer's Engineering Personnel.	As design familiarisation given in Annexure-II, Part-C, Section-VI, is covering a lot of proprietary information which are normally covered under collaboration, this is excluded from BHEL scope. However, training of employer's personnel in O&M of the plant is included as required in clause 8.08.01	BHEL explained that the system employed for 250 MW boiler is same as 210 MW boiler. Therefore, engineering training is not required and only O & M training shall be imparted. FGD system comprises of many equipments and the complete system will be installed fully only at site. Hence, engineering training for FGD system will be provided by BHEL / FGD vendor at site. NTPC noted.
53.	VI/C	GTR	11 of 39	8.03.05 (a) (iii) 8.03.05 (b)	Final copies of the approved drawings shall be submitted in vector form on CD ROM. All documents/text information shall be in the latest version of MS Office and MS Excel as applicable.	Final copies of the approved drawings will be submitted in raster form only and not in vector form. All documents/text information will be in hard copy or PDF format only.	BHEL confirmed that all initial and intermediate submissions will be in vector form, but final submissions shall be raster form so that it is not editable. The same is acceptable

SECTION- XVIII

FLUE GAS DESULPHURISATION SYSTEM

1.0 General

This proposal is prepared for the flue gas desulphurization plants of NTPC, Bongaigaon Coal fired thermal power plants (3 x 250 MW).

1.1 Introduction

Global environmental problems are drawing large attention in these days. Among these, SOx emission has become a major issue and consequently the importance of Flue Gas Desulphurization (FGD) technology, as a countermeasure for this problem is becoming greater. The wet limestone / gypsum FGD process has been incorporated to thermal power plants over the last 30 years or more.

Basic conditions which are expected to be fulfilled by a FGD plant are:

(1) Good Sulphur Removal efficiency
(2) High plant reliability
(3) Easy operation and maintenance
(4) Not a source of secondary pollution
(5) Enables use of easily available absorbent with good marketability of the by-product
(6) Low in operation and construction costs

The wet limestone / gypsum process which fulfills the above conditions in the treatment of large flue gas volume from thermal power stations has therefore become the main stream technology and is being widely adopted.

2.0 FGD Design Condition

The following design and design and guarantee conditions have been adopted for suitably sizing the FGD plant system.

Sl No	Parameters	Guarantee Point	Design Point
01	Boiler load, MW	250	BMCR
02	Type of coal	Design Coal	Worst Coal
03	Ambient Conditions		
	a) Temperature	27°C	42°C
	b) Relative Humidity	60 %	60 %
04	Flue gas flow, Nm^3/s at ID fan outlet (Wet Basis)	263.8	303.3
05	Density of Flue Gas, kg/m^3	0.819	0.784
a)	Flue Gas Composition at ID Fan outlet		
b)	SO_2 % by volume (Wet Basis)	0.193	0.203
c)	SO_3	1.5 % Conversion from SO_2	
d)	Moisture % by volume (Wet Basis)	10.571	13.910
e)	CO_2 % by volume (Wet Basis)	10.912	10.392
f)	O_2 % by volume (Wet Basis)	5.964	5.751
g)	N_2 % by volume (Wet Basis)	72.360	69.744
h)	HCl	Not Applicable	
i)	HF		
j)	NH_3		
k)	CO, PPM	100	
l)	Dust, mg/Nm^3	<50	
m)	Inlet SO_2 Concentration, mg/Nm^3 (Wet Basis)	5559.3	5775.3
n)	SO_2 Removal efficiency	95 %	

3.0 FGD Process Description

3.1 System Overview

The process of FGD system is shown in the Process Flow Diagrams enclosed with the offer.

3.2 FGD Process Chemistry

The chemistry of the overall SO_2 absorption from the flue gas and conversion to gypsum is as below:
First, in the absorber tower, the SO_2 is absorbed into the slurry and then it dissociates to $H^+ + HSO_3^-$:

$SO_2 + H_2O \rightarrow H_2SO_3$
$H_2SO_3 \rightarrow H^+ + HSO_3^-$

The HSO_3^- ions are oxidized partially by oxygen in the flue gas and completely by oxygen in the absorber tank, into SO_4^{2-}

The acidic absorbent slurry, containing H^+ and SO_4^{2-} ions in the absorber tank, reacts with calcium carbonate ($CaCO_3$) suspended in the alkaline limestone slurry. The sulphate ions are neutralized by the carbonate ions and hydrated gypsum slurry ($CaSO_4.2H_2O$) is formed:

$2H^+$ and $SO_4^{2-} + CaCO_3 + H_2O \rightarrow CaSO_4.2H_2O + CO_2$

A portion of the gypsum slurry is branched from the absorber recirculation line to the gypsum filter and solid gypsum ($CaSO_4.2H_2O$) is recovered.

To compensate the consumption of calcium carbonate, fresh limestone slurry is continuously fed into the absorber tank on demand. The refreshed absorbent

slurry is re-circulated from the absorber tank to the absorber and sprayed into the flue gas via the header pipe and the spray nozzles.

3.3 Flue Gas System

Flue Gas from the boiler is induced into the FGD plant by ID fans. Total gas pressure loss in the FGD plant is compensated by ID fans. Bypass duct is provided to permit isolation of FGD plant or flexible operation of boiler and FGD plant.

A high sealing efficiency guillotine type of damper is provided at the bypass duct of each FGD plant. A guillotine damper is provided at the FGD inlet duct. Similarly a guillotine type of damper is provided at the FGD outlet duct. During the FGD plant in service, the bypass damper is closed and seal air is supplied by seal air fan into the bypass damper in order to prevent leakage of flue gas through the bypass damper. During outage of the FGD plant while the boiler unit is in operation, the FGD inlet and outlet dampers are closed and seal air is injected into them to ensure complete isolation between the FGD plant and the boiler unit. Seal air fans are installed for every damper to supply the seal air through FGD seal air heater. Seal air is heated up by the seal air heater to avoid acid condensation due to flue gas temperature drop that causes corrosion of the materials.

3.4 Flue Gas Reheating System

One vertical shaft regenerative type rotary gas-gas heater (GGH) is provided in the gas path. Untreated and treated gas is properly sealed by the rotor sealing system with adjustable mechanism so that total leakage of the flue gas side to clean gas side is kept to minimum.

For prevention of plugging, an automatic sequentially operated soot-blowing system is furnished. High pressure washing system starts automatically when pressure drop of flue gas that passes through GGH exceeds more than admissible range. Dust blown by soot blowing system or washed out by GGH

high pressure pump may have an adverse impact on limestone reactivity if it directly goes down into the absorber, so it is recovered in the GGH drip tray which is installed under the GGH and transferred to absorber sump. It is discharged out via the waste water tank.

3.5 Bleed and dewatering

The system bleed is sent to the hydro cyclone where the flow is classified to percentages of overflow and underflow. The underflow is directed to the vacuum filter tank and the overflow is piped to the recovered water tank.

The vacuum filter produces a gypsum cake with approximately 5 – 10 % moisture.

The filtrate removed from the vacuum filter is collected in the filtrate tank. This water is augmented by clean water and is used for limestone slurry preparation, and as make up water for the FGD to replace water lost through evaporation and bleed.

3.6 Limestone Storage and Limestone Preparation System

There are two numbers of limestone silos provided, each sized for 24 hrs capacity for three (3) FGDs operating at 100 % BMCR. Each silo is provided with its own bag filter and exhaust fan which is designed to exhaust displaced air during fill up of the silos. The bag filters are provided with a pulse jet cleaning system. Limestone slurry preparation is initiated when the level in the limestone slurry tank goes below a certain level. At this level, the knife gate at the bottom of the silo hopper opens, the fluidizing valves of the hopper open and limestone is fed to the gravimetric feeder which is preset to feed a fixed rate of limestone to the ball mill. A corresponding metered amount of water to make limestone slurry is introduced to the ball mill. The output of the ball mill is directed to the ball mill tank. The tank contents are pumped to a hydro cyclone (ball mill classifier). The

underflow of the hydro-cyclone is piped back to the ball mill for re-milling. The overflow of the hydro cyclone is directed to the limestone slurry tank.

3.7 Forced Oxidation

The majority of the SO_2 removed in the FGD system is converted to $CaSO_3$. For effective gypsum cake production and for optimum pH control, it is necessary to completely oxidize all sulphites into sulphates. Oxidation blowers are provided for this purpose. The oxidation air blowers send air bubbles through the recirculation tank liquid level. The quantity and size of the air bubbles effectively oxidize the sulphites as the bubbles travel to the surface of the recirculation tank.

The absorber tank is equipped with two set of side entering type agitators. Absorber tank agitators are operated during shut down of absorber recirculation pumps.

A highly efficient two stage mist eliminator is located on the top of absorber tower. Entrained mist reaching the mist eliminator is collected and returned to the absorber tank. A washing spray system is installed to intermittently wash down the mist eliminator element surfaces and thereby prevent any deposit buildup on them. Both front and back surfaces of 1st (upstream) mist eliminator and front surface of 2nd (downstream) mist eliminator is operated automatically. The back surface of 2nd mist eliminator is manually operated during outage, etc. process water is stored in the absorber washing tank and pressurized by service air. The washing water isolation valves are automatically operated following sequence program.

The wet / dry interface on the inlet duct is intermittently washed to prevent formation of gypsum scaling. These interface-washing pipes supply water directly to the bottom of the absorber inlet duct to clean off any build up of soot or other residue from the flue gas.

4.0 FGD System - Equipment Scope of Supply

All equipment furnished by BHEL are adequately sized to meet the required objectives and shall be suitable for outdoor installation.

4.1 Isolation Dampers for FGD

Each FGD will be provided with one inlet damper, one outlet damper and one bypass damper. All the dampers will be of duct line size, guillotine type and provided with a heated seal air fan.

4.2 Ductwork, Expansion joints and duct supports

Duct will generally be sized for a maximum velocity of 13 m/s. The material of construction will be 7 mm thick carbon steel suitably reinforced as required. Duct work on the discharge side of the FGD absorber up to FGD by pass duct will be lined with GRP lining or any other recommended material after taking approval from NTPC.

Metallic type expansion joints will be provided as required to accommodate thermal expansion in the duct. Material of construction will be selected properly to suit process conditions. All support requirements for the above ductwork will be provided.

4.3 FGD Absorber

Absorber will be designed to remove the specified SO_2 from the gas stream. Absorber will feature an inlet emergency spray manifolds, absorber spray zones, two mist eliminator, mist eliminator wash spray manifolds and agitators. Absorber material construction will be carbon steel lined with soft natural rubber. Inlet portion of the absorber will be clad with 2 mm thick Haste Alloy C – 276.

4.4 **Absorber recirculation pumps**

Each absorber will be provided with four numbers of recirculation pumps, three (3) operating and (1) Standby. Pumps will be rubber lined horizontal centrifugal pumps with a suitable HT drive motor.

4.5 **Oxidation Air Blowers**

Each absorber will be provided with two (2) oxidation air blowers, One (1) operating and one (1) spare. Blower will be positive displacement type and sized to spurge the oxidation air through the recirculation tank level. Each blower will be provided with a suitable drive motor.

4.6 **Limestone Slurry Tanks**

Two (2), 100 % capacity limestone slurry tanks will be provided for complete redundancy. Each tank will be sized for 12 hours of limestone slurry supply for three (3) FGD units. Each tank will be provided with level and density instrumentation. Each tank will be provided with a top mounted agitator to ensure completely homogeneous slurry. The inside wall of the tank will be rubber lined.

4.7 **Limestone Slurry Pumps (totally six (6) Nos.)**

Two numbers of limestone slurry tanks, each will have one dedicated limestone slurry pump for each unit & one stand by pump. The pump will be horizontal centrifugal type, rubber lined. Each pump will be provided with its own drive motor.

4.8 **Limestone Silos, (2) Nos.**

Each silo will be sized for 24 hours of limestone requirements for three (3) FGDs. Each silo will be provided with a pulse jet type bag filter to evacuate air displaced during limestone filling, wire guided type radar transmitter, and safety breather

valve. Silo hopper bottom will be provided with a manual knife gate valve. Each silo hopper will be provided with fluidizing air pads to activate the hopper.

4.9 Limestone Slurry Preparation Systems (2 Lots)

Each of the two limestone silos above has its own dedicated limestone slurry preparation system. Each limestone slurry preparation system is sized for 110 % capacity for three (3) FGDs in operation. Each limestone slurry preparation system consists of:

4.9.1 One (1) – 110 % capacity (for three FGDs) wet ball mill. The ball mill will be designed to produce suitable limestone slurry. Greater than 90% of the solids from the mill should pass through a 325 mesh screen.

4.9.2 One Ball mill recycle tank to receive the instantaneous output of the ball mill. Tank will have its own top mounted agitator.

4.9.3 Two (2) ball mill recycle tank pumps, one operating and other as spare.

4.9.4 One (1) ball mill hydro-cyclone (Classifier).

4.10 Three (3) Primary Dewatering System

Each FGD will have its own dedicated primary dewatering system (Hydro cyclone). Hydro-cyclone will be made of rubber lined carbon steel.

4.11 One (1) Vacuum filter tank

This tank is provided to receive the underflows from the three (3) hydro cyclones above. Tank will be sized for 8 Hrs of underflow from three (3) operating FGDs. As per the specifications, tank will be rubber lined carbon steel. Tank will be provided with its own level transmitter and top mounted agitator.

4.12 Vacuum Filter Pump

One (1) No pump will be provided to feed each vacuum filter. Pump will be rubber lines horizontal centrifugal type with its drive motor.

4.13 Two (2) vacuum Belt filter system

Each vacuum belt filter system will include:

4.13.1 Vacuum belt filter with drive motor

4.13.2 Vacuum pump along with drive motor with gas / liquid separator and vacuum receiver.

4.13.3 Cloth wash water tank and two (2) cloth wash pumps (one operating and one as spare).

4.13.4 Cake wash water tank and two (2) cake wash pumps (One operating and one as spare).

4.14 One Recovered Water Tank

Tank will be designed to operate at approximately 50 % capacity in order to allow sufficient room to receive all hydro cyclone overflows plus unbalance water flow surges. Tank will be provided with its own ultrasonic type level transmitter and top mounted agitator.

4.15 Recovered Water pumps (2 Nos)

Two recovered water pumps, one (1) working and (1) spare will be provided to provide recovered water to the users on demand. Pumps will be provided with suitable drive motors and accessories.

4.16 Elevator (1 no / FGD)

Rack & pinion type Elevator is provided in each FGD for easy accessibility to FGD system & GGH, using inter connection platforms. 5 stoppages are identified provisionally

5.0 SCOPE OF SUPPLY - ELECTRICALS, CONTROLS & INSTRUMENTATION

The following scope has been envisaged in the Electrical and C & I portion for the proposed FGD Plant.

5.1 HT motors for Absorber recirculation Pump, Oxidation air compressor, Vacuum Pump and Wet ball mill.

5.2 LT motors for various FGD auxiliaries.

5.3 Electric actuators with integral starter for open close Gates at FGD Inlet, Outlet and Bypass.

5.4 Electric actuators with integral starter for open close valves as per scheme.

5.5 Local push button station as per requirement.

5.6 One FGD MCC for each unit double front, draw-out type for providing power to electrical equipment of Absorber, GGH area of FGD. Customer shall provide power supply to FGD MCC. The FGD MCC shall be located in FGD Control room which is common for all the three units.

5.7 One GYPSUM MCC common for the entire THREE unit double front, draw-out type for providing power to electrical equipment of Gypsum dewatering system of FGD. Customer shall provide power supply to GYPSUM MCC. The GYPSUM MCC shall be located in FGD Control room which is common for all the three units.

5.8 One LIMESTONE MCC common for the entire THREE unit double front, draw-out type for providing power to electrical equipment of Lime stone milling system of FGD. Customer shall provide power supply to LIMESTONE MCC. The LIMESTONE MCC shall be located in FGD Control room which is common for all the three units.

5.9 One set of Instruments as per scheme.

5.10 Bearing temperature measurements of Slurry recirculation pump and oxidation air compressorVacuum Pump and Wet ball mill. These shall be wired upto Junction box / Marshalling terminal.

5.11 HT Motor winding temperature measurement element.

5.12 One set of Junction boxes.

5.13 One set of LT power cable (PVC insulated, PVC inner sheathed unarmored and PVC FRLS outer sheath type) and control cable (PVC insulated, PVC inner sheathed unarmored and PVC FRLS outer sheath).

5.14 One set of cable tray and tray supports required.

5.15 Earthing materials above ground level.

5.16 One FGD PLC with OWS for each FGD unit and ONE common PLC with OWS for gypsum handling and lime stone handling system (common for all three units) each unit located in FGD Control room which is common for all the three units.

5.17 One DC Distribution Board for providing DC supply to FGD MCC for unit 1, FGD MCC for unit 2, FGD MCC for unit 3, GYPSUM MCC , LIMESTONE MCC.

5.18 Illumination for FGD equipment, tanks, sheds only.

6.0 Civil and Structural

Civil

The major civil works involved in the FGD plant area (except foundations) are:

- Buildings for FGD control room (common for three FGD plants)
- Building for Limestone milling system and
- Building for gypsum dewatering

The type of buildings to be provided for the FGD system shall be as follows:

The building housing reagent unloading, storage, grinding, slurry preparation required in wet limestone process shall be in RCC construction with RCC roof slab.

The re-circulating slurry and gypsum disposal pump house, required in lime stone process shall also be in RCC construction. The FGD system control room building shall be in RCC construction. The underground limestone unloading and reclaiming hopper required will be in RCC construction with stainless steel liner in inside face.

Concrete flooring with ironite topping shall be provided in material handling / maintenance area. The pump house floor, switchgear room and compressor room shall have tile flooring. The pump house operating and MCC shall have mosaic tile flooring. The control room will have tile flooring and battery room will be provided with acid and alkali resistant tile flooring.

Reagent unloading, storage and grinding facilities and lime slurry preparation facilities shall be housed in a building of suitable size. The building will be of RCC construction with brick wall cladding.

The lime slurry pump house shall have suitable hoisting arrangements for handling pumps during erection and maintenance.

Structural

1. Supporting steel work for all the auxiliaries such as ducts, piping, cable trays, cranes, hoists, etc.
2. Platforms, walkways and stairways including chequered plates, grating, handrails, etc.
3. Process pit covers and the necessary supporting arrangements for installed equipment (such as pumps and agitators) including all embedded components.

7.0 Utilities

7.1 Process water distribution System

The process water taken from raw water pipe is stored in the process water tank and then it is distributed by process water pump and absorber washing pump. For removal of foreign particles strainers are provided at pump suction. The process water is distributed to the following major users:

(a) By process water pumps

1) Absorber make up water
2) Oxidation air line washing
3) Wet and dry interface washing
4) Belt filter washing tank make – up water
5) Vacuum pump seal water

(b) By Absorber washing pumps

1) Mist eliminator washing water
2) GGH washing water

7.2 Cooling Water System

Cooling water for FGD plant is distributed to the following equipment.

1) Absorber Recirculation pumps (if necessary)
2) Limestone ball mill

Cooling water is returned back to the main cooling water circuit. No water treatment for cooling water system is considered.

7.3 Instrument Air System

Instrument air is used to drive the instrumentation or control equipment for the absorber section and other parts of the FGD plant.

7.4 Seal Air System

Seal air from the seal air fans is heated up by seal air heater using steam and then hot seal air is supplied to the FGD dampers.

7.5 Steam

Steam is used for GGH soot blowing, Damper seal air heating.

8.0 Terminal Points

The following terminal points have been considered for the proposed FGD plant:

8.1 Limestone: At the inlet of the limestone silos (Limestone conveying feeders conveying limestone into the silos is excluded from FGD scope of work.

8.2 Gypsum: Gypsum discharge chute at the delivery of gypsum belt filter (Gypsum belt conveyor at the outlet of vacuum belt filter is excluded from scope).

8.3 Waste water pumps outlet pipe to be terminated at employer's ash water pump house.

8.4 Foundation bolt of equipment and supporting structures.

8.5 Input terminals of FGD LT MCC for unit 1, FGD LT MCC for unit 2, FGD LT MCC for unit 3, Gypsum Dewatering MCC, Limestone Milling System MCC housed in FGD control room

8.6 Input terminals of FGD PLC for units 1, 2 and 3 located in the FGD control room (UPS Supply)

8.7 Input terminals of Common PLC. (UPS Supply)

8.8 Input terminal of DC distribution Board.

8.9 Terminal block of HT motors in FGD plant for HT Supply (HT cables and terminations are excluded from FGD scope of supply).

9.0 Exclusions

The following equipment, materials and services are excluded from the scope of BHEL and shall be arranged by the purchaser.

9.1 Limestone conveying upto the limestone silos and the preceding limestone unloading, storage and handling system.

9.2 Gypsum handling and storage system beyond the vacuum belt filter in gypsum dewatering building.

9.3 Civil work execution including foundation for the equipment and structures located outside the FGD plant buildings i.e. control room, limestone milling system building & gypsum dewatering building.

9.4 Design and construction of earthing pits and connection of the FGD above ground earthing system to the power station earth grid.

9.5 Ventilating equipment, Fire detection system, fire extinguishers, lighting fittings etc. for FGD control room and other areas of FGD plant.

9.6 Illumination of FGD field equipments, FGD control room, approach roads to FGD equipments, analyzer room, Gypsum dewatering room, Lime stone handling room.

9.7 Fire detection system for FGD field equipments.

9.8 Air conditioning of FGD control room, Analyser room for areas where solid state control equipment will be located.

9.9 UPS power supply (230 V; 50 Hz; 1 kVA) for FGD PLC / Common PLC/ control desk for Operator Work Station PC housed in FGD Control room.

9.10 DC power supply for FGD MCC for unit 1, FGD MCC for unit 2, FGD MCC for unit 3, GYPSUM MCC, LIMESTONE MCC.

9.11 Communication between employer's DDCMIS/ and FGD PLC.

9.12 Service transformer for FGD MCC for unit 1, FGD MCC for unit 2, FGD MCC for unit , Gypsum Dewatering MCC, Limestone milling system MCC.

9.13 LT bus-duct between service transformers and FGD MCC for unit 1, FGD MCC for unit 2, FGD MCC for unit 3, Gypsum Dewatering MCC, Limestone Milling System MCC.

9.14 HT MCC for Absorber recirculation Pump, Oxidation air compressor, Vacuum Pump and Wet ball mill.

9.15 HT Cables for above.

9.16 HT cable trench /supports for above HT Cables.

9.17 Interlocking of HTMCC / Service transformer with FGD MCC for unit 1, FGD MCC for unit 2, FGD MCC for unit 3, Gypsum Dewatering System MCC, Limestone slurry system MCC.

9.18 Interlocking of HTMCC with space heater of motors of Absorber recirculation Pump, Oxidation air compressor, Vacuum Pump and Wet ball mill.

9.19 Analyzers for SOx, NOx, CO in outlet duct.

9.20 Opacity monitor.

9.21 Electronic earth for FGD PLC.

9.22 Vibration transducers along with necessary cables for Slurry recirculation pump and oxidation air compressor and their drives & Vibration monitoring system.

9.23 Cables between bearing /winding RTD of drives junction box and Customer DDCMIS.

9.24 Cables from HTMCC to FGD PLC/ Common PLC.

9.25 Cables from customer DDCMIS to FGD PLC / Common PLC

9.26 All civil Works in FGD plant (BHEL scope: Control Room, LS Room, Gypsum Room)

9.27 Any other equipment/service not specifically covered under the Scope of Supply of this proposal

10.0 PERFORMANCE GUARANTEE OF FGD Plant

10.1 The performance test shall be carried out in accordance with ASME PTC 40 (1991) code. The details of the test shall be mutually agreed upon between BHEL and employer after award of contract.

11.0 Schedule of Utilities (3 units)

Sl No	Description	Value
01	Process Water	360 m3/h
02	Instrument Air	180 Nm3/h (Cont) 150 Nm3/h – additional during emergency stop for 15 mts
03	Service Air	190 Nm3/h (Cont) 300 Nm3/h – additional during emergency stop for 15 mts
04	Cooling Water	10 m3/h
05	Steam	4.8 tph @ 13.5 ata, 210 deg C
06	Connected Load	Refer drive lists furnished with the offer

12.0 List of Annexure

12.1 List of Instruments.

12.2 List of HT Drives

12.3 List of LT Drives

12.1 Annexure – 1

List of Instruments

Sl No	Description
1	Ultrasonic Level transmitter with manifold isolation valves and fixing arrangements Microprocessor based 2 wire HART protocol compatible. Range 0- 5 m
2	Pressure transmitter with manifold isolation valves and fixing arrangements Microprocessor based 2 wire HART protocol compatible. Range 0- 10 bar , Medium: Slurry
3	Ph Analyzer with manifold isolation valves and fixing arrangements and calibration chemicals Cell in situ type , Microprocessor based, Accuracy <+/- 1% of span
4	Vibration monitoring system (8 probes) with panel
5	Density meter with manifold isolation valves and fixing arrangements and callberation equipments
6	Differential Pressure transmitter with manifold isolation valves and fixing arrangements Microprocessor based 2 wire HART protocol compatible. Range 0- 10 bar , Medium: Slurry
7	RTD 4 wire with plug in connector
8	Head mounted transmitter for RTD with local display
9	Pressure gauge Bourdon type
10	Flow Transmitter with manifold isolation valves and fixing arrangements, Positive displacement type.
11	SO 2 Meter with manifold isolation valves and fixing arrangements , caliberation gas for one year , sampling type ,Principle : radiation absorption, Accuracy +/- 1% of FS ,RS 485 Modbus port.
12	Pressure switch Bellow type sensing element SS316 Range: 0-10 bar Medium: slurry
13	Level switch capacitance type sensing element SS316 Range: 0-10 bar Medium: Lime water

12.2 Annexure – 2

List of HT Drives

Sl No	Description	Qty for 1 unit	Qty for 3 . units	Rating
1	Absorber Recirculation Pump A/D	4	12	1000 kW
2	Oxidation Air Compressor A/B	2	6	200 kW
3	Vacuum Pump A/B	-	2	480 kW
4	Wet Ball Mill A/B	-	2	1210 kW
5	Service transformers for FGD MCC	2	6	1600 KVA
6	Service transformers for Gypsum MCC	-	2	1600 KVA
7	Service transformers for Lime stone MCC	-	2	1600 KVA

Note:

1) Necessary number of spare feeders to be suitably decided by NTPC.

2) The drive ratings are preliminary and subject to variation during detailed engineering.

12.3 Annexure – 3

List of LT Drives

FEEDERS PROVIDED IN FGD MCC (Qty Three Nos./ Unit)				
FLUE GAS SYSTEM				
Sl No	Service	Qty/Unit	Qty/three units	Rating
1	FGD Inlet Guillotine Damper	1	3	3.75 kW
2	FGD Outlet Damper	1	3	3.75 kW
3	Seal air blower for inlet damper	1	3	3.75 kW
4	Seal air blower for outlet damper	1	3	3.75 kW
5	Elevator for FGD	1	3	15 kW
SO2 ABSORPTION OXIDATION SYSTEM				
1	Absorber Tank Agitator A/B	2	6	45 kW
2	Motorized valves		30	0.5 kW
3	Mist Eliminator Wash Water pumps	2	6	15 kW
4	Limestone Slurry Feed Pump A/B	2	6	30 kW
4	Gypsum Bleed Pump A/B	2	6	45 kW
REHEATING SYSTEM				
1	GGH Scavenging Fan Motor	1	3	110
2	Gas Gas Heater (GGH) Motor	1	3	15
3	GGH Upper Soot Blower Motor	1	3	1.5
4	GGH Upper Soot Blower Seal Air Fan Motor	1	3	0.75
5	GGH Lower Soot Blower Motor	1	3	1.5
6	GGH Lower Soot Blower Seal Air Fan Motor	1	3	0.75
7	GGH High Pressure Pump Motor	2	6	50
8	GGH Low Pressure Pump Motor	2	6	18.5

FEEDERS PROVIDED IN GYPSUM MCC (QTY ONE NO/UNIT)				
GYPSUM DEWATERING HANDLING SYSTEM				
1	Primary Hydro-cyclone Feed Tank Agitator	-	1	15 kW
2	Valve in hydro-cyclone line		40	0.5 kW
3	Primary Hydro-cyclone Feed Pump A/B	-	2	110 kW
4	Gypsum Belt Filter A/B	-	2	18.5 kW
5	Belt Filter Washing Tank Pump A/B	-	2	37 kW
8	Filtrate Tank Agitator	-	1	5.5 kW
9	Filtrate Pump A/B	-	2	55 kW
12	Hydro-cyclone Waste Water Tank Agitator	-	1	18.5 kW
13	Hydro-cyclone Waste Water Tank Pump A/	-	2	45 kW
14	Waste Water Tank Agitator	-	1	15 kW
1	Waste Water Tank Pump A/B	-	2	30 kW
16	Lime Tank Agitator	-	1	2.2 kW
FEEDERS PROVIDED IN LIMESTONE MCC (QTY ONE NO/UNIT)				
LIMESTONE PREPARATION SYSTEM				
1	Limestone Storage Conveyor A/B	-	2	5.5 kW
2	Limestone Storage Silo Shut-off Gate A/B	-	2	0.75 kW
3	Gravimetric Feeder A/B	-	2	5.5 kW
4	Gravimetric Feeder Outlet Gate A/B	-	2	0.75 kW
6	Jacking System for wet ball mill	-	2	5 kW
7	Inching Motor for wet ball mill	-	2	5 kW
8	H.P Trunnion Lube Oil Pump A/B	-	2	7.5 kW
9	L.P Trunnion Lube Oil Pump A/B	-	2	2.2 kW
10	Mill Separator Tank Agitator A/B	-	2	3.75 kW
11	Mill Circuit Pump A/B A/B		4	45 kW
12	Limestone Slurry Storage Tank Agitator	-	2	55 kW (37)

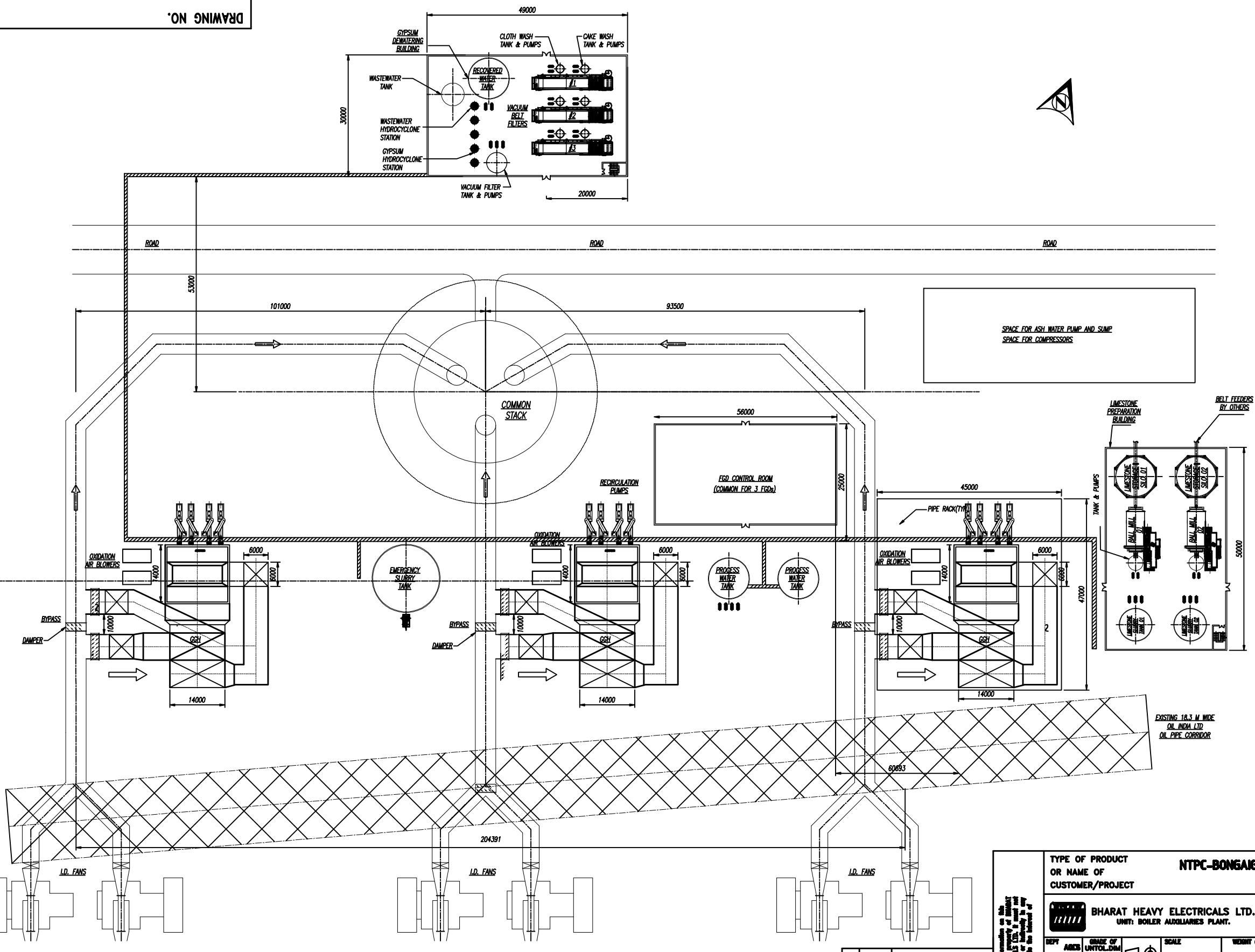
SUMP SYSTEM				
1	Absorber Sump Agitator	1	3	5.5 kW
2	Absorber Sump Pump A/B	2	6	22 kW
3	Auxiliary Absorber Tank Agitator	-	1	37 kW
4	Auxiliary Absorber Tank Pump	-	1	18.5 kW.
5	Valves in Auxiliary Air Tank pump		30	0.5 kW
6	Waste Water Sump Agitator	-	1	3.7 kW
7	Waste Water Sump Pump	-	1	11.0 kW
8	Valves in waste water pumps line		4	0.5 kW
9	Limestone Area Sump Agitator	-	1	3.7 kW
10	Limestone Area Sump Pump	-	1	15 kW
UTILITY SYSTEM				
1	Process Water Pump A/C		3	75 kW (55)
2	Lime tank agitator		1	3.7 kW
3	Absorber Washing Pump A/C	-	3	18.5 kW (11 kW)

Note:

1) The drive ratings are preliminary and subject to variation during detailed engineering.

