TECHNICAL SPECIFICATION OF LIME STONE GRINDING SYSTEM

SPECIFICATION No.: BA89015

REV	DATE	PREPARED	CHECKED	APPROVED
02	02.07.2021	P V S BABU	AMAN	KHRK
01	20.07.2020	P V S BABU	AMAN	SG
00	19.02.2020	P V S BABU	AMAN	SG

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Heavy Power Equipment Plant
Ramachandrapuram, Hyderabad - 502032

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1.PROJECT INFORMATION

A Memorandum of Agreement (MOA) has been entered on 29.07.2015 amongst Govt. of Jharkhand (GoJ), Jharkhand Urja Vikash Nigam Limited (JUVNL), Jharkhand UrjaUtpadan Nigam Limited (JUUNL), Jharkhand BijliVitaran Nigam Limited (JBVNL) and NTPC Limited to form a Joint Venture Company of NTPC Limted& JBVNL for transfer of Patratu Thermal Power Station (PTPS) located in Ramgarh District of Jharkhand State to the proposed JV Company for Performance Improvement of existing capacity & 4000 MW Capacity expansion of PTPS. Further to signing of JV agreement on 29.07.2015, a Joint Venture Company namely Patratu Vidyut Utpadan Nigam Limited (PVUNL) has been incorporated amongst GoJ, JUVNL, JBVNL and NTPC Ltd. on 15.10.2015. The Performance Improvement of existing capacity and 4000 MW Capacity expansion of Patratu STPS will be implemented by the JV Company (JVC). The configuration of expansion of 4000 MW shall consist of 5 units of 800 MW to be implemented in two phases; Phase-I: 3x800 MW and Phase-II: 2x800 MW. The present proposal is for Patratu STPS Phase-I (3x800 MW).

a)	Owner	Patratu Vidyut Utpadan Nigam Limited (PVUNL)
b)	Buyer	BHEL, Hyderabad
c)	Process/Application	Flue Gas Desulphurization

A) SITE CONDITIONS

Site Elevation Basis +335 meters above sea level

Barometric Pressure

			Barometric Pressure		
			Minimum	Reference	Maximum
Observational Record		hPa			
Design Value	Outdoor	hPa		**974**	

Ambient Temperature

			Ambient Temperature		
			Minimum	Reference	Maximum
Observational Record		Deg C			
Design Value	Outdoor	Deg C	**27**		**45**
Design Value	Indoor	Deg C			

Relative Humidity

			Humidity		
			Minimum	Reference	Maximum
Observational Record		%			
Design Value	Outdoor	%		**60**	
Design Value	Indoor	%			

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Note:

1) Guarantee point site conditions shall apply for the Guarantee Values as well as for the Guarantee test/Performance test.
2) Equipment and Material must be suitable for the range of ambient site conditions.

B) PROJECT LOCATION

Patratu Thermal Power station (PTPS) is located just outside the coal belt of South Karanpura in Ramgarh District of Jharkhand State. The nearest Railway Station is Patratu which is at a distance of about 4 km on Barkakhana-Barwadih Railway line.

The latitudes and longitudes of the site are as follows:

Corner name	Latitude	Longitude
Top Corner	23° 38 ' 60 '' N	85° 17' 51.5" E
Bottom Corner	23° 38 '12.5 '' N	85° 17' 27" E
Left Corner	23° 38 ' 22.5 '' N	85° 17' 10.6 '' E
Right Corner	23° 38 ' 40 '' N	85° 17' 57 '' E

Airport

The nearest commercial airport is Ranchi at about 45 km by road.

2. GENERAL DESRIPTION OF LIMESTONE GRINDING SYSTEMS

The purpose of this system is to grind lump limestone of Size 25 mm (Max) to powder and for preparation of limestone slurry. The duct from the limestone silo hopper feeds the limestone to the gravimetric feeder. The Gravimetric feeder feeds limestone to Wet ball mill system. The Wet Ball Mill system consists of Wet Ball Mill, Wet Ball Mill Lubrication system, Mill circuit tank with an agitator, Mill circuit Pump, Mill Hydro cyclone, 3-way distributor and accessories. The Wet Ball Mill is the wet horizontal type. The Process water is supplied to Wet Ball Mill and Wet Mill circuit Tank. Slurry from the Wet Ball Mill flows by gravity to the Wet Mill Receiver Tank and then is pumped up to the Mill Hydro cyclone to be classified. The Mill Hydro cyclone underflow containing the oversized material is re-circulated to the Wet Ball Mill inlet directly, while the overflow is discharged to the Limestone Slurry storage Tank via the 3 -way distributor as a product of Wet Ball Mill system.

<table>
<tr><th>S.No.</th><th>Description</th><th>Requirement</th></tr>
<tr><td>1</td><td colspan="2">Quantity</td></tr>
<tr><td></td><td>Quantity of Limestone Grinding Systems</td><td>2 sets (1 working + 1 standby) - common system</td></tr>
<tr><td>2</td><td colspan="2">Parameters</td></tr>
<tr><td></td><td>Design Capacity of mill</td><td>87.9 TPH</td></tr>
<tr><td></td><td>Media to be Handled</td><td>Limestone</td></tr>
<tr><td></td><td>Limestone Analysis</td><td>Refer Clause No. 6</td></tr>
<tr><td></td><td>Type of WBM System</td><td>Horizontal</td></tr>
<tr><td></td><td>Duty</td><td>Continuous</td></tr>
<tr><td></td><td>Location</td><td>Inside Building</td></tr>
<tr><td>3.</td><td colspan="2">Power Supply</td></tr>
<tr><td></td><td colspan="2">The following voltage levels shall apply:
AC
<table>
<tr><th></th><th colspan="3">Medium Voltage SWGR</th><th colspan="3">Low Voltage SWGR</th></tr>
<tr><th></th><th colspan="2">Nominal</th><th colspan="2">Range</th><th colspan="2">Nominal</th><th colspan="2">Range</th></tr>
<tr><td>Voltage (Steady State)</td><td>11/ 3.3</td><td>kV</td><td>+/- 6</td><td>%</td><td>240 / 415</td><td>V</td><td>+/- 10</td><td>%</td></tr>
<tr><td>Voltage (Transient)</td><td>-</td><td>V</td><td></td><td>%</td><td></td><td>V</td><td></td><td>%</td></tr>
<tr><td>Frequency</td><td>50</td><td>Hz</td><td>-5 to +3</td><td>%</td><td>50</td><td>Hz</td><td>-5 to +3</td><td>%</td></tr>
<tr><td>Phase</td><td colspan="3">3</td><td>φ</td><td colspan="3">1φ for 240V, 3φ for 415V</td><td>φ</td></tr>
<tr><td>Number of Line</td><td colspan="3">-</td><td></td><td colspan="3">-</td><td></td></tr>
</table>
DC
<table>
<tr><th></th><th colspan="3">Medium Voltage SWGR</th></tr>
<tr><th></th><th colspan="2">Nominal</th><th>Range</th></tr>
<tr><td>Voltage (Steady State)</td><td>220</td><td>V</td><td>-15 to +10 %</td></tr>
<tr><td>Voltage (Transient)</td><td>-</td><td>V</td><td>%</td></tr>
</table>
Power Distribution
<table>
<tr><td>Distribution of Power Cable</td><td>☐ Under Ground
☑ Over Ground</td></tr>
</table>
<table>
<tr><th></th><th></th><th colspan="2">Voltage</th><th>Phase</th><th>Emergency Power Source</th><th>Note</th></tr>
<tr><td>Motor</td><td>AC</td><td>11</td><td>kV</td><td>3P</td><td></td><td>≥1500 kW</td></tr>
<tr><td></td><td></td><td>3.3</td><td>kV</td><td>3P</td><td></td><td>≥200 kW- <1500 kW</td></tr>
<tr><td></td><td></td><td>415</td><td>V</td><td>3P</td><td></td><td>≥0.2 kW- <200 kW</td></tr>
<tr><td></td><td></td><td>240 (1 Phase) / 415</td><td>V</td><td>3P</td><td></td><td>0.2 kW and under</td></tr>
<tr><td>Power outlets for welding</td><td>AC</td><td>415</td><td>V</td><td>3P</td><td></td><td></td></tr>
<tr><td>Power outlets for portable tools</td><td>AC</td><td>240</td><td>V</td><td>3P</td><td></td><td></td></tr>
<tr><td>Safety power outlets</td><td>AC</td><td>240</td><td>V</td><td>3P</td><td></td><td></td></tr>
<tr><td>Lighting Distribution</td><td>AC</td><td>415</td><td>V</td><td>3P</td><td></td><td></td></tr>
<tr><td>Normal Lighting Apparatus</td><td>-</td><td>240</td><td>V</td><td></td><td></td><td></td></tr>
<tr><td>Emergency Lighting Apparatus</td><td>-</td><td>240</td><td>V</td><td></td><td></td><td></td></tr>
<tr><td colspan="7">Control Voltage for</td></tr>
<tr><td rowspan="2">Switch gear</td><td>DC</td><td>220 / 110</td><td>V</td><td>1P</td><td></td><td></td></tr>
<tr><td>AC</td><td>110</td><td>V</td><td>1P</td><td></td><td>For control supply</td></tr>
<tr><td>Breaker Controls</td><td>DC</td><td>24</td><td>V</td><td>-</td><td></td><td></td></tr>
</table>
1) Design Ambient Temperature-- 50 Deg C
2) Design Ambient Temperature for equipment installed in A/C Rooms--35 Deg C
Bidder shall design and supply the equipment suitable for satisfactory operation under above mentioned power supply condition. HT motor is in BHEL scope.</td></tr>
</table>

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4.

CONTROL & INSTRUMENTATION SYSTEM

BASIC DESIGN CRITERIA:

When more than one device uses the same measurement or control signal, the transmitter and other components/ module shall be fully equipped to provide all signal requirements. All the 4-20 mA output signals from transmitters/other control system shall be able to drive minimum 500 Ohms load resistance. The system shall be arranged so that the failure of any monitoring device or control components or spurious intermediate grounding in the signal path shall not open the signal loop nor cause the loss or malfunction of signal to other devices using the same signal**.**

ENVIRONMENTAL CONDITIONS:

Instruments, devices and equipment's for location in outdoors/indoor/air-conditioned areas shall be designed to suit the environmental conditions indicated below and shall be suitable for continuous operation in the operating environment of a coal fired utility station and also during periods of air conditioning failure without any loss of function, or departure from the specification requirements covered under this specification.

Ambient Temperature (outside cabinets)	Pressure	Relative humidity	Atmosphere	Required protection Class of panels/ cabinets/ desks to be provided by contractor.
Outdoor Location				
55 degree C max.	Atmosp here	100 % Max.	Air (dirty)	IP 55
4 degree C min.	Atmosp here	5 % min.	Air (dirty)	IP 55
Indoor Location				
55 degree C max.	Atmosp here	95 % Max.	Air	IP 54**
4 degree C min.	Atmosp here	5 % min.	Air	IP 54**
Air Conditioned Areas				
24 +/- 5 degree C normal	Atmosp here	95 % Max.	Air	IP 22***
50 degree C max. *	Atmosp here	5 %min.	Air	IP 22***
* During air conditioning failure.				
** For non-ventilated enclosures. For ventilated enclosures, protection class shall be IP 42.				
*** With a suitable canopy at the top to prevent ingress of dripping water.				

For PCs, OWS, EWS, Servers, Printers and other peripherals, maximum temperature limit shall be 35 Deg.C. For mini-UPS, the same shall be 40 Deg.C.

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5.	**Cooling water:** All lube oil cooler to be designed for cooling water supply temperature of 38 Deg C and max temperature drop of 10 Deg C. Refer Annexure-3 for details.

3. APPLICABLE CODES & REGULATIONS

The design and materials shall conform to the requirements of applicable codes and regulations of the latest edition (as applicable as on date of bid opening). The design, manufacturing, installation and testing of the Lime stone Grinding System/Wet Ball Mill System shall follow the latest applicable Indian/International (ISO/ASTM/AISI/ASME/EN/Japanese) Standards. If any other country standard used shall also be accepted subjected to approval by NTPC, in such case bidder shall furnish adequate information to justify that these standards are equivalent or superior to the international standard mentioned above. A copy of such standard duly translated (complete word to word translation) in English shall be furnished by vendor.

4. INTENT OF SPECIFICATION

This specification covers the minimum requirements for the complete design, material, manufacturing, shop inspection, testing at the manufacturer's works, supervision of erection & commissioning and performance guarantee testing of Limestone Grinding System along with accessories.

a. The FGD system will be provided with common limestone grinding system (LGS). 2 numbers of Wet Ball Mill (1 working + 1 standby) shall be provided. This WBM system shall be located inside the Ball Mill Building. Building is in BHEL scope. Refer Enclosed General Arrangement drawing – **Annexure-15**

b. Bidder shall assume full unit responsibility for the entire equipment assembly and make all possible efforts to comply strictly with the requirements of this specification and other specifications/attachments to inquiry/order.

c. In case, deviations are considered essential by the Bidder (after exhausting all possible Efforts), the same shall be separately listed in the enclosed **Annexure-2**.

d. No deviation or exception shall be permitted without the written approval of the purchaser.

e. Compliance to this specification shall not relieve the Bidder of the responsibility of furnishing equipment and accessories/auxiliaries of proper design, materials and workmanship to meet the specified start up and operating conditions.

f. In case, the Bidder considers requirement of additional instrumentation, controls, safety devices and any other accessories/auxiliaries essential for safe and satisfactory operation of the equipment, the same shall be recommended along with reasons in a separate section and include the same in scope of supply.

g. All accessories, items of work, though not indicated but required to make the system complete for its safe, efficient, reliable and trouble free operation and maintenance shall also be in supplier's scope unless specifically excluded.

h. Bidder are requested to carefully examine and understand the specification and seek clarification, if required, to ensure that they have understood the specification. The bidders offer should not carry any sections like clarifications, interpretations and/or assumptions.

5. PROVENNESS CRITERIA:

The Bidders are required to meet the Qualification Requirement (QR) for Wet Ball Mill system as per enclosed **Annexure-1 & submit the Annexure to qualification requirement (Attachment-3K). Bidder's offers will be rejected if they fail to meet the QR**.

6. MEDIA ANALISYS

The analysis of limestone, water & instrument air used in limestone grinding system in as per enclosed Annexure-3.

7.SCOPE OF SUPPLY (Refer Enclosed P&ID for Details — Annexure-4)

Scope for the bidders shall include Design, Engineering, Manufacture, Inspection/testing as per approved quality plans, Packing, Supply, Supervision of Erection & Commissioning, Performance Guarantee Test and handing over of final Customer. Refer Enclosed General Arrangement drawing – **Annexure-15**

Design: Includes basic engineering, detail engineering, preparation and submission of engineering drawings/calculations/datasheets/quality assurance documents/field quality plans, storage instructions, commissioning procedures, Erection & assembly Drawings, operation & maintenance manuals, performance guarantee test procedures and assisting BHEL in obtaining time bound approval from NTPC.

