
TECHNICAL SPECIFICATION

FOR

LIMESTONE GRINDING SYSTEM

CONFIDENTIAL

CUSTOMER : NTPC
PROJECT : DADRI 2 x 490MW
APPLICATION : FLUE GAS DESULPHURIZATION SYSTEM



BHARAT HEAVY ELECTRICALS LIMITED
(A GOVT OF INDIA UNDERTAKING)
Flue Gas Desulphurization Group
Ranipet

	TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM NTPC DADRI 2X490MW
DADRI:FGD:LGS:R01	

TECHNICAL SPECIFICATION FOR LIMESTONE GRINDING SYSTEM

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Document Revision History:

Revision	Date	Status and Description	
01	09.05.2018	Revised Issue	Following changes incorporated a) Cl. No. 25 is revised (O & M Services for 10 Years Operation) b) Cl. No. 26 - deleted c) Valve material specification (Doc. No. Dadri:Valve:001) added
00	12.04.2018	Fresh Issue	General technical specifications



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PART –I

MAIN SUPPLY



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1.0 PROJECT INFORMATION:

a.	Owner	NTPC
b.	Buyer	BHEL, Ranipet
c.	Process/Application	Flue Gas Desulphurization system

A) SITE CONDITIONS

1.	Ambient Temperature and Relative Humidity		
a.	Average Site Condition (ASC)		
	Ambient Temperature	:	27 deg C
	Ambient Temperature (Design)	:	45 deg C
	Relative Humidity	:	60 %

Note:

- 1) Reference 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 AND APPROACH

a.	Country	India
b.	State/Division	Uttar Pradesh
c.	District	Gautam Buddha Nagar

2.0 APPLICABLE CODES & REGULATIONS

The design and materials shall conform to the requirements of applicable codes and regulations of the latest edition. The design, manufacture, installation and testing of the Limestone Grinding System (LGS) shall follow the latest applicable Indian/International (AIS / ASME/EN/Japanese) Standards.

3.0 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 (LGS) along with accessories which is furnished in the Flue Gas Desulphurization plant of DADRI 2 x 490 MW FGDF systems. The following points may be noted.

- a. There are 2 units of each 490 MW and each unit is envisaged with one FGD system. The FGD system will be provided with common Limestone Grinding System (LGS).



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Two (2) streams of Limestone Grinding System (1 working + 1 standby) shall be provided. This Limestone Grinding System (LGS) shall be located inside the Ball Mill Building. Building is in BHEL scope.

- 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 Bidder's proposal under separate section, titled as "List of Deviations/Exceptions to the Enquiry Document (**Annexure-IV**)".
- d. Any deviation, not listed under the above section, even if reflected in any other portion of the proposal, shall not be considered applicable.
- e. No deviation or exception shall be permitted without the written approval of the purchaser.
- f. 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.
- g. 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.
- h. 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.

4.0 PROVENNESS CRITERIA:

The Bidder shall offer only proven design which meets the Provenness criteria indicated in the **Annexure-I**. Necessary document evidences as per **Annexure-3K for qualification** shall be submitted along with the bid. If bidder doesn't meet the specified provenness criteria, they are denied to participate in this tender.

The Bidders are required to meet the Qualification Requirement (QR) for Wet Ball Mill system as per **Annexure-I & submit the Annexure to qualification requirement (Annexure-3K)**



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5.0 TECHNICAL INFORMATION

S.No.	Description	Requirement
1.	Quantity	
	Quantity of Limestone Grinding system	2 streams (1 working + 1 standby)
2.	Parameters	
	Wet Ball Mill Design capacity	19.4 TPH
	Medium to be handled	Limestone
	Limestone Analysis	Refer Clause 5.1
	Type of WBM system	Horizontal
	Duty	Continuous
	Location	Inside Building

5.1 LIMESTONE ANALYSIS/CHARACTERISTICS

LIMESTONE CHARACTERISTICS:

Chemical Analysis(% by mass)			
1.	CaO	%	47-51.0*
2.	MgO	%	0.9-2.0
3.	Fe ₂ O ₃	%	0.45-1.0
4.	Al ₂ O ₃	%	1.19-2.1
5.	SiO ₂	%	2.1-4.5
6.	Mn ₂ O ₃	%	<0.12
7.	P ₂ O ₅	%	Traces
8.	Cl ₂	%	<0.015
9.	Na ₂ O	%	<0.16
10.	K ₂ O	%	<0.01
11.	TiO ₂	%	<0.02
12.	Total Sulphur	%	<0.1
13.	LOI	%	39.0-41.3
	Not used		
Physical properties			
1	Bond Index	kWh/sh.T	13
2	Granule size		Medium



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5.2 WATER ANALYSIS

Process water (CW blowdown water) is to be used during the grinding process of limestone in Wet Ball Mill (WBM). Process water analysis is provided below.