DRAWING NO.

ALL DIMENSIONS ARE IN MILLIMETRES

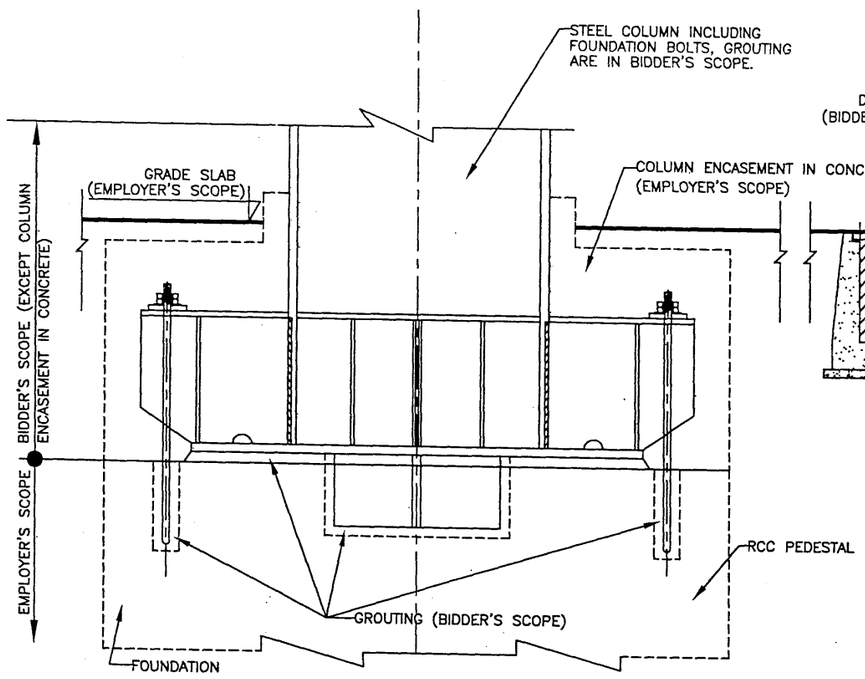


FOR TENDER PURPOSE ONLY

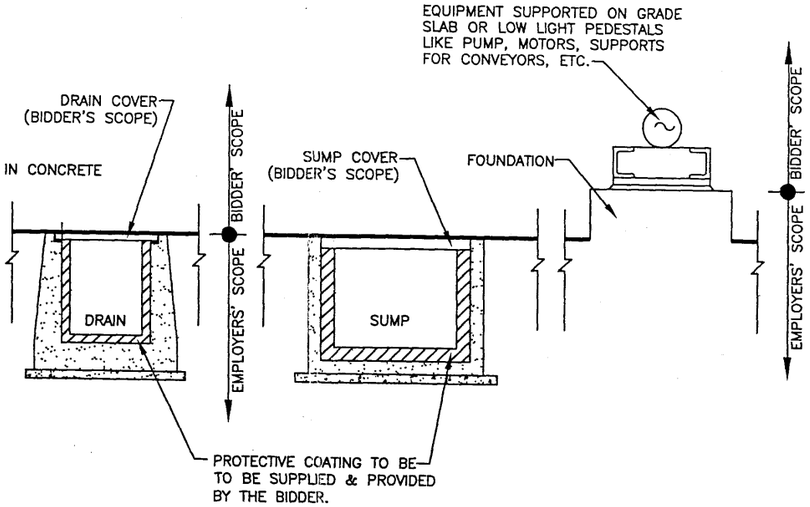
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT	NTPC-BONGAIGAON- 3 X 250 MW						
BHARAT HEAVY ELECTRICALS LTD., UNIT: BOILER AUXILIARIES PLANT.		DRN	ASATHYA		03.08.07	NO.OF VAR.	-
		CHD	PAVANKUMARAN		03.08.07		
		APPD	SUBRAMANIAN		03.08.07		
DEPT ABES	GRADE OF UNTOL.DIM	SCALE	N.T.S	WEIGHT (KG).	**	REF. TO ASSY/OLD DRG.	-
CODE 062	FRBA999					min no.	-
TITLE	LAYOUT OF FGD	CAPD CODE	U 01	DRAWING NO.	3-FW-190-00009	REV	00
				SHEET	01 OF 01		

REV	DATE	ALTERED
		CHECKED
ZONE		

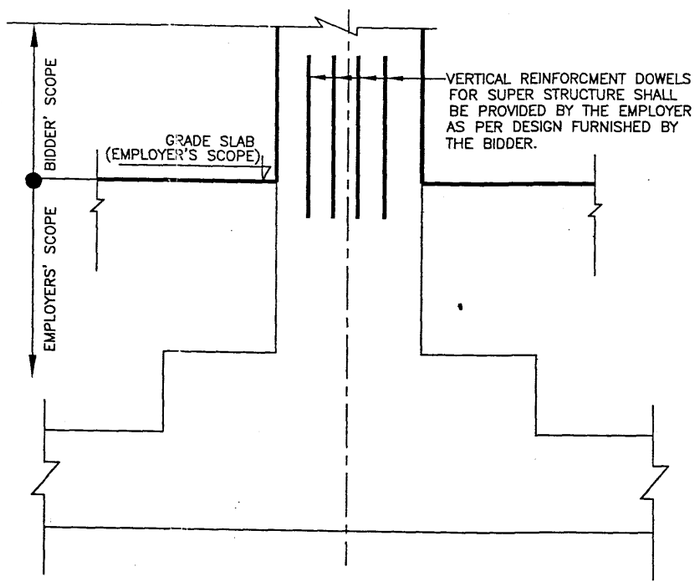
Size A3



FOUNDATION DETAILS OF STEEL SUPER STRUCTURE



FOUNDATION, PAVING, COLUMN ENCASEMENT, DRAINS & SUMP ARE IN EMPLOYER'S SCOPE.



FOUNDATION DETAILS OF RCC SUPER STRUCTURE

RELEASED FOR TENDER PURPOSE

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M (S&L)	M (SG)	E	C	C&I	ARCH.	APPD	DATE
A	FOR TENDER PURPOSE ONLY		Bar		--	--	--		--	--	[illegible]	25.07.07
					CLEARED BY							

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

PROJECT
BONGAIGAON THERMAL POWER PROJECT
(3X250MW)

TITLE
TERMINAL POINT FOR CIVIL WORKS
FOR FGD SYSTEM AND ASSOCIATED BUILDINGS & FACILITIES

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	4610-101-POC-A-002	A

AUTOCAD FILE NAME : BONGAIGAON-SG-CIVIL-FGD-SCOPE.DWG

CHIMNEY
TYPICAL
SEE TERMINAL POINT DEAIL REFER DRAWING NO. 4610-101-POC-A-001
SG OPACITY MONITOR
AT SG
AT SO_2 SG
AT NO_x SG
AT NO_x SG
AT CO SG
2X
5th Cell PART OF DUCTS
FROM UNIT NO.1
AT SO2 X2
FLUE GAS FROM ID FANS
REFER DRWING NO. 4610-101-POM-A-003
GATE SEAL AIR BLOWER
GGH
DPT
PT
PI
TE
X2
X3
MIST ELIMINATORS
ABSORBER
FROM MIST ELUMINATION WASH WATER PUMPS
EMERGENCY WATER TANK
LT X2
FROM FILTER PUMPS (FOR CONTINUATION SEE DRG. No. 4610-101-POM-A-006 Sh 3 OF 3)
FROM PROCESS WATER PUMPS (FOR CONTINUATION SEE DRG. No. 4610-101-POM-A-006 Sh 3 OF 3)
FROM LIMESTONE SLURRY PUMPS (FOR CONTINUATION SEE DRG. No. 4610-101-POM-A-006 Sh 2 OF 3)
OXIDATION TANK
SLURRY RECIRCULATION PUMPS
Typical for each pump
From process water pump
DM X3
PH X3
TO GYPSUM DEWATERING SYSTEM (FOR CONTINUATION SEE DRG. No. 4610-101-POM-A-006 Sh 2 OF 3)
GYPSUM BLEED PUMPS
To Absorber
Drainage (Typical)
SEE NOTE-4
TE x 2
VT x 2
OXIDATION AIR COMPRESSOR

LEGEND :

- PUMP
- AIR COMPRESSOR
- NON RETURN VALVE
- MANUAL GATE VALVE(OPEN)
- MANUAL GATE VALVE(CLOSED)
- MOTORISED GATE VALVE(OPEN)
- MOTORISED GATE VALVE(CLOSED)
- MOTORISED GATE
- AGITATOR
- PNEUMATIC CONTROL VALVE
- RAW LIME STONE
- PROCESS WATER
- FILTRATE
- LIME STONE SLURRY
- GYPSUM SLURRY
- RECIRCULATION SLURRY
- AIR
- GAS
- VACUUM
- TG TEMPERATURE GAUGE
- TE TEMPERATURE ELEMENT
- PI PRESSURE INDICATOR
- DPT DIFFERENTIAL PRESSURE TRANSMITTER
- PT PRESSURE TRANSMITTER
- FM FLOW TRANSMITTER
- LT LEVEL TRANSMITTER
- AT ANALYSER INSTRUMENT
- VT VIBRATION TRANSDUCER
- SG SCOPE UNDER SG PACKAGE
- EMPLOYER SCOPE UNDER EMPLOYER
- DM DENSITY METER
- PH pH METER

TYPICAL FOR EACH COMPRESSOR

NOTES

1. THE SCHEME IS INDICATIVE AND SHALL BE FINALIZED DURING DETAILED ENGINEERING BASED ON SPECIFICATION AND SYSTEM REQUIREMENT.
2. ANY EQUIPMENT / VALVE / PIPE NOT SHOWN IN THE DRAWING BUT REQUIRED FOR COMPLETION OF THE SYSTEM SHALL BE INCLUDED IN THE SCOPE OF THE BIDDER.
3. NUMBER OF AGITATORS / SLURRY SPRAY LEVELS/PUMPS SHALL BE AS PER THE CONTRACTOR'S STANDARD PRACTICE WITH REDUNDANCIES STIPULATED IN THE SPECIFICATION.
4. IN CASE THE CONTRACTOR OFFERS A CENTRIFUGAL TYPE COMPRESSOR A MOTORIZED VALVE/GATE SHALL BE PROVIDED AT THE DISCHARGE OF EACH COMPRESSOR.
5. PROCESS WATER FROM SERVICE WATER LINE SHAL BE SUPPLIED TO THE CONTRACTOR AT EMPLOYER'S TERMINAL POINT AT A SINGLE POINT DEFINED IN CLAUSE NO. 1.06.02 SUB-SECTION: IV, PART-A, SECTION-VI OF THE SPECIFICATION. ALL PIPING FROM THE TERMINAL POINT SHALL BE IN THE CONTRACTOR'S SCOPE.
6. EMERGENCY WATER TANK FOR SPRAY IN INLET DUCT SHALL BE PROVIDED BY THE CONTRACTOR. ALTERNATIVELY, THE CONTRACTOR MAY TAP OFF THE SPRAY FROM MIST ELIMINATOR WASH WATER TANK.
7. INSTRUMENT SHOWN HERE ARE THE MINIMUM REQUIRMENT, ANY ADDITIONAL INSTRUMENT NEEDED AS PER SYSTEM REQUIRMRNT SHALL BE PROVIDED BY THE CONTRACTOR.
8. ALL INSTRUMENTS SHALL BE PROVIDED WITH ISOLATION VALVES.
9. ALL INSTRUMENTS IN SLURRY LINES SHALL BE PROVIDED WITH ISOLATION VALVES AND DIAPHRAGM.
10. ALL TEMPERATURE ELEMENTS (TEs) SHALL BE PROVIDED WITH TEMPERATURE TRANSMITTERS.
11. ONLY ULTRASONIC LEVEL TRANSMITTERS SHALL BE PROVIDED FOR SLURRY TANK / SUMPS.
12. ALL MANUAL PUMP SUCTION VALVES SHALL BE PROVIDED WITH OPEN LIMIT SWITCHES
13. ALL TANKS SHALL BE PROVIDED WITH LEVEL GUAGES FOR LOCAL LEVEL INDICATION
14. PROPER DRAINAGE AND WATER WASHING ARRANGEMENT AS BIDDER'S PROVEN PRACTICE TO BE GIVEN.

FOR TENDER PURPOSE ONLY

NTPC LTD.
(A Government of India Enterprise)
ENGINEERING DIVISION

PROJECT: BONGAIGAON THERMAL POWER PROJECT (3 x 250 MW)

TITLE: ABSORBER SYSTEM SCHEMATIC DIAGRAM (TYPICAL FOR EACH UNIT)

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	DM	ARCH	APPD.	DATE
					CLEARED FOR						

SIZE	SCALE	DRG NO.	REV. NO.
A-1		4610-101-POM-A-006 SH 1 OF 3	B

AUTOCAD DWG. NO. FSD-003.DWG

LIMESTONE MILLING SYSTEM

DAY SILO FEED CONVEYOR

SG

LIMESTONE BUNKER – A

DAY SILO FEED CONVEYOR

SG

LIMESTONE BUNKER – B

LIMESTONE TO MILL–B

FEEDER–A

LIMESTONE BALL MILL – A

MAIN MOTOR

GEAR BOX

AUXILIARY MOTOR

MILL SEPERATOR TANK

MILL CIRCUIT PUMP (2x100%)

MILL HYDROCYCLONE – A

FROM MILL–A

FROM MILL–B

LIMESTONE SLURRY STORAGE TANK (COMMON FOR ALL UNITS)

TO UNIT # 2 SLURRY PUMP

TO UNIT # 3 SLURRY PUMP

UNIT#1 SLURRY PUMP (TYPICAL) (2x100%)

TO ABSORBER TOWER OF UNIT–1

Drainage Sump

FROM PROCESS WATER PUMPS (FOR CONTINUATION SEE DRG. No. 4610-101-POM-A-006 Sh 3 OF 3

NOTES

1. FOR NOTES AND LEGENDS SEE DRAWING NO. 4610–101–POM–A–006 SH 1 OF 3

TYPICAL ARRANGEMENT ONE LIMESTONE MILL

NTPC LTD.
(A Government of India Enterprise)
ENGINEERING DIVISION

PROJECT: BONGAIGAON THERMAL POWER PROJECT (3 x 250 MW)

TITLE: SCHEME OF FGD MILLING SYSTEM

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

SIZE: A–1 | SCALE: | DRG NO.: 4610–101–POM–A–006 SH 2 OF 3 | REV. NO.: B

AUTOCAD DRG. NO. FGD-001.DWG

TO AUXILIARY ABSORBENT TANK

FROM UNIT # 1

FROM UNIT # 2

FROM UNIT # 3

TO AUXILIARY ABSORBENT TANK

TO AUXILIARY ABSORBENT TANK

TO OTHER HYDROCYCLONE / BELT FILTER

PRIMARY HYDROCYCLONE

SECONDARY HYDROCYCLONE FEED TANK

SECONDARY WASTE WATER HYDROCYCLONE X2

PROCESS WATER LINE

LIME TANK FOR NEUTRALISATION

Recirculation cum mixing

WASTE WATER TANK

LEVEL CONTROL STATION FOR EACH TANK

PROCESS WATER

BELT FILTERS

CLOTH WASH WATER

TO GYPSUM CONVEYOR

AIR DISCHARGE

VACUUM PUMP

VACUUM PUMP SEAL

RECEIVER TANK

SEE NOTE-2

TYPICAL ARRANGEMENT FOR ONE VACUUM BELT FILTER

To U#3Absorber tank make-up

To U#2Absorber tank make-up

To U#1Absorber tank make-up

To Limestone Slurry Preparation System

Process Water Tank (2x100%)

Process Water Pumps

To Mist Eliminator Washing System of Unit-2

To Mist Eliminator Washing System of Unit-2

To Mist Eliminator Washing System of Unit-3

Mist Eliminator Wash Water Pumps

To Absorber Tanks

Absorbent Slurry Sump Pump (2x100%)

FROM GYPSUM BLEED PUMPS

Auxiliary Absorbent Tank

SEE NOTE-2

FILTRATE TANK

TO ABSORBERS

BELT FILTER WASH WATER PUMP

Drainage Sump

NOTES

1. FOR NOTES AND LEGEND SEE DRAWING NUMBER 4610-101-POM-A-006 SH 1 OF 3.
2. ARRANGEMENT FOR CAKE AND CLOTH WASHING SYSTEM INDICATED IS TYPICAL. BIDDER MAY OFFER AN ALTERNATE SYSTEM AS PER HIS PROVEN PRACTICE

FOR TENDER PURPOSE ONLY

NTPC Limited (A Government of India Enterprise) ENGINEERING DIVISION

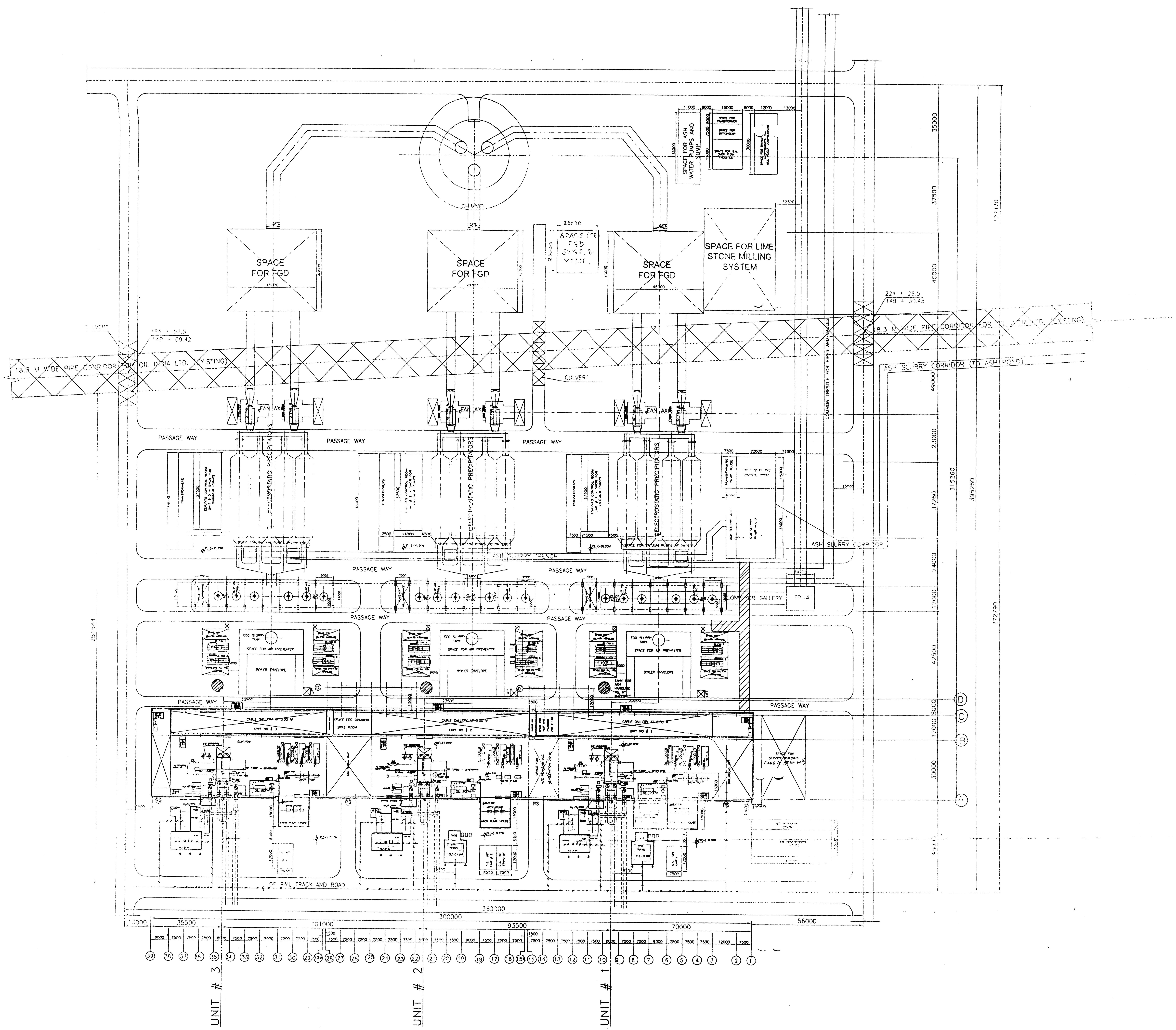
PROJECT: BONGAIGAON THERMAL POWER PROJECT (3 x 250 MW)

TITLE: SCHEME OF GYPSUM DEWATERING SYSTEM

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

SIZE	SCALE	DRG. NO.	REV.
A-1		4610-101-POM-A-006 SH 3 OF 3	B

AUTOCAD DRG. NO. FGD-601.DWG



LEGEND

	PIPE HATCH
	VERTICAL BRACING
FPD	FIRE PROOF DOOR
R	REMOVABLE HAND RAILING
	PIPE & CABLE TRESTLE
	FIRE BARRIER WALL

NOTES

1. [illegible] EQUIPMENT SHALL BE GENERALLY IN ACCORDANCE WITH THE LAYOUT AND [illegible] REQUIREMENTS INDICATED IN THESE DRAWINGS. HOWEVER BUILDING SIZES [illegible] ARE MINIMUM REQUIREMENT AND ACTUAL SIZE SHALL BE AS PER FUNCTIONAL REQUIREMENT BUT NOT LESS THAN THOSE INDICATED IN THESE DRAWINGS.
2. [illegible] CABLES, STRUCTURES ARE TO BE PLACED BELOW 7.0M (BOP, BOC OR BOS) IN FRONT OF BOILER BETWEEN THE 8.0M CORRIDOR SEPARATING MAIN PLANT AND FIRST ROW OF BOILER COLUMNS (i.e. CD BAY).
3. [illegible] DOORS PROVIDED ON C- ROW INTERCONNECTING WITH BOILER ARE OF DOUBLE DOOR TYPE TO AVOID INGRESS OF DUST TO MAIN PLANT BUILDING.
4. [illegible] OF DOORS /REMOVABLE COVERS SHOWN IN THE DRAWINGS ARE INDICATIVE AND [illegible] BE FINALISED DURING DETAILED ENGINEERING.
5. [illegible] DIMENSIONS ARE IN MM'S AND LEVELS ARE IN METRES.
6. [illegible] CORRESPONDS TO EL. (+) [illegible] METERS.
7. [illegible] WALL REQUIREMENTS :
   [illegible] STAIRCASES AT 'A' ROW & 'C' ROW SHALL BE PROVIDED WITH [illegible] THICK BRICK ENCLOSURE
   [illegible] ROOM WALLS.
   [illegible] BATTERY CHARGER & [illegible] BATTERY ROOMS.
   [illegible]
8. [illegible]
   200 mm THK RCC WALL FROM EL 0.0M TO 0.6M FOR LUBE OIL ROOM.
9. FIRE BARRIER WALL :
   PROVIDED ON A- ROW BETWEEN AXIS NO. 10-13, 22-25, 35-38.

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REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.			
B	LOCATION OF CONTROL ROOM REVISED	PA	HS	AG	SC		
A	RELEASED FOR TENDER PURPOSE	RGP	HS	AG	SC	PA	RLD

NTPC Limited.
(A Government of India Enterprise)
ENGINEERING DIVISION

PROJECT: BONGAIGAON THERMAL POWER PROJECT (3x250MW)

TITLE: EQUIPMENT LAYOUT PLAN AT EL 0.00M.

SIZE	SCALE	DRG. NO.	REV. NO.
A1	1:1000	4610-999-POM-A-001	B

Sl No.	Reference	Line,Clause No.,Page No. No.	Existing	To be read as under
1.	BDS Item No.10.2 , Sec-III (BDS) of Bidding Document	First Para at Page 12 of 18	(ii) Milestones at (i) above are to be indicated for each system covered in the scope bidder such as: 1. Power Cycle Piping 2. Electrostatic Precipitator 3. Fuel Oil System 4. Chemical dosing system 5. Associated electrical & C&I system 6. Boiler area elevators etc.	(ii) Milestones at (i) above are to be indicated for each system covered in the scope bidder such as: 1. Power Cycle Piping 2. Electrostatic Precipitator 3.**Flue Gas Desulphurisation System** 4.Fuel Oil System 5.Chemical dosing system 6.Associated electrical & C&I system 7.Boiler area elevators etc.
2.	BDS Item No.11.3 , Sec-III (BDS) of Bidding Document	Last Para at Page 16 of 18	The bids shall be evaluated based on the cost of pulveriser grinding element consumption/replacement considering the guaranteed values and the cost of **mandatory spares furnished by the bidder for the grinding elements in the price schedule**. The grinding elements to be considered for this purpose shall be grinding balls/ Rollers and Rings / Bowl / Tyre Segments.	The bids shall be evaluated based on the cost of pulveriser grinding element consumption/replacement considering the guaranteed values and the cost of **mandatory spares furnished by the bidder for the grinding elements in schedule-1/Schedule-2.** The grinding elements to be considered for this purpose shall be grinding balls/ Rollers and Rings / Bowl / Tyre Segments.

Sl No.	Reference	Line,Clause No.,Page No. No.	Existing	To be read as under
3	BDS Item No.11.3 , Sec-III (BDS) of Bidding Document	Para 5 of BDS at Page 17 of 18	In the above calculations, the cost of wear parts for the mills shall be those quoted by the bidder for **the corresponding parts in the price schedule-10A. The costs shall be the CIF price for foreign supplies and ex-works price for indigenous supplies.**	In the above calculations, the cost of wear parts for the mills shall be those quoted by the bidder for **the Mandatory spare parts in Schedule-1 / Schedule-2. The costs shall be on CIF basis and ex-works basis.**
4	BDS Item No.11.3 , Sec-III (BDS) of Bidding Document	Page 17 of 18	------	Add following note at the end of BDS Item No.11.3: Note: **Bidder must quote the mandatory spares price for grinding elements in Schedule-1/Schedule-2 as these prices shall be considered for evaluation of Bids. In the event the mandatory spares prices for grinding elements are not furnished by the Bidder in Schedule-1 / Schedule-2, the Employer will make its own assessment of the cost of such items for the purpose of ensuring fair comparison of bids.**

AMENDMENTS/ERRATA NO.1
BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION
STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
PART A							
1.	VI	A	I	1.03.10	3/9	Associated …….. Cooling System.	Associated ……. Cooling System, **Compressed Air system**.
2.	VI	A	IIIA-01	1.06.00	2/31	Desuperheating…….Reheaters.The spray water …….. Boiler Feed Pumps,	Desuperheating…….Reheaters.The spray water for Superheaters/ Reheaters shall be tapped from suitable location up stream or downstream of H.P. heaters as per the proven experience of the bidder.
3.	VI	A	IIIA-01	1.06.01 (f)	13/34	Non-return valves in the individual spray lines on the down stream of spray control valves.	**This clause has been deleted.**
4.	VI	A	IIIA-01	1.06.02 (d)	13/34	Non-return valves in the individual spray lines on the down stream of spray control valves.	**This clause has been deleted.**
5.	VI	A	IIIA-01	1.08.00	5/31	Valves for soot blower ….. valves etc. Manually……provided for isolation of each elevation of furnace blowers. These ……. shut off type.	Valves for soot blower ……. valves etc. Manually …….. provided at **each leg** of furnace blowers. These …….. shut off type.
6.	VI	A	IIIA-01	1.15.00 (i)	13/34	**Needle valves as well as** motor operated (sliding gate type) Raw Coal Bunker shut off gate at the bunker mouth and manually operated gate at RC feeder inlet (all of above for each coal feeder).	Motor operated (sliding gate type) Raw Coal Bunker shut off gate at the bunker mouth and manually operated gate at RC feeder inlet (all of above for each coal feeder).
7.	VI	A	IIIA-01	1.15.11	17/31	On line fuel measurement …… as	The clause has been deleted.

AMENDMENTS/ERRATA NO.1
BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION
STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						required.	
8.	VI	A	IIIA-01	1.15.12	18/31	Adjustable orifice……. PF pipelines.	**Fixed type** orifice ….. P.F. pipe at pulveriser outlets.
9.	VI	A	IIA-01	1.16.10	19/31	Suitable fabric type expansion joints wherever necessary shall be installed	Suitable **metallic** type expansion joints wherever necessary shall be installed
10.	VI	A	IIIA-01	1.18.01 (f)	20/31	Oil connections to each burner from ring main with fine filters as near as possible to each burner and means for determination of oil flow to each burner.	Oil connections to each burner from ring main with **one common filter and flow meter in the incoming fuel oil line at the boiler front.**
11.	VI	A	IIIA-01	1.20.02	23/31	Galleries, walkways, platforms, staircase hand rails, ladders and gratings etc. as specified shall be provided at the Steam Generator floors including the interconnecting platforms between the Steam Generator floors and main building at four (4) elevations (excluding ground floor) and between the Steam Generator and bunker buildings at four (4) elevations on either sides of each Steam Generator as per the details given in the Technical Specification. Number of inter-connecting platforms between Boiler and Coal Bunker building for each level / floor shall be two (2) numbers on each side of boiler i.e four (4) numbers per boiler.	Galleries, walkways, platforms, staircase hand rails, ladders and gratings etc. as specified shall be provided at the Steam Generator floors including the interconnecting walkway (minimum 2 m clear & One (1) number per boiler) between main plant building and the boiler at 3 elevations i.e. Operating, PRDS and Deaerator floor levels. Also interconnecting platform between Boiler and Coal Bunker buildings at 3 elevations i.e. Feeder floor level, Tripper floor level and roof of Mill bay shall be provided by the contractor. Number of inter-connecting platforms between Boiler and Coal Bunker building for each level / floor specified above shall be One (1)

AMENDMENTS/ERRATA NO.1
BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION
STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							number per boiler.
12.	VI	A	IIIA-01	1.20.03	24/31	For meeting ……. area of 15,000 m^2 (Clear of…… for ESPs). ……..	For meeting …… area of **14000** m^2 (Clear of …… for ESPs, **Auxiliary Boiler, FGDs**, etc). ……..
13.	VI	A	IIIA-01	1.23.01-04	25/31	Contractor shall……. ……..the model.	***The clauses have been deleted.***
14.	VI	A	IIIA-01	1.27.00 (b)	29/31	Boiler Maintenance Work Station (BMW)……..	***The clause has been deleted.***
15.	VI	A	IIIA-03	1.00.00	1/2	Contractor's scope …... for 4 X 250 MW Steam Generator……following:	Contractor's scope …... for 3 X 250 MW Steam Generator……..following:
16.	VI	A	IIIA-03	1.08.00 (b) (i-iii)	1/2	Computer model …….	***The clause has been deleted.***
17.	VI	A	IIIA-03	1.08.00-1.15.00	2/2	1.08.00……..1.15.00	***Clause numbers changed to 1.09.00……1.16.00***
18.	VI	A	IIIA-04	2.04.00	2/6	Clean gas ……. at an elevation of 31 m above …….. unit in operation.	Clean gas ……. at an elevation of **35 m** above …….. unit in operation.
19.	VI	A	IIIA-04	2.06.00	2/6	The gypsum……. consisting of multiple streams of primary and secondary dewatering equipments……..…The waste water …….shall be pumped to Employer's Ash slurry sump by Contractor……	The gypsum……. consisting of **dual** streams of primary and secondary dewatering equipments……..…The waste water …….shall be pumped to Employer's Ash **water** sump by Contractor……
20.	VI	A	III-A04	3.01.01	2/6	5 no. wet tube mills along with all accessories.	**2X100% Limestone storage silos each having 24 hours storage capacity equivalent to the**

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							requirements of FGD systems of 3X250 MW. The storage silo shall be complete with supporting steel structure, platforms, staircase, air canons, power operated gates, gravimetric feeders, level switches, air relief devices, etc. The storage silo shall be designed to receive limestone from 1x100% belt conveyors. The storage silos and hopper cones shall be fabricated of carbon steel, with a fluropolymer lining (3mm minimum) in the cones to ensure reliable discharge of material. The storage shall be capable of feeding the limestone by means of gravimetric feeder to 2x100% wet ball mills with each mill sized to meet 110% of the maximum limestone requirement of all the three units operating simultaneously at 100% BMCR, with Design/Worst/Best Coal (whichever gives the maximum limestone requirement). The design of storage silos shall confirm to IS 9178.
21.	VI	A	III-A04	3.01.02	2/6	In addition…….enclosed in BPS.	***Clause deleted.***
22.	VI	A	III-A04	3.01.03	2/6	2 limestone slurry tanks, each with 2 hrs storage capacity for 3 units.	2 limestone slurry tanks, each with **12 hrs** storage capacity for 3 units.