Test: The scope of the bidder includes all shop tests, type tests, site tests, routine tests etc., fulfilment of complete quality assurance & inspection requirement and related activities for all the equipment & systems covered under the scope of the bidder.

Painting: The bidder scope of work includes supply of paints and painting of all equipment's as per approved painting schedule from NTPC.

Supervision of Erection & commissioning: Includes supervision of erection & commissioning, supervision of startup and trial operation of the entire LGS system.

Performance Guarantee Test: the guarantee tests shall be carried out as per approved Performance guarantee test procedure, all the special equipment, tools and tackles, instruments, measuring devices required for successful conductance test shall be provided by bidder free of cost.

Each mill system shall be supplied by separate distribution box.

The scope of supply for each **Limestone Grinding System** (i.e., one set of LGS) shall include but not limited to the following:

Sl. No.	Item Description	Quantity per Mill	UNIT	Vendor to confirm
1.	Chute from lime stone silo hopper bottom to feeder	1	NO	
2.	Inlet rod gate at gravimetric feeder inlet	1	NO	
3.	Knife gate valve at gravimetric feeder inlet with electric actuator (with integral starters - non-intrusive type, SIL2 certified)	1	NO	
4.	Gravimetric feeder along with its drives and other accessories (complete assembly)	1	SET	
	i. All connection chute with proper liner			
	ii. All connection bolts/nuts/washers for installation			
	iii. Required instruments and any safety device			
	iv. Fully closed type with opening door			
5.	Facility for unloading the limestone silo, through feeder, to a truck at ground level along with all necessary chutes/diversion chutes and gate valve	1	SET	

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Sl. No.	Item Description	Quantity per Mill	UNIT	Vendor to confirm
6.	Knife gate valve (KGV) below the gravimetric feeder outlet chute. (actuator with integral starter; nonintrusive type SIL2 certified)	1	NO	
7.	Chute from gravimetric feeder to ball mill inlet	1	NO	
8.	Wet ball mill complete (with all accessories)	1	SET	
	i. Horizontal Ball Mill and Speed reducer			
	ii. Auxiliary motor for inching operation with speed reducer, Clutch system			
	iii. All coupling for connecting main motor to reducer, inching motor to clutch and reducer, and reducer to pinion.			
	iv. Lubrication system with all piping and piping supports (Piping Supports and piping design is supplier's scope of supply)			
	v. Mill Shell, Feed Head, Discharge Head			
	vi. Water cooling for lubrication system and gearbox			
	vii. Dumpster or Drum (Ball and limestone rejects)			
	viii. Ball charging device (Tripping Device) &Ball Charging Hopper. Vendor to supply (Hoist for lifting & shifting the balls is BHEL's sope).			
	ix. All interconnecting extended drain pipe and chutes			
	x. Support Beam (Inlet chute, Ball charge chute (Piping), etc.)			
	xi. Provision for Vibration Monitoring system			
	xii. Initial Ball charge –Full quantity of each size			
	xiii. Anchor Bolts and Nuts of all sizes			
9.	Mill separator tank with all nozzles as per P&ID	1	SET	
10.	Mill tank agitator with IE3 motor and gear box	1	SET	
11.	Mill circuit pump with IE3 motor	2	SET	
12.	Mill hydro cyclone and complete accessories	1	SET	
	i. Hydro cyclone clusters			
	ii. Anchor bolts, nuts and washers			
	iii. Companion flanges for inlet and overflow			
	iv. A variety size of vortex finders for all the hydro cyclone			
	v. Accessory piping within the skid			
13.	Distribution box with pneumatic actuator	1	SET	

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Sl. No.	Item Description	Quantity per Mill	UNIT	Vendor to confirm
14.	All coupling for connecting main motor to reducer, inching motor to clutch and reducer, and reducer to pinion.	1	SET	
15	Bearing lubrication system of	1s	SET	
	a) LP/HP (both pump 2x100%)			
	b) 3 Heaters & oil tank with 2x100% duplex filter			
	c) Oil cooling system			
	d) SS pipes & valves to supplied as per vendor design			
	e) Jet lubrication system to ring gear & pinion			
16	Foundation bolts, anchor bolts, nuts for entire system	1	SET	
17.	Complete base frame including drive motor base frame	1	SET	
18.	Butterfly valves as per P&ID with Nonintrusive type Electrical actuator -SIL2 certification	As per P&ID	NOS	
19.	Butterfly valves as per P&ID with manual actuator	As per P&ID	NOS	
20.	Each Butterfly valve as per P&ID with pneumatic actuator & limit switch to be terminated in individual Junction Box as per enclosed wiring diagram	As per P&ID	NOS	
21.	Pneumatic regulating flow control valves as per P&ID	As per P&ID	NOS	
22.	Pressure transmitter(PT)-HART compatible as per P&ID with root valve/diaphragm valve	As per P&ID	NOS	
23.	Pressure indicator (PI) With root valve/diaphragm	As per P&ID	NOS	
24.	Pressure gauge with root valve	As per P&ID	NOS	
25.	Expansion joint at inlet and discharge of the pumps	4	NOS	
26.	Flow transmitter (FT)	As per P&ID	NOS	
27.	Flow Indicator control (FIC)	As per P&ID	NOS	
28.	Weight indicator (WT)	As per P&ID	NOS	
29.	Weight indicator Control	As per P&ID	NOS	
30.	Level transmitter (LT)	As per P&ID	NOS	
31.	Level Indicator Control Alarm	As per P&ID	NOS	
32	Vortex flow meter	As per P&ID	NOS	

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Sl. No.	Item Description	Quantity per Mill	UNIT	Vendor to confirm
33	Temperature Transmitter with HART compatibility for each mill mill bearing	4	NOS	
34	Local control panel with interlock logics	1	SET	
35	Complete piping as per P&ID:	1	SET	
	a. Water line			
	b. Slurry line			
	c. Instrument airline			
	d. Pump flushing line,			
	e. Tank over flow, & Drain piping valve			
	f. All drain piping			
36	Complete erection and assembly drawing	2	SET	
37	Density meter/mass flow meter(Coriolis Meter)	1	NO	
38	All instruments/ transmitter shall be provided along with Junction Boxes	1	SET	
39	Mechanical seal flushing globe valve, any other valves not covered above	As per P&ID	SET	
40	All motors shall be provided with suitable double compression cable gland	1	SET	
41	Temporary strainers for the Mill circuit pump	2	SET	
42	Any other valves/instruments which are required for operation and maintenance of the system, shall considered by the vendor while submitting the offer	1	SET	
	(list of items shall be submitted along with offer)			
43	Painting and Rust Prevention during shipment and construction			
44.	Export packing and Inland Transportation			
45.	Supervision of Erection & commissioning at site			
46.	Performance Test and Inspection at site			
47.	Special tools & tackles as applicable	1	SET	

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Sl. No.	Item Description	Quantity per Mill	UNIT	Vendor to confirm
48.	Start-up & Commissioning spares as applicable	1	SET	
49.	Customer Approved Drawings, Installation, operation and maintenance manuals a. Customer Approved Drawings—8 prints + 4 No's of CD ROMS'/DVDs/Portable Hard disk. b. Erection Drawings—10 prints + 4 No's of CD ROMS'/DVDs/Portable Hard disk. c. Erection manuals—6 prints + 4 No's of CD ROMS'/DVDs/Portable Hard disk. d. Operation Manual—6 prints + 4 No's of CD ROMS'/DVDs/Portable Hard disk. e. All quality documents, test reports, performance and functional guarantee reports/procedures —6 prints + 4 No's of CD ROMS'/DVDs/Portable Hard disk .			
50.	Bidder to quote for the Mandatory Spares) with breakup price.	-	-	
51.	(A) Pneumatic piping from the tapping point to filter regulator of respective valve is GI. (B) From filter regulator to cylinder port is SS-304 for all pneumatic butterfly valves	As required in the system	SET	
52.	Any other items required for completeness of the equipment except the items covered in the exclusions.	1	SET	

NOTE:

- Bidder shall refer to the P&ID diagram for details
- All the utility pipes (water pipes, instrument air, etc.,) are provided at single point near to limestone ball mill building. Bidder has to further take the piping from the point terminated by BHEL.
- All connecting pipes / chutes, pipe supports, trestles, valves, motor (other drives) etc. along with necessary valves from chute to mill and from hydro-cyclone to common slurry storage tanks and wherever required within the system shall be in the scope of the supplier.

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8. GENERAL TECHNICAL REQUIREMENTS

Sl. No	Description	Vendor to confirm
1.	Descriptions in the drawings, in the documents, and in the displays shall be in English	
2.	Bidder shall submit instruction manual for all the equipment's covered under the scope of bidder as per agreed engineering schedule. The instruction manuals shall contain full details required for erection, commissioning, operation and maintenance of each equipment. The manual shall be specifically complied for this project. The erection portion of manual shall contain erection strategy, sequence of erection, erection instructions, critical checks (along with permissible deviations/tolerance), Bill Of Materials, procedure for erection, general safety procedures to be followed. Procedure for initial checking after erection, procedure for testing (along with acceptance norms) check list for commissioning/pre-commissioning activities, List of tools and tackles. All the manuals shall be two rim PVC bound stiff sided binder able to withstand constant usage. The cover shall be printed with project name.	
3.	Suitable guards shall be provided for protection of personnel on all exposed rotating and /or moving machine parts. All such guards shall be designed for easy installation and removal for maintenance purpose.	
4.	Any item not included above but necessary for safe and reliable operation of the milling system proposed by the supplier shall also be in the suppliers' scope.	
5.	The equipment shall be designed to withstand the corrosive and moist environment in which these are proposed to operate.	
6.	Noise level produced by any rotating equipment individually or collectively shall not exceed a) 90 dB(A) for ball mill and b) 85 dB(A) for all other equipment's like pumps, feeder, etc., Noise level measured at a distance of 1.0 meters from the source in any direction and 1.5m above operating floor. Predicted sound pressure levels for the WBM drive assemblies shall be submitted as part of the proposal data.	
7.	The overall vibration level shall be as per ISO 10816.	
8.	Suitable drain connections shall be provided.	
9.	The equipment shall be suitable for stable operation continuously.	
10.	Suppliers shall suitable specify their delivery schedule along with the offer and Standard code specified shall be strictly adhered.	
11.	All instruments such as pressure transmitters, density transmitters (especially at hydro-cyclone outlet), and other necessary transmitters wherever necessary shall be supplied by the suppliers	
12.	Supplier shall provide the loading of item and other factors which shall be required for effective civil construction.	

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Sl. No	Description	Vendor to confirm
13.	Tanks, pumps, hydro-cyclone etc. are to be designed by vendor based on their experience considering the required milling capacity of each Ball Mill System	
14.	Limit of connection: The buyer (BHEL) has an intention to minimize interface for utilities as much as possible. The bidder shall consider this requirement in the planning stage of layout for the equipment. The bidder shall provide the header piping for WBM and branch piping to each nozzle. Terminal points for all utilities shall be located at skid edge. The bidder shall specify all terminal points with tie-in number in the P&ID and submit it in the proposal to confirm the scope of supply.	
15.	Service life: Entire equipment except wearing parts shall be designed and fabricated for a minimum service life of 30 years of operation or 200,000 full load operating hours whichever is longer.	
16.	Corrosion allowance: Corrosion allowance for entire equipment shall be in accordance with latest applicable Indian / International standard.	
17.	Unless otherwise specified , flanges shall be in accordance with ANSI B16.5 Class 150	
18.	Name plate: All equipment shall be provided with nameplates indicating the item number and service name. Name plates shall be of 304 Stainless steel plate and placed at a readily visible location. Nameplate of main equipment shall have enough information, which will be confirmed during engineering phase. Stainless steel nameplates for all instruments and valves shall be provided.	
19.	Rotation arrows shall be cast in or attached with stainless steel plate on each item of rotation equipment at a readily visible location.	
20.	Unless otherwise specified, all equipment items where the weight exceeds 15 kg shall be provided with suitable lifting lugs, ears or ring bolts or tapped holes for lifting rings. Minimum shock factor for lifting lugs shall be minimum 2.0. The position of lifting lugs and reference dimension shall be shown on GA and/or outline drawings. NDT shall be conducted for lifting lugs. When any spreader bars are required for lifting and laydown, the bidder shall provide spreader bar with equipment.	
21.	Skid Mount/Transportation: Equipment shall be fabricated as skid mount design as much as practical to minimize erection at the site.	
22.	Two pieces of stainless steel earth lugs shall be provided with equipment diagonally. The position of earth lugs shall be shown on each GA and/or outline drawing.	
23.	Provide double nuts for anchor bolts	
24.	Bidder shall provide allowable vibration level on foundation in foundation drawings and/or general arrangement drawings.	
25.	If the driver/driven equipment train is in the resonance condition or any vibration problems occur, the bidder shall solve the problems in a timely manner.	
26.	Bidder shall provide the mating flanges with the necessary gaskets.	