S.No	Constituents	Unit	Water quality
1.	Total Dissolved Solids	ppm	~2110
2.	Calcium as CaCO ₃	ppm	721
3.	Magnesium as CaCO ₃	ppm	286
4.	Sodium as CaCO ₃	ppm	358
5.	Potassium as CaCO ₃	ppm	
6.	Iron as Fe	ppm	1.7
7.	Fluoride as F	ppm	0.11
8.	Bicarbonate as CaCO ₃	ppm	688
9.	Chlorides as CaCO ₃	ppm	168
10.	Sulphate as CaCO ₃	ppm	512
11.	Nitrate as NO ₃	ppm	0.55
12.	Silica	ppm	121
13.	pH		7.0 – 8.2
14.	Turbidity	NTU	55

5.3 WET BALL MILL SYSTEM - PROCESS DESCRIPTION

Limestone grinding system shall be designed to produce limestone slurry for continuous FGD operation. Employer envisages 2 streams (1 working + 1 standby) of common Limestone Grinding system for both the FGD units. Each stream shall be capable of independent operation.

Grinding of limestone

Limestone is fed by gravimetric feeder from limestone silo to wet ball mill. The limestone slurry from wet ball mill shall be discharged to mill overflow tank. Grinding water for the limestone ball mill shall be ratio controlled by the signal of gravimetric feeder to maintain specified solid content at outlet of mill hydro cyclone. Limestone slurry from mill overflow tank is pumped via mill circuit pump to hydro cyclone for classification.

Distribution of hydro cyclone overflow and underflow

Distribution of hydro cyclone overflow and underflow will be made by distribution (splitter) box provided under the hydro cyclone. In normal operation, hydro cyclone overflow will be sent to limestone slurry feed tank (A or B) and underflow return to inlet of ball mill. And at recirculation mode, both of the overflow and underflow will be returned to mill overflow tank.

The change of operation mode as summarized shall be established with pneumatic actuated valve or flap by remote signal.



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Limestone grindings system shall comprise of:

- i. 2 nos. of Limestone silo shut off gates
- ii. 2 nos. of Gravimetric Feeders
- iii. 2 nos. of wet horizontal ball mills
- iv. Each mill shall be fed from an independent Limestone bunker (bunker in BHEL scope). Each mill shall be complete with the following items, as a minimum requirement:
 - a. A bunker outlet gate
 - b. A gravimetric limestone feeder along with its drive and all other auxiliaries
 - c. 1 no. separator tank with agitator(s).
 - d. 2x100% Mill circuit pump.
 - e. 1 set of hydro-cyclone
 - f. 1 set of distribution box
 - g. A peripheral/central drive system with motor, speed reducer gearbox and other auxiliaries.
 - h. An auxiliary motor for inching operation with speed reducer.
 - i. Complete lubricating system with appropriate lubricating medium storage facility (i.e. 1 no. lube oil tank for storage of lube oil and/or 1 no. grease storage drum as required).
 - j. Lube oil pumps, coolers, duplex oil filters, connecting piping and necessary load & remote indicating instruments. Each lube oil pump and cooler shall have a 100% identical stand-by.
- v. All connecting pipes / chutes along with necessary valves between various systems of the mill and from hydro-cyclone to common slurry storage tanks shall also be in the scope of the contractor. Necessary pipes, pipe supports, trestles etc. as required for the routing of the pipes shall be under the contractor's scope. Any item not included above but necessary for safe and reliable operation of the milling system proposed by the contractor shall also be in the contractors' scope.