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STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
23.	VI	A	IIIA-04	3.01.06	3 of 6	Each mill…….provided by employer under a separate contract. Each mill……	Each mill…….provided by **bidder**. Each mill…….
24.	VI	A	IIIA-04	5.01.00	4 of 6	The employer……three units. The common …comprise of 5 sets of dewatering equipments.	The employer……. three units. The common comprise of **2 sets** of of dewatering equipments.
25.	VI	A	IIIA-04	5.02.00	4 of 6	Each set (suitable of handling/dewatering of one unit)…….equipment (3 working sets + 2 standby sets)…….requirement: i. One set of primary hydrocyclones. ….. v. Complete……. line.	Each set (suitable of handling/dewatering of three unit)…….equipment (**1** working sets + **1** standby sets)……..requirement: i. One set of primary hydrocyclones. ….. v. Complete …….line. **vi. One set of secondary hydrocyclones.**
26.	VI	A	IIIA-04	5.03.00	4 of 6	As an alternate offer…….specification.	The clause is deleted.
27.	VI	A	IIIA-04	6.00.00	5 of 6	AUXILIARY ABSORBENT SUMP	AUXILIARY ABSORBENT TANK.
28.	VI	A	IIIA-04	6.01.00	5 of 6	The employer……absorbent sump,……..	The employer……absorbent **tank**,……..
29.	VI	A	IIIA-04	6.02.00	5 of 6	The contractor……..2X100% slurry pumps…….	The contractor……**.1X100%** slurry pumps…….

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
30.	VI	A	III-A04	9.00.00 (New Clause)	6/6	-	***New clause added:*** **Contractor shall provide buildings for limestone silos and milling system with associated equipments, for gypsum recovery system facilities like vacuum belt filter, vacuum pumps, etc. and for FGD control room. The buildings must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipments of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.**
31.	VI	A	III-A04	10.00.00 (New Clause)	6/6	-	**The contractor shall furnish platforms, walkways for access of each equipment, valves, dampers, gates, instruments etc. handling facilities adequately each component of FGD system.**
32.	VI	A	III-A04	11.00.00 (New Clause)	6/6	-	**The contractor shall furnish one rack and pinion elevator of minimum capacity of 1000 kgs in FGD system for easy access & movement of man/materials.**

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STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
33.	VI	A	IV	1.14.01	8/9	Limestone Bunker Outlet flanges (Refer tender drawings Drg No. 4610-101-POM-A-006 Sh 2 of 3)	Discharge of Day Silo Feed conveyor (Refer tender drawings Drg No. 4610-101-POM-A-006 Sh 2 of 3)
34.	VI	A	IV	1.15.01	8/9	Gypsum belt filter discharge chute (Refer tender drawings Drg No. 4610-101-POMA-006 Sh 3 of 3)	Gypsum belt filter discharge chute **at an elevation of 5.0 m.** (Refer tender drawings Drg No. 4610-101-POMA-006 Sh 3 of 3)
35.	VI	A	IV	1.16.01	8/9	Waste water pump outlet at employer's ash slurry sump (Refer tender drawings Drg No. 4610-101-POM-A-006 Sh 3 of 3)	Waste water pump outlet at employer's ash **water** sump (Refer tender drawings Drg No. 4610-101-POM-A-006 Sh 3 of 3)
36.	VI	A	IV	2.17.00	9/9	All foundation…….Bidder's scope).	All foundation…….Bidder's scope) and foundation for Rack & Pinion elevator for FGD.
37.	VI	A	V	Notes to Table 2(b)	10/13	(i)….. (ii)…..	(i)….. (ii)….. (iii) **Under all operating conditions in constant pressure mode, MS pressure at turbine inlet shall be 150 kg/cm^2 (abs)**
38.	VI	A	VI	1.03.00	1/34	The term "TMCR" …… 0% cycle make-up and design condenser pressure …… condenser pressure.	The term "TMCR" …….0% cycle make-up and **77 mmHg** condenser pressure ……. condenser pressure.
39.	VI	A	VI	3.01.00 (vi)	6/34	**Particulate Emission/ ESP efficiency** Particulate emission from ESP shall not be more than 31 mg/Nm^3 under guarantee point …….. this subsection.	**Particulate Emission/ ESP efficiency** Particulate emission from ESP shall not be more than **18 mg/Nm^3** under guarantee point ……. this subsection.
40.	VI	A	VI	3.01.00 (ix)	6/34	Auxiliary Power Consumption at 100% TMCR	Auxiliary Power Consumption at 100% TMCR

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BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION
STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
				(a)		(250 MW) unit load. The total …… RH of 60%, with 3% cycle make-up shall be guaranteed …….the test.	(250 MW) unit load. The total …… RH of 60%, with **0%** cycle make-up shall be guaranteed …….the test.
41.	VI	A	VI	3.01.00 (ix) (b)	6/34	Auxiliary Power Consumption at 80% TMCR (200 MW) unit load. The total auxiliary power consumption …… ……with 3% cycle make-up shall be guaranteed …….the test.	Auxiliary Power Consumption at 80% TMCR (200 MW) unit load. The total auxiliary power consumption …… …… with **0%** cycle make-up shall be guaranteed …….the test.
42.	VI	A	VI	8.02.00 (i)	14/34	Performance testing shall….whichever is earlier. In case ….. on nos. of coal pulverisers …. guaranteed capacity. …….	Performance testing shall….whichever is earlier. In case ….. on Three (3) nos. of coal pulverisers …. guaranteed capacity. …….
43.	VI	A	VI	8.02.00 (xv)	19/34	Steam purity at drum outlet.	This clause has been deleted.
44.	VI	A	VI	8.02.00 (xix)	19/34	Bidder shall demonstrate Aux. Steam Generator capacity ……..Specification	This clause has been deleted.
45.	VI	A	VI	8.02.00 (xx)	19/34	Bidder shall demonstrate maximum surface temperature …… Section-VIA	This clause has been deleted.
46.	VI	A	VI	9.00.00 (ii)	27/34	Test Loads 100% TMCR (500 MW unit Load) 80% TMCR (400 MW unit Load)	Test Loads 100% TMCR (**250** MW unit Load) 80% TMCR (**200** MW unit Load)
47.	VI	A	VI	9.00.00 (vi)(3-11)	28/34	3 (loss due to carbon monooxide), 4 (loss due to sensible heat in ash), 9 (loss due to radiation), 10 (loss due to mill reject) 11 (loss due to external cooling)	**4** (loss due to carbon monooxide)**,** **5** (loss due to sensible heat in ash), **6** (loss due to radiation)**,** **7** (loss due to mill reject) **8** (loss due to external cooling)
48.	VI	A	VI	10.08.00	31/34	The Contractor shall ……. subject to	The Contractor shall ……. subject to

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STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						the provisions of Clause 3.00.00 note (iv) of this Sub-Section.	the provisions of Clause **4.00.00** note (iv) of this Sub-Section.
49.	VI	A	VI	12.00.00 (New Clause)	34/34	-	***New clause added:*** METHOD OF COMPUTING TEST EFFICIENCY OF FGD The performance tests shall be carried out in accordance with ASME PTC 40 (1991) code. The details of the test shall, however be mutually agreed upon between the employer and the contractor.
PART B							
50.	VI	B	IIM-01	1.01.01	1/104	**Type** The steam generator shall be of sub critical drum type (Natural circulation) with single……..reheat.	**Type** The steam generator shall be of sub critical drum type with single……..reheat.
51.	VI	B	IIM-01	1.04.01 (c)	3/104	The steam generator and its auxiliaries……..for design coal	The steam generator and its auxiliaries……..for **worst coal.** **Combined inert content (Ash + Moisture) (%)** **48.34** **Maximum Ash Content (%)** **32.66** **Max. Total moisture Content (%)** **17.26** **Hardgrove Grindability Index. (HGI)** **43**

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STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							Gross Calorific value (KCal/Kg) **3828** **IDT of Coal Ash (deg C) (reducing atmosphere)** **1050 ^{O} C**
52.	VI	B	IIM-01	1.05.00	4/104	The existing …… this project. Employer shall make …. facilities .	The existing …… this project. **Contractor** shall make …. facilities .
53.	VI	B	II-M-01	12.05.02 (ii)	38/105	Number of standby mills At 100% of TMCR, (250 MW unit load) blended worst coal firing Two At 100% BMCR blended worst coal firing One At 100% BMCR blended design coal firing Two	Number of standby mills At 100% of TMCR, (250 MW unit load) blended worst coal firing One At 100% BMCR blended worst coal firing Nil At 100% BMCR blended design coal firing One
54.	VI	B	II-M-01	14.03.00	65/**104**	Fan…….. maintenance. The….. ……..requirements: **DESCRIP** | **FD Fans** | **ID Fans**	Fan…….. maintenance. The….. ……..requirements: **DESCRIP** | **FD Fans** | **ID Fans**

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BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION
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<table>
<tr><th rowspan="2">Sl. No. (1)</th><th colspan="5">REFERENCE (2)</th><th rowspan="2">INSTEAD OF (3)</th><th rowspan="2">READ AS (4)</th></tr>
<tr><th>SECTION</th><th>PART</th><th>SUB-SEC</th><th>CLAUSE</th><th>PAGE NO.</th></tr>
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<tr><th>TION</th><th></th><th></th></tr>
<tr><td>Type…..</td><td>Stream…..</td><td>backward ……..</td></tr>
<tr><td>Blade material</td><td>high strength cast aluminum alloy, BHN-75 (min.)</td><td>25 mm…….</td></tr>
<tr><td>Fan ……..</td><td>1400 rpm (max.)</td><td>600 rpm (max.)</td></tr>
<tr><td>…….</td><td>……. ……..</td><td>……. ……</td></tr>
</table>
Note:
(a) Contractor……..them.
(b) Although…….Commissioning.</td><td>
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<tr><th>TION</th><th></th><th></th></tr>
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<tr><td>…….</td><td>……. ……..</td><td>…… ……. …</td></tr>
</table>
Note:
(b) Contractor…….them
(c) Although……..commissioning.</td></tr>
<tr><td>55.</td><td>VI</td><td>B</td><td>IIM-01</td><td>14.05.00 (c)</td><td>67/104</td><td>Natural frequency of all fan components ……..speeds.</td><td>Natural frequency of all axial fan components……. speeds.</td></tr>
<tr><td>56.</td><td>VI</td><td>B</td><td>II-M-01</td><td>15.01.11</td><td>73/105</td><td>(a)Reinforced fabric-type ….. ductwork.</td><td>Clause modified as indicated in Annexure-I.</td></tr>
</table>

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BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION
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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						(b)…... (c) Complete … …. manufacturer. (d) The fabrics shall ….. permeability". (e) The …….. weatherability. (f) The corrosion ….. Celsius. (g) For the …. accumulation. (h) The minimum ……. commissioning. Note: However, the ……..employer's approval	
57.	VI	B	II-M-01	21.09.00 (d)	94/**104**	Electrostatic Precipitator Outer casing 20 SWG Aluminium for ESP	Electrostatic Precipitator Outer casing **22** SWG Aluminium for ESP
58.	VI	B	II-M-01	21.13.00	95/104	Hexagonal wire mesh shall be conforming to following: **Temperature Range** **Material** **Mesh size**	Hexagonal wire mesh shall be conforming to following: **Temperature Range** **Material** **Mesh size**

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						(a) Upto 400°C Galvanized Steel 10-13 mm aperture 0.71 mm diameter (b) Above 400°C Stainless Steel —do—	(a) Upto 400°C Galvanized Steel 10-13 mm aperture **0.56 mm diameter** (b) Above 400°C Stainless Steel —do—
59.	VI	B	II M - 01	26.01.01	103 of 104	Full range performance testing…….	Full range & full scale performance testing on actual fan…….
60.	VI	B	IIM-01	9.01.00 (5)	21/104	Means of Temperature Control (a)Super heaters : Spray Water attemperation……. to the employer)	Means of Temperature Control (a)Super heaters : Spray water for Superheaters shall be tapped from suitable location up stream **or downstream of H.P. heaters as per the proven experience of the**

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						(b) Reheaters* : i) Primary controls : Tilting of burners/gas biasing/gas recirculation (gas to be tapped off after ID fans), ii) Secondary (emergency) controls : spray water attemperation (utilizing water tapped off from interstage of BFP)	**bidder.** (b) Reheaters* : i) Primary controls : Tilting of burners/gas biasing. ii) Secondary (emergency) controls : Spray water shall be tapped off from suitable location up stream **or downstream of H.P. heaters as per the proven experience of the bidder.**
61.	VI	B	II M - 01	9.02.00 (iii) (a) (New Clause)	25 of 104	-	***NEW CLAUSE INSERTED*** The spray water pipe lines for superheater spray shall be suitably sized to restrict water velocity below 4 m/sec .
62.	VI	B	II M - 01	9.02.00	25 of		***NEW CLAUSE INSERTED***

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
				(iii) (b) (New Clause)	104 after	-	The superheater spray control valves, block valves etc shall be suitably sized to minimize pressure drops and ensure adequate superheater spray flow under all operating conditions. The Source of spray water shall be from the boiler feed pump discharge, upstream or downsteam of feed water heaters. The exact pressure at the terminal point to SG package will be intimated to the successful bidder during detailed engineering stage.
63.	VI	B	IIM-03	1.02.00	1/15	The steam generator……ESP components/surfaces.	The steam generator……ESP components/surfaces. ***(New paragraph added as below)*** **However, Bidder should note that the fuel for this project shall be a blended coal having high sulphur from supplies of Makum Coal Fields of NECL (Assam) given in Table1(A) of Part A, Sub-sec-V.and Non Ranigang Coal fields of ECL viz Mugma, Salanpur, SP mines and Rajmahal Coal Fields given in table-1 (B) of Part A, Sub-sec-V. The coal/ash quality parameters of range**

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							of coals to be fired are given in Table-1(c) of Part A, Sub-sec-V. Bidder is advised to independently analyze the properties of coal and ash. The design of electrostatic precipitator and selection of material for various components shall be appropriate for such high sulphur coal so as to ensure satisfactory performance, reliability and long life of the components
64.	VI	B	IIM-03	2.01.01	2/15	The Contractor shall perform model study (Physical scale modeling as well as CFD modeling) to achieve…….. the precipitator.	The Contractor shall perform **Physical scale model study** to achieve ……. the precipitator.
65.	VI	B	IIM-03	2.01.02	3/15	In addition……..	***The clause has been deleted.***
66.	VI	B	IIM-03	4.00.00	4/15	Gas distribution…….The distribution screen shall be of modular design. The contractor……..screens clean.	Gas distribution…….....The distribution screen shall be **made of corrosion resistant material and** of modular design. The contractor……..screens clean.
67.	VI	B	IIM-03	5.01.00	3/15	Collecting .....rapping.Minimum plate thickness shall be 18BWG. Each plate…….proposal.	Collecting .....rapping. **The material and minimum plate thickness shall be of corten steel or equivalent & 18BWG**. Each plate…….proposal.

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)				READ AS (4)			
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.								
68.	VI	B	IIM-03	11.00.00	9/15	Sl. No	Item	Guarantee Point	Design Point	Sl. No	Item	Guarantee Point	Design Point
						7	No. of series electrical fields out of operation	Nil	Nil	7	No. of series electrical fields out of operation	Nil	**One**
						8	ESP Dust Collection Efficiency (%)	To be worked out by Bidder to limit ODB to 31 mg/NM^3 (maximum).	To be worked out by Bidder to limit ODB to 50 mg/NM^3 (maximum).	8	ESP Dust Collection Efficiency (%)	To be worked out by Bidder to limit ODB to **18 mg/NM^3** (maximum).	To be worked out by Bidder to limit ODB to 50 mg/NM^3 (maximum).
						9	Minimum specific collection area ($m^2/m^3/sec$)	230	218	9	Minimum specific collection area ($m^2/m^3/sec$)	**196**	**-**
69.	VI	B	IIM-04	1.00.00	1/18	The engineering……system.				The engineering……system.			

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						The owner ……less than 90% and residual moisture not more than 10%. The complete…….the system.	The owner ……. less than **95% , surface moisture not more than 10%, and chloride content not more than 100 ppm.** The complete…….the system. **The complete installation of liners shall be made under the supervision of the FGD manufacturer.** **In the execution of the welds contractor must ensure that welding material has same corrosion resistance as the actual plate surface.** **Alloy to carbon steel welds must either be hidden behind a covering strip of alloy material, or be executed by a special welding procedure ensuring the same quality at the weld surface as the alloy lining.** **All welding which shall be in the contact with process fluids shall be**

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)				READ AS (4)			
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.								
										executed under the supervision of the designer/manufacturer.			
70.	VI	B	IIM-04	1.02.00	1/18	**Sl. No.**	**Item**	**Guarantee Point**	**Design Point**	**Sl .No.**	**Item**	**Guarantee Point**	**Design Point**
						1	Boiler Load in MW (e)	250 MW	250 MW	1	Boiler Load	250 MW	**100 % BMCR**
						2	Type of Coal	Design coal	Worst coal	2	Type of Coal	Design coal	Worst coal/**Design coal / Best coal.**
						3	…..	……	…..	3	…..	……	…..
						4	Gas flow (M3/sec)	To be worked out by Bidder when firing the specified design coal at TMCR (250MW) load, considering 25% excess	To be worked out by Bidder when firing the specified worst coal at TMCR (250MW) load, considering 25% excess	4	Gas flow (M3/sec)	To be worked out by Bidder when firing the specified design coal at TMCR (250MW) load, considering **20**% excess	To be worked out by Bidder when firing the specified worst / design / best coal at TMCR (250MW) load, considering **20**%

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)			READ AS (4)			
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.							
								air at economizer outlet, 15% Air heater in leakage and 2% duct and ESP leakage as a minimum.				air at economizer outlet, 15% Air heater in leakage & 2% duct and ESP leakage as a minimum.
						5	…..	……	…..			
						6	Inlet SO2 concentration (gms/ Nm3)	To be worked out by the Bidder (based on the above conditions).	To be worked out by the Bidder (based on the above conditions).			
						……The FGD system shall however be capable of treating and providing						
											air at economizer outlet, 15% Air heater in leakage and 2% duct , ESP leakage and 1.5 % GGH leakage as a minimum.	excess air at economizer outlet, 15% Air heater in leakage & 2% duct , ESP leakage and 1.5% GGH leakage as a minimum.
									5	…..	……	…..
									6	Inlet SO2 concentration (gms/ Nm3)	To be worked out by the Bidder (based on the above	To be worked out (maximum) by the Bidder (based

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						successful performance with flue gases produced when burning any coal from the specified range including coal with sulphur content upto 3.5%.	condition s). on the above condition s). …….The FGD system **material selection** shall however be capable of **handling** and providing successful performance with flue gases produced when burning any coal from the specified range **and also the coal having sulphur content upto 3.5%. Bidder to note that the selection of the material shall not only be suitable for high sulphur content, but also chloride content in the process slurry.**
71.	VI	B	IIM02	1.00.00 (F)	2/4	The feed……necessary. Two feed…….with NRV. The contractor … supplied.	The feed……necessary. Two feed…….with NRV. The contractor ……. supplied. OR Alternatively, the bidder can offer deaerator feed water storage tank having a capacity adequate to sustain operation of auxiliary boiler for minimum half an hour without feed water make-up. In this case, bidder will

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							have to tap feed water from employer's terminal point. Employer will provide DM water at the terminal point at a pressure of 3-4 kg/cm2 (g).
72.	VI	B	IIM-04	2.02.04	3/18	The gas duct…….shall be or equivalent. Alternatively…….be provided.	The gas duct from Gas-Gas Heater (GGH) outlet to Absorber **shall be made of S-TEN 1 of Nippon Steel Corporation or equivalent. The duct from GGH outlet to stack shall be Carbon steel with C276 lining of minimum 2 mm thickness.** Alternatively…….be provided.
73.	VI	B	IIM-04	2.02.05	3/18	In addition…….system proposed.	In addition…….system proposed. **Bidder to note that application of lining material in the ducts shall be carried out under the supervision of designer/manufacturer.**
74.	VI	B	IIM-04	2.02.06	3/18	All guide vanes……made of SS 317 LMN or better material.	All guide vanes……made of 317 LMN **or appropriate material which offers similar or better corrosion resistance properties as of duct plates.**
75.	VI	B	IIM-04	3.01.01	4/18	The GGH …….Heat Pipe type heat exchanger, with carrier fluid……. higher capacity.	The GGH …….Heat Pipe type heat exchanger **or a non-leak type heat exchanger**, with carrier fluid……. higher capacity.
76.	VI	B	IIM-04	3.03.02	5/18	In case ……. 200 mg/Nm3.	In case ……. 200 mg/Nm3. **The**

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							material of GGH components shall be as specified below: **Heat extractor components: STB340/ ASTM A214 or better.** **Heat recovery components: CR1A/ ASTM A423, A618 or better.**
77.	VI	B	IIM-04	3.03.05	6/18	The contractor …….. the contractor.	The contractor …….. the contractor. **Any other proven cleaning system shall also be acceptable, if the contractor has previous experience of the same.**
78.	VI	B	IIM-04	3.03.06 (New Clause)	6/18	-	***New Clause Added:*** **Separate arrangements, if required, for water washing shall also be provided for washing all sides of heat transfer surfaces during scheduled plant shutdown.**
79.	VI	B	IIM-04	4.03.01	7/18	The contractor may offer either a grid type oxidation system or a sparge jet oxidation system, for oxidation of sulfite sludge to sulfates, as per his proven practice.	The contractor may offer either a grid type oxidation system or a sparge jet oxidation system **or lance type or air rotary sparge system** for oxidation of sulfite sludge to sulfates, as per his proven practice.
80.	VI	B	IIM-04	4.03.04 (New Clause)	7/18	-	***Add new clause as 4.03.04:*** **The oxidation system shall be complete with a quenching system**

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							to cool down heated oxidation air in order to prevent any scaling or buildup that could occur at the sparger tips due to localized evaporation of recycled slurry.
81.	VI	B	IIM-04	4.05.06	8/18	The absorber shall be made of 7 mm thick mild steel with corrosion resistant metallic lining to avoid corrosion of the base material.	**The absorber and oxidation tank shall be made of 7 mm thick carbon steel.** **The absorber tower and oxidation tank shall be provided with 2 mm (minimum) thickness lining / cladding / wall paper of SS 317 LMN / Alloy 31 or other proven material such as rubber lining (4mm thick minimum) as per bidder's practice. In case of rubber lining, bidder to ensure required temperature resistance at absorber inlet by means of special lining as per bidder's proven practice.** **The material shall be so selected that the minimum guaranteed life of 20 000 hrs shall be achieved.** **Sufficient protection shall be provided for the base of the tank to prevent mechanical damage,**

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							particularly during maintenance. **The material of process equipments of flue gas desulphurization system shall be appropriate for the chloride and pH level at which the process is to operate.**
82.	VI	B	IIM-04	4.05.07	8/18	The absorber wet-dry interface …… maintenance.	**The absorber wet-dry interface shall be made of Alloy C276 / Alloy 59 or better material.**
83.	VI	B	IIM-04	4.05.08	8/18	The absorber tower & outlet duct shall be provided with 2 mm (minimum) thickness lining / cladding / wall paper of SS 317 LMN / Alloy 31 or better material.	The absorber outlet duct shall **made of SS 317 LMN / Alloy 31 or better material**.
84.	VI	B	IIM-04	4.05.09	8/18	The spray …….. outer side. The spray nozzles shall be of silicon carbide.	The spray …….. outer side. The spray nozzles shall be of silicon carbide **or ceramic or equivalent having a minimum guaranteed life of 20000 hours.**
85.	VI	B	IIM-04	5.04.01	9/18	There shall be five (5 nos.) tube mills for grinding of limestone. …… occurring together.	There shall be **2 X 100 %** tube mills for grinding of limestone. …… occurring together.
86.	VI	B	IIM-04	5.04.02	9/18	In addition to the base offer……the Technical Specification.	***This clause has been deleted.***
87.	VI	B	IIM-04	5.04.05	10/18	All parts of …….	All parts of …….

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						guaranteed wear life of not less than 14000 hrs …….. wear parts.	guaranteed wear life of not less than **8000 hrs** …….. wear parts.
88.	VI	B	IIM-04	5.05.01	11/18	The contractor …… meet 2 hours continuous ……. is lower.	The contractor …… meet **12 hours** continuous ……. is lower.
89.	VI	B	IIM-04	6.01.01	10/18	In addition to the base offer described above, the bidder may also give an alternate offer for 2x100% gypsum dewatering system ……. ……. this Specification. Bidder shall indicate ……. in the Technical Specification.	**The contractor shall provide 2x100%** gypsum dewatering system ……. ……. this Specification.
90.	VI	B	IIM-04	6.02.01	10/18	Each set of …… produced by one unit operating at 100% BMCR …….. belt filters.	Each set of …… produced by **three units** operating at 100% BMCR …….. belt filters.
91.	VI	B	IIM-04	6.02.03	10/18	The primary …… belt filters. The …..to Hydro-cyclone Waste Water sump. …. this Sub-Section.	The primary ……belt filters. The …..to Hydro-cyclone Waste Water **tank via secondary hydrocyclone feed tank and secondary waste water hydrocyclone as shown in the relevant tender drawing**. The …. this Sub-Section.
92.	VI	B	IIM-04	6.03.01	10/18	Each vacuum belt ….. whichever is minimum: i. Gypsum Quantity 110% of gypsum produced by one Absorber …..gypsum	Each vacuum belt ….. whichever is minimum: i. Gypsum Quantity - 110% of gypsum produced by **three** Absorber

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STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						flow. ii. ……. iii. Gypsum purity 90 % (minimum)	…..gypsum flow. ii. ……. iii. Gypsum purity - **95 %** (minimum)
93.	VI	B	IIM-04	6.03.09	13/18	Gypsum cake ….. belt conveyor.	Gypsum cake ….. belt conveyor. **The elevation of discharge point of vacuum belt filter shall be atleast 5.0 m above GL.**
94.	VI	B	IIM-04	6.06.08	15/18	The waste …….to ash slurry sump. The material …… be Stainless Steel-410.	The waste …….to ash **water** sump. The material …… be Stainless Steel-410.
95.	VI	B	IIM-04	6.08.00	15/18	The contractor …. 2x100% Slurry sump pumps …… of 12 hours.	The contractor …. **1x100%** Slurry sump pumps …… of 12 hours.
96.	VI	B	IIM-04	8.01.00	16/18	Employer shall provide ……..FGD system.	**Contractor** shall provide ……..FGD system.
97.	VI	B	IIM-04	13.02.00	18/18	Equipments …… Staircase with a minimum width of 1000 mm shall be provided for ……..acceptable.	**Equipments …… Staircase with a minimum width of 1200 mm shall be provided for ……..acceptable.**

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
98.	VI	B	IIM-04	13.10.00 (New Clause)	18/18	-	**New Clause Added:** **The interconnecting platforms between absorber tanks shall be provided at two levels (minimum), preferably at top level and at intermediate levels to facilitate the movement of man and material. The platform width shall be atleast 1200 mm. The interconnecting platform levels shall necessarily have elevator landings.**
99.	VI	B	IIM-04	14.00.00 (New Clause)	18/18	-	**Add new clause as enclosed at Annexure-IV.**
100.	VI	B	IIM-04	15.00.00 (New Clause)	18/18	-	**Add new clause as 15.00.00.** **Leak tightness testing of dampers for each type and size of damper at shop to demonstrate the guaranteed gas tightness efficiency (on flow). The minimum guaranteed gas tightness efficiency of dampers shall not be less than that indicated in clause no. 2.03.03, Sub-Section-II M-04, Part B, Section VI.**
101.	VI	B	IIM-04	16.00.00 (New Clause)	18/18	-	**Add new clause as 16.00.00.** **Bidder shall provide all necessary**

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							arrangements for purging & flushing of all the process pipelines, equipments etc. Bidder to ensure proper draining facilities for the complete system including proper drainage of acidic fluids from the ducts so as to avoid any accumulation of acidic fluids anywhere.
PART E							
102.	VI	E				Drg. No. 4610-101-POM-A-006(Rev. A) (Sheet No. 1of3, 2of3,3of3)	Drg. No. 4610-101-POM-A-006(Rev.B) (Sheet No. 1of3, 2of3,3of3)
#							
103.	VI	B	IV-I-10	3.00.00(9)	7 of 8	Battery……. Yes	Battery…….Yes*
104.	VI	B	IV-I-10		8 OF 8	Note: ……..	Note: …… ***For batteries with electric power supply system of SG C&I, the contractor shall submit for owner's approval the reports of all the type tests as per IS-10918 carried out within last five years from the date of bid opening and the tests should have been either conducted at an independent laboratory or**

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							should have been witnessed by a client. The complete type test reports shall be for any rating of battery in a particular group, based on plate dimensions being manufactured by supplier. **For batteries with electric power supply system of auxiliary plants type test reports for batteries shall be as per standard practice of manufacturer.**
105.	VI	B	IV-I-02	14.02.00	51 of 52	The AMC shall cover total maintenance of all hardware & software coming under the scope of DDCMIS and shall include free repair/replacement of all cards/modules/peripherals/cables/components etc., correction of software problems and supply of expendable items. The Bidder shall ensure 99.7% availability of the system with the AMC. For the AMC the Contractor shall maintain the same staff as mentioned above for warranty period (i.e. at least one engineer, two supervisors and four technicians).	The AMC shall cover total maintenance of all hardware & software coming under the scope of DDCMIS and shall include free repair/replacement of all cards/modules/peripherals/cables/components etc., correction of software problems and supply of expendable items. The Bidder shall ensure 99.7% availability of the system with the AMC. For the AMC the Bidder may maintain adequate no.of staff at site as per his own assessment if considered necessary to ensure availability.
106.	VI	B	Apendix-I to SG C&I	1.00.00	2 of 8	The contractor shall provide functional groups as indicated in drg no.3530-	The contractor shall provide functional groups as indicated in drg no.4610-101-POI-A-009……

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						101-POI-A-009……	
107.	VI	B	IV-I:04	3.00.00(a)	3 OF 6	Shall be one piece solid bored type of 315 SS of step less tapered design. (As per ASME PTC 19.3, 1974)	Shall be one piece solid bored type of 316 SS of step less tapered design. (As per ASME PTC 19.3, 1974)
108.	VI	B	IV-I-08	1.01.03	1 OF 6	This specification does not cover special type of control valves such as combined pressure and temperature control valve for Aux PRDS applications etc.	For special requirements of Control Vlaves such as Pressure and Temperature Control valves of Auxiliary PRDS, Start Up Drain control valves etc., refer corresponding mechanical sections.
109.	VI	A	III:C	3.00.00	3 of 8	Other special C&I systems…… …….. ……	Other special C&I systems…… …….. …… Conductivity type Level Switching System
110.	VI	B	IV:I3	1.11.00 (**New Clause)**	7 of 7		**Insert new clause 1.11.0 as indicated in Annexure-II**
##							
111.	VI	B	IIM-05	7.00.00 (D)	10 of 33	**Alloy Steel** **Mandatory Requirements:** - As per DIN 17175 for X-20 material	**Alloy Steel** **Mandatory Requirements:** -As per DIN 17175 for X-20 material

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						- As per ASME B&PV Sect.II for ASTM Materials	**-All tests , as given in respective material code (other than supplementary requirements), shall be carried out as minimum. This includes the tests wherein it is specified in the ASTM code that "the test is to be carried out when specified by the purchaser" or any such indication, in the code.**
112.	VI	B	IIM-05	7.00.00 (D)	10 of 33	**Carbon steel** **Mandatory Requirements:** - As per ASME B&PV Sect.-II	**Carbon steel** **Mandatory Requirements:** **All tests , as given in respective material code (other than supplementary requirements), shall be carried out as minimum. This includes the tests wherein it is specified in the ASTM code that "the test is to be carried out when specified by the purchaser" or any such indication, in the code.**
113.	VI	B	IIM-05	7.00.00 (D)	11 of 33	**Alloy Steel** **Supplementary requirements:** For X20 material	

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						1) Product analysis of finished pipe as per DIN 17175 Cl. 8.4.2 on two pipes per cast per delivery 2)Transverse tension test on the end on 5% of pipes per lot as per DIN17175 cl.8.5.2 3)For fittings, product analysis and transverse tension test as above and 100% MPI For ASTM materials 1. S1 and S2 for pipes (one end on 5% of pipes per lot) 2. S1, S2 & S4 for ASTM A234 pipe fittings S2,S3 & S4 for ASTM A182 fittings	Deleted
114.	VI	B	IIM-05	7.00.00 (D)	11 of 33	**Carbon steel** **Supplementary requirements:** 1. S1 and S2 for ASTM A106 Gr.C(one end on 5% of pipe per lot) 2. S2, S4 & S5 for ASTM A105 3. S1, S2, S4 for ASTM A234 WP	Deleted
###							
115.	VI	A	III:B Electrical Scope	7.02.00	3 of 4	Insulators alongwith heating and ventilation system for insulator compartments complete with fans,	Insulators alongwith heating or hot air ventilation system for insulator compartments complete with fans,

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						heaters and necessary control etc. to avoid moisture condensation.	heaters and necessary control etc. to avoid moisture condensation.
116.	VI	B	IIIE-01 Motors	1.10.00	1 of 7	Degree of protection for various enclosures as per IS:13947 shall be as follows	Degree of protection for various enclosures as per IS:4691,IEC60034-05 shall be as follows
117.	VI	B	IIIE-01 Motors	7.03.00 (c)	4 of7	6.6 kV AC motors:Class F : with winding temperature rise limited to class B. The winding insulation process shall be total Vacuum Presure Impregnated i.e resin poor method.They shall withstand 1.2/50 microsec. switching surges of 4U+5 KV (U=Line voltage in KV).The coil inter-turn insulation shall be suitable for 0.3/3 micro sec. surge of 20KV followed by 1 min power frequency high voltage test of appropriate voltage on inter turn insulation.	6.6 kV AC motors: Class F : with winding temperature rise limited to class B. The winding insulation process shall be total Vacuum Presure Impregnated i.e resin poor method.They shall withstand 1.2/50 microsec. switching surges of 4U+5 KV (U=Line voltage in KV).The coil inter-turn insulation shall be suitable for 0.3/3 micro sec. surge of 20KV.
118.	VI	B	IIIE-01 Motors	8.01.05 (d)	6 of7	Full load test	Full load test(subject to test bed constraint)
119.	VI	B	IIIE-01 Motors	8.01.05 (g)	6 of7	Surge-withstand test at 20KVp with 0.3/3 micro sec. wave on each type of 6.6 KV motor coils respectively with at least five such impulses, followed by one minute power frequency high voltage test on turn to turn insulation, after cutting the coil and bringing out the turns suitably.The power frequency test voltage shall be decided during	Surge-withstand test at 20KVp with 0.3/3 micro sec. wave on each type of 6.6 KV motor coils respectively with at least five such impulses.