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Sl. No	Description	Vendor to confirm
27.	All the surfaces of the carbon steel should be rust prevented before shipment for the period of at least 12 months for storage and construction.	
28.	Bidder to provide capacity of crane or hoist required for material handling and the details of heaviest component to be handled.	
29.	The list of all Bought out items with makes and country of origin to be mentioned along with offer to be submitted.	
30.	Quality Plan to be submitted along with the offer.	
31.	Cost towards the participation in discussions/meetings, providing technical assistance during technical discussions/meetings with customer for approval of drawing/documents etc. TA/DA, boarding and lodging to attend these meetings shall be borne by the bidder and shall be inclusive in supply portion.	
32.	Material of construction for all equipment/components shall be subject to NTPC/ BHEL approval during detail engineering. Accordingly, bidder shall consider MOC for all equipment/component as per best engineering practice.	
33.	Bidder to provide sub vendor list and Bidder shall strictly adhere to NTPC approved vendor list. In case bidder proposes an additional vendor for an item or vendor approval is required for any new item, acceptance shall be subject to approval by NTPC/ BHEL before placing order and bidder shall submit relevant documents as per sub-supplier questionnaire attached in enclosed Annexure-5 (Sub-Questionnaire).	
34.	It shall be the complete responsibility of the successful bidders to obtain "Sub Vendor Approval" from BHEL / NTPC for all equipment's & components. Any delay in sub vendor's approval should not affect the project schedule. If any of the sub vendors does not have the approval of NTPC/ BHEL, the same may be replaced with another NTPC/BHEL approved sub-vendor only, without any price implications to BHEL.	
35.	The modalities of inspection (Stage, Final, In-process) shall be finalized during detail engineering after submission of quality assurance plan (QAP). It shall be reviewed by the NTPC/ BHEL. Bidder shall follow the procedures of inspection as per the approved QAP. Bidder has to submit the following documents along with inspection call and if any other documents required as per approved QAP. - Raw material inspection certificate - Internal test reports - Statutory certificates as required. - All inspection & testing shall be carried out based on the following documents: a. Relevant Standards b. Specifications c. Approved drawings d. Data Sheets	

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Sl. No	Description	Vendor to confirm
	e. Calibration certificate for all the measuring instruments f. Bidder should also coordinate in getting the MDCC's (Material Dispatch clearance certificate) and all types of IC's (Inspection Certificates) from the NTPC along with BHEL.	
36.	Minor Chipping i.e. up to 50 mm thk, micro leveling and providing shim plates for erection of equipment / item at site shall be in the scope of bidder.	
37.	During detail engineering, bidder to strictly adhere to BHEL/NTPC drawing formats, document numbering, quality plan & FQP formats	
38.	The identification and numbering of equipment, systems, items, etc. of supply, as well as of all documents and drawings shall be in accordance with reference Designation System for Power Plants - KKS system.	
39.	Complete detail engineering drawings, calculations, selection of components etc. shall be reviewed & subject to approval of BHEL/NTPC during detail engineering	
40.	Bidder shall furnish necessary inputs & drawings of all equipment in editable Auto CAD/ MS-Word /Excel format.	
41.	During detail engineering, successful bidder shall ensure flow of drawings/documents as per schedule. Any comments from BHEL/NTPC should be addressed timely by the bidder.	
42.	Bidder to note that list above is not exhaustive and any work /items required for completing the smooth operation and ensuring satisfactory running of the machines till final hand over to the end user (NTPC) shall also be in the scope of the bidder.	
43.	Bidder shall submit the signed and stamped copy of all the pages which constitutes this technical enquiry specification signed by authorized signatory and clearly mentioning each clause under following two categories to avoid any ambiguity in scope understanding & the scope division along with technical offer. a. "Accepted without deviation and considered in scope of work" b. "Not considered in scope of work"	

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9.DESIGN AND CONSTRUCTION OF MILL AND ACCESSORIES

(Bidder to fill and submit the enclosed technical data sheet along with offer)

9.1 CHUTE

Sl. No	Description	Vendor to confirm
a)	Silo opening size: 24 inch.	
b)	The minimum valley angle of chutes shall be 60 degrees from horizontal. Transfer chutes shall be adequately sized and sloped to ensure smooth flow of Lime without any accumulation anywhere.	
c)	Chutes shall be made of minimum 20 mm thick TISCRAL / SAILHARD/ LSLAS07 or equivalent or fined with SS304 material. All chutes should have one inspection door at every floor and for the ones in between the floors (more than 1.5 meter above the operating floor level) suitable access for trouble free maintenance shall be provided. For sealing of inspection doors labyrinth type arrangement to be provided.	
d)	Complete chute work in the region of flap gates shall be fabricated from 20 thk TISCRAL or equivalent. In case of vertical chute (valley angle more than 80 degree) complete chute, work shall be of 20 mm thick TISCRAL or equivalent material. While finalizing the chute work inside the building, arrangement for shifting and replacing chute legs, proper handling arrangement/wall openings, trolleys, hoists shall also be provided. While fabricating the chute, no welds in between shall be allowed.	
e)	**Ball Mill Chute:** Feed chute shall be corrosion resistant metal lined and designed to prevent overflow. Inlet chute shall have necessary provisions for loading balls into the ball mills, such as ball charging hopper. A discharge chute shall be provided with necessary provisions to collect and separate balls and tramp metal.	

9.2 CHUTE BLOCKAGE SWITCHES

Sl. No	Description	Vendor to confirm
a.	One no. chute blockage switch of proven type (subject to approval of the employer) shall be provided	
b.	Chute blockage switch shall trip the feeding conveyor in case of Chute blockage and protect the feeding conveyor equipment.	

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9.3 SILO SHUT OFF GATE VALVE

Sl. No	Description	Vendor to confirm
a.	A bunker outlet chute shall be provided for feeding limestone from bunker to the feeder. The size of the opening chute shall be sufficient to ensure proper flow of the limestone. There shall be no reduction of section in the bunker outlet chute from bunker to feeder. The inlet chute shall be provided with suitable poke doors/holes in order to remove jamming/blockage. A manual and motorized bunker shut-off gate shall be provided at the inlet to each feeder	
b.	All parts of the gate in contact with limestone shall be of stainless steel construction.	
c.	The shut-off gates and its actuator shall ensure 100% closing of the gate even with 'Bunker full of limestone'.	
d.	Facility shall be provided to open/close the bunker outlet gate, through actuator, from remote as well as local (integral starter)	
e.	In addition, a hand wheel with proper access shall also be provided for manual operation of the gate. The force at the rim of the hand wheel shall not exceed 35 kg with bunker full of limestone.	
f.	For each bunker facilities shall be provided for unloading the bunker, through feeder, to a truck at ground level, along with all necessary chutes and diversion chutes.	

9.4 GRAVIMETRIC FEEDER

Sl. No	Description	Vendor to confirm
a.	Gravimetric feeders (closed type) shall be sized to meet 110% of the maximum mill capacity.	
b.	The limestone feeder belt shall be of seamless rubber construction. It should be possible to adjust the belt tension from outside without opening the feeder body.	
c.	All parts in contact with limestone except belt shall be of stainless steel construction.	
d.	The feeder shall have adequate instrumentation to detect 'loss of flow'.	
e.	The feeder shall have a motor/pneumatic operated gate at the outlet.	
f.	For each bunker facilities shall be provided for unloading the bunker, through feeder, to a truck at ground level, along with all necessary chutes and diversion chutes.	

9.5 WET BALL MILL

<table>
<tr><th>Sl. No</th><th>Description</th><th>Vendor to confirm</th></tr>
<tr><td>a.</td><td>There shall be two numbers wet Ball mills for grinding of limestone, each mill shall be sized to meet the following conditions, all occurring together.
<table>
<tr><td>Capacity</td><td>87.9 Tons Per Hour (TPH)</td></tr>
<tr><td>Input Limestone Size</td><td>1” (max.) – 25 mm</td></tr>
<tr><td>Output Fineness</td><td>30wt% slurry with Output Fineness 90% or higher through 325 mesh</td></tr>
<tr><td>Mill Wear Part</td><td>Conditions Near Guaranteed Wear Part Life.</td></tr>
<tr><td>Limestone bond index</td><td>13 (min) kWh/ T</td></tr>
</table></td><td></td></tr>
<tr><td>b.</td><td>The limestone ball mill shall produce ground limestone slurry at the rated tons/hr (dry basis) with 30wt% slurry with Output Fineness 90% or higher through 325 mesh. The wet ball mill shall be of the wet horizontal type and shall be furnished complete with drive system including speed reducer and Inching Drive, gear lubrication system, bearing lubrication system, all accessories and all required instrumentation to furnish a complete functioning ball mill.</td><td></td></tr>
<tr><td>c.</td><td>Ball mills shall be designed to accept the following streams concurrently; dry limestone feed, process water and recycle stream of oversized limestone slurry.</td><td></td></tr>
<tr><td>d.</td><td>Ball mill shall be fabricated of heavy structural quality welded steel plate. All shell welds shall be full penetration welds.</td><td></td></tr>
<tr><td>e.</td><td>Each mill shall have an outlet spout that is opposite of the inlet chute.</td><td></td></tr>
<tr><td>f.</td><td>Head, trunnion and shells shall be per the Bidder's standards. The main shaft shall be forged alloy steel and shall be equipped with heavy duty, precision type which are designed to provide reliable and trouble free operation. The design shall ensure that thrust is not transmitted through the gear reducer, shaft and coupling to the motor.</td><td></td></tr>
<tr><td>g.</td><td>The mill shell shall include two (2) inspection doors with a minimum size. The inspection doors shall be sized to admit the largest liner segment or discharge grate. The openings shall be hinged (if possible) and shall be equipped with watertight seals and bolted enclosures.</td><td></td></tr>
<tr><td>h.</td><td>The mills shall be designed and constructed with adequate strength and rigidity to ensure true alignment of the shell and trunnion bearings. Shell shall be bolted to the shell, using an external flange design. Head and shell shall be drilled for liners prior to shipment. The discharge shall be provided with a trommel screen.</td><td></td></tr>
<tr><td>i.</td><td>All internal parts that may require replacement shall be designed to be easily dismantled and replaced without necessity of removing the mill or its drive from the foundations.</td><td></td></tr>
<tr><td>j.</td><td>Water-jacketed inserts shall be included for bearing cooling, if necessary. The pedestal and cap shall be of welded steel fabrication with inspection doors in the caps. Sole plates shall be adjustable.</td><td></td></tr>
<tr><td>k.</td><td>Vibration shall be minimized.</td><td></td></tr>
</table>

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Sl. No	Description	Vendor to confirm
l.	For each mill bearing 2 nos. of Temperature elements (TE) & Transmitters (TT) with feature of HART compatibility to be provided. (Per Mill 4 nos. of TT & TE)	
m.	A local emergency stop switch shall be provided for all motors(Bidder's Scope) in mill system	
n.	The local control station (with emergency stop switch/ local/remote, etc.) shall be provided for each inching drive.	
o.	Ball mill shall be completely shop assembled, aligned and operated in so far as possible. Components shall be match marked after shop assembly to assure proper assembly in the field.	
p.	Mill Liners • All wetted surface except for ball and trommel grate shall be rubber lined. • All rubber linings shall be done in strict accordance with the rubber Manufacture is inspection and applicable codes and standards. • Mill liners shall be attached by through bolts with leak proof washers.	
q.	Ball Mill Drives Each ball mill shall be furnished with speed reducing gear driver and inching drive. Speed reducer shall be provided with a flexible, spacer type, coupling and guard. Mill gear and pinion shall be of Spur design. Ball Mill Motor is in BHEL Scope of supply.	
r.	Grinding Balls • The Bidder shall furnish a complete ball charge for each mill. • The Bidder shall provide in the data for frequency, procedures and equipment for ball removal, screening of undersized balls, and ball charging. • The Bidder shall provide the ball consumption rate versus limestone hardness in his offer. • Bidder shall also guarantee ball consumption per ton of limestone throughput.	
s.	All integral auxiliaries of the mills like hydro-cyclones, separator tank & mill circuit pumps shall be sized to meet the above conditions (a). A 100% stand-by pump shall be provided for the mill circuit pump.	
t.	The mill hydro-cyclone set shall have sufficient redundancy. A minimum 10% spare Hydro-cyclone shall be provided in each set of hydro-cyclone. Hydro-cyclones shall be of modular construction. It shall be possible to remove and replace individual hydro-cyclone with the set in service. Individual isolation valve shall be provided for each hydro-cyclone for this purpose. The hydro-cyclone shall be of proven design and shall be provided with replaceable rubber lining. The hydro-cyclone shall be provided with replaceable rubber lining of Thickness 12 mm for the feed chamber and 12 mm for the overflow launder. The liners shall have a minimum wear life of not less than 8000 hrs.	
u.	All parts of the mill including mill body, HP & LP trunnion, hydro-cyclones, integral pipes, mill circuit pumps and other parts in contact with limestone slurry shall be provided with replaceable rubber wear liners. The wear liners or wear parts shall have a **minimum guaranteed wear life of not less than 8000 hrs** without reversal of the liners. The guaranteed capacity and fineness of the mill shall not be affected within the guaranteed life of the mil wear parts.	
v.	The material of the balls shall be chosen to ensure that the balls do not lose their original shape and to ensure minimum ball consumption. The supplier shall also **guarantee ball**	

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Sl. No	Description	Vendor to confirm
	consumption per ton of limestone throughput. The supplier shall furnish the **minimum ball diameter** below which the balls shall be replaced.	
w.	Facility shall be provided for on-load loading of steel balls to the mill.	
x.	The ball mill shall be driven by a motor through a peripheral gear/ central drive system. An auxiliary motor shall also be provided for inching of mills after trip and during maintenance.	
y.	The lube oil system shall have 100% stand-by arrangement for lube oil pumps and oil coolers of each circuit with independent pump / cooler and tank. Wherever required duplex oil filters shall be provided.	
z.	The mill auxiliaries like separator tanks, mill circuit pump, hydro-cyclones and all connecting pipes handling limestone slurry shall have replaceable rubber linings.	
aa.	Piping and wiring within the skid shall be in the vendor's scope.	
bb.	Local control panel shall have display on the front panel and necessary electrical parts.	
cc.	Supplier shall furnish the minimum ball diameter below which the balls shall be replaced. Each mill shall be sized to meet the following conditions, all occurring together.	

9.6 MILL CIRCUIT TANK

Sl. No	Description	Vendor to confirm
a.	The slurry preparation tank shall be CS construction with replaceable rubber lining. The storage tanks shall be equipped with sufficient number of agitators, to avoid settling.	
b.	All the slurry tanks shall be designed, fabricated, erected and tested in accordance with the IS:803, latest edition. Additional Corrosion allowance of 1.5mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the Contractor	
c.	Tanks shall be made from IS:2062 quality mild steel plates of tested quality. The tanks shall be of welded construction.	
d.	Interior surface of the tanks shall lined with replaceable chlorobutyl/bromobutyl rubber lining of minimum 5 mm thickness and the outside surface shall be coated with paint as approved by the Employer. The Tanks shall be provided with drain, manholes, over flow & inlet level control valves etc. Suction screens shall be installed to protect the pumps. Bidder shall source rubber lining work from proven supplier.	