6.0 SCOPE OF SUPPLY

Scope for the bidders shall include Design, Engineering, Manufacturing, Packing, Supply, Supervision of Erection & Commissioning, Performance Guarantee Test and handing over of final Customer (NTPC).

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.

Supply: Includes manufacturing/fabrication, shop floor testing, stage inspections, final inspections, painting & packing.



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Supervision of Erection & commissioning: Includes supervision of erection & commissioning, supervision of trial operation, PG test, training of customer's O&M Personnel and handing over to customer.

The scope of supply for **Limestone Grinding** system (LGS) shall include but not limited to the following:

S. No.	Item Description	Qty
1.	Limestone Storage Silo Shut-off Gate with chute	2 set
2.	Gravimetric limestone feeder along with its drive and all other auxiliaries	2 set
3.	Wet Ball Mill	2 set
4.	Mill Separator tank	2 set
5.	Mill Separator tank agitator(s)	2 set
6.	Mill circuit pumps with motor	4 set
7.	Distributor Box	2 set
8.	Mill Hydro-cyclone with complete accessories	2 set
9.	Peripheral drive system with motor, speed reducer gear box and other auxiliaries	2 set
10.	Auxiliary motor for inching operation with speed reducer	2 set
11.	Complete lubrication system with lube oil tank	2 set
12.	Lube oil pumps, coolers, duplex oil filters, connecting piping and necessary load & remote indicating instruments. Each lube oil pump and cooler shall have a 100% identical stand-by pump	2 set
13.	Complete interconnecting pipes / chutes along with necessary valves between various systems of the mill and from hydro-cyclone to common slurry storage tanks including companion flanges with gaskets and fasteners	2 set
14.	Base frames wherever applicable (including HT Motor base frame)	2 set
15.	Complete erection and assembly drawings	4 sets
16.	One complete set of instruments required for the LGS	1 set



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17.	Cabling and wiring from local instrument to JB	1 set
18.	Initial ball charge	2 set
19.	Local Control Panel	1 set
20.	All LT Motor	1 set
21.	Foundation bolts	1 set
22.	Factory test	1 set
23.	Supervision of erection / commissioning	1 set
24.	Start-up & Commissioning spares	1 set
25.	Special tools & Tackles if appl	1 set
26.	Painting and Rust Prevention during shipment and construction	1 set
27.	Seaworthy Packing & Forwarding to Project Site office	1 set