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						detailed engineering.	
120.	VI	B	IIIE-01 Motors	8.01.06 (c)	7 of 7	Type test report on Elastimold terminal connector as per ANSI/IEEEE-386-1985	This sub-clause stands deleted
121.	VI	B	IIIE-08 ESP Electrical	2.04.00	3 OF 10	Add a new line at clause end:	Max. temperature rise : Winding 55 deg.C above ambient 50 deg.C. Oil 50 deg.c above ambient 50 deg.C.
122.	VI	B	IIIE-08 ESP	5.01.00 (c)	4 OF 10	High resolution 21" colour CRT	High resolution, minimum 20" flat TFT colour monitor
123.	VI	B	IIIE-08 ESP	5.01.00 (f)	5 OF 10	Color inkjet printer for alarms and reports	Colour lazer printer for alarms and reports
124.	VI	B	IIIE-08 ESP Electrical	5.01.00 Last line	5 OF 10	The PC based master controller i.e. operating and monitoring station together with 21" colour CRT, keyboard and colour inkjet printer shall be located in the Employer's unit control & equipment room/ programmer's room for each unit	The PC based master controller i.e. operating and monitoring station together with high resolution minimum 20" flat TFT colour monitor, keyboard and colour lazer printer shall be located in the Employer's unit control & equipment room/ programmer's room for each unit
125.	VI	B	IIIE-07 VFD	1.01.00	01 of 10	Transformers:IS 2026	Transformers:IS 2026,IEC 60076
126.	VI	B	IIIE-07 VFD	6.02.01(d)(vi)	10 of 10	Surge withstand test at sixty five percent value of (4U+5KV) with 0.3/3 micro sec. Wave on motor coils with at least 5 such impulses, followed by one minute power frequency high voltage test on turn to turn insulation, after cutting the coil and bringing out the	Surge withstand test at sixty five percent value of (4U+5KV) with 0.3/3 micro sec. Wave on motor coils with at least 5 such impulses.

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						turns suitably. The power frequency test voltage shall be decided during detailed engineering.	
127.	VI	A	VII Mandatory Spares	1.18.03(k)	Page 26 of 50	Switches and Gaskets:1 set (One set means one complete replacement for all the TR sets of one boiler)	Gaskets:20 sets (One set means one complete replacement for one TR set)
128.	VI	A	VII Mandatory Spares	1.18.03(m)	Page 27 of 50	MCC Auxiliary Control Panel (i) Breaker 1 set (ii)Power contacts 1 set (iii)Auxiliary relays 1 set (iv)Over load relay 1 set (v)Power fuse 1 set (vi)Contact fuse 1 set (vii)Control terminal block 1 set	MCC Auxiliary Control Panel (i) Breaker :1 set (ii)Power contacts :1 set (iii)Auxiliary relays :1 set (iv)Over load relay :1 set (v)Power fuse :1 set (vi)Control fuse :1 set (vii)Control terminal block 1 set Add note: One set means complete replacement for one auxillary control panel
129.	VI	A	VII Mandatory Spares	1.18.02 VFD	Page 24 of 50	LT Transformer (VFD) (i) (a) Primary :3 nos each rating (b)Secondary:3 nos each rating (ii)Winding temperature indicator with alarm & trip contacts : 1 no. (iii) Oil temperature indicator with alarm & trip contacts : 1 no. (iv)Magnetic oil level gauge: 1no (v) Pressure relief device: 1no (vi) Diaphragm for explosion vent: 1 no. (vii)Buchholz relay/sudden pressure	LT Transformer (VFD) (i) HV Bushings with metal parts and gaskets :3 nos. (ii) LV Bushings with metal parts and gaskets: 3 nos. (iii) Neutral Bushing with metal parts and gaskets: 1 no(not applicable for Dd0 vector group) (iv) Winding temperature indicator with alarm & trip Contacts: 1 no. (v) Oil temperature indicator with

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						relay (as applicable):1no. (viii)Silica gel charge:1 charge (ix) Floats with contacts for buchholz relay: 1 set (x) Set of gaskets: 1 set (xi)Contacts tap changer:1 set (xii)Set of valves (1 no. of each size):1 set (xiii)Pressure gauge (applicable for sealed tank) :1 no. of each type (xiv)Set of windings for one limb in a suitable oil container : 1 for each rating	alarm & trip contacts: 1 no. (vi) Magnetic oil level gauge: 1 no. (vii) Pressure relief device: 1 no. (viii) Buchholz relay complete: 1 no. (ix) Set of gaskets: 1 sets* (x) Set of valves :1 set* *Set consists of quantities required for 1 complete transformer
130.	VI	A	VII Mandatory Spares	4.00.00	Page 37 of 50	MANDATORY SPARES FOR LT SWITCHGEAR (AS APPLICABLE) 1)Complete pole of breaker: 2)Spring charging motors: 3)Aux. contact set: 4)Limit switches: 5)Arc chutes: 6)Fixed contact set: 7)Moving contact set: 8)Arcing contact: 9)Charging spring: 10)Current transformer (metering): 11)Current transformer (protection): 12)Closing coil: 13)Trip coil: 14)CT for Bimetal O/L relays: 15)Voltage transformer:	MANDATORY SPARES FOR LT SWITCHGEAR (AS APPLICABLE FOR SOOTBLOWER MCC ,FGD LTMCC) 1)Complete pole of breaker:2 Nos. of each type & rating 2)Spring charging motors:4 Nos. of each type & rating 3)Aux. contact set: 4 sets of each type & rating 4)Limit switches: 6 Nos. of each type & rating 5)Arc chutes:4 Nos. of each type & rating 6)Fixed contact set:3 sets of each type & rating 7)Moving contact set:3 sets of each

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						16)Control supply transformer: 17)Ammeter: 18)Voltmeter: 19)Relays: 20)Power contactor: 21)Coil of above contactor: 22)Air break switches: 23)DP air break switches (DC): 24)Control & selector switches: 25)Control fuses & neutral links: 26)Indicating lamps: 27)Bus bar support insulators (each type):. 28)Bus duct flexibles connectors: 29)Primary disconnect in MCC(Male/ femal contact) 30)Push buttons: 31)Power fuses: 32)Thermal bimetal relays: 33)Indication Lamp Holders complete: 34)Maintenance tools and accessories for Maintenance (bidder to list): 35)Terminal blocks: 36)Busbar alluminium flat pieces: 37)Busbar angles/formed pieces for breaker: **NOTE :** a. Quantity mentioned in percentage (%) is the % of total installed.	type & rating 8)Arcing contact:3 sets of each type & rating 9)Charging spring:3 Nos. of each type & rating 10)Current transformer (metering):6 Nos. of each type & rating 11)Current transformer (protection):6 Nos. of each type & rating 12)Closing coil: 12 Nos. of each type & rating 13)Trip coil:12 Nos. of each type & rating 14)CT for Bimetal O/L relays:3 Nos. of each type & rating 15)Voltage transformer:2 Nos. of each type & rating 16)Control supply transformer:2 Nos. of each type & rating 17)Ammeter:2 Nos. of each type & rating 18)Voltmeter:2 Nos. of each type & rating 19)Relays:2 Nos. of each type & rating 20)Power contactor:2 Nos. of each type & rating 21)Coil of above contactor:2 Nos. of each type & rating 22)Air break switches:3 Nos. of each

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						b. If percentage comes as fraction next higher integer should be considered for the purpose of quantity required.	type & rating 23)DP air break switches (DC):3 Nos. of each type & rating 24)Control & selector switches:2 Nos. of each type & rating 25)Control fuses & neutral links: 10 nos of each type & rating 26)Indicating lamps: 10 Nos. for each type & rating 27)Bus bar support insulators (each type):. 28)Bus duct flexibles connectors(if applicable):1 set of each type & size 29)Primary disconnect in MCC(Male/ female contact) complete set of each type:3 nos 30)Push buttons:2 Nos of each type 31)Power fuses: 6 Nos of each type & rating 32)Thermal bimetal relays:2 Nos of each type & rating 33)Indication Lamp Holders complete:10 Nos of each type 34)Maintenance tools and accessories for Maintenance (bidder to list):2 Sets 35)Terminal blocks:20 Nos. 36)Busbar aluminium flat pieces:1 set of each type & size 37)Busbar angles/formed pieces for

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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							breaker:1 set of each type
####							
131.	VI	B	V		29 of 40	a) The basic wind speed "Vb" at ten metres above the mean ground level : 55 metres/second	a) The basic wind speed "Vb" at ten metres above the mean ground level : 50 metres/second
132.	VI	A	III:D	1.01.01	1 of 4	All supporting…….below: a) Steam Generator &auxiliaries. …. . g) FGD system	All supporting…….below: b) Steam Generator &auxiliaries. …. . g) FGD system **h) Low pressure piping.** **i) Equipment cooling water system.**
133	VI	A	III : D	3 of 4	2.00.00 Point no. 8	Construction and maintenance of roads between boiler and ESP and access roads to his work sites, offices, stores etc. as required for providing approach/access for men, materials, equipment and construction/erection activities. Rectification of damage of roads (constructed by the Employer) caused by the Contractor.	Construction and maintenance of roads between boiler and ESP, ESP and ID Fan and access roads to his work sites, offices, stores etc. as required for providing approach/access for men, materials, equipment and construction/erection activities. Rectification of damage of roads (constructed by the Employer) caused by the Contractor.
#####							
134.	VI	B	VII QM-01	1.01.10 Full clause	7 & 8 of 14	Steam Generator Water Circulation Pumps …….. 1.5 times the design pressure.	Deleted , as not in scope.
135.						a.) All raw materials used shall have	a.) All raw materials used shall have

AMENDMENTS/ERRATA NO.1
BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION
STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
	VI	B	VII QM-08	1.01.00 (a), para-1	1 of 5	co-related mill test certificate meeting material specification.	co-related mill test certificate meeting material specification. All tests, as given in respective material code (other than supplementary requirements), shall be carried out as minimum. This includes the test wherein it is specified in the ASTM code that "the test is to be carried out when specified by the purchaser" or any such indication, in the code.
136.	VI	B	VII QM-08	1.01.00 (b), para-2, line-1 to 4	1 of 5	All pipe lengths shall be subjected to 100 % ultrasonic examination as per BS 3602 or equivalent with longitudinal calibration notch of depth 5% of wall thickness (0.3mm min. and 1.5mm max.) shall be adhered to and UT/RT on longitudinal welds at the tube mill.	(b.) All pipe lengths shall be subjected to 100 % ultrasonic examination as per BS 3602 or equivalent with longitudinal calibration notch of depth 5% of wall thickness (0.3mm min. and 1.5mm max.) shall be adhered to.
137.	VI	B	VII QM-08	1.02.00 (a), para-1	2 of 5	a.) Raw material of all forged/ formed fitting shall be ultrasonically tested. All mother pipes used for fitting shall be ultrasonically tested or hydraulic tested. Forged fitting shall be ultrasonically tested and formed fittings shall be MPI tested.	a.) Raw material of all forged/ formed fitting shall be ultrasonically tested. All mother pipes used for fitting shall be ultrasonically tested or hydraulic tested. Forged fitting shall be ultrasonically tested and formed fittings shall be MPI tested. All tests, as given in respective material code (other than supplementary requirements), shall be carried out as minimum. This includes

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							the test wherein it is specified in the ASTM code that "the test is to be carried out when specified by the purchaser" or any such indication, in the code.
138.	VI	B	VII QM-			-	***New Sub-section added as per annexure-III..***
139.	VI	B	M-09,	4.01.08	12 of 14	**Insert a new Clause: Cl.No. 4.01.08 of Sub-sectionII:M9, page 12 of 14** Lube oil pressure and temperature in the oil circuit of compressor shall be automatically controlled.	
140.	VI	B	M-09	2.14.00	4 of 14	The lifting capacity of EOT crane shall be 120(%) of the weight of the heaviest part to be lifted during erection or operation or maintenance inside the compressor house . The minimum capacity shall be 5 tonnes	The lifting capacity of EOT crane shall be 125 percent of the weight of the heaviest part to be lifted during erection or operation or maintenance inside the compressor house . The minimum capacity shall be 8 tonnes.
141.	***Additional Mechanical amendments enclosed at Annexure V.***						
142.	***Additional C & I amendments enclosed at Annexure VI.***						
143.	***Additional Civil amendments enclosed at Annexure VII.***						

Cl. 15.01.11, SubSection II-M-01, Part B, Section VI, pg 73/105

a) Metallic type expansion joints suitable for the service conditions shall be provided. The expansion joint design shall conform to the requirements of the EJMA Standards.

b) ……..

c) The expansion joints shall be of heavy duty construction. The expansion joint material shall be compatible with the flowing medium, the external environment and the operating temperature. Suitable corrosion and erosion allowances shall also be taken.

d) All parts of expansion joints shall be suitably designed for all stresses that may occur during continuous operation and for any additional stresses that may occur during installation and also during transient condition. No movement of the expansion joint due to duct misalignment, if any, shall be imposed which has not been anticipated and designed into the movement capability of the expansion joint

e) For the flue gas ducts or for air ducts where ingress of ash/dust particles from atmosphere or air preheaters etc. is expected, the expansion joints shall be designed with suitable internal cover/canopy fixed at one end and freely supported (sliding type) at the other end in the direction of flow to avoid dust accumulation. The cover/canopy should be suitably designed so as not to interfere with any internal duct support and material should be selected taking into account expansion at the operating temperature.

f) If expansion joints are procured as bought out items then complete installation of expansion joint shall be under supervision of the expansion joint manufacturer.

g) The expansion joints shall be tested as per requirements specified elsewhere in the Technical Specification.

h) Contractor shall furnish the complete ducting system drawings clearly specifying the location of all anchors, guides, supports, fixed points and expansion joints. The anchors and guides must be suitable for the highest pressures to be applied to the system. Anchors, guides and duct supports shall be installed in strict accordance with the ducting system drawings.

i) The minimum trouble free operational life of expansion joint shall be not be less than 20000 hrs of operation from the date of commissioning.

j) Expansion joints weighing more than 250 kg shall be provided with lifting lugs.

k) Each joint shall have a permanently attached brass or stainless steel metal tag indicating the tag numbers and other salient design features.

l) Every expansion joint shall be provided with installation instructions which shall describe the simple, straightforward requirements that must be followed to insure a trouble-free installation. Further, Shipping bars shall be installed on the expansion joint to maintain the proper shipping length. Shipping bars shall be painted yellow.

New Clause: Cl. 1.11.00, Subsection – IV-I3, Part B, Section VI, Pg 7/7

1.11.0 CONDUCTIVITY TYPE LEVEL SWITCHING SYSTEM

1.11.1 For Driplegs level, etc. used for alarm & protection purposes, conductivity type level probes shall be provided. Each of the switching systems shall be furnished complete with up to 2 nos. conductivity probes for Driplegs (Eight nos. for separator level application), column for mounting the conductivity probes, isolating valves, drain valves, vent valves, electronic units & racks for mounting the electronic hardware, twisted & shielded pair interconnecting cables. The conductivity probes & the column for mounting these probes shall be designed for the respective pressure and temperature conditions. The material of column & probes etc. shall be subject to Employer's approval during detailed engg. Stage.

1.11.2 The electronic unit shall be separate & dedicated for each of the switching system. Each switching system shall have independent and separate redundant, internally fused Power supply pack/converter.

1.11.3 The electrodes shall be designed in such a manner that they sense the rising water level and that they do not give faulty indication due to falling condensate on the electrodes. Also, each system shall incorporate proper validation circuits that eliminate spurious or unwanted alarm/trip actions due to a single channel fault. The system shall have fault diagnostic features such as process faults, system hardware fault, probe failure, circuit board failure, shorted wire etc. Further the system should be able to distinguish between a cable fault & electrode fault.

1.11.4 For each of the levels sensed by each of the switching systems, the Contractor shall provide 2 nos. potential free changeover contact rated for 5A at 240V AC and 0.25 A at 220V DC.

The system shall be proven & approved by factory mutual USA or equivalent, IBR etc.

1.00.00 **AIR COMPRESSOR SYSTEM**

1.01.00 AIR COMPRESSORS :

a) All pressure parts shall be hydraulically tested at not less than 150% of design pressure prior to painting and lining, if applicable. The test pressure will be maintained for 30 minutes.

b) All other parts including inter-connecting piping shall be hydraulically tested wherever possible, as per relevant codes.

c) Ultrasonic testing shall be carried out on all forgings and shafts (if dia.>= 50mm) viz. Crank shaft, connecting rod, piston rod, etc. MPI/DP test will be done on machined areas of the above components.

d) Pistons shall be subjected to DP testing.

e) During assembly all clearances and alignments shall also be checked and recorded.

f) Rotor shall be statically and dynamically balanced.

1.01.01 PERFORMANCE TEST (SHOP TEST) :

a) Performance test on the compressors shall be carried out in accordance with ISO:1217/eq.. The test shall also include demonstration of loading and unloading mechanism (Capacity control) and operation of safety valves.

b) Power consumption at motor input terminal at rated capacity as well as at fully unloaded condition of all the compressor shall be measured.

c) Vibration and noise level measurement will be done during shop performance test.

d) Test shall be carried out on all compressors with contract drive motor where power consumption for compressors has been indicated as a guaranteed parameter

e) Clearance on Type test requirements from Employer's Engg. Shall be reviewed prior to final clearance.

1.02.00 INTAKE AIR FILTER & SILENCER

1.00.00 Test for Capacity, Pressure drop and Efficiency shall be done as per manufacturer's standard.

1.03.00 AIR RECEIVER, HEAT EXCHANGERS, MOISTURE SEPERATORS, AIR DRYING PLANT:

1 Each finished vessel shall be hydraulically tested to 150% of the design pressure for a duration of 30 minutes.

2 NDT on weld joints shall be as per respective code requirements or the minimum as specified below:

(i) 100 % DPT on root run of butt welds.
(ii) 100% DPT on all finished butt welds and fillet welds
(iii) 10% RT on butt welds which shall include all T- joints.

3 Tube to Tube sheet joint of the heat exchangers shall be subject to Mock-up test as per the relevant standards.

4 Reactivation blowers shall be tested for FAD, temp. rise, noise & vibration. Rotating parts shall be dynamically balanced.

5 Completely assembled ADP shall be pneumatically tested at design pressure for a duartion of 5 minutes. Functional and sequential operation testing of the completely assembled ADP shall be demonstrated at shop. Other accessories shall be tested as per relevant code and sections. Dew point measurement shall be done .

1.04.00 H.O.T. CRANE :

a) Chain pulley Blocks shall be tested as per IS: 3832.

b) Following NDT requirements shall be met :

(i) 100% RT of Butt welds in tension and 10% RT of butt welds in compression.
(ii) DP at random on all weldments.

Deflection, load, overload & travel check on HOT crane assembly shall be carried out as per IS:3177.

1.05.00 PIPINGS, VALVES, TANKS&VESSELS, FITTINGS AND OTHER SPECIALITIES

Refer , relevant clauses as indicated in SG portion of Technical specification .

All forgings, dia ≥ 50 mm shall be Ultrasonic Tested irrespective of the type, size & rating of the valve.

CLAUSE NO.	ANNEXURE-IV to AMENDMENT NO. 1
14.00.00	ELEVATOR FOR FGD SYSTEM
	This section is intended to cover design, engineering, supply, erection, testing and commissioning of the complete Rack & Pinion type Elevators as specified hereinafter complete in all respects and adequate for safe, efficient and trouble free operation of the elevator.
14.01.00	CODES AND STANDARD
	The design, manufacture, inspection and testing of Elevator shall comply with all the currently applicable statutes, regulations and safety codes in the locality where the equipment is to be installed. The Elevator shall conform to the latest edition of standards and codes. Other internationally acceptable standards/ codes, which ensure equal or higher performance than those specified, shall also be accepted. Nothing in this specification shall be construed to relieve the contractor of the required statutory responsibility. In case of any conflict in the standard and this specification, the decision of the Project Manager shall be final and binding.
14.02.00	**DESIGN AND CONSTRUCTION REQUIREMENTS**
14.02.01	GENERAL
14.02.02	This section covers the design, engineering, fabrication, installation, commissioning and testing of the rack and pinion type vertical lift elevator including required enclosures, hoist, mast and guide rail, cab drive unit machinery buffers, power cable, control cable, mechanical and electrical equipment. The design of the elevator shall be in such a way that the elevator operation will be safe at all times.
14.02.03	Elevator shall be located at suitable locations and shall be capable of operating from the ground floor to the top platform of FGD with intermediate stops at all platform levels.
14.02.04	All mechanical and electrical operating devices and Trailing cable shall be designed for outdoor operation with dusty and high humidity conditions and shall operate equally well in any ambient temperature as per project synopsis. Additionally, all mechanical and electrical components of the elevator shall be designed to withstand a temperature of 50°C ambient.
14.02.05	**ENCLOSURES**
	A three-sided enclosure with one access door shall be provided for ground landing. At each platform landing above ground level, a one sided enclosure with access door shall be provided. Enclosures shall be fabricated from tubular steel and/or other structural shapes expanded metal or wire mesh of suitable height and primer coated with one coat of the manufacturer's standard primer and finish paint. The ground landing shall be provided at a suitable height above the foundation slab to ensure a safety space underneath the cage. The space under the landing shall be surrounded by foundation enclosure. The staircase shall be provided for access to the cage. Enclosure access doors shall be electrically and mechanically interlocked so that they remain closed and locked except when the cab is at a landing. Doors shall be bi-parting and swinging type.
	Base of the three-sided enclosure shall be securely anchored to the ground level floor slab using expansion type anchors.

CLAUSE NO.	ANNEXURE-IV to AMENDMENT NO. 1
14.02.06	**Mast**
	Mast shall be provided in sections of suitable length, consisting of tubular sections and/or structural shapes welded together to form a framework to which the rack is bolted. Mast shall be securely anchored to the building structure.
14.02.07	**Cab**
14.02.08	Cab frame shall be fabricated from tubular steel and/or other structural shapes enclosed with expanded metal or wire mesh.
14.02.09	Cab floor shall be of 6 mm thick Aluminum chequered plate or approved equivalent. Cab shall be attached to a framed structure and form an integral part with the drive mechanism located atop the cab.
14.02.10	Framed structure shall include guide rollers and safety hooks to ensure positive engagement of the rack and pinion to prevent cab disengagement in case of roller failure.
14.02.11	Cab roof shall be provided with an escape hatch electrically interlocked with the hoist control system. Tubular steel handrail shall enclose the cab roof for maintenance operations.
14.02.12	Cab door and landing level enclosure doors shall be electrically and mechanically interlocked to prevent the cab from being operated unless the cab door and landing level enclosure doors are fully closed and to prevent the doors from being opened while the cab is in motion.
14.02.13	One cabin fan and two recessed fluorescent lamps along with the fittings to be provided with one no. emergency light with battery & battery charger.
14.03.00	**Drive Unit & Safety Device**
14.03.01	Drive unit located on the cab shall be complete with AC squirrel cage induction motor, reduction gear, drive pinion and an over-speed governor. Drive unit shall incorporate an electric disc brake and an external manual brake release. The brake on the electric motor will be self adjusting type. In case of the power failure, the brake will be automatically applied & will stop the cab. A hand lever, which can be operated from the cage, is to be provided to enable the occupants to ease the brake and lower the cage to the bottom level. Motor shall be connected to a reduction gear, which drives the pinion.
14.03.02	An over-speed governor must be incorporated to protect the cab against over speed during the cab downward motion. At a predetermined speed higher than normal, the brake, mechanism shall be actuated and stop the downward motion of the cab gradually. The brake should remain locked on following this action and has to be manually reset before normal elevator operation can be resumed.
14.03.03	A remote control shall be provided for testing the safety device. The Contractor shall ensure that no individual is in cab during the test.
14.03.04	The drive system shall be designed so that it will be capable to operate smoothly without any tendency to rock or judder with all vertical, horizontal forces as well as the moments through the rack.
1.03.05	Suitable arrangement shall be provided to bring the cage safely to the ground by gravity in the event of power failure.

CLAUSE NO.	ANNEXURE-IV to AMENDMENT NO. 1
14.04.00	**Buffers** Sufficient no. of buffers of spring loaded/hydraulic type shall be fitted below the cab. The buffer shall be capable of stopping the cab without permanent damage or deformation to themselves or any other part of the equipment. The no. of buffers shall be fixed as to ensure proper sharing of impact loads by all of them.
14.05.00	**Power supply** Two incomers (One from Bus-A and One from Bus -B of the MCC) for the supply to each elevator shall be provided with castle key interlocks.
14.06.00	**Power and Control Cabinets** All electrical components furnished with the elevator shall be completely wired, energised and checked. All electrical control devices shall be in enclosures. Equipment furnished shall also include the following : (a.) Momentary contact push button for raise/lower control. (b.) Reversing combination motor starter with a three phase thermal overload relay for motor protection. However, the control circuit in the elevator will have miniature circuit breakers. (c.) Electric and mechanical interlocks on cab access door and landing level enclosure doors. (d.) An ultimate three phase over travel limit switch which cuts off power and control supply in case of over travel. The switch can also be manually turned to off position. (e.) Safety device as mentioned elsewhere in this specification. (f.) An alarm push button shall be provided in the cage. Alarm signal will be transferred to the auxiliary panel at elevator base. The auxiliary panel at the base will have battery and battery charger for the alarm horn. Potential free contracts for remote alarm shall also be provided. (g.) Reverse phase relay connected to prevent operation of the cab with improper phase rotation or failure in any phase in the power supply. (h.) The cable shall be supported by brackets on the cage and guide rails. A cable trolley will keep it in tension and will be guided on the same rail as the cage. The trailing cable shall run through cable guides. (i.) One auxiliary panel shall be furnished and mounted on the ground level enclosure. Panel shall be in enclosure equipped with a main “ON-OFF” switch, main Contractor, relays, control transformer and MCB’s, terminal blocks, and all other accessories required for normal operation of the elevator. (j.) One main control panel shall be furnished and mounted on the top of cab. Panel shall be in enclosure equipped with necessary equipment like rectifier, battery, battery charger, contactors, breakers, control transformer and MCB’s, thermal overload relays and all other equipment and accessories required for normal operation of the elevator. (k.) Cab shall be controlled by a semiautomatic control system with push buttons for ‘UP’ ‘Down’ and ‘Stop next landing’. The cab shall be controlled from inside and shall have painted placard located above the door. Cab shall be furnished with

CLAUSE NO.	ANNEXURE-IV to AMENDMENT NO. 1
	emergency alarm push button, limit switches, and all other necessary control devices required to ensure safe and continuous cab operation, One trailing cable shall connect the cab main control panel to the auxiliary panel at ground level to supply the cab with all power requirements. An extra core of equal size shall be provided for earthing of cab. Cable guides shall be installed every 6 meters to avoid entanglement of this cable. (l.) Each landing assembly shall include a limit switch and push button control station installed and wired to a landing junction box. (m.) All enclosures containing electrical, devices shall be provided with 240 Volts, single phase space heaters with adjustable thermostat control. (n.) Cab shall be equipped with a 220 Volts, 20W fluorescent lights, fan, 5A, 220V, 3 pin receptacle, emergency light, battery & battery charger. (o.) Control cabinets shall be sheet steel enclosed dust, weather and vermin proof. Sheet steel used shall be cold rolled and at least 2.0 mm thick. Degree of protection of control cabinet shall be as per relevant electrical section. Control cabinet shall be provided with hinged doors (s) with pad locking arrangements. All doors, removable covers and plates shall be gasketted all round with neoprene gaskets. (p.) Each motor to be controlled from the control cabinet shall be provided with 3-pole isolating switch. HRC fuses, contactors shall be of AC4 duty class with thermal overload relays with single phase preventer. The isolating switch and contactor shall be rated at least 20% more than the connected motor full load current. The controller and resistor for motor shall confirm to relevant IS and shall be continuously rated for 150% full load current of the motor. (q.) All fuses shall be of the HRC cartridge type mounted on plug in type of fuse base having a prospective current rating of not less than 80 kA. (r.) All push buttons shall have 2NO and 2NC self reset contacts.
14.07.00	**Electric Motor** Elevator drive motor shall be squirrel-cage induction type designed and manufactured to conform to the requirements of this specification. Motor shall be designed for operation at the required speed, 415Volts, 3 phase, 50 hertz, and shall be suitable for full voltage starting, frequent starting S3 duty class as per IS:4722 with CDF of 25% and maximum number of starts 120/hour at 50°C ambient temperature. Motor nameplate kW ratings shall not exceed when the equipment is operating within the limits of the maximum load requirements. Motor shall have class “F” non-hygroscopic insulation with temp. rise limited to Class B (IS:325), Motor shall be totally enclosed and furnished with cast iron or Al alloy frame, brackets, gaskets conduit box & fan cover. Motor shall be furnished with grease pre lubricated, double-shielded, anti-friction bearing having life rating of not less than 42,500 hours under coupled service requirements. All exposed metal surfaces shall be protected with a polyester paint or coating which is moisture & corrosion resistant. Motor shall be provided with internal 220 Volt AC single-phase space heaters or an alternate heating system to prevent condensation within the motor during extended periods of idleness. Motor and driven equipment shall be direct coupled and mounted on a common baseplate.