9.7 MILL CIRCUIT PUMPS

S. No	Description	Vendor to confirm
a)	Quantity: 2 No's for each limestone grinding system (Total 4 numbers)	
b)	Margins: Flow 10% (minimum) Head 15% (minimum)	
c)	Solids Concentration Max. 55% by weight or actual as per suppliers practice, whichever is minimum.	
d)	The Contractor shall offer only proven design in successful operation in similar application at previous installations. The design, manufacture, installation and testing of the pumps shall follow the latest applicable Indian / International (ASME /EN / Japanese) Standards.	
e)	The pumps shall be designed for continuous operation. The pump shall be single stage centrifugal type capable of delivering the rated flow at rated head with margins as specified in the respective clauses.	
f)	The slurry concentration in the pump shall not exceed 55% by weight.	
g)	All the slurry pumps shall be provided with motorized suction and discharge valves. In addition, flushing water lines with motorized valves shall be provided for each pump for automatic flushing of the pump after each shut down. The flushing water for the pumps shall be taken form the process water supply	
h)	In case of pump with rubber lined casing, the casing should be radially split to allow easy removal of impeller	
i)	All the pump wear parts in contact with the slurry shall be provided with replaceable rubber/elastomer liners suitable for the fluid handled. The Bidder can also offer an hi chrome alloy line pump if the Bidder has previous experience of the same for similar applications. The material used by the contractor shall be proven in previous installations.	
j)	The material and thickness of the liners shall ensure a minimum service life of 2 years before replacement. All the wear parts of the pump shall be guaranteed for a minimum wear life of not less than 14000 hrs.	
k)	The design of the shaft shall ensure that the operating speed is at least 20% above the critical speed of the shaft.	
l)	The pump shall be provided with seals of proven type and seal type shall be flushless .The shaft shall be supported on heavy duty ball/roller bearings.	
m)	Design and construction of various components of the pumps shall conform to the following general specifications. For material of construction of the components, data sheets shall be referred to.	
	a) Pump Casing	
	Pumps shall be Radial Split Casing, Close/Semi-open, Over-hang, End Suction type Back Pull-out design, Vertical Discharge type for Horizontal Centrifugal Pump. The casing shall be designed to withstand the maximum shut-off pressure developed by the pump at the pumping temperature. Pump casing shall be provided with a vent connection and piping with fittings & valves. Casing drain as required shall be provided complete with drain valves, piping and plugs. It shall be provided with a	

S. No	Description	Vendor to confirm
	connection for suction and discharge pressure gauge as standard feature. It shall be structurally sound to provide housing for the pump assembly and shall be designed hydraulically to minimum radial load at part load operation.	
	b) Impeller	
	Impeller shall be closed, semi-closed or open type as specified elsewhere and designed in conformance with the detailed analysis of the liquid being handled. The impeller shall be secured to the shaft, and shall be retained against circumferential movement by keying, pinning or lock rings. On pumps with overhung shaft, impellers shall be secured to the shaft by a lockout or cap screw which tightness in the direction of normal rotation.	
	c) Impeller/Casing Wearing Rings	
	Replaceable type wearing rings shall be provided at suitable locations of pumps. Suitable method of locking the wearing ring shall be used. Wearing rings shall be provided in pump casing and/or impeller as per manufacturer's standard practice.	
	d) Shaft	
	The critical speed shall be well away from the operating speed and in no case less than 130% of the rated speed. The shaft shall be ground and polished to final dimensions and shall be adequately sized to withstand all stresses from rotor weight, hydraulic loads, vibration and torques coming in during operation.	
	e) Shaft Sleeves	
	Renewable type fine finished shaft sleeves shall be provided at mechanical seals. Shaft sleeves shall be fastened to the shaft to prevent any leakage or loosening. Shaft and shaft sleeve assembly should ensure concentric rotation.	
	f) Bearings	
	Heavy duty bearings, adequately designed for the type of service specified in the enclosed pump data sheet and for long, trouble free operation shall be furnished. The bearings offered shall be capable of taking both the radial and axial thrust coming into play during operation. In case, sleeve bearings are offered additional thrust bearings shall be provided. Antifriction bearings of standard type, if provided, shall be selected for a minimum life 20,000 hrs. of continuous operation at maximum axial and radial loads and rated speed. Proper lubricating arrangement for the bearings shall be provided. The design shall be such that the bearing lubricating element does not contaminate the liquid pumped. Where there is a possibility of liquid entering the bearings suitable arrangement in the form of deflectors or any other suitable arrangement must be provided ahead of bearings assembly. Bearings shall be easily accessible without disturbing the pump assembly. A drain plug shall be provided at the bottom of each bearings housing.	
	g) Mechanical Seals	
	Mechanical seals shall be of single type with either sliding gasket or bellows between the axially moving face and shaft sleeves or any other suitable type. The sealing faces	

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S. No	Description	Vendor to confirm
	should be highly lapped surfaces of materials known for their low frictional coefficient and resistance to corrosion against the liquid being pumped.	
	The pump supplier shall coordinate with the seal maker in establishing the seal chamber of circulation rate for maintaining a stable film at the seal face. The seal piping system shall form an integral part of the pump assembly. For the seals under vacuum service, the seal design must ensure sealing against atmospheric pressure even when the pumps are not operating. Seals shall be fleshless type.	
	h) Pump Shaft Motor Shaft Coupling	
	The pump and motor shafts shall be connected with an adequately sized flexible coupling of proven design with a spacer to facilitate dismantling of the pump without disturbing the motor. Necessary coupling guards shall also be provided.	
	i) Base Plate	
	A common base plate mounting both for the pump and motor shall be furnished. The base plate shall be fabricated steel and of rigid construction, suitably ribbed and reinforced. Base plate and pump supports shall be so constructed and the piping unit so mounted as to minimize misalignment caused by mechanical forces such as normal piping strain, internal differential thermal expansion and hydraulic piping thrust. Suitable drain troughs and drip lip shall be provided.	

9.8 MILL CIRCUIT TANK AGITATOR

S. No	Description	Vendor to confirm
a)	Mill circuit tank agitator shall be of top entry (vertical) type and to be designed for continuous operation. The design of the agitators shall be of proven type. The shaft of the agitators shall be of Carbon steel with rubber lining with a minimum life of 2 years. Blades shall be of Alloy 926 or better material.	
b)	Agitators shall be supplied in tanks and vessels to prevent caking and settlement of particles out of the slurry.	
c)	Standard type agitators with suitable characteristics shall be used wherever practical. The agitators shall be complete with motor, gearbox, agitator shaft, coupling, safety guards, mechanical seal (for side entry agitators), impeller, support legs, agitator mounting flange including bolts nuts and gasket etc.,	
d)	All agitator parts and accessories in contact with the stirred fluid shall be constructed of materials specifically designed for the conditions and nature of the stirred fluid and be resistant to erosion and corrosion.	
e)	Each agitator and its associated equipment shall be arranged in such a manner as to permit easy access for operation, maintenance and agitator removal without interrupting plant operation.	
f)	To prevent mechanical blocking load start-up after standstill of pumps, piping and agitators for slurries shall be applied with C-hose connection.	
g)	Lifting lugs and eyes and other special tackle shall be provided as necessary to permit easy handling of the agitators and their components.	

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h)	Static and dynamic (as far as applicable) balancing of all agitators shall be carried out after assembly.	
i)	All agitator parts and components shall be designed and calculated for fatigue life, considering maximum bending loads, induced by fluctuating hydraulic forces and torsional loads, based on the installed motor power. For side entry agitators the alternating bending moment resulting from impeller and shaft weight has to be considered additionally.	
j)	All exposed moving parts shall be covered by guards.	
k)	Agitator shall be flange mounted.	
l)	The shape of the impeller blades of top entry agitators shall be designed to avoid wear on the impellers which will affect the agitator performance as specified for a minimum period of 2 years of continuous operation under design conditions for the range of coal & limestone specified in the specification. In order to avoid excessive wear impeller tip speeds must not exceed 12 m/s.	
m)	Belt drives (if applied) shall be properly designed to provide a minimum lifetime of 2 years under design conditions.	

9.9 PIPING / VALVES

S. No	Description	Vendor to confirm
a)	The limestone slurry pipes shall be sized to minimize erosion and avoid settling of the limestone at part load operation. The slurry pipes shall be lined with replaceable rubber lining of minimum 6 mm thickness. Slurry pipes shall be designed to keep the velocity above the settling velocity under all operating conditions. The supplier may provide a recirculation line with motorized isolation valve for the above purpose. Additional thickness of 2mm shall be provided at bends.	
b)	All the pipes handling slurry shall be provided with replaceable rubber lining or FRP of proven quality. The Supplier can provide slurry pipes of size lower than 3" made up of FRP material (Silicon carbide coating on slurry exposed surface) if bidder has proven experience of the same.	
c)	For Butterfly Valves refer specification enclosed in Annexure-6. For pneumatic valves, instrument air is available on corner of the ball mill building. Further piping to all individual valve shall be bidder's scope.	
d)	All valves shall be ASME B16.34 PN16 (Class 150)Wafer Type with EPDM lining face to face	
e)	For Limestone Slurry Line Valves - BODY:A126-B, DISC:A351-CF8M, STEM: Duplex 2205	
f)	For Water Line – Body: A105/A216-WCB, Disc & Stem :13CR EPDM	
g)	For Instrument Air Line- A105 + GI	
h)	For Material of construction for pipe refer to P&ID enclosed and as per specification enclosed in Annexure-6- Pipe & valves spec.	
i)	Supplier shall provide all necessary arrangements for purging & flushing of all the process pipelines, equipment's etc.	

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9.10 HYDROCYCLONE

S. No	Description	Vendor to confirm
a)	The hydro cyclone classification system shall be provided to classify the limestone slurry to the specified size. Overflow from the hydro cyclone shall be gravity fed by distribution piping to the limestone storage tank. The underflow shall be recycled back to the ball mill for further grinding	
b)	Total no. hydro-cyclone – 2 No's; 1 no (100%) per grinding system.	
c)	Mill hydro cyclone may be of polyurethane. Hydro-cyclone shall be of modular construction and designed for 100% of inlet feed. It shall be possible to remove and replace individual hydro-cyclone with the set in service. Individual isolation valve shall be provided for each hydro-cyclone for this purpose. The hydro-cyclone shall be of proven design and shall be provided with replaceable rubber lining of thickness 12 mm for the feed chamber and 12 mm for the overflow launder. The liner shall have a minimum wear life of not less than 8000 hours	
d)	The mill hydro-cyclone set shall have sufficient redundancy. A minimum 10% spare hydro-cyclone shall be provided in each set of hydro cyclone.	
e)	All parts of the hydro-cyclones, integral pipes, mill circuit pumps and other parts in contact with limestone slurry shall be provided with replaceable rubber wear liners.	

9.11 MOTOR

S. No	Description	Vendor to confirm
a)	▪ Above 0.2 kW and upto 200 kW: 3 phase 415 V AC-VENDOR SCOPE ▪ Above 200 kW and upto 1500 kW: 3.3 KV- BHEL SCOPE ▪ Above 1500 kW: 11 KW-BHEL SCOPE Bidder to submit the motor datasheet as per format given in the specification. Motor shall be sourced only from NTPC approved sources and **data sheet approval shall be obtained from BHEL before placing order.** If motor is procured from any new source, acceptance shall be subject to approval by NTPC/ BHEL before placing order and bidder shall submit relevant documents as per sub-supplier questionnaire attached in enclosed Annexure (sub-supplier questionnaire). Double compression cable gland with lugs to be provided by the vendor, however, exact size will be informed to vendor after award of contract. Motors shall be as per the **specification given in Annexure-7**	

9.12 Design Ambient conditions for Electricals

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S. No	Description	Vendor to confirm
	1) Design Ambient Temperature --- 50 Deg C 2) Design Ambient Temperature for equipment installed in A/C Rooms --- 35 Deg C	

9.13 FIELD MOUNTED LOCAL JUNCTION BOXES & CONDUITS

S. No	Description	Vendor to confirm
a)	**JUNCTION BOX** shall be Powder coated Junction box with CRCA sheet for IP class IP65 and the following requirements to be met: **No. of ways ------** 12/24/36/48/64/72/96/128 with 20% spares terminals. **Material and Thickness------** 4mm thick Fiberglass Reinforced Polyester (FRP). **Type---** Screwed at all four corners for door. Door gasket shall be of synthetic rubber. **Mounting clamps and accessories-----** Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands required for erection shall be of SS, included in Bidders scope of supply **Type of terminal blocks---------** Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm2. A M6 earthing stud shall be provided. **Grounding-------** To be provided. **Color -------** RAL 7035.	
b)	**CONDUITS** Conduits shall be generally used for interconnecting cables from field instruments to Local JB's. All rigid conduits, couplings and elbows shall be hot dipped galvanised rigid mild steel in accordance with IS: 9537 Part-I (1980) and Part-II (1981). The conduit interior and exterior surfaces shall have continuous zinc coating with an overcoat of transparent enamel lacker or zinc chromate. Flexible conduits shall be water leak, fire and rust proof flexible GI conduits shall be provided. The temperature rating of flexible conduit shall be suitable for actual application. All rigid conduit fittings shall conform to the requirements of IS: 2667, 1976. Galvanized steel fitting shall be used with steel conduit. All flexible conduit fittings shall be liquid tight, galvanized steel. The end fittings shall be compatible with the flexible conduit supplied. Conduit sealing, explosion proof, dust proof and other types of special fittings shall be provided as required by these specifications and shall be consistent with the area and equipment with which they are installed. Fittings installed outdoors and in damp	

	locations shall be sealed and gasketed. Hazardous area fittings and conduits sealing shall conform with NEC requirements for the area classification. Contractor shall provide double locknuts on all conduit terminations not provided with threaded hubs and couplings. Water tight conduit unions and rain tight conduit hubs shall be utilised for all the application which shall be exposed to weather. Moisture pockets shall be eliminated from conduits. Conduits shall be securely fastened to all boxes and cabinets.	

9.14 VFD

S. No	Description	Vendor to confirm
a)	**VFD's shall be as per the specification given in Annexure-8**	

9.15 INSTRUMENTS

S. No	Description	Vendor to confirm
a)	All instruments shall be as per specification enclosed **in Annexure-9**. Vendor to supply all the instruments as given in the P&ID. Primary instruments like microprocessor based transmitters employing HART protocol, thermocouples & RTD's along with temperature transmitters, pressure/diff pressure/temperature/flow*ultrasonic/electromagnetic) transmitter & gauges, flow sensing elements (orifice plates, flow nozzles etc.,), ultrasonic, radar type level transmitters and density meter(coriolis type). Integral to equipment which are not indicated in the tender drawings, but are required for control, monitoring and operation of the equipment for which no P&ID is attached shall be provided to meet the actual system requirements and meeting redundancy and other technical specifications. For binary and analog inputs required in major equipment's of FGD system, protection triple-sensing devices shall be provided. Binary and analog inputs, which are required for protection of more than one equipment as well as protection signals for HT drives etc., triple sensing devices shall be provided. For other critical binary and analog inputs required for protection and interlock purpose of other equipment (Eg. Those interlocks which may lead to loss if	

	production, non-availability of major equipment etc.,) **triple sensors** shall be provided Temperature elements, electronic transmitters etc., are to be provided for all the cases. Use of process actuated switches is acceptable only in case indicated in tender drawings.	

9.16 NETWORKING PROTOCOLS AND CONTROL LOGICS:

S. No	Description	Vendor to confirm
a)	All the measuring instruments, process instruments and electrical actuators shall be through HART protocol.	
b)	Each equipment shall be furnished with required instrumentation and electrical accessory devices mounted and connected to local junction boxes. Bidder shall provide the control logic for the entire system.	

9.17 Actuators

S. No	Description	Vendor to confirm
	All Pneumatic and Electrical Actuators shall be in compliance with Annexure-6 and Annexure-17 respectively.	