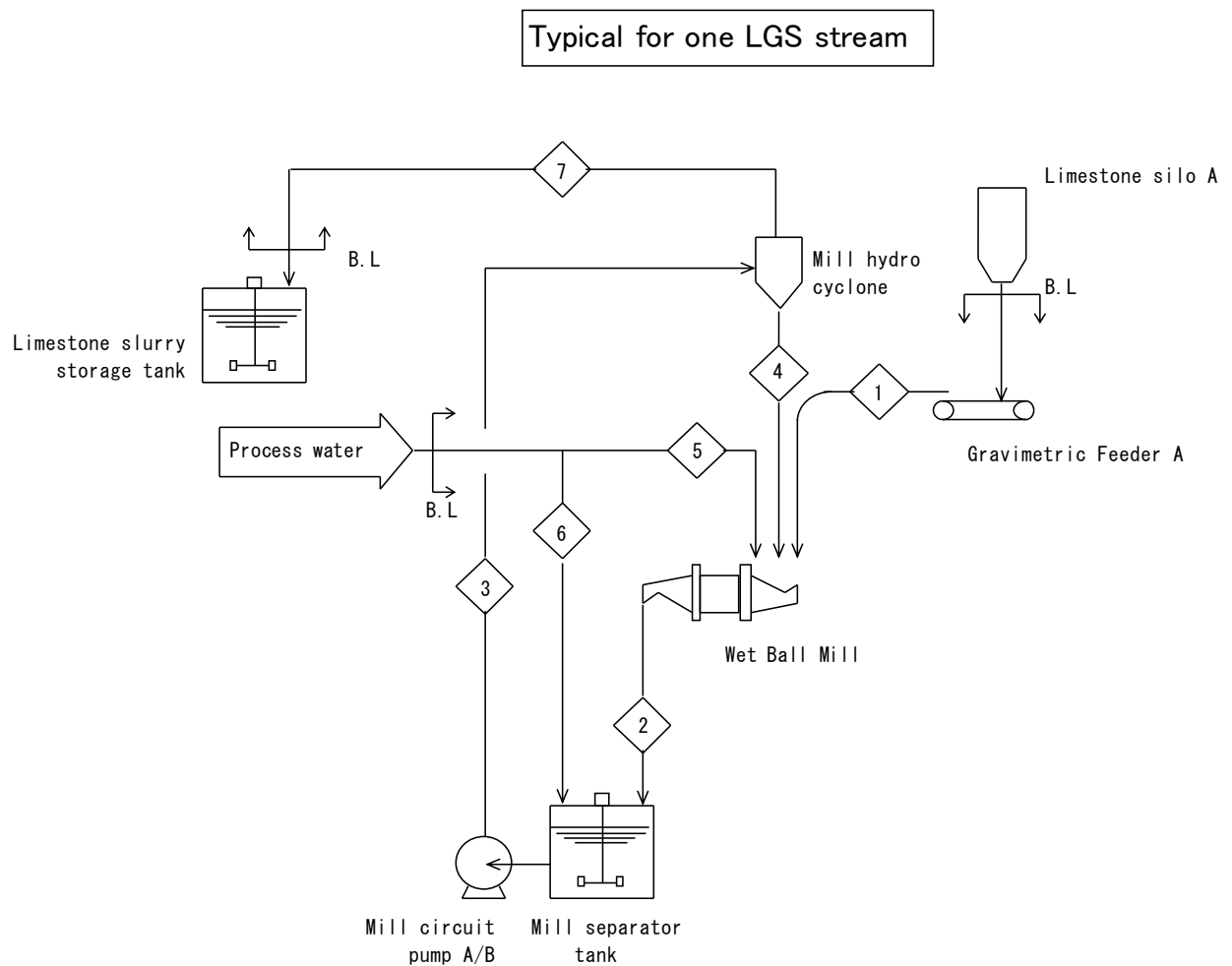


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6.1 PROCESS PARAMETERS:

6.1.1 PROCESS FLOW DIAGRAM WITH SCOPE DEMARCATION





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6.1.2 PROCESS DATA

Stream no	<1>	<2>	<3>	<4>	<5>	<6>	<7>
Fluid	Lump limestone	Limestone ball mill over flow	Hydro cyclone feed	Hydro cyclone underflow return	Process water to ball mill	Process water to mill tank	Limestone product slurry
Total flow m ³ /h	-						
Total flow kg/h	19400						
Temp °C	45	*1)			45	45	
Solid wt. %	100				0	0	30
Solid comp wt. % CaSO ₄ .2H ₂ O CaCO ₃ Fly ash Other Total	As per cl. no. 5.1				-	-	As per cl. no. 5.1
pH	--				7.0 – 8.2	7.0 – 8.2	
Cl ⁻ mg/l as CaCO ₃	--				168	168	

Note:

*1) Vendor shall consider additional heat generated by friction of balls inside mill and propose temperature.

Blank cells shall be filled by vendor

6.1.3 TERMINAL POINTS

- Bidder's scope starts from limestone silo outlet. Limestone silo will be in BHEL scope. Necessary chute between silo outlet and gravimetric feeder is in bidder's scope.
- Process water for limestone grinding will be provided at one location near wet ball mill building. Further piping from terminal point to LGS system are in bidder's scope.
- Limestone product slurry shall be terminated by bidder at the inlet of limestone slurry storage tank. Limestone slurry storage tank in BHEL scope.
- Cooling water for LGS equipment cooling will be provided at one location near wet ball mill building. Further piping from terminal point to LGS system are in bidder's scope and return line for equipment cooling shall be terminated by bidder at one location near plant boundary.
- Service & instrument air will be provided at one location near wet ball mill building. Further piping from terminal point to LGS system utilities are in bidder's scope.