CLAUSE NO.	ANNEXURE-IV to AMENDMENT NO. 1
14.08.00	**CABLES** Insulated armoured power /control cable shall be FRLS - HR insulated, stranded copper / aluminum conductors and shall be provided in accordance with IS:1753 (latest edition) and IS:1554 (Part-I) (latest edition). Trailing cables in the elevator shaft should be specially designed for the specific service and shall conform to IS. Trailing cables shall be EPR insulated for 1.1 kV and shall be neoprene jacketed flexible cord. Conductor accessories including terminal materials like glands, lugs etc. markers, tying materials, and cable supports shall be furnished and installed.
14.09.00	**Earthing** (a.) GENERAL Complete earthing system shall be furnished for all equipments and accessories of the elevator as per relevant IS. (b.) MATERIALS The earthing of all electrical items being supplied by the Contractor shall be in his scope. For earthing the various equipment, conductor sizes shall be as listed below : (1.) Motor above 5 kW upto 30 kW 25x6 mm2 GI flat (2.) Motors upto 5 KW and misc. small item like conduits, junction boxes etc. 8 SWG GI wire (3.) Cab earthing Additional core of trailing cable The earthing strip/wire shall be connected to the earthing mat by the Contractor. Clamps and other hardware of iron or steel used with the grounding system shall be hot-dip galvanised. Bolts, washers, and nuts shall be hot-dip galvanised steel.

DATA SHEET : ELEVATOR

1.0.0	**GENERAL**	
1.1.0	Type of Service	Passenger-Cum-Goods
2.0.0	**DESIGN & CONSTRUCTION**	
2.1.0	Carrying capacity	1000 Kg
2.2.0	Rated speed	Approx 25 - 40 mtrs / min.
2.3.0	Total Travel	Shall be as per actual dimension of the Absorber tower/tank.
2.4.0	No. of floors to be served	As per requirement
2.5.0	Entrance	As per requirement
2.6.0	Min. cab Floor size (inside) WxLxH	1.3m x 2.0m x 2.1 m
2.7.0	Various heights of landing floors to be served	Suitable for working.
2.8.0	Drive Motors (AC)	One (1) No.
2.9.0	Cab Flooring	6 mm thk. Al. Chequered plate.

AMENDMENTS/ERRATA NO.1 **BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION** **STEAM GENERATOR WITH ESP PACKAGE**	ANNEXURE-V TO AMENDMENT NO -1

<table>
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<tr><td>1.</td><td>VI</td><td>A</td><td>IIIA-01</td><td>1.27.00</td><td>29/31</td><td>Contractor’s scope shall include following special softwares and measuring instruments for four steam generators:

(a) Instrument for Tube Thickness Measurement

The scope shall include 12 nos. ultrasonic thickness gauges……equivalent.

(b)…..
(c) …..</td><td>Contractor’s scope shall include following special softwares and measuring instruments for three steam generators:

(a) Instrument for Tube Thickness Measurement

The scope shall include 9 nos. ultrasonic thickness gauges……equivalent.

(b)…..
(c) …..</td></tr>
<tr><td>2.</td><td>VI</td><td>A</td><td>IIIA-01</td><td>1.28.00</td><td>30/31</td><td>One……for all 4 steam generators…….and accessories…….</td><td>One……for all three steam generators…….and accessories…….</td></tr>
<tr><td>3</td><td>VI</td><td>A</td><td>I</td><td>3.01.00 (a)</td><td>7 of 9</td><td>Type and Rating for Qualification
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Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						Gas to Gas Heat Exchanger / Rotary regenerative type with vertical axis of rotation Or with Heat Pipe type / Gas to Gas Heat exchanger rating not less than that supplied for a similar FGD application capable of handling flue gas flow equivalent to 200 MW or more. Bidder shall …… is qualified.	Gas to Gas Heat Exchanger * / Rotary regenerative type with vertical axis of rotation Or with Heat Pipe type / Gas to Gas Heat exchanger rating not less than that supplied for a similar FGD application capable of handling flue gas flow equivalent to 200 MW or more. Bidder shall …… is qualified. **Note:** *** Bidder, who is regular manufacturer of similar type of heat exchangers, can manufacture Gas to Gas Heat Exchanger provided he has collaboration or association or valid licensing agreement for design, engineering, manufacturing of Gas to Gas heat exchanger with such manufacturers who meet the requirements stipulated for Gas to Gas Heat Exchanger at Cl. No. 3.01.00.** **Further, the collaborator/associate/licensor shall provide all design, design calculation, manufacturing drawings.**

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
							The owner reserves the right to fully satisfy himself regarding capability and capacity of bidder, his collaborator/associate/licensor and the proposed arrangement.

AMENDMENTS/ERRATA NO.1 **BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION** **STEAM GENERATOR WITH ESP PACKAGE**	ANNEXURE-VI TO AMENDMENT NO -1

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<tr><th>Sl no</th><th>Service</th><th>Body material</th><th>Trim material</th></tr>
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<tr><td>3</td><td>VI</td><td>B</td><td>IV:I8</td><td>7.00.00</td><td>5 of 6</td><td>4</td><td></td><td>
<table>
<tr><td>Fail Safe/Fail Freeze</td><td>Fail Safe/Fail Freeze Feature is to Be Provided.</td></tr>
</table>
</td><td>
<table>
<tr><td>Fail Safe/Fail Freeze</td><td>Fail Safe/Fail Freeze Feature is to Be Provided. (In case, the fail freeze feature is not intrinsic to the positioner, Bidder shall achieve the same externally through solenoid valve connected in the pneumatic circuit).</td></tr>
</table>
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<table>
<tr><th></th><th colspan="7">REFERENCE</th><th>EXISTING</th><th>MODIFIED</th></tr>
<tr><th>Sl. No</th><th>SEC</th><th>PART</th><th>SUB-SEC.</th><th>CL. NO.</th><th>PAGE NO.</th><th>PARA</th><th>LINE NO.</th><th></th><th></th></tr>
<tr><td>4</td><td>VI</td><td>B</td><td>IV:I10</td><td>1.01.01 (b) (i)</td><td>1 of 8</td><td></td><td></td><td>The same has been carried out by the Bidder/ sub-vendor on exactly the same model/ rating of equipment.</td><td>The same has been carried out by the Bidder/ sub-vendor on exactly the same model/ rating of equipment. (For control valves, this shall be same size, type & design).</td></tr>
<tr><td>5</td><td>VI</td><td>B</td><td>IV:I10</td><td>3.00.00 (15)</td><td>8 of 8</td><td></td><td></td><td><table><tr><td>Col 1</td><td>Col 2</td><td>Col 3</td><td>Col 4</td><td>Col 5</td><td>Col 6</td></tr><tr><td>…</td><td>..</td><td>…</td><td>…</td><td>…</td><td>…</td></tr><tr><td>15</td><td>Control valves</td><td>CV test</td><td>ISA 75.02</td><td>Yes</td><td>Yes</td></tr></table></td><td><table><tr><td>Col 1</td><td>Col 2</td><td>Col 3</td><td>Col 4</td><td>Col 5</td><td>Col 6</td></tr><tr><td>…</td><td>..</td><td>…</td><td>…</td><td>…</td><td>…</td></tr><tr><td>15</td><td>Control valves</td><td>CV test</td><td>ISA 75.02</td><td>No</td><td>Yes</td></tr></table></td></tr>
<tr><td>6</td><td>VI</td><td>B</td><td>IV:I8</td><td>8.05.00</td><td>6 of 6</td><td></td><td></td><td>Cv test: Cv test shall …….for Employer approval.</td><td>Cv test: Please refer Sub-section-IV:I10. (Type test requirements).</td></tr>
</table>

AMENDMENTS/ERRATA NO.1 **BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION** **STEAM GENERATOR WITH ESP PACKAGE**	ANNEXURE-VI TO AMENDMENT NO -1

	REFERENCE							**EXISTING**	**MODIFIED**
Sl. No	**SEC**	**PART**	**SUB-SEC.**	**CL. NO.**	**PAGE NO.**	**PARA**	**LINE NO.**		
7	VI	B	IV:I4	4.00.00 (e)	9 of 19			Field bus compatible temperature Transmitters (For Boiler Metal Temperature measurement applications) Minimum Requirement shall be as follows:- Temperature signals …… …… …… modular system.	Field bus compatible temperature Transmitters (For Boiler Metal Temperature measurement applications) Minimum Requirement shall be as follows:- Temperature signals …… …… ……modular system. As an alternate, remote T/C and RTD input modules are also acceptable subject to: a) Meeting the requirement of above clause b) Provision of enclosure and AC (Note 1 & 2 are also applicable)
8	VI	B	IV:I4	Notes:-2	9 of 19			Composite Accuracy is to be calculated as summation of all applicable accuracies of temp transmitter, for converting sensor input to output in 4-20 mA (e.g., basic accuracy, digital accuracy, D/A accuracy, etc.)…… .	Composite Accuracy is to be calculated as summation of all applicable accuracies of temp transmitter, for converting sensor input to output in 4-20 mA/ digital signal (e.g., basic accuracy, digital accuracy, D/A accuracy, etc.)……

Aneexure-VII to AMENDMENT NO.1 FOR BONGAIGAON THERMAL POWER PROJECT (3X250 MW) – STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE

SL No	TECHNICAL SPECIFICATION REFERENCE					INSTEAD OF	READ AS
	SEC	Part	Sub-Sec	Page No.	Clause No.		
1.	VI	A	III A-04	1 of 6	1.01.00	…Civil Works (Excluding foundation) such as grouting required for mills/pumps and any other equipments etc. is included in the contractor's scope of work. The contractor shall also include all supporting and structural works, like pipe trestles in their scope.	…The scope of civil works shall be as per sub-section IIID of section VI part A of technical specification.
2.	VI	A	IIID	1 of 4	1.01.07	…,embedments and insert inserts details, etc.,…	…,embedments, insert details, reinforcement dowel details,…
3.	VI	A	IIID	2 of 4	1.01.18	Detailed technical requirements for Civil Works are covered elsewhere in the specification	All Civil, Structural & Architectural works (excluding foundations) required for entire FGD system including associated buildings & facilities as detailed under sub section IIIA-04 of section VI part A is included in the scope of the bidder. Bidder's scope shall also include all supporting structural works for ducting, piping, cabling, etc. The terminal point for civil works for FGD system shall be as indicated in drg. no. 4610-101-POC-A-002. Protective linings in the sumps, trenches, pits, etc. constructed by the employer shall be supplied and provided by the bidder. Design/drawings for the foundations and substructure below grade level for entire FGD system including associated buildings and facilities will be provided by the bidder. The requisite geotechnical design data to enable design of foundations & substructure will be furnished to the bidder during detailed engineering stage.
4.	VI	A	IIID	2 of 4	1.01.19 (new Clause)		Detailed technical requirements for Civil Works are covered elsewhere in the specification
5.	VI	A	IV	10 of 10	2.21.00 (New Clause)		Foundation, lift pit, elevator shaft and machine room for ESP control room building Elevator. (However, the supply of inserts, embedment, etc. shall be in contractor's scope).

Aneexure-VII to AMENDMENT NO.1 FOR BONGAIGAON THERMAL POWER PROJECT (3X250 MW) – STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE

SL No	TECHNICAL SPECIFICATION REFERENCE					INSTEAD OF	READ AS
	SEC	Part	Sub-Sec	Page No.	Clause No.		
6.	VI	A	IV	10 of 10	2.22.00 (New Clause)		Earthing mat below ground
7.	VI	B	V	1 of 40	1.01.05	…shall be of steel and shall be supplied and provided by the contractor.	…shall be of steel and shall be supplied and provided by the contractor. However, the support structures of FGD system including associated buildings and facilities can be either in reinforced concrete or steel above foundation level or grade level depending upon the functional requirements and shall be supplied and provided by the contractor.
8.	VI	B	V	1 of 40	1.01.09	Steam Generator, ESP and FGD Structure shall be supported by Contractor on Foundation through Foundation Bolt assemblies installed at the time of first stage concreting.	Steam Generator, ESP and FGD Structures (in steel) shall be supported by Contractor on foundation through foundation bolt assemblies installed at the time of first stage concreting. However, for RCC super structures of FGD system, employer shall leave reinforcement dowels at grade level.
7.	VI	B	V	5 of 40	3.02.05 (New Clause)		Minimum grade of reinforced cement concrete shall be M25.
8.	VI	B	V	10 of 40	3.04.03	…For Design of Hoppers IS : 9178 Parts - I, II & III shall be followed.	…For Design of Hoppers IS : 9178 Parts - I, II & III shall be followed. Mild Steel for hopper shall be minimum 6mm in thickness excluding corrosion allowance. The corrosion allowance shall be as per IS: 9178. Design of RCC structures shall be as per the provisions of IS:456
9.	VI	B	V	13 of 40	3.04.22 (New Clause)		RCC super structures of FGD system shall be framed structures with columns, beams, slabs, etc. Cladding shall be of brickwork with plastering on both sides. Roof shall be provided with water proofing treatment. Buildings & facilities shall be finished with appropriate architectural finishes in consultation with the employer to match with the architectural treatment of other adjoining plant buildings.

Aneexure-VII to AMENDMENT NO.1 FOR BONGAIGAON THERMAL POWER PROJECT (3X250 MW) – STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE

SL No	TECHNICAL SPECIFICATION REFERENCE					INSTEAD OF	READ AS
	SEC	Part	Sub-Sec	Page No.	Clause No.		
10.	VI	B	V	13 of 40	3.04.23 (New Clause)		Roof water proofing treatment shall be provided using high solid content liquid urethane based elastomeric water proofing membrane applied to give uniform joint less dry film thickness of minimum 1.5 mm (as per ASTM C 836 and C 898), with separate wearing course as per ASTM C - 898. This treatment shall also include application of polymerised mastic over the roof to achieve smooth surface as primer coat. Wearing course on the top of membrane shall consist of 25 mm thick P. C. C. (M-15) cast in panels of maximum 1.2 x 1.2 m size and reinforced with 0.56 mm diameter galvanized chicken wire mesh and sealing of joints using sealing compound / elastomeric water proofing membrane.

S. No.	Item Description	UNIT # 1	
		By Bidder	By his subvendor
	a) Designed	#Yes/#No	#Yes/#No
	b) Engineering, including		
	- Static/stress analysis	#Yes/#No	#Yes/#No
	- Dynamic analysis	#Yes/#No	#Yes/#No
	- Hanger engineering	#Yes/#No	#Yes/#No
	c) **Fabrication**	#Yes/#No	#Yes/#No
	d) **Supply**	#Yes/#No	#Yes/#No
	e) **Erection**	#Yes/#No	#Yes/#No
	f) Testing & commissioning	#Yes/#No	#Yes/#No
x)	**Whether the systems are in successful operation as on the date of bid opening**	**#Yes/#No**	**#Yes/#No**

S. No.	Item Description		
	(b)	Size & Model no.	
	(c)	Capacity (Tonnes/hr.)	
		(i) Capacity of limestone mill for the reference plant (Tonnes/hr.) under following associated conditions : (bidder to fill in below)	
		(a) Limestone fineness	(... % through ..... mesh)
		(b) Limestone input size	(upto .....mm)
		(c) Bond index of limestone	(.....)
		(ii) Capacity of limestone mill for the reference plant (Tonne/hr.) with following associated conditions	
		(a) Limestone fineness 90% through 325 mesh	
		(b) Limestone input size up to 25 mm	
		(iii) Bidder to enclose all relevant correction curve for variation in the mill capacity of the reference plant w.r.t parameters indicated at (ii) above	

S. No.	Item Description
1.10.00	Technical Particulars
	(a) Make/Model No.
	(b) KVA rating of 50°C ambient
	(c) Rated voltage (KV) (at least 70 KV)
	(d) Rated primary/secondary current (at least 1000 mA)
	(e) Type of oil
	(f) Type of cooling
	(g) Reference standard

Q. CONTROL AND INSTRUMENTATION (C&I) EQUIPMENTS/SYSTEMS

Q.(1) BURNER MANAGEMENT SYSTEM (including Boiler Protection)

(i) Name of the station and its location

(ii) Client name and its address, Fax No. & Tel. No.

– e-mail id

– website address

(iii) Name and Designation of the responsible person in client's organisation

एन टी पी सी लिमिटेड
(भारत सरकार का उद्यम)
NTPC Limited
(A Govt. of India Enterprise)
(Formerly National Thermal Power Corporation Ltd.)

केन्द्रीय कार्यालय/Corporate Centre

Fax: 95-11-26493561, 26001172

01/CS-4610-101-2-PRA **Dated 23.08.2007**

M/s. Bharat Heavy Electricals Limited,
Power Sector-Marketing,
Asian Games Village,
New Delhi-110003

Kind Attn: Mr. Amit Yadav, Engineer (Marketing)

Sub: Steam Generator with Electrostatic Precipitator Package for Bongaigaon TPP (3x250 MW) -IFB Ref. CS-4610-101-2 dated 31.03.2007 (International Competitive Bidding).

Dear Sir,

1.0 This has reference to Bid Document No. CS-4610-101-2 issued to you on 17.04.2007 for the subject package. Enclosed please find following Amendments/Clarification to the Bidding Documents.

(A) Clarification No.6 to Bidding Documents; Document No. CS-4610-101-2- Clrf-06 dated 16.08.2007.
(B) Amendment No. 3 to Section-VI (Technical Specification) of Bidding Documents; Document No. CS CS-4610-101-2- Amdt-07 dated 16.08.2007
(C) Amendment No. 2 to Section-II(ITB) of Bidding Documents; Document No. CS CS-4610-101-2- Amdt-08 dated 22.08.2007
(D) Amendment No. 1 to Section-V(SCC) of Bidding Documents; Document No. CS CS-4610-101-2-Amdt-09 dated 22.08.2007
(E) Amendment No. 2 to Section-VII(Part 1 of 2) of Bidding Documents; Document No. CS CS-4610-101-2- Amdt-10 dated 22.08.2007

2.0 The above Amendments/Clarification is to be read in conjunction with Bid Document and will form its integral part.

3.0 The updated list of various sections of Bid Document is also enclosed at Annexure-I to this letter.

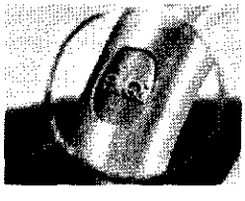
4.0 Above Amendments/Clarification is being issued to you in triplicate. You are requested to return one copy of this letter along with its enclosures duly signed and stamped on each page as confirmation of receipt. The second copy of the letter along with its enclosures duly signed and stamped on each page is to be enclosed with the original bid and the third copy is for your reference and records.

Thanking You,

Yours faithfully,

23/8/07

(Ashok Kumar)
Sr. Manager (CS/Th-I)
Fax-0120-2410359/2410011
Email : ashokkumar@ntpceoc.co.in



एन टी पी सी लिमिटेड
(भारत सरकार का उद्यम)
NTPC Limited
(A Govt. of India Enterprise)
(Formerly National Thermal Power Corporation Ltd.)

केन्द्रीय कार्यालय/Corporate Centre

LIST OF UPDATED SECTIONS/VOLUMES OF BIDDING DOCUMENTS

Name of Contract Package: Steam Generator with Electrostatic Precipitator Package

Name of Project: **Bongaigaon Thermal Power Project (3X250 MW)**

Document No.: CS-4610-101-2 Date of Issue: 23.08.07

Each set of Bidding Documents comprises of the following:

Sl. no	Description of Base Document	Status of Amendments to Base Documents issued till date
1.	Section-I: Invitation For Bids (IFB)	-Nil-
2	Section-II : Instruction to Bidders (ITB)	Amendment No. 1 (CS-4610-101-2-AMDT-02 dated 31.07.2007) Amendment No.2 (CS-4610-101-2-AMDT-08 dated 22.08.2007)
3	Section-III: Bid Data Sheets (BDS)	Amendment No. 1 (CS-4610-101-2-AMDT-03 dated 31.07.2007)
4	Section-IV: General Conditions of Contract (GCC)	-Nil-
5	Section-V: Special Conditions of Contract (SCC)	Errata No. 1 (CS-4610-101-2-AMDT-04 dated 31.07.2007) Amendment No. 1 (CS-4610-101-2-AMDT-09 dated 22.08.2007)
6	Section-VI:Technical Specification including Tender Drawings Part A to Part F (five books and one Drawing Folder)	Amendment No. 1 (CS-4610-101-2-AMDT-01 dated 30.07.2007) Amendment No. 2 (CS-4610-101-2-AMDT-06 dated 02.08.2007) Amendment No. 3 (CS-4610-101-2-AMDT-07 dated 16.08.2007)
7	Section-VII: Forms & Procedures (FP) i) Book 1 of 2 ii) Book 2 of 2	Amendment No. 1 (CS-4610-101-2-AMDT-05 dated 31.07.2007) Amendment No. 2 (CS-4610-101-2-AMDT-10 dated 22.08.2007)
8.	Clarification No.1 to Bidding Documents	Document Ref. No.:CS-4610-101-2-CLRF-01 dated 18.06.2007
9.	Clarification No.2 to Bidding Documents	Document Ref. No.:CS-4610-101-2-CLRF-02 dated 23.05.2007
10.	Clarification No.3 to Bidding Documents	Document Ref. No.:CS-4610-101-2-CLRF-03 dated 02.07.2007

अभियांत्रिकी कार्यालय परिसर, प्लाट नं. ए-8ए, सैक्टर-24, पोस्ट बाक्स नं. 13, नोयडा (उ.प्र.) पिन-201301
ENGINEERING OFFICE COMPLEX, Plot No. A-8A, Sector-24, Post Box No. 13, NOIDA (U.P.) Pin-201301
टेलिफोन : 0120-2410333 (10 लाईने) 0120-2410116 (5 लाईने) फैक्स : 0120-2410136, 0120-2410137
Telephone : 0120-2410333 (10 Lines) 0120-2410116 (5Lines) Fax : 0120-2410136, 0120-2410137
पंजीकृत कार्यालय : एन. टी. पी. सी. भवन, स्कोप काम्पलैक्स, 7, इंस्टीट्यूशनल एरिया, लोधी रोड, नई दिल्ली -110003
Regd. Office : NTPC Bhawan, SCOPE Complex, 7, Institutional Area, Lodhi Road, New Delhi-110003

एनटीपीसी
NTPC

एन टी पी सी लिमिटेड
(भारत सरकार का उद्यम)
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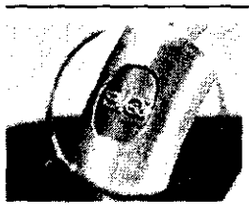
केन्द्रीय कार्यालय/Corporate Centre

Sl. no	Description of Base Document	Status of Amendments to Base Documents issued till date
11.	Clarification No.4 to Bidding Documents	Document Ref. No.:CS-4610-101-2-CLRF-04 dated 30.07.2007
12.	Clarification No.5 to Bidding Documents	Document Ref. No.:CS-4610-101-2-CLRF-05 dated 02.08.2007
13.	Clarification No.6 to Bidding Documents	Document Ref. No.:CS-4610-101-2-CLRF-06 dated 16.08.2007

Note: Section-I, II, III, IV and V are in one bound book.

SIGNATURE : 23/8/07
NAME : ASHOK KUMAR
DESIGNATION:.SR. MGR(CS/Th-1)



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Telephone : 0120-2410333 (10 Lines) 0120-2410116 (5Lines) Fax : 0120-2410136, 0120-2410137
पंजीकृत कार्यालय : एन. टी. पी. सी. भवन, स्कोप काम्पलैक्स, 7, इंस्टीट्यूशनल एरिया, लोधी रोड, नई दिल्ली -110003
Regd. Office : NTPC Bhawan, SCOPE Complex, 7, Institutional Area, Lodhi Road, New Delhi-110003

Clarification No. 6
BONGAIGAON THERMAL POWER PROJECT - 3 x 250 MW
SG WITH ESP PACKAGE
Pre-bid clarification

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	BIDDER'S QUERY	NTPC CLARIFICATIONS
	SEC/ PART	SUB-SEC.	PAGE NO.	CLAUSE NO.			
1.	VI/B	IIM-04	1/18	1.02.00	(Sl. No. 70 of Amendment No. 1 to technical specifications) Design Point – Boiler load - 100% BMCR – worst coal/design coal/best coal	Design point of 250 MW worst coal has been amended to 100% BMCR – worst coal/design coal/best coal. However, against item "gas flow", the amendment states TMCR (250 MW) with worst/design/best coal. Since the above is contradictory, please clarify which one is correct	The design point gas flow shall be the maximum flue gas flow occurring when firing design/worst/best coal at 100% BMCR. Suitable amendment elaborating the same is being issued.
2.	VI/B	IIM-04	1/18 & 10/18	1.00.00 & 6.03.01	(Sl. No. 69 & 92 of Amendment No. 1 to technical specifications) ...Gypsum purity not less than 95%... Gypsum purity - **95 %** (minimum)	As per the revised requirement, the purity of gypsum has been enhanced from 90% to 95% without any corresponding change in the limestone characteristics. As per the proven technology available, this is not achievable and in order to attain 95% purity, the property of input limestone also needs to be revised. Please review and confirm.	The minimum gypsum purity shall be 90%. Suitable amendment elaborating the same is being issued.
3.	VI/A	V	13/13	Table 5	Bond Index - 3	Bond Index specified in NIT for Limestone is 3 which is considered to be too low as per our experience and may result in an undersized milling system. Hence, we request NTPC to review the same and confirm appropriate Bond Index to be considered for design of the lime stone milling system.	The bond index of 3 (three) specified in the specifications is an indicative value from the available limestone data. For design of limestone milling system, Bond Index of 13 (thirteen) shall be considered. Suitable amendment elaborating the same is being issued.

AMENDMENT/ERRATA NO. [illegible]
BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION
STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
1	VI	B	IIM-04	1.02.00	1/18 (S. No. 70 of Amendment No. 1 to Technical Specifications)	1 .... 2 .... 3 .... 4 Gas flow (M3/sec) .... To be worked out by Bidder when firing the specified worst / design / best coal at TMCR (250 MW) load, considering 20% excess air at economizer outlet, 15% Air heater in leakage & 2% duct , ESP leakage and 1.5% GGH leakage	1 .... 2 .... 3 .... 4 Gas flow (M3/sec) .... To be worked out by Bidder when firing the specified worst / design / best coal at **100% BMCR load**, considering 20% excess air at economizer outlet, 15% Air heater in leakage & 2% duct , ESP leakage and 1.5% GGH leakage

AMENDMENT/ERRATA NO.3
BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION
STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
						as a minimum. as a minimum. 5 .... 6	as a minimum. as a minimum. 5 .... 6 ....
2	VI	B	IIM-04	1.00.00	1/18	The engineering.....system. The owner ..... producing gypsum with purity not less less than 95% , surface moisture not more than 10%, and chloride content not more than 100 ppm. The complete.....the system. The complete ..... designer/manufacturer.	The engineering.....system. The owner ..... producing gypsum with purity not less less than **90%** , surface moisture not more than 10%, and chloride content not more than 100 ppm. The complete.....the system. The complete ..... designer/manufacturer.
3	VI	B	IIM-04	6.03.01	12/18	Each vacuum belt ..... whichever is minimum: i. Gypsum Quantity - 110% of gypsum produced by three Absorber .....gypsum flow. ii. ..... iii. Gypsum purity - 95 % (minimum)	Each vacuum belt ..... whichever is minimum: i. Gypsum Quantity - 110% of gypsum produced by three Absorber .....gypsum flow. ii. ..... iii. Gypsum purity - **90 %** (minimum)

AMENDMENT/ERRATA NO.2
BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION
STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
4	VI	A	V	Table 5 Limestone characteristics	13/13	**Chemical Analysis**	**Chemical Analysis**
						1.	1. ....
						2.	2. ....
						3.	3. ....
						4.	4. ....
						5.	5. ....
						6.	6. ....
						7.	7. ....
						8.	8. ....
						9.	9. ....
						Impurity Level	**Impurity Level**
						1	1 ....
						Hardness & Size	**Hardness & Size**
						1 Bond Index 3	1 Bond Index * 3
						2	2 ....
						3	3 ....
							***Note: The Bond Index specified above is an indicative value from the available limestone data.** **For design of limestone milling system, Bond Index of 13 (thirteen) shall be considered.**

AMENDMENT/ERRATA NO.3
BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATION
STEAM GENERATOR WITH ESP PACKAGE

Sl. No. (1)	REFERENCE (2)					INSTEAD OF (3)	READ AS (4)
	SECTION	PART	SUB-SEC	CLAUSE	PAGE NO.		
5	VI	B	IIM-04	5.04.01	10/18	There shall be 2 X 100 % tube mills for grinding of limestone. ..... occurring together. i. Load — 100% BMCR ii. Flow — 110% of limestone requirement of one absorber with Boiler firing Design/Worst/Best whichever gives the maximum limestone requirement. iii. Input Limestone Size — 1" (min.) iv. Output Fineness — 90% or higher (as per the requirement of absorber) through 325 mesh v. Mill Wear Part Conditions — Near Guaranteed Wear Part Life.	There shall be 2 X 100 % tube mills for grinding of limestone. ..... occurring together. vi. Load — 100% BMCR vii. Flow — 110% of limestone requirement of one absorber with Boiler firing Design/Worst/Best whichever gives the maximum limestone requirement. viii. Input Limestone Size — 1" (min.) ix. Output Fineness — 90% or higher (as per the requirement of absorber) through 325 mesh x. Mill Wear Part Conditions — Near Guaranteed Wear Part Life. **xi. Limestone Bond Index — 13**
6	VI	A	IIIA-04	6.01.00 (Sl. No. 28 of Amendment No. 1 to Technical Specifications)	5/16 (pg 5/42 of Amendment No. 1 to Technical Specifications)	The employer shall provide a common auxiliary absorbent tank, common for the three units, of sufficient capacity for storage of absorber slurry of one unit.	The **contractor** shall provide a common auxiliary absorbent tank, common for the three units, of sufficient capacity for storage of absorber slurry of one unit.

Sl No.	Reference	Line,Clause No.,Page No.	Existing	To be read as under
1	Sec-II (ITB)	Clause 8.3 (v), Page -11 of 31	(v) **Attachment 20: Declaration on Fraud Policy** Declaration regarding abiding by **Fraud Policy** of NTPC displayed on NTPC's Website.	(vi) **Attachment 20: Declaration on Fraud Prevention Policy** Declaration regarding abiding by **Fraud Prevention Policy** of NTPC displayed on NTPC's Website.
2	Sec-II (ITB)	Clause 35, Page -31 of 31	**Fraud Policy** The bidder along with its associate/collaborator/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to the **Fraud policy** of the Employer displayed on its tender website http://www.ntpctender.com and shall immediately apprise the Employer about any fraud or suspected fraud as soon as it comes to their notice. A certificate to this effect shall be furnished by the bidder along with his bid.	**Fraud Prevention Policy** The bidder along with its associate/collaborator/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to the **Fraud Prevention Policy** of the Employer displayed on its tender website http://www.ntpctender.com and shall immediately apprise the Employer about any fraud or suspected fraud as soon as it comes to their notice. A certificate to this effect shall be furnished by the bidder along with his bid in attachment-20 to Bid Form (Section-VII, Part 1 of 2)

Sl No.	Reference	Line,Clause No.,Page No.	Existing	To be read as under
1.	SCC No. 14 of Sec-V (SCC) of Bidding Document	Second para of page 9 of 10	**Add a new GCC clause 45 as below** **Fraud Policy :** The contractor along with their associate/collaborator/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to the **Fraud policy** of the Employer displayed on its tender website http://www.ntpctender.com.	**Add a new GCC clause 45 as below** **Fraud Prevention Policy :** The contractor along with their associate/collaborator/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to the **Fraud Prevention policy** of the Employer displayed on its tender website http://www.ntpctender.com.