10. PACKING AND FORWARDING

S. No	Description	Vendor to confirm
a)	Proper packing to be ensured. **Indigenous Supply:** WBM & sub system assembly shall be wrapped in polythene bags & packed in a strong rigid wooden crate. Rain water should not enter into the WBM internals during storage in the outer yard of power plant. **Imported Supply:** All imported supply should be packed as per Sea worthy packing standards Annexure – 10 (Specification: **HY0490569**). All imported items should have Sea worthy packing. Liberal packing materials and struts shall be provided to arrest rolling and to protect from transit damages.	
b)	Equipment and process materials shall be packed and semi-knocked down, to the extent possible, to facilitate handling and storage and to protect bearings and other machine surfaces from oxidation. Each container, box, crate or bundle shall be reinforced with steel strapping in such a manner that breaking of one strap will not cause complete failure of packaging. The packing shall be of best standard to withstand rough handling and to provide suitable protection from tropical weather	

	while in transit and while awaiting erection at the site. All the major equipments shall be supplied in steel crates. The package shall be supplied in containers and it should be suitable for storage in the outside yard of the plant for a minimum period of 12 months.	
c)	Equipment and materials in wooden cases or crates shall be properly cushioned to withstand the abuse of handling, transportation and storage. Packing shall include preservatives suitable to tropical conditions. All machine surfaces and bearings shall be coated with oxidation preventive compounds. All parts subject to damage when in contact with water shall be coated with suitable grease and wrapped in heavy asphalt or tar impregnated paper.	
d)	Crates and packing material used for shipping will become the property of owner (NPGCL).	
e)	Packaging or shipping units shall be designed within the limitations of the unloading facilities of the receiving ports and the ship will be used. It shall be the bidder's responsibility to investigate these limitations and to provide suitable packaging and shipping to permit transportation to site.	
f)	Packing (tare) shall be part of the equipment cost and shall not be subject to return. The packing should ensure integrity and cohesiveness of each delivery batch of equipment during transportation. In case of equipment assemblies and unit's delivery in the packing of glass, plastics or paper the specification of packing with the material and weight characteristics are to be indicated.	
g)	Each package should have the following inscriptions and signs stenciled with an indelible ink legibly and clearly: a. Destination b. Package Number c. Gross and Net Weight d. Dimensions e. Lifting places f. Handling marks and the following delivery marking	
h)	**Each package or shipping units shall be clearly marked or stenciled on at least two sides as follows.** **Patratu Thermal Power station (PTPS)** **Ramgarh District of Jharkhand State, India** **EPC CONTRACTOR: "BHARAT HEAVY ELECTRICALS LIMITED, INDIA"** In addition, each package or shipping unit shall have the symbol painted in red on at least two sides of the package, covering one fourth of the area of the side.	
i)	Each part of the equipment which is to be shipped as a separate piece or smaller parts packed within the same case shall be legibly marked to show the unit of which it is part, and match marked to show its relative position in the unit, to facilitate assembly in the field. Unit marks and match marks shall be made with steel stamps and with paint.	
j)	Each case shall contain a packing list showing the detailed contents of the package. When any technical documents are supplied together with the shipment of materials	

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	no single package shall contain more than one set of such documents. Shipping papers shall clearly indicate in which packages the technical documents are contained.	
k)	The case number shall be written in the form of a fraction, the numerator of which is the serial number of the case and the denominator the total number of case in which a complete unit of equipment is packed.	
l)	Wherever necessary besides usual inscriptions the cases shall bear special indication such as "Top", "Do not turn over", "Care" , "Keep Dry" etc. as well as indication of the center of gravity (with red vertical lines) and places for attaching slings (with chain marks)	
m)	Marking for Safe handling: To ensure safe handling, packing case shall be marked to show the following: a. Upright position. b. Sling position and center of Gravity position. c. Storage category. d. Fragile components (to be marked properly with a clear warning for safe handling).	
n)	Each crate or package is to contain a packing list in a waterproof envelope. All items are to be clearly marked for easy identification against the packing List. All cases, packages etc. are to be clearly marked on the outside to indicate the total weight where the weight is bearing and the correct position of the slings are to bear an identification mark relating the to the appropriate shipping documents. All stencil marks on the outside of cases are either to be made in waterproof material or protected by shellac or varnish to prevent obliteration in transit.	
o)	**The packing slip shall contain the following information:** Customer name, Name of the equipment, Purchase Order number with Date, Address of the delivery site, Name and Address of the Sender, Serial Number of WBM & accessories, BHEL item Code, Gross Weight and Net weight of Supplied items.	
p)	Prior to transport from manufacturer's work to destination, components of the unit s completely cleaned to remove any foreign particles. Flange faces and other machined s shall be protected by an easily removable rust preventive coating followed by s wrapping.	
q)	All necessary painting, corrosion protection & preservation measures shall be ta specified in painting schedule. Supplier shall consider the coastal environment zone w defined as "very severe" during final finishing/shipping.	
r)	Successful bidder shall furnish the detail packing /shipment box details with information like packing box size, type of packing, weight of each consignment, sequence no. of dispatch, no. of consignment for each deliverable item against each billing break up units/ billable blocks. Without these details the BBU shall not be approved during detail engineering. Also, complete billing break-up with above mentioned details shall be submitted 10days of LOI.	
s)	All items/equipment shall be dispatched in properly packed condition (i.e. no item shall be dispatched in loose condition such that it becomes difficult to store/identify its location at site at a later stage).	

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t)	Cases which cannot be marked as above shall have metal tags with the necessary markings on them. The metal tags shall be securely attached to the packages with strong steel binding wire. Each piece, Skid, Case or package shipped separately shall be labelled or tagged properly.	

11. SUPERVISION OF ERECTION, TESTING AND COMMISSIONING

S. No	Description	Vendor to confirm
a)	The erection of Limestone Grinding System (LGS) will be done by owner (BHEL) as per Erection Manual and check List provided by bidder. The bidder has to supervise for erection, pre-commissioning & post- commissioning check-up, start-up, trial runs of all the items covered under the scope of supply.	
b)	There will be **Six visits per grinding system totally there will be 12 visits**. The bidder will be informed well in advance for the visit. Bidder shall consider **60 working days per grinding system**.	
c)	In case erection and commissioning activities get delayed due to any account, resulting into overstay of vendor supervisory engineer beyond schedule time, then BHEL shall pay for additional man-day stay of vendor supervisory engineers. Vendor to quote Per day cost for deputation along with this offer.	
d)	TA/DA, boarding and lodging shall be borne by the bidder and shall be inclusive in supervision charges portion.	
e)	Charges for supervision of Erection & commissioning shall be quoted by the bidder.	
f)	Price comparison for evaluating the lowest bid will be considered all main supply, supervision of E&C charges and mandatory spares price all together.	

12. EXCLUSION

S. No	Description	Vendor to confirm
	The following work associated with the LGS will be by BHEL: a. Supply of main drive HT motor b. Civil foundations (however vendor to provide foundation drawing & materials like Foundation bolts, anchor bolts, nuts) c. Walkways, platforms and ladders (Vendor to provide GA drawing. However, fabrication & material supply, Erection by BHEL) **d.** Element handling hoists	

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13. INSPECTION AND TESTING

(As per approved quality plan. However, minimum requirements are as below)

S. No	Description	Vendor to confirm
1.	**Quality Plan Requirement:**	
	(i) MQP (Manufacturing Quality Plan) shall be submitted in attached format for BHEL/Customer review & approval. Typical MQP is attached (Annexure-11) for indicative purposes for guidance & use.	
	(ii) MQP shall invariably cover w.r.t Inward inspection including on Raw material Procurement, In process and Final inspection in elaborated way/details.	
	(iii) Bidder shall also to give specific confirmation that on need basis, their competent officials shall visit to BHEL/customer for finalization of Quality plan including test procedure/methodology during pre- award / post award approval / detailed engineering in the event of an order.	
	(iv) No deviation on BHEL/Customer approved MQP is acceptable.	
	(v) Bidder shall agree to submit all cross referred documents other than codes/standards to BHEL/Customer/Consultant.	
	Important Notes shall be included in MQP: (a) Latest revision of Standard s & Specification shall apply. Only International Standards are applicable. Indian & Chinese Standards are not applicable (b) Materials shall be procured in compliance to Functional Technical Specification. (c) Inspection shall be in compliance with Approved Quality Control Procedure for the Product. (d) NDT shall be carried out by Qualified Personnel with compliance to Approved NDT Procedures and Acceptance Norms, as per ASME Section V. (e) Gauges and measuring Instruments, with valid calibration only shall be used. (f) Cleaning and Painting of products shall be carried out as per Approved Painting Schedule. (g) Finished Products shall be packed to comply with Approved Packing Schedule. (h) Welding shall be carried out by Qualified Personnel with compliance to Approved NDT Procedures and Acceptance Norms, as per ASME Section V.	
2.	**Domestic / Inland Inspection** will be carried out by BHEL/BHEL appointed Third Party Inspection Agency (TPIA) / Customer/Customer Appointed Inspection Agency/Consultant. This is applicable for all Stage inspection and Final Inspection identified as "W" - Witness or "CHP" - Customer Hold Point as per customer approved Quality Plan/ Technical specification / Approved Drawing/ Approved Data	

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	sheet / Scheme / PID / PFD / SLD (Process Instrumentation Diagram / Process Flow Diagram / Single Line Diagram) etc. (As applicable). "The inspection charges at actuals incurred by BHEL will be loaded to compare with foreign suppliers".	
3.	**Inspection Agency for Foreign Bidders and also for Indian Bidder but importing from Foreign Sources:** (1) Any one of the following Third Party Inspection Agency (TPIA) shall be appointed by the bidder and same shall be furnished by the bidder in techno commercial bid itself. (2) The details of TPIA with contact details like Name of the official, Phone no, Email id shall also to be submitted during pre/post award. However cost for such inspection agency shall be borne by the bidder only. Inspection charges for such inspection agency shall be indicated separately so that if BHEL/Customer is undertaking the inspection by on their own, then these charges non claimable by the bidder. **List of TPIA** 1) M/s Bureau Veritas 2) M/s TUV-Nord 3) M/s TUV-SUD 4) M/s TUV Rheinland 5) M/s Lloyds Register 6) M/s DNV	
4.	**Stage Inspection during manufacturing Process:** Stage Inspection during manufacturing shall be carried out as per approved quality plan and all necessary documents shall be provided for review, verification and clearance for further processing. This inspection call shall be given well in advance (at least 2 weeks before) to TPI/Bidder's own inspection agency to avoid delay in the manufacturing processes.	
5.	**Inspection before dispatch for domestic supplier:** Inspection before dispatch at supplier's works shall be carried out by BHEL/BHEL appointed Inspection agency. Inspection shall be done as per approved Quality plan/ Technical specification/ Approved Drawing/ Approved Data sheet.	
6.	**Inspection at Foreign Source/Supplier:** (a) As in Sl. No.: 3. shall be ensured without fail. (b) No material / items shall be dispatched without getting the written communication from BHEL / Customer inspection carried out by BHEL/BHEL appointed Third Party Inspection Agency (TPIA) / Customer/Customer Appointed Inspection Agency/Consultant. This is applicable for all Stage inspection and Final Inspection identified as "W" - Witness or "CHP" - Customer Hold Point as per customer approved Quality Plan/ Technical specification / Approved Drawing/ Approved Data sheet / Scheme / PID / PFD / SLD (Process Instrumentation Diagram / Process Flow Diagram / Single Line Diagram) etc. (As applicable). Inspection before dispatch for Foreign supplier: Inspection before dispatch at supplier's works shall be carried out by bidder appointed inspection agencies having international presence at vendors and or vendor's sub vendor works. Inspection shall	

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	be done as per approved Quality plan/ Technical specification/ Approved Drawing/ Approved Data sheet by TPIA mentioned in Sl. no: 03 at supplier's cost.	
7.	**Painting** shall be done strictly as per BHEL/Customer approved painting schedule / scheme only. Paint Thickness / Paint shade shall be ensured as per BHEL / Customer approved painting schedule / specification / data sheet etc. No deviation is acceptable unless otherwise accepted by BHEL/Customer in writing. Any conflict if any among BHEL / Customer approved painting schedule / Spec / data sheet etc shall be brought to the notice to BHEL well in advance before proceeding including the BOI being procured for assy / skid like motors etc	
8.	Specific conformation for document package in the event of an order (2 Hard copies & soft copy in PDF file) is to be given containing the following with proper linkages (i) Index Sheet (ii) MQP/RQP/Endorsement Sheet (As applicable) (iii) TCs identified by BHEL/ Customer for record for "CHP" / "W" and Verification portion ("V") as given in approved QP. (iv) Final inspection report + TC including Chemical + Mechanical + HT + NDT etc. (v) Third party Inspection report + TC (vi) Customer CHP/ MDCC (vii) Type test / Performance Test reports conducted (viii) Type test / Performance Test approval/ clearance obtained from BHEL/Customer (ix) BOM with As Build Drawings with actual make / rating used with BHEL/customer approved drawings**.**	
9.	**Packing / Seaworthy Packing** shall be as per BHEL Packing schedule / approved drg / sketch. This shall be ensured to take care transit / handling / transshipment in Road / Sea / Air. Photographs are to be submitted for BHEL review before dispatching the material as per contract conditions.	
10.	**Outsourcing of test facilities**: Bidder shall ensure all the testing facilities in house. However If any of the test facilities are not available with successful bidder, then bidder shall ensure the same at NABL accredited third party lab / Govt. / Govt. Lab for major testing such as NDT, Electrical & Mechanical testing.	
11.	**Important Note:** No deviation on the above requirement 01 to 10 is acceptable w.r.t Quality Requirement and those offers not meeting these specific customer requirement is liable for rejection and hence the bidder shall submit all the required documentary evidences in the offer itself.	
12.	## Necessarily to be filled up by the bidder at the time of offer itself otherwise the offer may not be considered w.r.t Quality Requirement being customer specific requirement.	
A)	**Minimum Testing requirements to be considered are as below:**	

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1.	Vibration levels measured on the non-rotating parts shall not exceed the zone limit "B" as defined in ISO 10816 at steady conditions and shall not exceed the zone limit "C" as defined in ISO 10816 at transient conditions.	
2.	List of Non-Destructive test over and above the material test are as follows: a. Mechanical Seal- Manufacturer's recommendation. b. Base Plate- Stress relieving of weld. c. Replaceable Rubber liner- Shore Hardness, Class and Type certificate.	
3.	Once mounting is finished and operation test will be conducted on each WBM to determine the characteristic curves to determine the parameters at the design point, mechanical running & performance testing shall be performed & witnessed.	
4.	Vibration test and Noise level test shall be witnessed at site.	
5.	For surfaces with rubber lining Welding shall be visually inspected to verify the absence of rough area and unacceptable transition between surfaces which prevent the adequate adherence of rubber. The acceptance criteria shall be as per latest standard.	
6.	For surfaces with rubber lining, degree of cleaning shall be visually checked before the application of the coating. There must be no area with oxidation, dirt or partially or generalized corrosion defects.	
7.	Test certificates shall be issued for each lot of raw material used in the coating, corresponding to specific weight and traction resistance.	
8.	For surfaces with rubber lining, adherence test shall be conducted on production samples. Adherence test shall be conducted on the actual surface through hammering. In order to verify the absence of air packets (or) surface without adherence.	
9.	For surfaces with rubber lining, Coating thickness shall be checked at 100%.A High voltage porosity test will be conducted on 100 % of the coated surface.	
10.	Wear resistant parts shall be UT/RT tested to check soundness after suitable heat treatment. Check for chemical composition, hardness and microstructure shall be carried out.	
11.	Wet ball mill shells shall be statically balanced.	
B)	**General Inspection requirements to be considered are as below:**	
1.	Bidder shall furnish written copies of shop production, fabrication and quality test procedures and drawings to be used for review by BHEL / NTPC prior to manufacture. Inspection of above mentioned tests by BHEL/ NTPC representative at bidder's works is envisaged.	
2.	**Ball Mill**	
	Raw material for shaft, coupling, gears and pinions, Mill Heads, top and bottom races and other rotating components shall be subjected to UT & Base frame for MPI. MPI/LPI shall be carried out to check surface soundness. Rubber wear lining of Mill Shell shall be checked for shore hardness. For Central driven ball mill shall be run tested (without grinding media) for 30 min at shop to check unusual noise and vibration.	