Sl. No.	Reference	Line,Clause No., Page No.	Existing	To be read as under
1.	Sec-VII part 1 of 2	First para at page 4 of 11, Clause 2.0 (v) of Bid Form	(v) Attachment 20 : Form of Acceptance of **Fraud Policy.**	(v) Attachment 20 : Form of Acceptance of **Fraud Prevention Policy .**

Sl. No.	Reference	Existing Page	Replace with	Remarks
1	Attachment-20 of Section-VII (Part 1 of 2)	Attachment-20, Page 1 of 1	Revised Attachment-20 (Revision-1) Page 1 of 1 is enclosed.	Words "Fraud policy" replaced by "Fraud Prevention Policy".

STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE FOR BONGAIGAON THERMAL POWER PROJECT, (3 X 250 MW)
BID DOCUMENT NO. CS-4610-101-2
(FORM OF ACCEPTANCE OF FRAUD PREVENTION POLICY)

Bidder's Name and Address :

To
Contract Services (Th-I),
NTPC Limited,
NOIDA - 201301.

Dear Sirs,

We have read the contents of the Fraud Prevention Policy of NTPC displayed on its tender website http://www.ntpctender.com and undertake that we along with our associate/collaborator/subcontractors/sub-vendors/consultants/service providers shall strictly abide by the provisions of the Fraud Prevention Policy of NTPC.

Yours faithfully,

Date :

Place :

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

S. NO.	REFERENCE			SPECIFICATION REQUIREMENT	BIDDERS QUEERY	NTPC CLARIFICATION
	TENDER PART/ SEC	SUB SEC.	PAGE/ CL.NO.			
01	A / VI	IIIA-01	2 of 31 1.06.00	For Reheater Desuperheating, the spray water shall be tapped off from the intermediate stage of Boiler Feed pumps. The spray water for Super heater shall be tapped from suitable location upstream of H.P. heaters(from BFP discharge or kicker stage outlet), unless contractor has proven experience of tapping off SH spray water from down stream side of HP heaters,---	The contractor has the proven experience of tapping off RH spray water also from down stream side of HP heater. Hence Inline with SH spray system tapping off RH spray water downstream side of HP heater may also be allowed.	In case the contractor has proven experience of tapping off RH spray water from downstream side of HP heaters, same shall also be acceptable. Necessary details shall be furnished by the bidders to substantiate above.
02	A / VI	IIIA-01	23 / 31 1.02.01	Inter connecting platforms between the Steam Generator floors and main building at four (4) elevations(excluding ground floor) and between the SG and bunker building at four (4) elevations on **either sides of each steam generator** as per the details given in the technical specification. Number of inter-connecting platforms between Boiler and Coal Bunker building for each level / floor shall be two (2) numbers **on each side of Boiler i.e. four (4) number per elevation**	Interconnecting platforms requirements as mentioned in Sec VI part B, Subsec-I, Layout Clause 1.01.02 is appropriate for the Rear mill arrangements called for in tender and hence followed. Kindly confirm.	Scope of interconnecting platform shall be in line with Clause no. 1.01.02, Sub-section-I, Layout Section-VI, Part-B Page 2 of 4.

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

S. NO.	REFERENCE			SPECIFICATION REQUIREMENT	BIDDERS QUEERY	NTPC CLARIFICATION
	TENDER PART/ SEC	SUB SEC.	PAGE/ CL.NO.			
	B / VI	Sub-Sec-I Layout	2 of 4 1.01.02	Inter connecting walkways between main plant building and boiler at Operating, PRDS and Deaerator floor level shall be provided by the contractor. Also, Inter-connecting platform between boiler and coal bunker building at Feeder floor level, Tripper floor level and roof of mill bay shall be provided by the Contractor. Number of inter-connecting platform between Boiler and Coal Bunker building for each level/floor specified above shal be One(1) number per boiler		
03	A / VI	IIIA-01	24 of 31 1.02.03	For meeting the above requirement in respect of platforms the bidder shall include in his proposal platform area of 15000 m^2 (clear of all intervening passes, columns, actuators, instrument enclosures, racks etc, and excluding area covered by staircases and platforms required for ESPs)	15000 m^2 platform area requirement appears to be for 500 MW SG. It shall be left to Bidders choice.	The platform area requirement is reduced to 14000 m2. Bidders shall include the platform area in the scope of bid proposal.
04	A/VI	IIIA-01**/ IIIA-03**	1 of 2 1.00.00	. Contractor scope shall include supply of ESP sets complete in all respects with all components and accessories etc., for 4x250 MW SG	The requirements are for 3 Steam Generators. Kindly clarify	4X250MW shall be read as 3X250MW.

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

S. NO.	REFERENCE			SPECIFICATION REQUIREMENT	BIDDERS QUEERY	NTPC CLARIFICATION
	TENDER PART/ SEC	SUB SEC.	PAGE/ CL.NO.			
05	A/VI	IIIA-03	1 of 2 1.08.00	a) Scale model b) CFD mode I), ii), iii)	Requirement is common for three units. Kindly clarify	Yes, it is common for three (3) units.
06	A / VI	IV	8 of 10 Terminal points	Exclusions :--------	The following are excluded from Bidders scope. 1. Raw coal Bunker and their supporting steel work in Bunker bay 2. HP-LP bypass system Kindly confirm	1. All civil, structural and architectural works for mill & bunker building including raw coal bunker is excluded from the scope of the bidder as per Cl. 2.16.00 of the technical specifications, Section-VI, part A, Subsection IV under Terminal points. 2. Complete HP & LP Bypass piping systems are in the scope of this package. Please refer clause 1.00.00 of the scope portion for Power

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

S. NO.	REFERENCE			SPECIFICATION REQUIREMENT	BIDDERS QUEERY	NTPC CLARIFICATION
	TENDER PART/ SEC	SUB SEC.	PAGE/ CL.NO.			
						cycle Piping (subsection-IIIA-05//Part-A/ Section-VI) in this regard. However, HP & LP By-Pass valves are excluded from the scope of supply of this package, ref. Note (a) under clause 1.03.01/Part-A/subsection-IV/ Setion-VI/) .
07	A/VI	IIIA-01	17 of 31 1.15.08 (b)	Power operated shut off gate before each coal burner and a power operated flap type mill discharge valve at each classifier outlet on each pulverized fuel pipe.	In line with the scheme for Pulveriser (Drg No: 4610-101-POM-005) Pneumatic operated gates before each coal burner and pneumatic operated mill discharge valve will be provided	Pneumatic operated gates before each coal burner and pneumatic operated mill discharge valves are acceptable.
	B/VI	IIM-01	45 of 104 12.07.02	Each coal burner shall be served by one separate coal pipe and shall be provided with one knife edge type gate valve at burner inlet. The valve shall be power operated…..		
	B / VI	IIM-01	34 of 104 12.02.01	Bunker shut off gates and RC feeder outlet gates shall be motor operated	Motor/ Pneumatic operated RC feeder outlet gates will be	Motor/ Pneumatic operated RC feeder outlet gates are acceptable .

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

S. NO.	REFERENCE			SPECIFICATION REQUIREMENT	BIDDERS QUEERY	NTPC CLARIFICATION
	TENDER PART/ SEC	SUB SEC.	PAGE/ CL.NO.			
			b)		provided	
08	B / VI	IIM-01	67 of 104 14.08.00 48 of 104 12.09.01	FD fan flow measuring devices f) Flow element (venturi/aerofoil system) shall be provided with three pair of tapping points at the suction of each FD fan D) Primary air flow measurement a) PA flow measurement(for total air flow measurement & control) using fan inlet elbow shall be provided	In line with the requirement mentioned for PA flow measurement (SEC VI/Part B, IIM-01 page 48 of 104 Cl. 12.09.01), FD flow measurement using fan inlet elbow will be provided.	Flow measurement using Fan inlet elbow are also acceptable.
09	B/VI	IIM-01	62 of 104 14.02.01 62 of 104 14.02.01	Air heater leakage FD fan – 10% or actual guaranteed whichever is high ID fan(60% BMCR load)- Based on minimum 15% leakage from Primary Air	**Kindly clarify the following:** Trisector Air heater system is offered inline with tender requirement in which the air leakage from the secondary side will be very less ie., not more than 1% of gas entering AH at BMCR. Hence Predicted leakage is sufficient for the FD fan sizing	Specification requirements to be followed for FD fan sizing.

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

S. NO.	REFERENCE			SPECIFICATION REQUIREMENT	BIDDERS QUEERY	NTPC CLARIFICATION
	TENDER PART/ SEC	SUB SEC.	PAGE/ CL.NO.			
			47 of 104 12.09.01 (d)	and 10% leakage from Secondary air Primary air fans Air-heater air-in-leakage of 15% for guaranteed whichever is higher	In Trisector AH system, FD fan leakage is very less and Primary air leakage is % of total gas flow entering AH. Hence 10% leakage or actual whichever is high will be considered for ID fan sizing inline with the requirement of air heater leakage specified for 50% BMCR flow(Page 64 of 104 Sl.Np 4(vi) Primary air leakage is % of total gas flow entering AH. Hence 10% leakage or actual whichever is high will be considered for PA fan sizing.	Specification requirements to be followed for ID fan sizing. Specification requirements to be followed for PA fan sizing.
10	A / VI	IIIA-01	4/31 1.07.01 (n)	Control valves on blow down tank / flash tank drain cooling water pipe line.	As followed in most of the projects, Motor operated reg. Globe valve will be provided in service water line(for cooling the drain) to IBD tank (This is also Inline with the clause SEC Vi/Part A clause 1.10.07,P 9/31).	Acceptable.

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

S. NO.	REFERENCE			SPECIFICATION REQUIREMENT	BIDDERS QUEERY	NTPC CLARIFICATION
	TENDER PART/ SEC	SUB SEC.	PAGE/ CL.NO.			
11	A / VI	IIIA-02	1/1 1.00.00	Under aux. Boiler – The scope shall also include one no feed storage tank upstream of deaerator ….for half an hour storage capacity of aux.boiler……	As per normal practice and as followed in various projects including 500MW units like Simhadri and Sipat , deaerator cum feed storage tank (of half an hour holding capacity) will be supplied. The feed storage tank is integral with deaerator and as such no separate DM tank has been considered. Also ref cl 1.07.03 under Terminal point and Exclusion (Part-A,sub.sec IV) as per which the Employer shall terminate DM water supply pipe line near aux. Boiler at a distance of 5mtrs……As such our scope doesn't include any condensate/DM transfer pumps (Also as per Part A, Sub sec IV & clause 2.06.00, DM make up, condensate transfer pumps etc. are excluded from scope).	The purpose of DM water storage tank is to allow at least half an hour of operation of auxiliary boiler without DM water make up. In case bidder can size the deaerator DM feed water storage tank for half an hour operation of auxiliary boiler without DM water make up, same can also be accepted. Bidder shall include necessary sizing calculation to substantiate above in the bid proposal. Further bidder has to take tap off of DM water from employer's terminal point.
	B / VI	IIM-02	2 / 4 1.00.00(F)	The contractor shall also provide one no DM water storage tank sized for half an hour make up water requirement of boiler at 100% BMCR, 2x100% make up water pumps along with necessary valves, piping and fittings shall also be supplied.		

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BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

S. NO.	REFERENCE			SPECIFICATION REQUIREMENT	BIDDERS QUEERY	NTPC CLARIFICATION
	TENDER PART/ SEC	SUB SEC.	PAGE/ CL.NO.			
12	A / VI	IIIA-01	13/31 1.14.02	2PA+2SA SCAPH with condensate collection tank and drain along with drain pipe upto flash tank	Since the SCAPH will be in operation only during start up / Low load and since the quantity of SCAPH condensate will be very meager it may not be economical to recover it. As per normal practice and as followed in most of the projects, SCAPH drain will be taken to IBD tank and as such condensate collection tank etc. is not envisaged.	Specification requirements to be followed.
13	B / VI	IIM-05	2/33 1.02.00 (c)	The design pressure of the Main steam piping system shall not be less than the design pressure of final SHO header.	As followed in all the projects, the design pressure of main steam upto boiler stop will be SHO header design pressure (which is inline with Clause (d)	Design pressure for MS piping up to & including boiler stop valve shall not be less than the design pressure of final SH outlet header . Design pressure

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BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

S. NO.	REFERENCE			SPECIFICATION REQUIREMENT	BIDDERS QUEERY	NTPC CLARIFICATION
	TENDER PART/ SEC	SUB SEC.	PAGE/ CL.NO.			
					)and beyond boiler stop valve it will be SH safety valve set pressure, meeting IBR requirement.	of MS piping beyond boiler stop valve shall be as per design code ASME B31.1, meeting IBR requirements

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BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

Sl.no.	Clause Ref.	Section / Part	Page No.	Specification Requirement	Bidder's Query	NTPC Clarification
1	5.00.00	Section VI, Sub_section III C, Part A	5 of 8	Electric Power Supply System	DDCMIS requires both 240V AC UPS as well as 24V DC power supplies. The scope of supply mentions only 24V DC supply. NTPC may please clarify whether 240V AC UPS supply is in purchaser's scope.	Bidders understanding is correct. For further clarity bidder to refer to Cl. 2.15.04, Sub-section-IV, Section-VI, Part-A, Cl. 1.04.00, Sub-section-IV-I-05, Section-VI, Part-B of technical specification.
2	1.02.07 1.00.00, 2.00.00	Section VI, Sub_section IV: I-02, Part B & Appendix - 1 to SG C&I	1 of 52 2,3 of 8	Contract quantities of SG C&I system shall be as per Appendix - I to SG Control & Instrumentation systems, Part B	A)NTPC may please clarify whether number of I/Os for drives shall be as required or shall be as per Table - I in Appendix - 1. B)Also NTPC may please clarify whether hardwired backup instrumentation shall be provided as per machine manufacturer's recommendation or as specified in clause 2.00.00 of Appendix - 1.	(a) The Table-I in Appendix-I indicates the basic I/O requirement for each type of drive. However for meeting any special requirement or specialised drive application, quantity of I/Os per drive shall be as required basis only. (b) Specification requirement is clear.

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

Sl.no.	Clause Ref.	Section / Part	Page No.	Specification Requirement	Bidder's Query	NTPC Clarification
3	1.08.00 / 1.	Section VI, Sub_section IV: I-02, Part B	3 of 52	Signal exchange - Terminal points	NTPC may please confirm that terminal points will be as below : 1. For signal exchange with Employer's DDCMIS of Station C&I package at terminals of SG C&I DDCMIS. 2. For communication link to HMI of Employer's Station C&I package will be at Ethernet port of HMIPIS of SG C&I. 3. For interfacing with Employer's switchgear & MCC at terminals SG C&I DDCMIS. All interconnecting cables will be in Employer's scope.	1. Bidder's understanding is correct. For clarity bidder to refer to Cl. 1.12.00 (b) (3), Sub-section-IV, Section-VI, Part-A of technical specification. 2. Bidder's understanding is correct. for clarity bidder to refer to Cl. 1.12.00 (b) (4) Sub-section-IV, Section-VI, Part-A of technical specification. 3. Bidder's understanding is incorrect. For clarify bidder to refer to drawing no. 4610-101-POI-A-021. For points no. (1) & (2) interconnecting cable is in employer's scope.

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

Sl.no.	Clause Ref.	Section / Part	Page No.	Specification Requirement	Bidder's Query	NTPC Clarification
4	1.12.00	Section VI, Sub_section IV: I-02, Part B	5 of 52	It shall be possible to operate any valve or drive belonging to any sub-system from the HMI of any other sub-systems also by a supervisory command through LAN.	Operation of SG C&I valve / drives from any system other than HMIPIS workstation of SG C&I DDCMIS is not recommended. NTPC may please review requirement of issuing supervisory command from LAN.	The requirement indicated is a feature of the HMIPS system, which needs to be complied with. Actual operation philosophy of drive of equipments shall be decided during engineering, keeping in view requirements of safety, normal operating practices etc.
5	3.02.03 & 7.00.00	Section VI, Sub_section IV: I-02, Part B Section VI, Sub_section IV : I-08, Part B	8 of 52 4 of 6	Smart Transmitters with superimposed Hart signals HART Protocol : Compatibility for Remote Calibration and Diagnostics	We presume that HART Management System for SMART Transmitters is part of Station C&I and is in Employer's scope. NTPC may please confirm.	Bidder's understanding is correct.
6	4.03.18	Section VI, Sub_section IV: I-02, Part B	19 of 52	It shall be possible to control all common system drives from all or some of the units.	NTPC may please clarify whether common system drive shall be controlled by SG C&I DDCMIS or TG C&I DDCMIS.	Bider to refer to clarification furnished against point no.4

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

Sl.no.	Clause Ref.	Section / Part	Page No.	Specification Requirement	Bidder's Query	NTPC Clarification
7	2.04.00	Section VI, Sub section IV:I-05, Part B	4 of 10	Battery Health Monitoring System	Battery Health Monitoring System (BHMS) is still not being offered by all the battery vendors. Inclusion of BHMS restricts the number of approved sub-vendors. In view of this NTPC is requested to consider exclusion of BHMS from Bidder's scope.	Specification requirement to be met.
8	Annexure - 1 to Appendix - 1 to SG C&I	Section VI, Sub_section IV Part B	1 of 2	Human Machine Interface Contract quantities	NTPC may please confirm that the information work stations and programming stations are dedicated for SG C&I DDCMIS functions only.	Bidder's understanding is correct.

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

1	VI	B	IIM-01	1.03.00 Page 2/104	Provision to be kept for a possible variation in rated flow of 810+/-25 TPH at Super Heater outlet at 100% BMCR.	The proposed variation of 3% may please be reviewed to reduce the same to a bare minimum level of around 1% to ensure minimum changes in boiler design & auxiliaries. Please confirm.	Specification requirements to be complied with.
2.	VI	A	VI	3.01.00 (ix) (a) & (b) page 6/34	Auxiliary Power consumption at 100% TMCR shall be guaranteed.	The Guarantee Fuel for which the Auxiliary Power needs to be guaranteed has not been specified. Kindly confirm same.	The guarantee fuel for auxiliary power consumption shall be design coal (blended) as indicated in column-4 of Table 1 (C), Subsection V, Section VI, Part A, of the technical specifications.
3	VI	A	VI	3.01.00 (ix) (a) & (b) page 6/34	Auxiliary Power Consumption at 100% TMCR …..with 3% cycle make-up shall be guaranteed.	As per Clause 1.03.00 (page 1/34 of Sub-section VI)- "The TMCR is defined as 250 MW under 0% cycle make-up" whereas in clauses 3.01.00 (ix) (a) & (b)- "TMCR is defined as 250 MW load with 3% cycle make-up" Please clarify.	TMCR is 250 MW under 0 % cycle make up and 77 mmHg (abs) condenser pressure.
4.	VI	B	IIM-01	1.05.00 page 8/104	Automatic Control Range for Steam Generator shall be from 45% BMCR to 100% BMCR.	Please provide feed water temperature at economizer inlet at 45% BMCR control load along with HBD.	Final feedwater temperature corresponding to 45% BMCR load will be approx. 210 deg C. This parameter is tentative and shall be finalised after finalisation of successful TG bidder.
5	VI	A	VI	9.00.00 (i) Page 27/34	Steam generator Efficiency Test Code As per BS EN12952-15:2003	For Steam Generator Efficiency Test code, we would like to propose ASME PTC 4.0 or 4.1 in place of BS EN 12952-15:2003. Please confirm acceptance.	Specification requirements to be complied with.
6	VI	B	IIM-01	1.20.03 Page	Bidder to submit details of NOx emission achieved by	The guaranteed Nox emission of 260 gms/GJ is found to be reasonable & also	Acceptable

				10/104	him at other stations using similar fuels burners/furnace designs, to substantiate his claims.	acceptable. However, furnishing details of such achievements elsewhere with similar coal is not really feasible for obvious reason. We therefore request NTPC to delete the same without any dilution on guarantee commitment.	
7	VI	B	IIM-01	6.02.00 Page 18/104	To Penthouse Cooling Fans.	Margins on Flow & Head are not Specified for these fans. Please provide details.	Bidder to provide fan margin as per their standard practice.
8	VI	B	IIM-01	17.15.00 Page 82/104	Provision shall be made to maintain the soot blower heads free from deposits during the periods when they are retracted & not in operation.	Based on our experience on Indian coal, we feel that the same is not required & would request you to delete the same. Please confirm.	Specification requirements to be complied with.
9	VI	A	II Project Synopsis Annex-I Page 5/10		Climatological Table.	The table gives data from 1956 to 1980. Please furnish recent updated table.	The data for 1956-80 is the latest data published by India Meteorological Department, which has already been furnished.
10	VI	A	VI	3.01.00 (vi) Page 6/34	Particulate Emission Electrostatic Precipitator Efficiency	Specification calls for efficiency guarantee for ESP based on ODB (outlet dust burden) and to be ensured for guarantee & design points. Design requirement of downstream equipment e.g. FGD is satisfied as long as ODB is ensured. Hence it would be appropriate to guarantee the ODB only and not collection on efficiency %. Please confirm acceptance.	Specification requirements to be complied with.

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

11	VI	B	IIM-03	11.00.00-8 page 11/15			The requirement is for 3X250 MW units.
		A	IIIA-03	1.00.00 Page 1/2	Electrostatic Precipitator (Line2)	Requirement mentioned as 4X250 MW Steam Generator in place of 3X250 MW. Necessary correction may please be made	
12	VI	A	IIIA-03	1.08.00 (b) (ii) Page 2/2	Electrostatic Precipitator	Configured model for Nabinagar TPP (4x250 MW) and …… Correction required to change it to Bongaigaon TPP (3x250 MW).	The error is being corrected.
13	VI	A	IIIA-04	5.04.00 & 5.06.00 Page 5/6	Gypsum Dewatering System	In clause no. 5.40.00, it is mentioned that "the over flow from the secondary hydro-cyclone shall be taken to a common filtrate water tank." Where as in clause no. 5.06.00 it is mentioned that "the over flow from the secondary hydro-cyclone shall be taken to waste water tank." Please clarify.	The over flow from secondary hydrocyclone shall be as per Cl. 5.06.00.
14	VI	A	IIIA-04	1.03.00 & 6.00.00 Page 1/6 & 5/6	Auxiliary absorbent Tank/Sump	In clause 1.03.00, it is mentioned as aux. absorbent tank, while in clause no. 6.00.00 & 6.07.00 it is mentioned as aux. absorbent sump. Please clarify.	Auxiliary absorber tank (Cl. 1.03.00) shall be deemed to be correct.

15	VI	B	IIM-04	6.07.00 Page 15/18	Auxiliary absorbent Tank/Sump	Specification calls for 2X100% slurry pumps. However, these pump are not for continuous duty & are put in service occasionally only in particular circumstances. Hence, it is common practice to install only one pump without any stand-by requirement. Please confirm acceptance.	Accepted.
		A	IIIA-04	6.02.00 Page 5/6			
16	vi	B	IIM-04	6.08.00 Page 15/18	Process water storage	Specification calls for 2 nos. process water tanks. However, as per standard practice, one no. tank is adequate to meet the requirement. Please confirm acceptance.	Specification requirements to be complied with.
		A	IIIA-04	7.00.00 Page 6/7			
17.	VI	B	IIM-04	12.00.00 Page 17/18	Waste Water Tank/Sump	In clause 6.06.05, it is mentioned as waste water sump, while in clause no. 6.06.00 it is mentioned as waste water tank. Please clarify.	"Waste water sump" may be read as "waste water tank".
		B	IIM-04	6.06.05/6.0 6.06 Page 14/18			
18	VI	A	V	Table-5 page 13/13	Lime stone Characteristic	Input granule size of Lime Stone which will be used as a feed for Wet Ball Mill is mentioned as "Medium". Please define the granulate size of the limestone.	Bidder to note that the input size for milling system shall be 1 inch (min). Refer Cl. no. 5.04.01 (iii), Subsection M-04, part B, Section VI.
19.	VI	B	IIM-04	4.0-5.07 Page 8/18	Absorber lining material	Specification calls for alloy C276/59 or better material for lining. However, common practice followed in Europe is to provide rubber lining which is adequate to meet duty requirement.	The rubber lining or other proven material as per bidder's practice is acceptable. However, bidder shall guarantee the minimum life of

						Please confirm acceptance.	rubber lining as 20 000 hrs.
20.	VI	C	-	14.00.00 page 33/39	Noise level	Specification calls for 85 dBA noise level measured at a height of 1.5 m above floor & at a distance of 1 m from equipment. According to our experience, this is not feasible for mills (we balls) & oxidation air blower where noise level can be 95 dBA. Outside the equipment building the levels however can be 85 dBA. Please confirm acceptance of 95 dBA noise level for such specific equipment.	Specification requirement to be complied.
21.	VI	A	IIIB	10.01.00 Page 4/4	HT drives (above 200 KW motor rating) shall be fed from Employers switchgear	Please clarify whether HT cables are in Bidder's scope. As per 2.12.00 of sub-section IV (terminal points) HT cables are coming under exclusion.	Refer clause 2.12.00 of sub-section IV (terminal points) of NTPC specification.HT cables are excluded from bidder scope
22.	VI	E	-	Tender Drawing	Drawing in 4610-999-POM-A-001 rev.A (Equipment Layout Plan)	Please clarify if the switchgear + control room close to ash slurry pump house as shown in the drawing, is the one dedicated to accommodate MCc and PLC for FGD. Please specify whether unit base solution i.e. 3 separated local control room, one for each FGD unit shall be acceptable.	The switchgear + control room provided close to ash slurry pump house is dedicated to ash slurry system only. The separate building for control room of FGD system is located near the Gypsum Dewatering System behind the chimney area. This control room is common for all the three FGD systems. The same is marked as "CR" and indicated in GLP drg. No. 4610-999-POC-F-001.
23.	VI	B	IIM-04 FGD	13.02.00 Page 18/18	Minimum Width of Stair case	As per clause no. 13.02.00 the minimum clear width of stair shall be 1000 mm	The clear width of stair case shall be 1200 mm. The stair

			V Civil	3.04.18 Page 13/40		whereas clause 3.04.18 stipulates the minimum clear width of stair shall be 1200 mm. Please clarify.	width in cl. 13.02.00 shall be read as 1200mm.
24	VI	D	12.00.00	12.02.00 Page 5/48	Connection of Thermo wells after steam blowing	Specification stipulates welding of thermo well sockets after steam blowing. Please confirm whether thermo well sockets can be welded to Pressure Parts prior to hydro Test.	Bidder to comply specification requirements.
25.	VI	D	25.00.00	25.01.00 & 25.05.00 Page 10/48	Employment of labour	Please confirm that NTPC will issue for-V in the name of the sub-contractors (deployed by the main Contractor foor field activities) to enable them to take Labour License in their names. Overall responsibility shall remain with the main Contractor.	Specification requirements to be complied with.
26.	VI	D	26.03.00	26.03.00 Page 11/48	Water	Construction and drinking water may please be provided by NTPC at a single source within the work site free of charge. Further distribution shall be the responsibility of the Contractor.	Specification requirements to be complied with.
27.	VI	D	33.01.03	33.01.03 (a) to (d) Page 14/48	Activities indicated against (a) to (d) to be submitted 18 months prior to schedule date of commissioning of the equipment/system	Duration of 18 months being considerably long, request please review the same to reduce this time frame to 6 months.	Specification requirements to be complied with.
28.	VI	A	IV	1.09.01 (b) & 1.09.02 (b) Page 6/10	Employer to provide one Instrument air & one Service air connection from the ring main for each unit.	This is contradictory to clause 1.00.00 (d) sub-section IIIA-09 Section-VI Part-A, which stipulates “Instrument & Service air distribution system for bidders facilities are included in bidder scope.”	Specification requirement is in order. Employer will provide one connection from which Bidder has to provide distribution system to Bidder’s

						Please clarify the scope.	facility.
29.	1.09.02	A	IIIA-11	1.00.00 page 1/1	ESP control room elevator	Please refer clause no. 1.01.02 of sub-section IIM-11 of Section VI Part-B Page 1/5 which stipulates- "No. of floors to be served shall be as per the specification of the Employer" Please specify no. of floors to be covered in the base offer.	ESP control room floor levels are 0.00/3.7m/8.4m/11.2m/16.7m/ 21.7m
30.	VI	A	IIIB	3.00.00 (f) Page 1/4	LT Power and Control Cables	Due to high capacity of ID fan Motor (minimum 2 MW, as stipulated in 3.01.00 of Part-A) secondary of VFD power transformer would be selected for a voltage of 2.1 KV or higher. Accordingly, all the Power cabling between Transformer to VFD and VFD to Motor is to be considered by NTPC, as these cables are HT cables & excluded from bidders scope (refer clause no. 2.12.00 of sub-section IV of section-VI, part-A) Please confirm.	Confirmed
31.	VI	B	IIIE-01	1.00.00 Page 1/7	Degree of protection for various enclosures as per IS:13947	For rotating machine (motor), Degree of protection for motor enclosures applicable shall be as per IS:4691. Please confirm.	The specification provisions are being suitably amended..
32.	VI	B	IIIE-01	7.06.00 Page 4/7	Noise level for all the motors shall be limited to 85 db(A)	For motor speeds rated upto 1500 rpm, Noise level for all the motors shall be limited to 85dB(A) at a distance of 1.5 mtr. From outer surface of motor. For motor speeds rated from 1500 rpm up to 3000 rpm, Noise level for all the motors	Bidder to comply with NTPC specification requirement

						shall be limited to 85+5dB (A) at a distance of 1.5 mtr. From outer surface of motor. Please confirm.	
33.	VI	B	IIIE-04	2.14.00	Cable selection & sizing	In our opinion, for Control cables these sizing clauses may ot be relevant & applicable. However, minimum size of 1.5 sq.mm will be maintained. Please confirm.	Bidder to comply with NTPC specification requirement
34.	VI	B	IIIE-07	1.02.00 Page 1/10	VFD system Power/Control panels shall be located in air conditioned room	Please clarify the detail scope for the VFD room building, Air conditioning requirement, Earthing work & illumination scope etc. for the VFD room which has not been clearly specified in the tender.	Scope of VFD system shall be as per clause no.3.00.00,subsection-IIIB,Section VI. VFD room building, Air conditioning, Earthing & illumination for the VFD room is excluded from bidders scope.
35.	VI	B	IIIE-07	4.04.00 (2) Page 6/10	Duplicate control supply with automatic changeover shall be provided	Please confirm that the incoming control power supplies to VFDs are to be provided by NTPC.	Incoming power supply feeder shall be provided by employer. The voltage of this feeder shall be either 415V AC or 220 V DC.
36.	VI	B	IIIE-08	General	General (ESP Package0	Scope of Service Transformers and Bus-ducts (if any) for feeding MCC/ACP/ESP has not been clearly specified in the tender. Hence, we presume that these are outside the bidder's scope. Accordingly, Incoming Power supplies to	Confirmed

						MCC/ACP of ESP are to be provided by NTPC. Please confirm.	
37.	VI	B	VI QM-01	1.01.01 (a) Page 1/14	Each plate shall be subjected to a 100% normal ultrasonic at the mill….of EN 10160:1999 equivalent ASTM standards. Elevated temp tensile tests…. For each heat.	We would like to propose SA435/SA435M as equivalent ASTM standard. Please confirm acceptance. Acceptance Criteria for such test may please be specified.	SA435/SA435M is not acceptable. Equivalent ASTM code SA578/SA-578M acceptance norms of level B may be followed. .
38.	VI	B	VI QM-01	1.01.01 (k) Page 2/14	After stress relieving (SR) all welds, internal and external shall be examined by MPI methods depending on size and accessibility and all butt welds shall be sub jected to 100% radiography.	Please confirm whether the requirement of 100% radiography can be deleted since UT is being done after SR.	This is agreed.
39.	VI	B	VI QM-01	1.01.02 (b) Page 2/14	All butt welds shall be subjected to RT examination. Also MP after SR	In general, we would like to propose ASME Section-V article 2 & ASME Sec-I Clause-PW 11.1 as the testing method and acceptance Criteria for RT wherever applicable. In general, the testing method and acceptance Criteria for MPI wherever applicable may be ASME sec V article 7 ASME Sec-VIII Div-1 Appendix-6 Please confirm acceptance.	Acceptable..
40.	VI	B	VI QM-01	1.01.02 (c) Page 2/14	All full penetration nozzle and attachment welds shall be subjected to UT prior stress relieving.	In general, the testing method and acceptance criteria for UT wherever applicable may be ASME sec V article-5 ASME sec-I Clause PW 11.2	ASME Sec-V article-5 is not relevant. Applicable code for UT of weld joint should be ASME Sec-V article-4 and