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	Butt welds in the tube/separator/body casing of the mill shall be tested by RT and MPI. All other welds in main tube/separator shall be tested by MPI/LPI for acceptance. The tube shall be statically balanced	
	All gearboxes shall be run tested for adequate duration to check rise in oil temperature, noise level and vibration. Check for leak tightness of gear case also shall be performed.	
	All WBMs will be inspected at the Bidder's works before dispatch or where the test facilities are available.	
3.	**Feeders**	
	Any welds in the casing/pulley fabrication shall be checked with MPI.	
	Routine tests shall be done as per relevant Indian Standards or equivalent International Standards	
	All major items like plates for casing, head pulley, tail pulley, pulley shaft and major castings shall be procured with respective material test certificates	
	Calibration check shall be carried out on all feeders	
4.	**PIPING, VALVE**	
	All pipes and fittings shall be tested as per applicable code.	
	All valves shall be hydraulically/Air tested for body, seat and back-seat (if applicable) as per relevant standard.	
	NDT on valves shall be as per relevant standard	
	Valves shall be offered for hydro test in unpainted conditions.	
	Functional checks of the valves for smooth opening and closing shall also be done.	
5.	**TANKS**	
	All welds joints shall be DP tested and complete tanks shall be water fill tested.	
	All atmospheric storage tanks fabricated and erected at site shall be subjected to tests (water fill test, NDT and Vacuum box test) according to design code as applicable	
	Rubber lining shall be tested for hardness and spark test, as applicable.	
6.	**PUMPS**	
	UT on shaft forgings (greater or equal to 40mm) and MPI/DPT shall be done on shafts and impeller to ensure freedom from defects.	
	The pump casing shall be hydraulically tested at 200% of pump rated head or at 150% of shut off head, whichever is higher. The test pressure shall be maintained for at least half an hour.	
	The pump rotating parts shall be subjected to static and dynamic balancing.	
	All pumps shall be tested at shop for capacity, head efficiency and brake horse power at rated speed as per relevant/applicable standard.	
	Noise and vibration shall be measured during the performance testing at shop.	
7.	**Agitators**	
	Rubber lining shall be tested for hardness and spark test	
	Impellers shall be tested for dimensional and balancing check	
	Gear Boxes shall be tested for run test as per standard practice	
8.	The Bidder shall furnish performance test procedure along with standard. The test procedure will be reviewed and approved by the BHEL/NTPC.	
9.	Wet ball mill shell shall be statically balanced.	

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10.	The Bidder shall conduct performance test for the remaining WBM and submit the reports.	
11.	Acceptance tolerance of actual versus guaranteed performance for capacity, head, efficiency and power absorbed shall be as per applicable standard.	
12.	Vibration levels shall be measured during shop running/performance tests.	
13.	Contract shaft seals shall be used during shop tests, unless the seal design is unsuitable for the shop-test condition.	
14.	WBM shall not be released for shipment, until shop tests data and performance tests curves have been approved by Owner.	
15.	Bidder should furnish **performance guarantee** as per applicable standard guarantee for the design, manufacture, material and safe & trouble-free operation of the WBM & all accessories.	
16.	BHEL shall witness the test at Bidder's works and a notice of minimum three (3) weeks shall be given for attending the inspection.	
17.	Bidder to arrange all calibrated gauges, Instruments during inspection.	
18.	Mechanical running and the performance test shall be carried out. Bidder to arrange Motor of same / higher rating for the shop test and inspection.	
19.	Acceptance tests to be carried out as per the procedure defined by the bidder which shall be submitted for BHEL/ NTPC approval.	
C)	PURCHASE AND SERVICE	
1.	The major items/ equipment's/ components to be manufactured in the shop of the contractor i.e. in-house items and those procured from sub-vendors / sub-manufacturer / sub-contractors i.e. bought out items (BOIs) shall be listed out by the contractor in their bid proposal.	
2.	The list of manufacturers/ sub-vendors for all the BOIs envisaged in contract shall be included in the bid proposal by the contractor which shall be reviewed by the NTPC during post bid discussions and the list of proposed manufacturers / sub-vendors for each of the BOIs shall be agreed/ approved. If any item is left out or gets included during detailed engineering, the contractor shall propose the manufacturer's / sub vendor's details for review / approval of NTPC, prior to initiating the procurement of such materials.	
3.	This specification also contains the Indicative vendor list (with disclaimer) mentioned against particular item/ equipment/ component/ system etc. The vendor list are only indicative and not exhaustive. Refer Annexure-16	

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14.PAINTING

Painting scheme given below is tentative. The painting details shall be finalized during contract stage:

14.1. Limestone Mill- Outside Surfaces:

<table>
<tr><th>S. No</th><th>Description</th><th>Vendor to confirm</th></tr>
<tr><td></td><td>
SURFACE PREPARATION:
Blast cleaning to Sa 2½
<table>
<tr><th colspan="2">PAINT</th><th>Total DFT (µm min)</th></tr>
<tr><td rowspan="2">PRIMER</td><td>Primer: Two coats of Epoxy resin based Epoxy Zinc phosphate primer to IS 13238
DFT- 50µ/coat (Total DFT µm min=100)</td><td>100</td></tr>
<tr><td>Intermediate:
One coat of Two component epoxy based intermediate paint pigmented with MIO/Tio2 DFT- 100µm min)</td><td>100</td></tr>
<tr><td rowspan="2">FINISH</td><td>Finish: One coat of Epoxy based finish paint to IS 14209, DFT- 75µ/coat</td><td>75</td></tr>
<tr><td>Finish: One coat of acrylic aliphatic polyurethane paint to IS 13213, DFT- 25µ/coat</td><td>25</td></tr>
<tr><td colspan="2">TOTAL DFT (µm min)</td><td>300</td></tr>
</table>
</td><td></td></tr>
</table>

14.2. Limestone Mill- Inside Surfaces:

<table>
<tr><th>S. No</th><th>Description</th><th>Vendor to confirm</th></tr>
<tr><td></td><td>
SURFACE PREPARATION:
Blast cleaning to Sa 2½ (Near white metal)
with surface profile 40-60µm conforming to ISO 8501-1
<table>
<tr><th colspan="2">PAINT</th><th>Total DFT (µm min)</th></tr>
<tr><td>PRIMER</td><td>Primer Coat: One coat of two component moisture curing inorganic Ethyl Zinc Silicate Primer to IS 14946,

(Solid by volume- 60% (min)), (Metallic zinc content 80% (min))
DFT = 70 µm per coat (min.)

Zinc dust composition shall be Type-II as per ASTMD520-00</td><td>70</td></tr>
<tr><td>FINISH</td><td></td><td></td></tr>
<tr><td colspan="2">TOTAL DFT (µm min)</td><td>70</td></tr>
</table>
</td><td></td></tr>
</table>

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14.3. Process water pipe accessories

<table>
<tr><th>S. No</th><th>Description</th><th>Vendor to confirm</th></tr>
<tr><td></td><td>SURFACE PREPARATION:
Power Tool Cleaning to St3 (SSPC-SP3)
<table>
<tr><th colspan="2">PAINT</th><th>Total DFT(µm min)</th></tr>
<tr><td rowspan="2">PRIMER</td><td>Primer: Red Oxide Zinc Phosphate Primer to IS: 12744 (Two coats)</td><td>60</td></tr>
<tr><td>Intermediate: One coat of Synthetic Enamel intermediate coat to IS 2932; DFT- 50µ</td><td>50</td></tr>
<tr><td>FINISH</td><td>Finish: Two coats of synthetic Enamel to IS 2932, DFT-50µm/coat
Shade: Grey white RAL 9002
Identification tag: Sea green shade no: 217 as per IS 5</td><td>100</td></tr>
<tr><td colspan="2">TOTAL DFT (µm min)</td><td>210</td></tr>
</table></td><td></td></tr>
</table>

14.4. Slurry Pipe Accessories

<table>
<tr><th>S. No</th><th>Description</th><th>Vendor to confirm</th></tr>
<tr><td></td><td>SURFACE PREPARATION:
Power Tool Cleaning to St3 (SSPC-SP3)
<table>
<tr><th colspan="2">PAINT</th><th>Total DFT(µm min)</th></tr>
<tr><td rowspan="2">PRIMER</td><td>Primer: Red Oxide Zinc Phosphate Primer to IS: 12744 (Two coats)</td><td>60</td></tr>
<tr><td>Intermediate: One coat of Synthetic Enamel intermediate coat to IS 2932; DFT- 50µ</td><td>50</td></tr>
<tr><td>FINISH</td><td>Two coats of Synthetic Enamel to IS 2932,
DFT- 50µ/ coat
Shade: Grey white RAL 9002
Identification Tag: Sea Green Shade no: 217 as per IS 5</td><td>100</td></tr>
<tr><td colspan="2">TOTAL DFT (µm min)</td><td>210</td></tr>
</table></td><td></td></tr>
</table>

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14.5. Service Air pipe accessories

<table>
<tr><th>S. No</th><th>Description</th><th>Vendor to confirm</th></tr>
<tr><td></td><td>
SURFACE PREPARATION:
Power Tool Cleaning to St3 (SSPC-SP3)
<table>
<tr><th colspan="2">PAINT</th><th>Total DFT (µm min)</th></tr>
<tr><td rowspan="2">PRIMER</td><td>Primer: Two coats of Epoxy resin based Epoxy Zinc phosphate primer to IS 13238
DFT- 50µ/coat (Total DFT µm min=100)</td><td>100</td></tr>
<tr><td>Intermediate:
One coat of Two component epoxy based intermediate paint pigmented with MIO/Tio2 DFT- 100µm min)</td><td>100</td></tr>
<tr><td rowspan="2">FINISH</td><td>Finish: One coat of Epoxy based finish paint to IS 14209, DFT- 75µ/coat</td><td>75</td></tr>
<tr><td>Finish: One coat of acrylic aliphatic polyurethane paint to IS 13213, DFT- 25µ/coat</td><td>25</td></tr>
<tr><td colspan="2">TOTAL DFT (µm min)</td><td>300</td></tr>
</table>
</td><td></td></tr>
</table>

14.6. Instrument Air pipe accessories

<table>
<tr><th>S. No</th><th>Description</th><th>Vendor to confirm</th></tr>
<tr><td></td><td>
SURFACE PREPARATION:
Power Tool Cleaning to St3 (SSPC-SP3)
<table>
<tr><th colspan="2">PAINT</th><th>Total DFT (µm min)</th></tr>
<tr><td rowspan="2">PRIMER</td><td>Primer: Two coats of Epoxy resin based Epoxy Zinc phosphate primer to IS 13238
DFT- 50µ/coat (Total DFT µm min=100)</td><td>100</td></tr>
<tr><td>Intermediate:
One coat of Two component epoxy based intermediate paint pigmented with MIO/Tio2 DFT- 100µm min)</td><td>100</td></tr>
<tr><td rowspan="2">FINISH</td><td>Finish: One coat of Epoxy based finish paint to IS 14209, DFT- 75µ/coat</td><td>75</td></tr>
<tr><td>Finish: One coat of acrylic aliphatic polyurethane paint to IS 13213, DFT- 25µ/coat</td><td>25</td></tr>
<tr><td colspan="2">TOTAL DFT (µm min)</td><td>300</td></tr>
</table>
</td><td></td></tr>
</table>

14.7. Valves and fittings (Temp <95 deg C)

<table>
<tr><th>S. No</th><th>Description</th><th>Vendor to confirm</th></tr>
<tr><td></td><td>SURFACE PREPARATION:
Power Tool Cleaning to St3 (SSPC-SP3)
<table>
<tr><th colspan="2">PAINT</th><th>Total DFT (µm min)</th></tr>
<tr><td>PRIMER</td><td>Red Oxide Zinc Phosphate Primer to IS: 12744 (Two coats)</td><td>60</td></tr>
<tr><td>FINISH</td><td>Synthetic Enamel to IS 2932 Shade: Grey white RAL 9002 (Two coats)- 30µ/ coat</td><td>60</td></tr>
<tr><td colspan="2">TOTAL DFT (µm min)</td><td>120</td></tr>
</table></td><td></td></tr>
</table>

15. SPARES

15.1. START UP & COMMISSIONING SPARES

S. No	Description	Vendor to confirm
	Start-up & Commissioning Spares shall be part of the main supply of the WBM. Start-up & commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system. All spares required for successful operation till commissioning of WBM shall come under this category. Bidder shall provide an adequate stock of such start up and commissioning spares to be brought by him to the site for the equipment erection and commissioning. The spares must be available at site before the equipment's are energized.	

15.2. MANDATORY SPARES (FOR EACH PROJECT)

Vendor to quote 1 Set per project. List of items with quantities per set is as per below tables.

PROJECT CONSISTS OF TWO SETS OF LIMESTONE GRINING SYSTEMS.