						Please confirm acceptance.	ASME Sec-I clause PW 11.2 and is acceptable to NTPC.
41.	VI	B	VI QM-01	1.01.03 (e) Page 3/14	Minimum 10% of the fillet joints shall be subjected to MPI/LPI. However…..subjected to 100% MPI/LPI.	In general the testing method and acceptance Criteria for LPI wherever applicable may be ASME sec V article 6 ASME sec-VIII Div.-1 Appendix-8 Please confirm acceptance.	Acceptable.
42.	VI	B	VI QM-01	1.01.10 (g) (iv) & (v) Page 7/14	Type Test: Quality assurance proof test & test to establish unit functioning of pump at temperature & pressure.	Please furnish relevant details cuh as type of test, controlling standard etc.	Test is not applicable as natural circulation has been specified.
43.	VI	B	VI QM-01	1.01.10 (g) (iv) Page 7/14	Type test: Hot standstill and start up tests	The criteria for conducting these tests may please be clarified. We prpose to conduct such tets at site during commissioning. Please confirm acceptance.	Test is not applicable as natural circulation has been specified.
44.	VI	B	VI QM-01	1.01.10 (g) (ii) Page 7/14	Routine Test: Over speed test.	Please confirm that this will not exceed 110% to avoid interfere with critical speed.	Test is not applicable as natural circulation has been specified.
45.	VI	B	VI QM-01	1.02.02 (a) Page 9/14	Forged shaft coming under air preheater like stub…..subjected to 100% UT at mill and magnetic particles inspection after machining	Please confirm that the test method and acceptance criteria be SA-388/SA-388M.	Acceptable.
46.	VI	B	VI QM-01	1.02.02 (b) Page 9/14	Non-modular design trial assembly is to be carried out at shop prior to dispatch.	For equipment like rotary air preheater that are having modular design baskets, complete trial assembly at shop is not	Acceptable.

						feasible & the same can be carried out at site during erection. Please confirm acceptance.	
47.	VI	B	VI QM-01	1.02.02 ©	Critical welds of rotor post shall be subjected to radiographic examination	RT may be applicable for butt joint only and for other comer fillet joint MPI may be conducted. Please confirm acceptance.	Acceptable
48.	VI	B	VI QM-01	1.02.03 (a) Page 9/14	Rotor components shall be subjected to ultrasonic test at mill	If the raw material is not supported by UT test report, option of carrying out UT testing at Fan Manufacturer shop as per SA388/SA-388M may be exercise. Please confirm acceptance.	Acceptable
49.	VI	B	VI QM-01	1.02.03 (d) Page 9/14	Test for Natural Frequency of Fans shall be carried out.	Please clarify it is applicable for impeller blades only or for all the fan parts.	Bidder's understanding is correct.
50.	VI	B	VI QM-01	1.02.04 (b) Page 9/14	Wear-resistant parts shall be …..and composition shall be carried out.	Grain requirement for microstructure acceptance may please be specified.	This may be discussed and resolved during finalization of QP.
51.	VI	B	VI QM-01	1.02.04 (c) Page 10/14	The tube shall be statically balanced.	We presume it is single plane balancing. Please confirm.	Acceptable
52.	VI	B	VI QM-01	1.02.11 (a) Page 12/14	Structural steel and built up plate girders for main boiler shall be fully killed fine grained and normalized.	As per the tender clause, it appears that the entire girder after fabrication shall be normalized and killed which is not feasible. However, all raw material plates for structure shall be normalized prior to fabrication and no heat treatment after fabrication shall be done. Please confirm.	Raw material requirement for structural steel joints has been clearly specified in SubSection V-Detailed Technical specifications of Civil works Cl. 3.00.00

CLARIFICATION NO.2 **ANNEXURE-I**

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

S.NO.	REFERENCE				BIDDER'S QUERY	NTPC CLARIFICATION
	SEC	PART	SUB-SECTION	CLAUSE NO. PAGE NO.		
1.	VI	B	IIM-01	3.00.00 (a)	According to the Tender documents Section-VI, Part-B, Sub-section-IIM-01-Steam Generator Auxiliaries, Clause No..3.00.00 (a) the design of all pressure parts (tubes, headers, drum, vessels, etc.) shall be as per IBR or other international codes with the approval of the Employer. According to the Clause No.3.00.00 (c) the thickness of the pressure parts shall be calculated using IBR formulae/factor of safety, etc. According to IBR Chapter I, clause 3(4) where no specific provision is made in these regulation fore design or manufacture of any pressure part, the Inspecting Authority may permit the design….conforming to the codes or standards like BS, ASME, TEMA, TRD, GOST and JIS. As we understand well, we can use for the stress analysis (calculation) of the all pressure parts DIN-TRD code with safety factors and prescribed allowances according to IBR.	Prevalent International codes for design are acceptable. However, same should satisfy the IBR & technical specification compulsorily.
2.	VI	B	IIM-01	5.02.00	According to the Tender Section-VI, Part-B, Sub-section-II M-01- Steam Generator & Auxiliaries, Clause No.5.02.00 furnace shall be water/steam cooled on all four sides. Our standard design of the furnace for higher steam parameters uses wall superheater on the upper part of the furnace walls.	Technical specification requirements shall be adhered to. Please refer Cl. No.9.02.00 1 (f), Subsection II M-01, Section VI, Part B.. The base offer is mandatory for evaluation of bid.

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S.NO.	REFERENCE				BIDDER'S QUERY	NTPC CLARIFICATION
	SEC	PART	SUB-SECTION	CLAUSE NO. PAGE NO.		
					Reference of the boiler of the same design will be included in the proposal. According to the Tender Section-VI, part-C-General Technical Requirements, Clause no. 3.00.00 alternate proposal offering similar equipment based on manufacturer's standard practice may also be considered, provided the base offer is in line with technical specifications, From the point of view of time proposal dead line, there cannot be possible to prepare alternate proposals (one with the boiler design according to the specification, another according to our standard practice, without required data and information. Can we offer our standard design with wall superheater supported with references without our proposal design rejected. Please confirm expressly.	
3.	VI	A	IIIA-01	1.27.00, 1.30.00	It is worldwide a typical (outside of India) to include in the scope of supply special software and measuring instruments as per above mentioned Clauses. There special software and instruments are generally provided by Owner, because require training of personal, upgrading , special service, etc. Can be these items excluded from the scope of the bid (supply) without being disqualified from	Bidder to comply with specification requirement regarding scope of supply.

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S.NO.	REFERENCE				BIDDER'S QUERY	NTPC CLARIFICATION
	SEC	PART	SUB-SECTION	CLAUSE NO. PAGE NO.		
					the bid evaluation process ?	
4.	VI	E		Tender Drg.	Section VI, Part-E Tender Drawings. In any drawing there is not seen the expected location of auxiliary boiler. Please complete.	Location of Aux. Boiler shall be in Boiler area behind the service Building. The exact location of the Aux. Boiler shall be finalized during detailed engg.
5.	VI	B	IIM-02		Section-VI, Part-B, Sub-section-II M-02 – Auxiliary Steam Generator. Please specify temperature of dematerialized water for auxiliary steam generator feeding.	The temperature of DM water will be in the range of 28 deg C to 30 deg C.
6.	VI	A	III A-10		Mill Reject Handling system, can be offered another type of this system (mechanical instead of pneumatic) ?	Specification requirements shall prevail.
7.	VI	A	IV	Terminal Points and exclusions.	Some discrepancies in terminal points given in the drawings occurred. The injection piping to reheater/superheater spray is in SG supply in the drg. Feed Water System (4610-999-POM-A-005 rev.A) is in TG supply. Please clarify.	The superheater and reheater spray piping is in TG scope of supply upto the common block valve. The piping downstream of the common block valve (including the common block valve) is in SG scope and supply) (Refer dwg. no. 4610-999-POM-A-009, Rev B.)

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STEAM GENERATOR WITH ESP PACKAGE

S.NO.	REFERENCE				BIDDER'S QUERY	NTPC CLARIFICATION
	SEC	PART	SUB-SECTION	CLAUSE NO. PAGE NO.		
					The same problem is with drg. Auxiliary Steam System (4610-999-POM-A-006 rev.A) the steam piping from cold reheat is in SG supply, but in the drg. External Steam System (4610-999-POM-A-007 rev.A) the same piping is in TG supply. Please clarify.	Auxiliary steam tapoff from CRH is in SG scope of supply (Refer 4610-999-POM-A-005, Rev B). However, the extraction steam tapoff to HP heater is from CRH is under SG scope of supply. Refer dwg. no. 4610-999-POM-A-005, Rev B)
8	VI	A	IV	Terminal Points and exclusions.	As we understand well, the battery limit of coal system is at the raw coal bunker outlet flanges. Who will supply bunker bay structure and raw coal bunkers ? It seems reasonable, the supplier of this part will supply the elevator with shaft, too. No elevator will be supplied for electrostatic precipitators. ESP will be equipped with hoisting equipment for maintenance and repairs. Please confirm.	All civil, structural and architectural works for mill and bunker building including raw coal bunker is excluded from the scope of supply of the bidder as per clause 2.16.00 of technical specifications, Section VI, part A, Sub Section IV under Terminal points. No elevator is envisaged for Bunker bay structures & raw coal bunker by Employer.

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S.NO.	REFERENCE				BIDDER'S QUERY	NTPC CLARIFICATION
	SEC	PART	SUB-SECTION	CLAUSE NO. PAGE NO.		
						Elevator is not envisaged for ESP. Elevator is to be provided for ESP control room as specified.
9.	VI	A	IV	Terminal Points and exclusions., Cl.1.01.01	It is unusual battery limit inside the chimney. We suppose battery limit on flue gas side outside the chimney on inlet flange to the chimney. The whole chimney including supports will be in the scope of chimney supplier. Please confirm.	The extent of flue gas duct in the scope of the bidder is clearly defined at clause no. 1.01.01 of the technical specifications, Section VI, part A, Subsection IV, under Terminal Points and the tender dwg no. 4610-101-POC-A-001.
10.	VI	B	M-05, Power Cycle Piping, M06, Low Pressure Piping Sys, M-08 Equipment Cooling		There is missing basic steam water balance of the unit in the diagrams attached to the Tender. It is mainly concerned of auxiliary steam system and cooling water system. Please, specify in detail requirements on steam and cooling water for equipment of the thermal cycle not included in the boiler island scope, as well as requirements on interconnection and capacity of common collectors and equipment.	Aux. steam requirement of the thermal cycle not included in the boiler scope is 45T/hr approximately. This requirement is tentative and final requirement shall be communicated after finalization of successful TG bidder. Regarding cooling water

S.NO.	REFERENCE				BIDDER'S QUERY	NTPC CLARIFICATION
	SEC	PART	SUB-SECTION	CLAUSE NO. PAGE NO.		
			Water System			requirements, the query is not clear. However the equipment cooling water system details are as given in A-08,M-08-ECW system and tender drawing - P & I diagram of Equipment Cooling Water system-Drg.No-4610-999-POM-A-025.
11.	VI	B	M-05, Power Cycle Piping, M06, Low Pressure Piping Sys, M-08 Equipment Cooling Water System		The piping systems are required in accordance with ANSI/ASME code. Can be applicable also DIN-TRD code for all piping? Please confirm expressly.	Bidder to comply the specification requirement.
12.	VI	A	IV	2.15.00	According to the Tender documents Section-VI, Part-A, Sub-section-IV – Terminal points &	BOP in this context indicates main plant equipments like

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S.NO.	REFERENCE				BIDDER'S QUERY	NTPC CLARIFICATION
	SEC	PART	SUB-SECTION	CLAUSE NO. PAGE NO.		
					Exclusion, Clause 2.15.00 BOP (C&I) part of DDCMIS- What is included in the scope of the mechanical part of BOP ?	ID/FD/PA fan, MDBFP etc. BOP (C&I) part of DDCMIS means. System for implementation of open loop control of these equipments, closed loop controls for coordinated master control, Furnace draft control, Fuel/Air flow control etc.
13	VI	A	IV	2.15.03	According to the Tender documents Section-VI, Part-A, Sub-section-IV – Terminal points & Exclusion, Clause 2.15.03 – Centralized steam and water analysis- Does it mean continuous measurement system for boiler water, blow down, dematerialized water and steam analysis ?	Bidder's understanding is correct. For more clarity the list of measurement points is attached at Annexure –II.
14					For the better understanding conception of the DDCMIS and electrical part it will be helpful to obtain the following documents: (a) single line diagram (MV and LV level) with a prompted battery limits between Employer's and Contractor scope. (b) DDCMIS configuration diagram indicated in detail the battery limits between Employer's and Contractor's scope.	a)Bidder to refer Electrical scope ,Subsection-IIIB, Part-A, SectionVI b)Specification requirement is clear. For more clarity bidder may refer to drawing no. 4600-101-POI-A-001, 4600-101-POI-A-09, 4600-101-POI-

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S.NO.	REFERENCE				BIDDER'S QUERY	NTPC CLARIFICATION
	SEC	PART	SUB-SECTION	CLAUSE NO. PAGE NO.		
						A-11/12, 4600-101-POI-A-021,
15					Shall be controllers FG-A01 (part of the DDCMIS) for Boiler Trip, Purge Unit Logics and Burner controls designed according to drg. 0000-999-POI-A-002SH2RA ?	Specification requirements are clear. Bidder's query is not clear. Assuming FG-S01 in place of FGA01, bidder's understanding is correct.

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Sl. No.	Job Spec. Reference				Item Description	Bidders Querry	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
1						There are required guarantees for a number of different parameters under this category. There are included altogether 37 guarantees of individual equipment or system of the mechanical part plus additional guarantees for I&C system. As far as of mechanical part parameters are conferment, these parameters can be divided into two groups: 1. Specific parameters of individual equipment and systems, 2. Technical parameters of individual equipment which influence main guarantees under the Category-I or represent design parameters of some equipment. **(A) Group 1** To this group we include following parameters: - noise - minimum boiler load without oil support combustion - run back capabilities - rate of load charge and sudden load charge - steam temperature imbalance - Air heater leakage	Specification requirement to be complied.

Sl. No.	Job Spec. Reference				Item Description	Bidders Querry	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
						- Boiler load with HP heaters out of operation - Steam purity - Auxiliary steam boiler parameters - Pressure drop across the FGD plant - Stack inlet temperature down stream FGD plant - Vacuum belt filter gypsum quality - These 12 parameters we can guarantee under conditions which shall be specified in our proposal.	
						B Group 2 To this group we include all other parameters not included in the group 1. Capacity of individual machines (equipment) e.g. mill capacity, fans performance characteristics, drives capabilities, margins on fans, limestone pulverizes capacity, capacity and power consumption of air compressors, etc. influence main guarantees under category-I (steam boiler capacity, auxiliary consumption, FGD system) Guarantees required for ESP are included in guarantees under category-I, too. The same is valid for guarantees connected with flue gas temperature (FEGT, actual/MVHT values)	Specification requirement to be complied.

Sl. No.	Job Spec. Reference				Item Description	Bidders Querry	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
						which influence boiler efficiency. Cold air velocity test (CAVT) has influence on auxiliary power consumption. Some guarantees required for power cycle piping, elevator, mill reject system, fuel oil handling and storage system, equipment of cooling water system, ceramic lining of pulverized fuel piping, etc. does not influence main guarantees at all. Guarantees connected with flue gas temperature (FEGT, actual/MHVT values), cold air velocity test are based on theoretical/computed data, mathematical simulation, etc. and their presentation and evaluation are approaching to experimental measurements and studies. Generally we not shall guarantee any parameters from the category IIII except of those specified in group 1. All these parameters shall be understood as technical information without any claim for liquidated damages or reject of the equipment/system Of course, some of these parameters can be checked at individual or complexity tests.	

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BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

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Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
01	VI/ A	V IIM:01 IIM:01 IIM:01	TABLE-1 47 of 104 12.09.01 62 of 104 14.02.01 62 of 104 14.02.01 10 of 15		COAL CHARAECTERISTICS (C) BLENDED COAL Design coal (4): HHV-4328 kcal/kg Worst coal (5): HHV-3828 kcal/kg Best coal (6): HHV-4828 kcal/kg Range of Adequacy coal Worst coal (7): HHV-3728 kcal/kg Best Coal (8) : HHV-5160 kcal/kg **(A) PA fan sizing Criteria** (a) (1) & (b) (1) Blended **worst coal firing with maximum moisture content** **Fan sizing Criteria** **FD fans** **Type of coal firing:** Blended design/Best/Worst whichever gives maximum FD	(a)Bidder under standing is that all equipments to be designed for the **specified coal** furnished in Design coal (4): HHV-4328 kcal/kg Worst coal (5): HHV-3828 kcal/kg Best coal (6): HHV-4828 kcal/kg. The margin to be added for these coals. The equipment should also capable of meeting the coal analysis furnished in the Adequacy coal by consuming the margin adopted in Specified coal mentioned above[SlNo (4), (5) & (6)]. Kindly confirm The coal analysis furnished in **Worst coal (5): HHV-3828 kcal/kg** is considered for the sizing. Adequacy worst coal analysis is not considered. (b) The specified coal analysis of the following will be considered for the design and the margin will be added to the maximum air quantity requirement of firing the following coals. **Design coal (4): HHV-4328 kcal/kg** **Worst coal (5): HHV-3828 kcal/kg** **Best coal (6): HHV-4828 kcal/kg** (c)The specified coal analysis of the following will be considered for the design and the margin will be added to the Maximum flue gas	Bidders may note the following with respect to coal data given at Table 1 (C): 1. Design coal is coal listed under column 4. 2. Worst coal is coal listed under column 5. 3. Best coal is coal listed under column 6. 4. Adequacy range is the range of coal given at Column 7 & 8. As regard to ESP design point coal, bidder may note that worst coal with maximum ash means: The bidder has to take worst coal (5) with ash % as given in coal(7) {32.66%} with corresponding reduction in moisture content of coal(5) {15.68%} and keeping the calorific value same as that of

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Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
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		IIM:03	11.00.00		fan air requirement **ID fans** **Type of coal firing:** Blended design/Best/Worst whichever gives maximum flue gas flow **ESP sizing Criteria** **2) Type of coal** Design point: **Worst blended coal(max. ash coal from range)**	quantity requirement of firing the following coals. **Design coal (4): HHV-4328 kcal/kg** **Worst coal (5): HHV-3828 kcal/kg** **Best coal (6): HHV-4828 kcal/kg** (d) The coal analysis furnished in **Worst coal (5): HHV-3828 kcal/kg** **is considered for the sizing.** Adequacy worst coal analysis is not considered.	coal(5).
02	VI -B	IIM-03	11 of 15	11.00.00 (7)	ESP SIZING CRITERIA No. of series electrical fields out of operation.	In the design point condition, it has been mentioned as 'nil'. Normally, it is 'one' instead of 'nil'. Please clarify.	Suitable amendment in this regard is being issued.

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Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
01.	VI-B	II M - 03	8 of 15	8.05.00	SCOPE OF SUPPLY Hopper aeration system consisting of aeration pads, heaters, blowers, piping etc, shall be provided on two sides of each hopper near the hopper work.	The aeration system consisting of aeration pads, heaters, blowers, piping etc, are form part of ash handling system as this has to be linked up with ash evacuation. Normally, ESP suppliers will only provide space in the ESP hoppers for installation of the aeration pads by the ash handling system vendor. Hence, these items may be included in the Ash handling system vendor scope. **Please confirm acceptance.**	Bidder to comply specification requirement.
02.	VI-B	II M - 01	94 of 104	21.09.00 (d)	INSULATION CLADDING 20 SWG Aluminium for ESP	Based on our experience, we recommend 0.71 mm thick plain Aluminium cladding sheet for ESP thermal insulation which is sufficient for the purpose. Hence, we propose 0.71 mm (22 SWG) thickness instead of 0.914 mm (20 SWG) confirming to IS 737 Gr 31000/H2. **Please confirm acceptance.**	Accepteble.
03.	VI-A	III A-01	11 of 31	1.13.02	Each ID fan shall be provided with bearing	Lube oil system envisaged for each ID fan is for bearing lubrication only.	Bidder's understanding is correct.

Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
					lubrication units consisting of:	**Please clarify.**	
04.	VI-B	II M-01	48 of 104 65 of 104	12.09.02 (A)/(a) 14.03.00	Fan blades – high strength Aluminium alloy with minimum hardness of BHN-75.	Blades of FD & PA fans will be either cast or forged aluminium alloy in line with all earlier contracts. **Please confirm acceptance.**	Forged aluminum alloy blades for FD and PA fans are also acceptable..
05.	VI-B	II M-01	49 of 104	12.09.02 (C)(c)	In case of oil lubricated bearing..... In addition sump lubrication with ring shall also be provided.	The bearings are sufficiently lubricated by the lube oil system and additional sump lubrication with ring is not required. **Please clarify.**	Specification requirements to be complied with.
06.	VI-B	II M-01	49 of 104 66 of 104	12.09.02 (C)(d) 14.04.00 (d)	Two nos. of Duplex RTD, (100 Ohm at 0 deg. C.) thermocouple and temperature indicators shall be provided … of each bearing of fans.	As there is no sufficient space available to mount two RTDs and two TIs, one number each is provided as per BHEL standard practice. **Please confirm acceptance.**	Four temp. measurement points are envisaged per bearing as per tender drawing/specification. Minimum two duplex RTDs are to be provided on each bearing. Third RTD/ temperature indicator may be or may not be provided depending on space availability.
07.	VI-B	II M-01	50 of 104	12.09.02 D(c)	Each bearing shall be provided with an oil level indicator and screwed drain plug.	As the bearings are inside the fan housing and the bearings are with circulation oil system, there is no need for oil level indicator for the bearings and hence the same are not provided. **Please confirm acceptance.**	Bidder's explanation for oil level indicator is acceptable. However screw drain plug is to be provided.
08.	VI-B	II M-01	65 of 104	14.03.00	25 mm (minimum) thick blade plate, provided with removable liners of wear resistant material having	ID fan blade material: P355NH – 16mm thick blade plate with XAR-400 – 7mm thick renewable wear liner fitted over the blade. **Please confirm**	Specification requirements to be complied with.

Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
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					10 mm thickness.	**acceptance.**	
					Fan rotational speed : 1400 rpm (max)	FD fan speed : 1480 rpm (max) **Please confirm acceptance.**	
					Fan rotational speed : 600 rpm (max)	ID fan speed : 590 / 740 rpm (max) **Please confirm acceptance.**	
					Abrasion and wear resistant, high BHN Steel having minimum 8.0mm/12mm (minimum) mild steel with liner thickness of 10mm(min).	ID fan shall be fabricated from 8.0mm thick mild steel plates. Scroll wall alone is provided with 7mm thick XAR-400 wear liners. **Please confirm acceptance.**	
09.	VI-B	II M-01	66 of 104	14.03.00 (a)	Contractor shall submit detailed calculations, for Employer's approval, to confirm compliance with above requirements for all fan components …. Combined static, dynamic as well as residual stresses shall be demonstra- ted within allowable limits.	BHEL will furnish the following details. 1. Torsional stresses of shaft 2. Critical speed of shaft including impeller hub and blades. Impeller is hydraulically mounted on shaft. Hence, combined static, dynamic as well as residual stresses will not arise. **Please confirm acceptance.**	Specification requirements to be complied with.
10.	VI-B	II M-01	66 of 104	14.04.00 (c)	Cooling Air circulation to be provided across main bearing.	FD fans handle atmospheric air. ID fans bearings are open to atmosphere. So, there is no need for cooling air circulation across the main bearing, hence the same is not provided. **Please confirm acceptance.**	Specification requirements to be complied with.

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Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
11.	VI-B	II M-01	66 of 104	14.05.00 (c)	Natural frequency of all fan components shall be established by vibration testing….	Natural frequency test of FD & PA fan Impeller blades alone will be done. For ID fan blades the natural frequency test is not required as it will be well above the operating frequency. **Please confirm acceptance.**	Accepted
	VI-B	VII:QM-01	9 of 14	1.02.03 (d)			
	VI-B	II M-01	66 of 104	14.05.00 (d)	The fan blade shall be subjected to natural frequency test. The other components of ID & FD fan wheels need not…		
12.	VI-B	II M-01 QM-02	103 of 104 5 of 5	26.01.01 2.01.00 (d)	Full range performance testing for each type and size….	The Fans are of proven design and hence performance testing for each type and size is not envisaged. **Please confirm acceptance.**	Specification requirements to be complied with.
13.	VI-E	DRG. NO: 4610-101-POM-A-003/	SH 2 of 2	-	Two numbers of TEs for connecting to BOP/C&I are shown for each ID/FD/PA fan bearing.	One number of bearing temperature measurement RTDs for each bearing for FD/ID/PA fans will be supplied in line with earlier NTPC projects. We are not providing Temperature Transmitters along with fan /motor RTDs. **Please confirm acceptance.**	Please refer reply at sl. no. 6 of Section – VII. Regarding scope of temperature transmitters, bidder to refer to Cl. 4.02.00, Subsection IIIC, Section VI, Part A.

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Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
		REV A					
14.	VI-A VI-B	III-A01 IIM-01	12 of 31 33 of 104	1.14.01 (10) 11.01.13	.. thermocouples or Platinum RTDs for measuring cold & hot end bearing metal temperature ….	APH bearings are of Anti-Friction type & immersed in the Sump Oil. Also, the APH rotor rotation speed is less than 2 rpm. Hence, the Sump Oil Temperature measurement is the reliable indication of the APH Bearing Metal Temperature, and RTDs are provided for Bearing oil Temperature measurement. **Please confirm acceptance.**	Accepted.
15.	VI-A VI-B	VI IIM-01	19 of 34 31 of 104	8.02.00 (xiii) 11.01.04, (4, ii)	... guarantee & demonstrate .. air in leakage ... after 3000 hrs of operation … & max drift in leakage … does not exceed 1%, 1 year after demonstration …. only external adjustment of seals	Leakage test will be done along with boiler PG test only, and not separately. The drift in leakage after 1-year operation will be 1 to 2%. Prior to the Boiler PG test, internal inspection / adjustment of Air Preheater Seals & Sealing Surfaces are required. **Please confirm acceptance.**	Specification requirements to be complied with.
16.	VI-B	IIM-01	31 of 104	11.01.04, (4, i)	External adjustable and easily replaceable seals	Externally adjustable sealing surfaces shall be provided. Prior to any adjustment, internal inspection of the Seals & Sealing surfaces is required. **Please clarify.**	Specification requirements to be complied with.
17.	VI-A VI-B	VI IIM-	14 of 34 11 of 104	8.01.00	… equivalent weighted sound level …. of any equipment … shall not	Normally, APH is run with Electric Motor during which the Noise Level will be 85db. Air Motor is an	Specification requirements to be complied with.

Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
		01		1.23.00	exceed 85 dBA ….	emergency drive which will operate only for a short duration during AC motor failure. Noise level during air motor operation will be ~ 95 db. **Please confirm acceptance.**	
18.	VI-A VI-B	III-A01 IIM-01	12 of 31 31 of 104	1.14.01 (1) & (2) 11.01.04 (5)	.. peripheral AC drive with automatic clutching / declutching.. .. air motor drive with automatic clutching / declutching..	APH Drive system consisting of 1 no. AC Motor & 1 no. Air Motor coupled to a two-input-shaft Speed Reducer having over-running clutch on the air motor side shaft, will be provided. **Please confirm acceptance.**	Specification requirements to be complied with.
19.	VI-A VI-B	III-A01 IIM-01	12 of 31 32 of 104	1.14.01 (5) 11.01.10	.. APH stand still sensing device with necessary logic components …lights, housed in enclosure. The motions to be precluded up at appropriate location of the rotor shaft	Stand still sensing device with proximity switch will be supplied to detect the slowing down of rotor. The alarm for slowing down of rotor shall be generated through the DDCMIS / DCS. Hence there will not be any separate enclosures / local panels. **Please confirm acceptance.**	Air heater standstill sensing device with all necessary logic components to be supplied by bidder. “Rotor stalled” contact shall be generated and the same shall be wired to DCS.
20.	VI-A	III-A01	13 of 31	1.14.01 (13)	Temperature switches on bearings for interlock purpose	RTDs shall be provided and shall be connected to DCS / DCMIS for Interlock purpose. **Please confirm acceptance.**	Bidder’s proposal is acceptable.
21.	VI-B	IIM-01	33 of 104	11.01.12 (h)	Special T&P kit for removal of bearing and for replacement of shaft	For APH, Hydraulic lifting Cylinders are provided as special tools, for supporting the Rotor during removal of the Bearings. No other T&P kit is	Specification requirements to be complied with.

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Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
						applicable. **Please confirm acceptance.**	
22.	VI-A	VII Mandatory Spares	12 of 50 16 of 50	1.06.00 1.09.00	Mandatory Spares: 1.06.00 (Tri-sector RAPH) 1.09.00 (Soot blowers)	In Clause No 1.06.00 (13) "Spare kit for rotor stoppage alarm" shall be changed as "Go switch" as this is the only item applicable. In Clause No 1.06.00 (14) "Spare kit for fire sensing device" shall be changed as "Thermocouples" as this is the only item applicable. In Clause No 1.06.00 (17) "Actuators" are not applicable. In Clause No 1.09.00 (7) "Reduction gear box & motor…" shall be changed as "Reduction gear box…" as the motor is already covered in Sl. No. 6. **Please confirm acceptance for these changes.**	Specification requirements to be complied with. Details will be finalized with the successful bidder.
23.	VI-B	IIM-01	74 of 104	15.02.04 (i)	(i) Guillotine Gate type: at locations in cl.no.15.02.01 (a), (b), (c), (d), (f) and (g) above	(i) Guillotine Gate type: at locations in cl.no.15.02.01 (a), (b), (c), (f) and (g) above. (d) will be guillotine gate or bi-plane damper depending on lay-out. **Please confirm acceptance.**	Specification requirements to be complied with.
24.	VI-B	IIM-01	74 of 104	15.02.04 (ii)	(iI) Bi-plane damper: at location indicated in cl.no.15.02.01 (e) above	(iI) Bi-plane damper: at location indicated in cl.no.15.02.01 (d) and (e) above depending on lay-out. **Please confirm acceptance.**	Specification requirements to be complied with.

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Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
25.	VI-B	IIM-01	74 of 104	15.02.05	The dampers mentioned in Clause 15.02.04 (i), (ii) above shall have a guaranteed gas tightness efficiency (on flow) of not less than 99.95% …….without…seal air	The dampers mentioned in Clause 15.02.04 (i), (ii) above shall have a guaranteed gas tightness efficiency (on flow) as follows: • With seal air 100%; • Without seal air 99.3% **Please confirm acceptance.**	Specification requirements to be complied with.
26.	VI-B	IIM-01	75 of 104	15.02.15 (a)	**Guillotine dampers** The damper sealing efficiency shall be 99.95% on flow without seal air, however with seal air it shall be 100%	For the guillotine gate, the guaranteed gas tightness efficiency (on flow) will be as follows: • With seal air 100%; • Without seal air 99.3% **Please confirm acceptance.**	Specification requirements to be complied with.
27.	VI-B	IIM-01	76 of 104	15.02.15 (b) (12)	**Multilouver Dampers** The damper sealing efficiency shall be 99.5% on flow without seal air, however with seal air it shall be 100%	For the bi-plane dampers, the guaranteed gas tightness efficiency (on flow) will be as follows: • With seal air 100%; • without seal air 99.3% **Please confirm acceptance.**	Specification requirements to be complied with.
28.	VI-B	VII-QM-01	12 of 14	1.02.10 (b)	Gas tight dampers shall be subjected to shop leakage test to demonstrate the guaranteed tightness for	Considering that the dampers are of proven design and have been supplied to various projects (including many NTPC projects), **no shop Leak tightness tests are envisaged**	Specification requirements to be complied with.

Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
					minimum one damper of each type and size offered	Gate, Biplane dampers and Louver dampers are not considered for leak tightness test. **Please confirm acceptance.**	
29.	VI-B	II-M-04	3 of 18	2.03.02	The gate in the bypass duct shall be of quick opening type to allow bypass to come into operation in case of emergency.	Considering the fast response as well as the leak tightness required, pneumatically operated Multi-louver (Biplane) Damper is considered instead of Guillotine Gate .The Damper will have provision for seal air to ensure leak tightness. **Please confirm acceptance.**	Specification requirements to be complied with.
30.	VI-B	II-M-04	4 of 18	2.03.03	The design of the gates shall ensure 99.95% leak tightness without seal air along the duct as well as from the duct to atmosphere.	For the guillotine gate, the guaranteed gas tightness efficiency (on flow) will be as follows: • With seal air 100%; • Without seal air 99.3% **Please confirm acceptance.**	Specification requirements to be complied with.
31.	VI-B	II-M-04	4 of 18	2.03.05	The blade and other components…. shall be made of SS317L…..	Suitable material will be selected considering the flow medium and operating conditions. **Please clarify.**	Specification requirements to be complied with.
32.	VI-A	III	1 of 5 & 2 of 5	1.05.00	Paints & painting The painting of various components shall comply with the requirements		Specification requirements to be complied with.

Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
	VI-B	II M-02	4 of 4	(P) Painting	stipulated in different parts of the specification. However, for components where no specific requirement is stipulated the painting conforming to the requirements stipulated below shall be provided. a) The surfaces which have surface temperature 95° C or less and which are insulated shall be painted with at least two coats of in organic Zinc silicate primer and two coats of enamel paint with total DFT not less than 80 microns. For painting of boiler components and auxiliary equipment, contractor shall comply with requirement of clause part A & Part C	As per standard practice for NTPC projects, we will provide 2 coats of red oxide to IS 12744 & Two Coats of Finish paint with DFT not less than 80 microns. **Please confirm acceptance.**	
33.	VI-C	GTR	23 of 39	09.02.09	All welding and brazing shall be carried out as	Welders and procedures are qualified as per AWS D1.1 for all products	Bidder to comply specification requirements.

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					per procedure drawn and qualified in accordance with requirements of ASME section IX/BS-4870…….	except rotor parts of fans, which is as per ASME Sec IX. No fresh test will be done. Records may be reviewed by NTPC. **Please confirm acceptance.**	
	VI-C	GTR	23 of 39	09.02.10	All brazers, welders and welding operators employed on…. Shall be qualified as per ASME section-IX….		
	VI-C	GTR	23 of 39	09.02.11	Welding procedure qualification & welder qualification test results shall be furnished to the Employer…		
34.	VI-C	GTR	23of 39	09.02.14	No welding shall be carried out on cast iron components for repair	Welding on cast iron parts are done for minor repair works only with qualified procedures & personnel. **Please confirm acceptance.**	Bidder to comply specification requirements.
35.	VI-C	GTR	25 of 39	09.02.26	Repair /rectification procedure to be adopted to make the job acceptable shall be subject to the approval of the employer /authorized representative	Repair procedures are to make the non-conforming product to original specification. We are experienced enough to handle these procedures with the Local Representative of NTPC. Hence specific customer approval may be waived. **Please confirm acceptance.**	Bidder to comply specification requirements.
36.	VI-B	IIM-	66 of	14.05.	Fan balancing:		(a) Specification requirements

Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
		01	104	00	(a) The fans shall be statically and dynamically balanced before shipment. (b) Balancing of each fan shall be checked and adjusted at site, if necessary. (d) The fan blade shall be subjected to natural frequency test.	(a) As per std practice followed for earlier NTPC projects shafts and impellers are dynamically balanced taking care of any static unbalance (b) Perfect balancing of each fan will be done at shop, hence no rechecking is necessitated / envisaged at site. (d) Axial fan blades only are frequency tested which is the practice for all earlier NTPC projects. **Please confirm acceptance.**	to be complied with. (b) Specification requirements to be complied with. (c) Refer clarification for Sl. No. 11 of Section VIII.
37.	VI-B	IIM-01	76 of 104	15 02 15(b) 4	Damper shaft shall be balanced about the bearing shaft axis.	Shafts coming in damper are too small for balancing and as such it has not been balanced in the past. Based on the quantum of shafts and its size, it is not technically feasible to balance. This is the practice for all earlier NTPC projects. **Please confirm acceptance.**	Accepted.
38.	VI-B	V: Civil	5 of 40	3.02. 02 (c)	Plates beyond 40 mm thickness shall be normalized and ultrasonically tested.	Plates without normalizing and with UT are proposed to be used for only shear key lugs under the base plate of ESP columns. This is the practice for all earlier NTPC projects. **Please confirm acceptance.**	Specification requirements to be complied with.
39.	VI-B	V:	14 of 40	3.07.01	Mild steel and medium /	Preheating for welding will be done in	Specification requirements to

Sl. No.	Job Spec. Reference				Specification Requirements	Bidders Query	NTPC Clarification
	Sec.	Part	Sub-sec.	Clause No.			
		Civil			high tensile steel plates thicker than 20 mm will require pre heating of the parent plate prior to welding (over 20 mm up to 40 and including 40 mm pre heating shall be 20 °C)	line with Qualified weld procedures. **Please confirm acceptance.**	be complied with.
40.	VI-B	V: Civil	23 of 40	5.01.08	All grating shall be blast cleaned to Sa 2 ½ finish & shall be hot dip galvanized at the rate of 610 Gms / sq m. All hand rails and ladders shall be galvanized to 610 gms/Sq.m	Galvanizing will be done after acid pickling as per relevant Indian standards. Hence no blasting is envisaged. **Please confirm acceptance.**	Specification requirements to be complied with.
41.	VI-B	VII: QM-01	09 of 14	1.02.02 (a) (c)	Air Preheater - Forged shaft coming under air prehater like stub shaft, main rotor forgings, housing hub shall be subjected to 100% UT and MPI after machining. Critical welds of rotor post shall be subjected to RT.	BHEL will follow the requirements in line with previous NTPC agreed norms. **Please confirm acceptance.**	Bidder to comply specification requirements.
42.	VI-B	VII:Q	9 of 14	1.02.03	**Fan** - Rotor components	a) Rotor components are ultrasonic	Acceptable

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		M-01		a b	shall be subjected to Ultrasonic testing and MPI after rough machining. Butt welds in rotor components shall be subjected to 100% RT. All welds shall be MPI tested after stress relieving.	tested and dye penetrant tested after machining which is the practice for earlier NTPC projects (b) Butt welds are 100% RT or UT tested and MPI tested after stress relieving which is the practice for earlier NTPC projects **Please confirm acceptance.**	
43.	VI-B	VII:Q M-03	1 of 2	1.01.00 (2) d	d) Cupping test for deep drawn sheets	Cupping test for deep drawn sheets shall be done only if envisaged in the National / International standards to which BHEL procures the material. **Please confirm acceptance.**	Acceptable
44.	VI-B	VII:Q M-03	1 of 1	1.03.00 (c)	(1) 100% RT/UT on Butt-welds of plates thickness > 32 mm. (2) For plates of 25 mm <thickness > 32 mm.- 10% RT and 100% MPI. (3) For plate of thickness < 25 mm – 10% MPI/ LPI.	RT/UT is done for butt welds of flanges(these are in tension) of built up beams of ESP structures. Butt welds of flanges of built-up columns are under compression and hence no RT/UT done but MPI is done 100%. **Please confirm acceptance.**	Bidder to comply specification requirements.
45.	VI-B	VII:Q M-03	1 of 1	1.03.00 (a)	a) Only material which has been identified against mill sheet or test certificate shall be used for construction.	(a) we procure IS 2062 matl in bulk it is not possible to identify the matl against TC during issue (steel grade will be identified) This is the practice for earlier NTPC projects.	Bidder to comply specification requirements.

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						Please confirm acceptance.	
46.	VI-B	VII:QM-02	4 of 5	1. 07. 00 (c)	Auxiliary Boiler 100% RT / UT on butt welds of plate thickness ≥ 32 mm. For plates of 25 mm thickness < 32 mm - 10 % RT & 100% MPI. For plate of thickness < 25 mm – 10% MPI / LPI.	Butt welds will be 100% MPI tested. The above is the practice for earlier NTPC projects. **Please confirm acceptance.**	Bidder to comply specification requirements.
47.	VI-B	VII:QM-02	5 of 5	2.01.00	(a) Fan - Rotor components shall be subjected to Ultrasonic testing and MPI after rough machining. (b) Butt welds in rotor components shall be subjected to 100% RT. All welds shall be MPI tested after stress relieving.	a) Rotor components are ultrasonic tested and dye penetrant tested after machining which is the practice for earlier NTPC projects (b) Butt welds are 100% RT or UT tested and MPI tested after stress relieving which is the practice for earlier NTPC projects **Please confirm acceptance.**	Acceptable.
48	VI-A	IIIA-04	1 of 6	2.02.00	Gas from ID Fan discharge shall be taken to the absorber through a Gas-Gas heater----------	Since no separate Booster Fan is specified, it is understood that proposed ID fan is to be designed for addl pressure drop across FGD. Pl clarify	Bidder's understanding is correct.

CLARIFICATIONS NO-2

ANNEXURE-II

BONGAIGAON TPP (3X250 MW) TECHNICAL SPECIFICATIONS

STEAM GENERATOR WITH ESP PACKAGE

S. NO.	SERVICE	INSTRUMENT	RANGE	Qty. / unit	Remarks
1	HOTWELL CONDENSATE(LEFT)	SP COND.	0-1, 0-10, 0-100 μ mho/cm (freely programmable)	1	Removable type cells
2	HOTWELL CONDENSATE(RIGHT)			1	
3	MAKEUP DM WATER	SP COND.	0-1, 0-10, 0-100 m mho/cm (freely programmable)	1	Continuous flow through type
4	MAIN COND PUMP DISCHARGE			1	
5	MAIN COND POLISHER OUTLET			1	
6	CONDENSER COOLING WATER			1	
7	FEED WTR AT ECONOMISER INLET			1	
8	BOILER DRUM WATER			1	
9	MAIN STEAM			1	
10	BOILER SATURATED STEAM			1	
11	MAKEUP DM WATER	CAT COND.	0-1 μ mho/cm log scale	1	
12	MAIN COND PUMP DISCHARGE			1	
13	MAIN COND POLISHER OUTLET			1	
14	FEED WTR AT ECONOMISER INLET			1	
15	MAIN STEAM			1	
16	BOILER SATURATED STEAM			1	

DOC. NO- CS-4610-101-2-CLRF-02 dated 23.05.2007

S.NO.	SAMP NO.	KKS CODE	SERVICE	INSTR UMENT	RANGE	Qty. / unit	Rem arks
17	SWQ-43	LCA20CQ104	MAIN COND PUMP DISCHARGE	pH	6-11 pH (freely programmable)	1	
18	SWQ-44	LCA50CQ104	MAIN COND POLISHER OUTLET			1	
19	SWQ-51	PAB15CQ101	CONDENSER COOLING WATER			1	
20	SWQ-52	PGB86CQ101	ECW-SG			1	
21	SWQ-53	PGB04CQ104	ECW-TG			1	
22	SWQ-47	LAB40CQ101	FEED WTR AT ECONOMISER INLET			1	
23	SWQ-48	HAD01CQ101	BOILER DRUM WATER			1	
24	SWQ-49	LBA00CQ103	MAIN STEAM			1	
25	SWQ-43	LCA20CQ103	MAIN COND PUMP DISCHARGE	DO2	0-20, 0-200 PPB (freely programmable)	1	One single stream
26	SWQ-46	LAB11CQ101	DEARATOR OUTLET			1	
27	SWQ-47	LAB40CQ104	FEED WTR AT ECONOMISER INLET			1	
28	SWQ-44	LCA50CQ102	MAIN COND POLISHER OUTLET	SILICA	0-50, 0-100, 0-500 PPB (freely programmable)	1	MULTI STREAM**
29	SWQ-48	HAD01CQ103	BOILER DRUM WATER				
30	SWQ-43	LCA20CQ102	MAIN COND PUMP DISCHARGE	SODIUM	0-1,0-10, 0-200PPB (freely programmable)	1	MULTI STREAM**
31	SWQ-44	LCA50CQ101	MAIN COND POLISHER OUTLET				
32	SWQ-49	LBA00CQ104	MAIN STEAM				
33	SWQ-50	HAH00CQ101	BOILER SATURATED STEAM				

S.NO.	SAMP NO.	KKS CODE	SERVICE	INSTRU MENT	RANG E	Qty. / unit	Remarks
34	SWQ-48	HAD01CQ104	BOILER DRUM WATER	PHOSPH ATE	0-10 ppm (freely progra mmabl e)	1	
35	SWQ-48	HAD01CQ105	BOILER DRUM WATER	CHLORID E ION	0-1000 ppb (freely progra mmabl e)	1	
36	SWQ-47	HAC10CQ102	FEED WTR AT ECONOMISE R INLET	HYDRAZI NE	0-50, 0-100PP B, 0-500PP B (freely progra mmabl e)	1	MULTI STREAM

S.No.	Guaranteed Parameters	Guaranteed Figures
(ii)	Steam Generator capacity (each unit) in T/hr of steam at rated steam parameters at superheater outlet **(** with any combination of mills working as per Employer's discretion) with the coal being fired from within the range specified in Table-1C, sub-section-V, Part-A, Section-VI of Technical Specification (clause no. **3.01.00(ii),** Sub-Section-VI, Part-A, Section-VI, of Technical Specification)	.....T/hr.
(iii)	Feed water pressure required at economiser inlet (at stop valve inlet) for main steam flow at 100% TMCR unit load (250 MW) (Clause no. 3.01.00 (iii) sub-section-VI, Part-A of Section-VI of Technical Specification)	.....kg/cm^2 (abs)
(iv)	Superheater attemperation spray water flow in T/hr. in accordance with clause 3.01.00 **(iv),** sub-section-VI, Part-A of Section-VI of Technical Specification, while firing design coal (blended) specified at Table-1C, sub-section-V, Part-A of Technical Specification and maintaining rated SH outlet steam temperature at	
	(a) 100% TMCR (250MW) unit load	.....T/hr.
	(b) 80% TMCR (200MW) unit load	.....T/hr.

S.No.	Guaranteed Parameters	Guaranteed Figures
	(g) All other parts coming in contact with coal (hours of operation)	.....hours
(vi)	Minimum sustained efficiency of Electrostatic Precipitator under guarantee point condition (in accordance with clause 3.01.00 (vi), sub-section-VI, Part-A, Section VI) at 100% TMCR (250 MW unit load) when firing design coal (blended) specified at Table-1C sub-section-V, Part-A of Tech. Spec.	.....% (To limit the outlet dust burden from ESP to **18** mg/Nm3 (max.)]
(vii)	**SO_2 Removal efficiency of FGD system** SO_2 removal efficiency of the Flue Gas Desulphurization (FGD) system, under Guarantee Point Conditions stipulated in clauses nos. 1.02.00 of Part-B, Sub-Section M4.	.....%
(viii)	**Limestone consumption of FGD system** Limestone consumption of FGD system in kg./hr at 100% TMCR (250 MW unit load) under Guarantee Point Conditions stipulated in clauses nos. 1.02.00 of Part-B, Sub-Section M4 and So2 removal efficiency of not less than 95%	.....Kg/hr.
(ix)	**Auxiliary Power Consumption** The auxiliary power consumption for all the equipment & auxiliaries related to steam generator ESP, FGD equipment cooling water pumps, mill reject handling system, compressed air system etc. including all auxiliaries listed at clause no. 6.00.00, Sub-Section-	.....KW

STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE FOR BONGAIGAON THERMAL POWER PROJECT, (3 X 250 MW)
BID DOCUMENT NO. CS-4610-101-2
(Demonstration Parameters/Capabilities)

Bidder's Name & Address :

To
Contract Services (Th.-I)),
NTPC Limited,
NOIDA - 201 301.

Dear sir,

We declare that the ratings, capacities and performance figures of the equipment/system furnished by us under this package are to be demonstrated by us. We further declare that in the event of any deficiencies in meeting the above parameters in respect of the characteristics mentioned below as established after conducting the guarantee test, you may at your discretion reject the equipment/system and recover payment already made or accept it after assessing the deficiency and effecting recovery from the contract price as specified in Sub-section-VI, Part-A, Section-VI (Technical Specification) of bidding document.

1.01.00 **Steam Generator and Auxiliaries**

(i) Coal Pulveriser capacities in T/hr. with design coal at rated fineness as per clause 8.02.00 (i), Sub-Section VI, Part-A, Section VI.

(a) At 100% mill loading with new set of grinding elements .....T/hr.

(b) At 90% mill loading with the originally installed grinding elements in nearly worn out condition or at the end of guaranteed wear life of grinding elements (whicheve is earlier) .....T/hr.

(ii) Operating life of ceramic lining of pulverised fuel pipes in hours of operation as per clause 8.02.00 (ii), Sub-Section VI, Part-A, Section VI. .....hrs.

(iii) Minimum steam generator (% of BMCR) load above which no oil support is required as per clause 8.02.00 (iii), Sub-section-VI, Part-A, Section-VI .....%

(iv) Performance charaterestics of ID, PA, FD & Mill seal air Fans (capacity, head developed etc.) .....

(v) Capabilities of All drives (Refer Clause 8.02.00 (v), Sub-Section-VI, Part-A, Section-VI) .....

(vi) Margin on fans (Ref clause no. 8.02.00 (vi), Sub-section-VI, Part-A, Section-VI).

(a) Seal Air Fans (Refer cl.12.05.06, Sub-Section-II-M1, Part-B, Section-VI) .....

(b) Primary Air Fans (Refer cl. 12.08.00, Sub-Section-II-M1, Part-B, Section-VI) .....

(c) Forced Draft fan & Induced Draft fan (Refer cl. 14.02.00, Sub-Section-II-M1, Part-B, Section-VI) .....

(vii) Run back capabilities (Ref. clause 8.02.00 (vii), Sub-section VI, Part-A, Section-VI) .....

(viii) Demonstration of boiler operation for rate of change of load and sudden load change withstand capability with important parameter deviations within permissible limits. (Ref. clause 8.02.00 (viii) Sub-section VI, Part-A, Section-VI and clause 1.11.00, 1.14.02, Sub-Section-II-M1, Part-B, Section-VI) .....

(ix) Maximum Furnace exit gas temperature (degree celsius) (MHVT Value) in accordance with clause 8.02.00 (ix), Sub-section VI, Part-A, Section-VI. .....

(x) Cold air velocity test (CAVT) (in accordance with clause 8.02.00 (x), Sub-section-VI, Part-A, Section-VI)

(a) Maximum average flue gas velocity at different steam generator sections (m/Sec.) .....

(b) Maximum deviation at each section with respect to average flue gas velocity (%) .....

(xi) Flue Gas temperature at entry & exit of various boiler heating surfaces (Actual/MHVT Values) (In accordance with clause 8.02.00 (xi), Sub-Section VI, Part-A, Section-VI)

(xii) Maximum steam temperature imbalance at superheater (SH) & reheater (RH) outlets between left and right header (degree celcius) (In accordance with clause 8.02.00 (xii), Sub-Section VI, Part-A, Section-VI) .....

(xiii) Air heater air-in leakage and max. drift in Air leakage (% of gas flow at AH inlet), (In accordance with Clause No. 8.02.00 (xiii), Sub-Section-VI, Part-A, Section-VI) .....

(xiv) Steam generating capacity (T/hr.) of Steam Generator when one and/or both or all strings of HP heaters are out of operation. (In accordance with clause no.8.02.00 (xiv), Sub-Section-VI, Part-A, Section-VI)

a) With one string of HP Heaters out .....

	b) With both strings of HP Heaters out	.....
(xv)	Maximum air in leakage in ESP as percentage of total gas flow at the guarantee point conditions as per clause no. 8.02.00(xvi), sub-section-VI, Part-A, Section-VI	.....
(xvi)	Max. ESP pressure drop at guarantee point as per clause 8.02.00 (xvii), Sub-Section-VI, Part-A, Section-VI	.....
(xvii)	Demonstration of Gas distribution among various gas steams and fields of ESP within limits specified in IGCI publication for EP7 at the guarantee point as per Cl. No. 8.02.00 (xviii), Sub-Section-VI, Part-A, Section-VI of Technical Specification	.....
(xviii)	Total pressure drop in gas path of FGD system (across the absorber & gas-gas heater) at 100% TMCR with boiler firing the design coal (blended) specified in Table-1(C), Sub-Section-V, Part-A under conditions stipulated in sub-section-M4, Part-B of Technical Specification	.....
(xix)	Stack inlet temperature with FGD system in operation at 100% TMCR with boiler firing design coal (blended) specified in Table 1(C), sub-section-V, Part-A & under conditions stipulated in sub-section M4, Part-B of the Technical Specification, (Clause 8.02.00 (xxii), sub-section-VI, Part-A)	.....

(xx)	Life of limestone mills wear parts as per clause 8.02.00 (xxiii) (i), sub-section-VI, Part-A of the Technnical Specification	.....
(xxi)	Capacity of each limestone mill as per clause 8.02.00 (xxiii) (ii) sub-section-VI. Part-A of the Technnical Specification	.....
(xxii)	Limestone mill ball consumption as per **Clause 5.04.06 sub-section-II M4 of Part-B of the** Technnical Specification	.....
(xxiii)	Capacity of vacuum belt filters as pe clause 8.02.00 (xxiv) sub-section-VI, Part-A of the Technnical Specification	.....
(xxiv)	Purity of gypsum filtered out of vacuum belt filters as per clause 8.02.00 (xxv), sub-section-VI, Part-A of the Technnical Specification	.....
(xxv)	Noise All the plant, equipment and systems covered under this specification shall perform continuously without exceeding the noise level as specified over the entire range of output and operating frequency specified as per 8.01.00 of Sub-section-VI of Part-A, Section-VI & Clause **14.00.00** of Part-C of Section-VI	.....
(xxvi)	The demonstration parameters/capa-bilities of other equipments shall be as per specification requirements (Refer clause no. 8.10.00, Sub-section-VI, Part-A, Section-VI)	.....

(xxvii) Power Cycle Piping

Actual hanger readings under cold and hot condition (at rated parameters) to match those of design cold and hot hanger readings for MS/CRH/HRH/ HP & LP bypass piping system as per clause 8.03.00, sub-section-VI, Part-A, Section-VI	.....
(xxviii) Demonstration of over load test, travel and hoisted speed for passenger & good elevator in accordance with clause no. 8.04.00, Sub-section-VI, Part-A, Section-VI	.....
(xxix) Rated capacity (T/hr.) of mill rejects system in accordance with clause no. 8.05.00, Sub-section-VI, Part-A, Section-VI	.....
(xxx) Capacity & total dynamic head of all fuel oil & LDO unloading pumps as per Cl. 8.06.00, sub-section-VI, Part-A of the Technnical Specification	.....
(xxxi) Equipment Cooling water system guarantees in accordance with as per clause no. 8.07.00, Sub-section-VI, Part-A, Section-VI	.....
(xxxii) Air Compressors and Air drying plant guarantees in accordance with, clause 8.07.01, Sub-section-VI, Part-A, Section-VI	.....
(xxxiii) Electrical system guarantees in accordance with clause no. 8.08.00, Sub-section-VI, Part-A, Section-VI	.....
(xxxiv) Control & Instrumentation system guarantees in accordance with clause no. 8.09.00, sub-section-VI, Part-A, Section-VI	.....

Date : (Signature).....

Place : (Printed Name).....

(Designation) .....

(Common Seal).....

Note : For all other equipment included in the scope of supply of bidder but not covered above, the demonstration tests to be carried out shall be mutually finalised between Contractor & Employer.

(ii) Milestones at (i) above are to be indicated for each of the following systems :

1. Power Cycle Piping
2. Electrostatic Precipitator
3. **Flue Gas Desulphurisation System**
4. Fuel oil system
5. Chemical dosing system
6. Associated electrical & C&I system
7. Boiler area elevators etc.

Date :

Place :

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

Note : For Steam Generator, the percentage of tonnage to be achieved against completion of each milestone is to be indicated by the bidder in his bid and enclosed as Annexure to this Attachment.

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
(D)	Electrostatic Precipitator including structures, platforms, walkways, stairs, ladders, associated electrical systems etc.						
	Sub Total of Item (I) (D)						
(E)	POWER CYCLE PIPING						
	(a) Main steam piping system including piping, fittings, specialities, valves, Hangers & supports, Insulation & cladding, etc.						
	(b) Cold Reheat piping system including piping, fittings, specialities,valves, hangers & supports, Insulation & cladding,etc.						
	(c) Hot Reheat piping system including piping, fittings, specialities, valves, Hangers & supports, Insulation & cladding, etc.						
	(d) HP Bypass piping system including piping, fittings, specialities, valves, Hangers & supports, Insulation & cladding, etc.						

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
	(e) LP Bypass piping system including piping, fittings, specialities, valves, Hangers & supports, Insulation & cladding, etc.						
	(f) Aux. steam piping system including piping, fittings, specialities, valves, Hangers & supports, Insulation & cladding, etc.						
	(g) Miscellaneous items in power cycle piping, not included in a to f above						
(F)	Equipments for Oxygenated Treatment						
(G)	LP Dosing System						
(H)	Equipment Cooling Water System						
(I)	Elevators & Cranes						
(J)	Mill Reject Handling System						

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
(K)	Air Compressors and Air Drying Plant						
(L)	Plant Performance Analysis, Diagnosis & Optimisation software system						
	Sub Total of Item (I) (E to L)						
(M)	**CONTROL & INSTRUMENTATION**						
	(a) SG C&I System including BMS, SADC etc.						
	(b) Man Machine Interface System						
	(c) Balance C&I items in Bidder's Scope including Coal Feeders control System, Electromatic Safety Valves, Furnace Temperature probes etc.						
	(d) Accoustic Pyrometers						
	(e) Furnance & Flame Viewing system						
	(f) Acoustic Steam leak Detection System						
	(g) Other SG-C&I Systems						
	(h) C&I for Plant Auxiliary Packages						
	Sub Total of Item (I) (M)						
	TOTAL OF ITEM (I) MAIN EQUIPMENT						

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
	m) Indicating lamp holder full set		10% of each type/colour				
	n) Semiconductor fuses for thyristor		1set				
1.18.02	**LT Transformer (VFD)**						
	a) (i) **HV bushing with metal parts & gaskets**		3 Nos. each rating				
	(ii) **LV bushing with metal parts & gaskets**		3 nos. each rating				
	(iii) **Neutral bushing with metal parts & gaskets**		**3 nos.**				
	b) Winding temperature indicator with alarm & trip contacts		1 no.				
	c) Oil temperature indicator with alarm & trip contacts		1 no.				
	d) Magnetic oil level gauge		1 no.				
	e) Pressure relief device		1 no.				
	f) Buchholz relay complete		1 no.				

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
	g) Set of gaskets		1 set				
	h) Set of valves (1 no. of each size)		1 set				

*** Set consists of quantities required for one complete transformer**

1.18.03 Electrostatic Precipitator (ESP)

(a)	Support insulator	4 nos.
(b)	Shaft insulator	6 nos.
(c)	Emitting electrodes	
	(i) Helical wire type	5% of the installed quantity in one set of ESPs for each SG

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
(j)	Transformer rectifier set						
	(a) Complete set		1 no.				
	(b) High voltage insulator		2 nos.				
	(k) Gaskets		**20 sets**				
	(One set means one complete replacement for 1 TR set)						
	(l) Control Switch						
	(i) Transformer-rectifier set controller		1 no.				
	(ii) Rapper controller complete		1 no.				
	(iii) Communication controller complete		1 no.				
	(iv) Electronic cards						
	(a) For rapper controller & ESP management system		1 set				
	(b) For transformer rectifier controller		1 set				

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
	(iii) Auxiliary relays		1 set				
	(iv) Over load relay		1 set				
	(v) Power fuse		1 set				
	(vi) Control fuse		1 set				
	(vii) Control terminal block		1 set				

Note : One set means complete replacement for one auxillary control panel.

1.19.00 FLUE GAS DESULPHURISATION SYSTEM

1.19.01 Gates in Flue Gas System

a)	Seals		1 set of each type (Set means complete replacement or one fgate)
b)	Actuator		1 no. of each type

1.19.02 Gas-Gas Heater

a) Regenerative Ljungstrom Type (if applicable)

i)	GGH Electric Motor complete	1 no.

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
3.01.04	Spare sets of gland packings for all the Globe valves for all sizes		Nil				
3.01.05	Spare gaskets for NRV for all the valves		Nil				
3.01.06	Spare set of Gaskets for safety relief valves, for all sizes		Nil				
3.01.07	Complete gate valves assly. Upto the size of 50 NB		Nil				
3.01.08	**Complete angle valves only upto the inlet size of 50 NB**		**2 nos**				
3.01.09	Complete Globe valves up to the size of 50 NB		2 nos				
3.01.10	Complete NRV's Assly. upto the size of 50 NB		2 nos				
3.01.11	Spring hangers (Varable spring & Constant spring hangers)		Nil				
3.01.12	Gasket for each flanged connection on high pressure steam and feed line		Nil				

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
3.01.13	**Steam traps and Y- Strainers** All internals required to complete one full assembly, except body		5% of total population of one (1) unit for each size, type, material and rating, or min.one (1) set				
3.01.14	Other Valves						
	(a) Each type, size and class for 100 mm and below but above 50 NB		1 no.				
	(b) Each type, size and Class above 100 mm		10% or 2 nos. whichever is more				

Note: Wherever valves are specified as mandatory spare, complete valve along with actuator and all other accessories which are the part of original supply shall also be supplied.

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
3.02.00	**LP PIPING** **Valves :**		**5% of the total population of each type, size and class or minimum 1 no. of each type, size and class, whichever is higher.**				
	Note : Wherever valves are specified as mandatory spare, complete valve along with actuator and all other accessories which are the part of original supply shall also be supplied.						
4.00.00	**MANDATORY SPARES FOR LT SWITCHGEAR (AS APPLICABLE FOR SOOTBLOWER MCC, FGD LTMCC)**						
4.00.01	Complete pole of breaker		**2 nos of each type & rating**				
4.00.02	Spring charging motors		**4 nos of each type & rating**				
4.00.03	Aux. contact set		**4 sets of each type & rating**				
4.00.04	Limit switches		**6 nos of each type & rating**				
4.00.05	Arc chutes		**4 nos of each type & rating**				
4.00.06	Fixed contact set		**3 sets of each type & rating**				

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
4.00.07	Moving contact set		**3 sets of each type & rating**				
4.00.08	Arcing contact		**3 sets of each type & rating**				
4.00.09	Charging spring		**3 nos of each type & rating**				
4.00.10	Current transformer (metering)		**6 nos of each type & rating**				
4.00.11	Current transformer (protection)		**6 nos of each type & rating**				
4.00.12	Closing coil		**12 nos of each type & rating**				
4.00.13	Trip coil		**12 nos of each type & rating**				
4.00.14	CT for Bimetal O/L relays		**3 nos of each type & rating**				
4.00.15	Voltage transformer		**2 nos of each type & rating**				
4.00.16	Control supply transformer		**2 nos of each type & rating**				
4.00.17	Ammeter		**2 nos of each type & rating**				
4.00.18	Voltmeter		**2 nos of each type & rating**				
4.00.19	Relays		**2 nos of each type & rating**				
4.00.20	Power contactor		**2 nos of each type & rating**				

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
4.00.21	Coil of above contactor		**2 nos of each type & rating**				
4.00.22	Air break switches		**3 nos of each type & rating**				
4.00.23	DP air break switches (DC)		**3 nos of each type & rating**				
4.00.24	Control & selector switches		**2 nos of each type & rating**				
4.00.25	Control fuses & neutral links		**10 nos of each type & rating**				
4.00.26	Indicating lamps		**10 nos of each type & rating**				
4.00.27	Bus bar support insulators		**4 nos of each type**				
4.00.28	Bus duct flexibles connectors (if applicable)		**1 set of each type & size**				
4.00.29	Primary disconnect in MCC (Male/ femal contact)		**3 nos**				
4.00.30	Push buttons		**2 nos of each type**				
4.00.31	Power fuses		**6 nos of each type & rating**				
4.00.32	Thermal bimetal relays		**2 nos of each type & rating**				
4.00.33	Indication Lamp Holders complete		**10 nos of each type**				

Item	Description	Code##	Qty.	# UNIT PRICE		# TOTAL PRICE (3 X 250 MW)	
				FOB	CIF (Indian port of Entry)	FOB	CIF (Indian Port of Entry)
1	2	3	4.	5	6	7=4x5	8=4x6
4.00.34	Maintenance tools and accessories for Maintenance (bidder to list)		**2 sets**				
4.00.35	Terminal blocks		**20 nos**				
4.00.36	Busbar alluminium flat pieces		**1 set of each type & size**				
4.00.37	Busbar angles/formed pieces for breaker		**1 set of each type**				
5.00.00	**DISTRIBUTED DIGITAL CONTROL MONITORING AND INFORMATION SYSTEM (DDCMIS) (INCLUDING UNITS –SG C&I AND FUEL OILSYSTEM)**						
5.01.00	Peripherals						
5.01.01	Keyboard		2 Nos. of each type.				
5.01.02	Mouse		2 Nos. of each type.				