S. No	Description	Vendor to confirm
a)	The list of mandatory spares considered essential by the Employer is indicated in the list below. The bidder shall indicate the prices for each and every item (except for items not applicable to the bidders design) in the 'Schedule of Mandatory Spares' whether or not he considers it necessary for the Employer to have such spares. If the bidder fails to comply with the above or fails to quote the price of any spare item, the cost of such spares shall be deemed to be included in the contract price. The bidder shall furnish the population per unit of each item in their Bid. Whenever the quantity is mentioned in "sets" the bidder has to give the item details and prices of each item.	
b)	Whenever the quantity is indicated as a percentage, it shall mean percentage of total population of that item in the station (project), unless specified otherwise, and the fraction will be rounded off to the next higher whole number. Wherever the requirement has been specified as a 'set' (marked by **) it will include the total requirement of the item for a unit, module or the station as specified. Where it is specified as 'set' (marked by*) it would mean the requirement for the single equipment / system as the case may be. Also one set for the particular equipment. e.g. 'set' of bearings for a pump would include the total number of Bearings in a pump. Also the 'set' would include all components required to replace the item; for example, a set of bearings shall include all hardware normally required while replacing the bearings.	
c)	The assembly / sub assembly which have different orientation (like left hand, right hand, top or bottom), different direction of rotation or mirror image positioning or any other regions which result in maintaining two different sets of spares to be used for subject assembly / sub-assembly shall be considered as different type of assembly/sub-assembly.	

d)	The prices of mandatory spares indicated by the Bidder in the Bid Proposal sheets shall be used for bid evaluation purposes.	
e)	All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the first unit. However, spares shall not be dispatched before dispatch of corresponding main equipment.	
f)	The Employer reserves right to buy any or all the mandatory spare parts.	
g)	Bidder to provide the split up price for mandatory spares during placement of order.	
h)	Bidder shall indicate the service expectancy period for the spare parts under normal operating conditions before replacement is necessary.	
i)	All spares supplied under this contract shall be strictly inter-changeable with the parts for which they are intended for replacements. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic with desiccators packs as necessary.	
j)	All the spares shall be manufactured as per same specification quality plan.	
k)	The bidder shall provide employer with cross-sectional drawings, catalogues, assembly drawings and other relevant documents so as to enable the employer to identify and finalize order for recommended spares.	
l)	Each spare part shall be clearly marked or labelled on the outside of the packing with its description. When more than one spare part is packed in a single case, a general description of the content shall be shown on the outside of such case and detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification.	
m)	The bidder will provide the employer with all the addresses and particulars of his sub-suppliers while placing the order on vendors for items/components/equipment's covered under the contract and will further ensure with his vendors that the employer, if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.	
n)	The bidder shall guarantee long term availability of spares to the employer for the full life of the equipment covered under this contract. The bidder shall guarantee that before going out of production of spare parts of the equipment covered under the	

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	contract, he shall give the employer at least 2 years advance notice so that the latter may order his bulk requirement of spares, if he so desires. The same provision will be applicable to sub-contractors. Further, in case of discontinuance of manufacture of any spares by the bidder and/or his subcontractors, bidder will provide the employer, two years in advance, with full manufacturing drawings, material specification and technical information on alternate equivalent makes required by the employer for the purpose of manufacture/procurement of such items.	
o)	Wherever set is mentioned, one set of the spares of that item shall be for complete replacement of that particular item for one equipment.	
p)	Any fraction of an item shall mean the next higher integer.	
q)	Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by bidder shall be the specified percentage (%) of the total population of the plant. In case quantity so calculated happens to be fraction, the same shall be rounded off to next higher whole number.	
r)	Where ever quantity has been indicated for each type, size, thickness, material, radius, range etc., the same shall be furnished in the bid.	
s)	In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed:	

15.2.1. Hydro-cyclone

S. No	Description	Nos. /Sets for each project	Vendor to confirm whether he quoted or not
1)	**Hydro-cyclone isolation valve**	10% of each type **OR** 1 no. whichever is higher	
2)	**Hydro-cyclone**	10% of each type **OR** 1 no. whichever is higher	
3)	**Hydro-cyclone rubber lining-Feed chamber and overflow chamber**	10% of each type **OR** 1 no. whichever is higher	

15.2.2. Feeders

Sl. No	Description	Nos. /Sets for each project	Vendor to confirm whether he quoted or not
1)	**Belt**	**4 sets***	
2)	**Belt drive motors**	**1 no**	
3)	**Belt drive reducer**	**2 nos**	
4)	**Speed reducer assembly**	**1 set***	
5)	**Weighing instruments**	**1 set***	
6)	**Feeder weighing roll**	**1 no**	
7)	**Gravimetric feeder gate actuator assembly**	**1 no**	
8)	**Counter assembly of feeder complete**	**1 no**	
9)	**Feeder head pulley assembly**	**1 no**	
10)	**Inlet span roller assembly**	**6 nos**	

15.2.3. LIMESTONE MILLS

Sl. No	Description	Nos. /Sets for each project	Vendor to confirm whether he quoted or not
1)	**Mill wear parts (liners) & grinding element**	**1 sets**	
	Note: One set of Mill wear parts (Liners) above is defined as under: 1 Set = (Grinding elements needed for complete replacement of one mill) X (8000 x 1)/GWL, rounded off to nearest highest whole number. Where: GWL = Guaranteed wear life of Mill wear parts as offered by the bidder.		
2)	**Auxiliary motor**	**1 nos**	
3)	**Gear box internals (including bearing and seals)**	**2 sets***	

4)	**Complete gear box**	**1 set***	
5)	**Lube oil/Grease System for**		
5.1.	**Pump assembly**	**2 no of each type**	
5.2.	**Motor**	**1 no of each type**	
5.3.	**Pressure regulator**	**1 no of each type**	
5.4.	**Filters**	**2 no of each type**	
5.5.	**Pump & motor coupling**	**1 no of each type**	

15.2.4. SLURRY VALVES

Sl. No	Description	Nos. /Sets for each project	Vendor to confirm whether he quoted or not
1.	Slurry valves	2 no of each type and size	

15.2.5. SLURRY LINE BENDS

Sl. No	Description	Nos. /Sets for each project	Vendor to confirm whether he quoted or not
1.	Slurry line bends	2 no of each type and size	

15.2.6. AGITATOR

Sl. No	Description	Nos. /Sets for each project	Vendor to confirm whether he quoted or not
1.	**Impeller assembly**	**1 no of each type**	
2.	**Bearing assembly**	**2 no of each type**	
3.	**Motor**	**1 no of each type**	
4.	**Belt and pulley (if applicable)**	**2 no of each type**	
5.	**Gear box assembly (if applicable)**	**1 no of each type**	

15.2.7. MILL CIRCUIT PUMPS

Sl. No	Description	Nos. /Sets for each project	Vendor to confirm whether he quoted or not
1.	Impeller Assembly	**1 nos. of each type**	
2.	Casing Liners (where replaceable liners are provided)	**2nos. of each type**	
3.	Seals	**4 sets of each type**	
4.	Bearings	**2 no. of each type**	
5.	Motor	**1 no of each type**	
6.	Motor-Pump Coupling	**1 no. of each type**	

15.2.8. CONTROL VALUES, ACTUATORS & ACCESSORIES

Following items shall be provided under this clause for all modulating control values under this package even if one or more of these items are also specified elsewhere under mandatory spares

Sl. No	Description	Nos. /Sets for each project	Vendor to confirm whether he quoted or not
1.	Pneumatic and electro-hydraulic actuator assembly	10% or 1 no of each type, model and rating, whichever is more	
2.	Diaphragms, O' rings, seals etc. of all types make etc.	100%	
3.	Pressure Gauges of all types	10% or 2 nos. of each whichever is more	
4.	Solenoid valves (if applicable)	10% or 2 nos. of each whichever is more	
5.	Positioner units/smart positioners (complete unit)& accessories (link assembly)	10% or 1 no. of each whichever is more	
6.	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 nos. of each whichever is more	
7.	Air lock relays	10% or 2 nos. of each whichever is more	

15.2.9. PNEUMATICS ISOLATION / BLOCK VALVES, ACTUATORS & ACCESSORIES

(For all ON/OFF valves supplied under this package even if one or more of these items are also specified elsewhere under mandatory spares)

Sl. No	Description	Nos. /Sets for each project	Vendor to confirm whether he quoted or not
1.	Pneumatic and electro-hydraulic actuator assembly	10% or 1 no of each type, model and rating, whichever is more	
2.	Diaphragms, O' rings, seals etc. of all types make etc.	100%	
3.	Limit switches (complete unit) & accessories (link assembly)	10% or 2 nos. of each whichever is more	
4.	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 nos. of each whichever is more	

15.2.10. CONTROL AND INSTRUMENTATION
ALL MEASURING INSTRUMENTS

Sl. No	Description	Nos. /Sets for each project	Vendor to confirm whether he quoted or not
1.	**Electronic Transmitters**		
	1.1 Transmitters of all types, ranges and model no. (For measurement of pressure, differential pressure, flow, level, etc.). This shall include magnetic/ electromagnetic flow meter, mass flow meter also.	10% or 1 no. of each type and model whichever is more	
	1.2 Level Transmitters(Ultrasonic/radar type)	50% of each type, and length including sensors.	
2.	Temp Elements		
	RTD's of each type and length (with head assembly, terminal block and nipple)	10% or 2 no. of each type and length whichever is more	
	Thermo-couples of each type (with head assembly, terminal block and nipple)	10% or 2 no. of each type and length whichever is more	
	Temperature Transmitters	10% if each type and model	
3.	Local indicators like temperature gauges, pressure gauges, differential pressure gauges, flow gauges, flow meters etc.,	5% or 1 no. of each make, model and type whichever is more(to be divided to various ranges in proportion to main of all make, model, type population).	
4.	Process actuated switch devices includes all types of pressure, differential pressure, flow, temperature, differential temperature, level switch devices	5% or 1 no. of each type and model whichever is more	
5.	PD type flow transmitters	1 no. of each type and model	
6.	Any other instruments(if applicable)	10% or 1 no. of each type and model whichever is more	
7.	PROCESS CONNECTION PIPING (For impulse piping/Tubing and air supply piping as applicable)		
	1. Valves of all types and models	10% or 1 no. of each type, class, size and model whichever is more	

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	2. 2 way, 3 way, 5 way valve manifolds	10% or 1 no. of each type, class, size and model whichever is more	
	3. Fittings	10% or 1 packet of each type, class, size and model whichever is more	
	4. Purge meters	5% of each model or 2 nos. whichever is more	
	5. Filter regulators	20% of each model or 2 nos. whichever is more	

15.2.11. ELECTRICAL ACTUATORS

Sl. No	Description	Nos. /Sets for each project	Vendor to confirm whether he quoted or not
1.	Actuators	1 no. of each type and	
2.	Power unit for modulating actuator	2 nos. of each type	
3.	DC-DC unit / Power Units	2 nos. of each type	
4.	Electronic cards	2 nos. of each type	
5.	Position feedback transmitters	2 nos. of each type	
6.	Control Unit	2 nos. of each type	
7.	Torque And limit switch assembly of each unit	2 nos. of each type	

15.3. RECOMMENDED SPARES

S. No	Description	Vendor to confirm
1.	In Addition to the spare parts mentioned above, the contractor shall provide a list of recommended spares for 3 years of normal operation of the plant and indicate the list and total prices. The list shall take into consideration the mandatory spares into consideration. The employer reserves right to buy any or all the recommended	

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	mandatory spares, the recommended spares shall be delivered at project site at least two months before the schedule date of initial operation.	
2.	Prices of recommended spares will not be used for evaluation of the bids. The prices of these spares will remain valid up to 6 months after placement of Purchase order. However, bidder shall be liable to provide justification for the quoted prices for these spares as desired by employer.	

16. SPECIAL TOOLS AND TACKLES

S. No	Description	Vendor to confirm
1.	Any special tools & tackles required for the entire equipment to disassemble, assemble or maintain the units, they shall be included in the quotation and furnished as part of the initial supply of the machine. List of special tools & tackles shall be decided by bidder as per his proven practice. When special tools are provided, they shall be packaged in separate, boxes with lugs and marked as "Special Tools for (tag / item number)."Each tool shall be stamped or tagged to indicate its intended usage. Levers and eye bolts for the removal of parts to be serviced shall be submitted with special tools.	

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17. PERFORMANCE GUARANTEES AND SCHEDULE OF GUARANTEES

SCHEDULE OF GUARANTEES:

All performance tests shall be carried out in accordance with the relevant latest international codes/standards. Bidder to confirm the compliance with Sub-Section –VI (Functional Guarantees & Liquidated Damages) of NTPC Specification, part of Annexure-13 of this specification.

CATEGORY –I GUARANTEES:

S. No	Description	Data
1.	Guaranteed auxiliary power consumption (equipment's to be considered for power consumption is as per 18.1 of this technical specification) at rated capacity in KW. Bidder shall furnish Break-up among list of equipment's considers which is subjected to approval.	**Bidder to Provide**

CATEGORY –III GUARANTEES:

S. No	Description	Data
1.	Rated capacity of Wet Ball Mill (WBM) TPH at rated Limestone output fineness. *Contractor shall demonstrate the above capacity with the originally installed grinding elements in nearly worn-out condition as mutually agreed for the purpose of ascertaining wear life of any of the wear parts*	**87.9 TPH @ ≥90% through 325mesh.**
2.	Life of WBM wear parts *Contractor shall demonstrate the life of wet ball Mill wear parts in line with requirements stipulated in chapter -9(Design and construction of mill and accessories) of the Technical Specification. The establishment of the above guarantee shall be based on the operating records available at the Power station and will be computed for each pulverizer based on actual total hours of operation.*	**≥ 8,000 hours**
3.	Guaranteed ball consumption *Contractor shall guarantee ball consumption per ton of limestone throughput in line with requirements stipulated in chapter -9(Design and construction of mill and accessories) the Technical Specification. Contractor shall furnish the minimum ball diameter below which the balls shall be replaced.*	**Bidder to Provide**
4.	Noise level at a distance of 1.0 meter from the equipment at site and 1.5 m above operating floor	**≤ 90 dB A(for ball mill) ≤85 dB A(for other equipment's)**

OTHER GUARANTEES

S. No	Description	Data
1.	Maximum vibration (peak to peak amplitude at site) microns	**Bidder to Provide**
2.	Scheduled Maintenance (Minor Overhauls): Recommended intervals between maintenance outages	**≥ 25,000 hours**

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3.	Scheduled Maintenance (Major Overhauls): Recommended intervals between maintenance outages	**≥ 75,000 hours**
4.	Equipment Availability (%) Continuous for 180 days	**Bidder to Provide**

PERFORMANCE TESTS AND ACCEPATNACE OF GUARANTEE TEST RESULTS

S. No	Description	Vendor to confirm
1.	All performance tests for WBM shall be carried out in accordance with any latest International codes/standards. 1. Capacity of the WBM to be guaranteed 87.9 TPH (with output fineness of 90% or higher passing through 325 mesh for the range of Limestone specified elsewhere). 2. The Bidder shall ensure a design of the equipment to achieve an average target availability of 98% for 120 days. 3. All the wear parts of the WBM shall be guaranteed for a minimum wear life of not less than 8000hrs. 4. Bidder to guarantee ball consumption per ton of limestone throughput. Bidder shall furnish the minimum ball diameter below which the balls shall be replaced. 5. Noise level ≤ 90 dBA(for ball mill excluding motor) and ≤ 85 dBA (for other equipment's) at 1m horizontal distance from equipment/enclosures and 1.5m above operating floor is to be guaranteed excluding motor. 6. Vibration levels measured on the non-rotating parts shall not exceed the zone limit "B" as defined in ISO 10816 at steady conditions and shall not exceed the zone limit "C" as defined in ISO 10816 at transient conditions. 7. Acceptance tests to be carried out as per the procedure defined by the bidder which shall be submitted for BHEL/ NTPC approval. 8. Power consumption for entire wet ball milling system. *Bidder to submit procedure to calculate motor shaft power as per IEC-60034 standard* 9. In the event that the performance test is unsuccessful, bidder shall take necessary remedial action at his cost and the performance test shall be repeated. 10. Product size: 30 wt. % slurry 325 mesh 90% passing limestone. **11. Refer Annexure-13 for functional guarantees and liquidated damages for short fall in performance, bidder to confirm the compliance accordingly.**	

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	12. For **Category – I guarantees**: In case during performance it is found that equipment/system has failed to meet the guarantees, the contractor shall carry out all necessary modifications and/or replacements to make the equipment/system comply with the guaranteed requirement at no extra cost to the employer and re-conduct the performance guarantees test(s) with Employers consent. In case the specified performance guarantee(s) is not met Liquidated Damages (LD) shall be imposed if the demonstrated guarantees are within acceptable Shortfall Limit. However, if the demonstrated performance guarantees continue beyond the stipulated Acceptable Shortfall limit even after the above modifications/replacements within ninety(90) days or a reasonable period allowed by employer after the test have been completed, the employer will have the right to either of the following: Reject the equipment /System / plant and recover from the contractor the payment already made OR Accept the equipment /system/plant after levying LD. The LD for shortfall in performance indicated in clause 18.0. The LD's shall be pro-rated for the fractional parts of the deficiencies. 13. For **Category – III & OTHER guarantees**: In case during performance it is found that equipment/system has failed to meet the guarantees, the contractor shall carry out all necessary modifications and/or replacements to make the equipment/system comply with the guaranteed requirement at no extra cost to the employer and re-conduct the performance guarantees test(s) with Employers consent. In case the specified performance guarantee(s) are still not met even after the above modifications /replacements within 90 days or reasonable period allowed by the Employer, after tests have been completed. the employer will have the right to either of the following: Reject the equipment /System / plant and recover from the contractor the payment already made OR Accept the equipment /system/plant after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract prices an amount equivalent to the damages as determined by NTPC. Such damages shall, however be limited to the cost of replacement of equipment, replacement of which shall remove deficiency so as to achieve the guaranteed performance.	

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18. GUARANTEED POWER CONSUMPTION

S. No	Description	Vendor to confirm
1.	**GUARANTEED POWER CONSUMPTION** Bidder to specify the guaranteed power consumption of complete limestone grinding system as well as individual equipment in their offer. While guaranteeing the auxiliary power consumption the bidder shall necessarily include all continuously operating packages under scope of supply. The auxiliaries to be considered shall include but not be limited to the following for Guaranteed Power consumption calculation (GPC). a. Gravimetric feeder – 1 No. b. Wet Ball mill Main Motor (**Shaft Power**- Bidder to submit procedure to calculate motor shaft power as per IEC standard.) - 1 No. c. Mill Circuit Pump- 1 No. **d.** Mill circuit Tank Agitator- 1 No. **e.** Wet ball mill lubrication – 1 set working pumps(HP Lube Oil Pump & LP Lube Oil Pumps) **f.** Main reducer lubrication system - 1 set of working pumps The equipment's listed above for calculating auxiliary power consumption are indicative. Any other equipment requires for continuous operation of the system shall be considered for calculation of auxiliary power consumption	
2.	**BIDDER TO GUARANTEE POWER CONSUMPTION ≤ 2630 KW FOR ENITRE WET BALL MILLING SYSTEM.** **In case power consumption more than 2630 KW bidder shall be loaded 1, 98,198 INR per KW.** Adjustment factor for excess power consumption in INR = (GPC-2630) X PL X 1 No. of Working WBM. GPC- Guaranteed Shaft Power Consumption quoted by bidder in KW. PL- Power Loading @ **1, 98, 198** INR/KW.	

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19. LIQUIDATED DAMAGES FOR POWER CONSUMPTION

S. No	Description	Vendor to confirm
1.	If actual shaft Power Consumption during prove out (or) PG Test operating at the duty point exceeds the value guaranteed by the bidder, liquidated damages for shortfall in performance shall be deducted from contract price as per the formula given below Liquidated damage deductible in INR per WBM = (APC-GPC) X P X 1 No. of Working WBM Where, • GPC- Guaranteed Shaft Power Consumption quoted by bidder in KW • APC- Actual Shaft Power Consumption in KW • P- Penalty @ Rs 1,98,198 per KW **Note:** • **In case of shortfall bidder has to carry out necessary modifications and/or replacements at no extra cost to the employer and re-conduct performance test with employers consent. In case the specified performance guarantees are not met and are within the acceptable shortfall limit (+1% of guaranteed auxiliary power consumption) then penalty shall be imposed.** • **If the contract currency is other than US dollars, then the liquidated damages shall be in equivalent amount in contract currency based on Bill selling exchange rate of State Bank of India prevailing on the 8th March 2018.**	

20. WARRANTY

S. No	Description	Vendor to confirm
1.	The Bidder warrants that the equipment/ items shall be free from defects in the design, engineering, materials and workmanship of the Plant and Equipment supplied and of the work executed. The Defect Liability Period shall be thirty six (36) months from the date of supply (or any part thereof) or twenty four (24) months from the date of commissioning (or any part thereof), whichever first occurs. If during the Defect Liability Period any defect should be found in the design, engineering, materials and workmanship of the Plant and Equipment supplied or of the work executed by the Bidder, the Bidder shall promptly, in consultation and agreement with BHEL regarding appropriate remedying of the defects, and at its cost, repair, replace or otherwise make good (as the Bidder shall, at its discretion, determine) such defect as well as any damage to the Facilities caused by such defect.	

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2.	In case of failure of the equipment to meet the guarantee, NTPC/BHEL reserves the right to reject the equipment. However, NTPC/BHEL reserves the right to use the equipment until new equipment supplied by bidder meets the guaranteed requirement .	

21.FIRST FILL OF CONSUMABLES:

S. No	Description	Vendor to confirm
1.	Bidder's scope shall also include supply and filling of all chemicals, reagents, resins, lubricants, grease, filters and consumable items for operation up to commissioning including top up requirements. All lubricants proposed for the plant operation shall be suitable for all operating and environmental conditions that will be met on site consistent with good maintenance procedures as instructed in the maintenance manuals.	
2.	Detailed specifications for the lubricating oil, grease, gases, servo fluids, control fluids, chemicals including items qualities and quantities required per month of the plant operation for the NTPC/BHEL's approval herein shall be furnished within 2 months f placement of Order. On completion of erection complete list of bearings/equipment giving their location and identification marks shall be furnished to BHEL along with lubrication requirements. All types of chemicals, consumables, lubricants and grease shall be readily obtainable locally and the number of different types shall be kept to a minimum. For each type and grade of lubricant recommended, bidder shall list at least three equivalent lubricants manufactured by alternative companies.	

22.TRAINING

S. No	Description	Vendor to confirm
	Successful bidder shall provide comprehensive training for NTPC/BHEL Engineering, O&M, Erection & Commissioning staffs at site covering all aspects of the LGS system - Operation & Maintenance, Troubleshooting etc. and also Engineering personnel at manufacturer's works.	

23.CONFLICT

S. No	Description	Vendor to confirm
	Bidder's equipment shall be designed for and shall meet the service, performance and minimum level of quality requirements specified. Bidder shall be solely responsible for advising NTPC in writing of any conflicts between the specifications and Bidder's design, including performance and levels of quality. Bidder agrees that its obligations,	

	liabilities and warranties shall not be diminished or extinguished due to its meeting the requirements of the Specification.	

24.DOCUMENTATION

S. No	Description	Vendor to confirm
	Bidder shall submit necessary data, documents , GA drawings (PDF & DWG), sections, sub-assembly drawings, specifications of main and sub components and necessary set of operation & maintenance manual as asked by NTPC must be furnished by bidder in soft copy forms for review. The documents will be in PDF as well as editable form like DOC, XLS, DWG.	

A. DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER:

Sl. No.	Description	Required for Part	Purpose
1.	**Attachment-3K(annexure of Qualification Requirement)**	I	Qualification Requirement (QR)
2.	**Reference plant details of similar or higher capacity mill size supplied**	I	QR
3.	Sign & Seal of bidder on all pages specification	II	Technical evaluation of Bid (TEB)
4.	Deviation list (if any to be submitted by Bidder)	II	TEB
5.	General Arrangement(GA) & Cross section drawing of ball milling system with bill of materials, Material Of Construction(MOC), major assemblies Weights and dimensions (also weight & dimensions of heaviest item in every assembly) for E&C.	II	TEB
6.	Ball Mill System foundation plan and loading details.	II	TEB
7.	PFD of Ball mill system with mass balance.	II	TEB
8.	P & ID diagram of ball mill system.	II	TEB
9.	P & ID diagram of Lube oil system of Support bearing and main reducer.	II	TEB
10.	Filled up Data sheet (Annexure-12) of ball mill and other accessories.	II	TEB
11.	Mill Performance curves.	II	TEB
12.	Operation philosophy and logic of ball mill system.	II	TEB
13.	Ball mill Sizing Calculation & Rotor G-D^2 (kg-m^2), design basis of motor sizing and T-S curve.	II	TEB
14.	Instrumentation list	II	TEB

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15.	Utility list	II	TEB
16.	Electrical Load List	II	TEB
17.	Schedule of Guaranteed power consumption along with breakup.	II	TEB
18.	Make of all bought out items & sub vendor list.	II	TEB
19.	Quality Plans.	II	TEB
20.	List of Start-up & Commissioning to be provided (vendor scope).	II	TEB
21.	List of Special Tools to be provided (vendor scope).	II	TEB
22.	Mill handling procedure and handling scheme with hoist crane requirement.	II	TEB
23.	Overall space & headroom requirement for Ball Mill System	II	TEB
24.	Terminal point details	II	TEB
25.	Catalogue	II	TEB

B. DOCUMENTS TO BE SUBMITTED AFTER CONTRACT:

Sl. No.	Description	Handing Over of Documents after Contract in weeks	Document required for
1.	Wet Ball Mill and Motor Sizing Calculations	1	Customer Approval
2.	Speed Torque Characteristic curve of Mill along following details for motor selection: • *Max Power Absorbed at Mill Output shaft.* • *Motor Rating.* • *Mill Speed (RPM).* • *Motor Speed (RPM).* • *Torque at Max Power Absorbed at Mill Output shaft referred to motor speed.* • *GD^2 referred to Mill Shaft.* • *Motor Starting torque.* • *Maximum axial thrust applied on motor shaft.* • *Inching reducer output speed.* • *Schematic arrangement of Mill drive train.*	1	Customer Approval
3.	Utility Consumption & Lubricating Oil List	2	Customer Approval
4.	Foundation plan and loading details(static and dynamic loads) Drawing, Anchor Bolts, mounting plates static & dynamic details	2	Customer Approval

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5.	Data sheet (data sheet to be furnished as per Annexure-13) & General Arrangement of Wet ball Milling system. Complete filled Datasheet containing performance curves. Performance curves should be provided for Mill Thru-put Vs. Bond Work Index (BWI), Input Limestone Feed size, Specific Energy and Wear Life.	2	Customer Approval
6.	Cross section drawing of ball milling system with bill of materials, Material Of Construction(MOC), major assemblies Weights and dimensions (also weight & dimensions of heaviest item in every assembly) for E&C.	2	Customer Approval
7.	P&ID drawing of Ball Mill & Lube Oil System(support bearing and main reducer) in PDF & AUTOCAD format and operating procedure.	2	Customer Approval
8.	Outline General Arrangement (OGA) of Mill Support Bearings with lube oil piping arrangement, cross sectional drawing of lube oil pumps along with data sheet and type test reports. All instruments and pumps data sheets. Wiring Drawings, Equipment sizing report and line & valve sizing report.	2	Customer Approval
9.	Pinion support Bearing, Coupling (all couplings), Reducer (main and Inching), Clutch and brake Drawings & Details. For reducer lube oil system: cross sectional drawing of lube oil pumps along with data sheet and type test reports. All instruments and pumps data sheets.	4	Customer Approval
10.	Sizing & General Arrangement of Mill circuit Tank	4	Customer Approval
11.	Data Sheet & GA for Mill circuit Pumps for Milling Area	4	Customer Approval
12.	Sizing, data sheet and General arrangement of Hydro-cyclone	4	Customer Approval
13.	Data sheet and drawing of Agitator for Mill Circuit tank. Data Sheet of agitator motor and type test report.	4	Customer Approval
14.	Data Sheet and drawing of gravimetric feeder. VFD and Motor Data Sheet and type test report(as applicable)	4	Customer Approval
15.	Equipment sizing reports	4	Customer Approval
16.	All piping (Slurry, water and instrument air) lines and valves sizing report.	4	Customer Approval
17.	Measurement list (with interlocks)	4	Customer Approval
18.	All Knife gate valves data sheets and drawings.	4	Customer Approval

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19.	Quality Plan with Inspection & Performance Test Procedure at site	4	Customer Approval
20.	Sub vendors List	4	Customer Approval
21.	Manufacturing Schedule	4	Review
22.	All Piping Arrangement Drawings (Water, Slurry & Instrument Air)	8	To verify layout out interference
23.	Special tools list	8	E&C
24.	Start-up & Commissioning Spares	9	E&C
25.	Pre Commissioning Check List	10	E&C
26.	Installation and assembly procedure	10	E&C
27.	Erection drawings and manual	10	E&C
28.	Operation and Maintenance Manual with lubrication schedule	10	E&C
29.	Recommended repair procedure	10	E&C
30.	List of All Motors with GA & Datasheet	10	For Power Supply &F
31.	Local Panel Control Circuit Diagram	10	For Feeder arrangement
32.	Electrical Load List with Single line Diagram	10	For Feeder arrangement
33.	Control philosophy and Logic Of Ball Mill	10	For DCS program
34.	Complete List of Valves	10	Customer Approval
35.	Complete List of Instruments along with Data Sheets	10	Customer Approval
36.	Catalogue	10	Customer Submission
37.	Pro-forma Packing List	12	Dispatch

ANNEXURES LIST

Annexure Sl. No.	Description
1.	Qualification requirement.
2.	Deviation list.
3.	Media Analysis.
4.	P&ID.
5.	Sub-questionnaire for suppliers.
6.	Piping and valves specification.
7.	Motors & JB's.
8.	VFD's.
9.	Instruments.
10.	Packing & forwarding.

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11.	Manufacturing Quality plan.
12.	Technical Data Sheet.
13.	Functional Guarantees and liquidated damages.
14.	Cables.
15.	General Arrangement & Elevation Details of Limestone grinding system.
16.	Indicative vendor list.
17.	Electrical Actuators.

VARIANT TABLE

VAR. No.	DESCRIPTION	MATERIAL CODE	Qty /Project
00	**Lime stone Grinding System**	**BA9789015003**	**2 Sets***
01	**Mandatory spares**	**BA9789015011**	**1 Set#**
02	**Liners**	**BA9789015020**	**3 Sets 2 sets main+1 set spare.**

*** Limestone grinding system scope of supply per set is as per Chapter No.: 07.**
 # Mandatory Spares Lot is as per Chapter No. 15.2.

RECORD OF REVISIONS

REV. No.	DATE	REVISION DETAILS	REVISED	APPROVED
01	20.07.2020	Power consumption revised	Uday	PVS
02	02.07.2021	Sub-QR clarification added in Annexure-1.	PVS	AMAN

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