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7.0 GENERAL REQUIREMENTS:

S.No.	Description
1.	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.
2.	Descriptions in the drawings, in the documents, and in the displays shall be in English
3.	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.
4.	The equipment shall be designed to withstand the corrosive and moist environment in which these are proposed to operate.
5.	Noise level produced by any rotating equipment individually or collectively shall not exceed 90 dB 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.
6.	The overall vibration level shall be as per ISO 10816.
7.	Suitable drain connections shall be provided.
8.	The equipment shall be suitable for stable operation continuously.
9.	Suppliers shall suitable specify their delivery schedule along with the offer and Standard code specified shall be strictly adhered.
10.	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
11.	Supplier shall provide the loading of item and other factors which shall be required for effective civil construction.
12.	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
13.	CHUTES: Minimum clear cross section of chute: 600 mm x 500 mm (inside both ways). Minimum clear cross section of Discharge debris chute: 500mm X 500mm (inside both ways)
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



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S.No.	Description
	layout for the equipment. The bidder shall provide the header piping for LGS 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.
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.



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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.	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.
31.	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, global standard and global references.
32.	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 Attachment-XX-Sub-Supplier Questionnaire .
33.	It shall be the complete responsibility of the successful bidders to obtain "Sub Vendor Approval" from BHEL / NTPC for all equipments & 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.
34.	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 e. Calibration certificate for all the measuring instruments



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	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.
35.	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.
36.	During detail engineering, bidder to strictly adhere to BHEL/NTPC drawing formats, document numbering, quality plan & FQP formats
37.	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.
38.	Complete detail engineering drawings, calculations, selection of components etc. shall be reviewed & subject to approval of BHEL/NTPC during detail engineering
39.	Bidder shall furnish necessary inputs & drawings of all equipment in editable Auto CAD/ MS-Word /Excel format.
40.	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.
41.	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.
42.	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"
8.0	DESIGN AND CONSTRUCTION
8.1	CHUTE
a.	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 Limestone without any accumulation anywhere.
b.	Chutes shall be made of minimum 20 mm thick TISCRA / SAILHARD/ LSLAS07 or equivalent 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



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S.No.	Description
	doors labyrinth type arrangement to be provided.
c.	Complete chute work in the region of flap gates shall be fabricated from 20 thk TISCRAI or equivalent. In case of vertical chute (valley angle more than 80 degree) complete chute, work shall be of 20 mm thick TISCRAI 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.
8.1.1	CHUTE BLOCKAGE SWITCHES
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.
8.2	SILO SHUT OFF GATE VALVE
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 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
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.
8.3	GRAVIMETRIC FEEDER
a.	Gravimetric feeders shall be sized to 21.35 TPH .
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'.



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S.No.	Description		
e.	The feeder shall have a motor/pneumatic operated gate at the outlet		
8.4	WET BALL MILL		
a.	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.		
	i.	Design capacity	19.4 Tonnes Per Hour (TPH) dry
	ii.	Input Limestone Size	1" (max.)
	iii.	Product Size	30 wt% slurry with output Fineness of 90% or higher through 325 mesh
	iv.	Mill Wear Part Conditions	Near Guaranteed Wear Part Life.
	v.	Ball consumption per ton of limestone throughput	700 g/Ton (Max.)
	vi.	Limestone bond index	13 (min) kWh/sh.T)
	vii.	Limestone analysis	As per cl. no. 5.1
b.	The milling system shall be designed to withstand for daily stop and daily start operation.		
c.	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.		
d.	All parts of the mill including mill body, 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.		
e.	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 contractor shall also guarantee ball consumption per ton of limestone throughput. The contractor shall furnish the minimum ball diameter below which the balls shall be replaced.		
f.	Facility shall be provided for on-load loading of steel balls to the mill.		
g.	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.		
h.	The lube oil system shall have 100% stand-by arrangement for lube oil pumps and oil		



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S.No.	Description
	coolers of each circuit with independent pump / cooler and tank. Wherever required duplex oil filters shall be provided.
i.	The mill auxiliaries like separator tanks, mill circuit pump, hydro-cyclones and all connecting pipes handling limestone slurry shall have replaceable rubber linings.
j.	Local control panel shall have display on the front panel and necessary electrical parts.
k.	The service factor of the gear unit (if any) shall be minimum 1.5.
l.	Piping and wiring within the skid should be in the vendor's scope.
m.	Nozzles and connections The suction and discharge pipes will be flanged and will have the same nominal test procedure as the body of the pump. Threaded connections are not admitted in these pipes.
n.	The flanges shall comply with the following standards: - Steel flanges as per ANSI B16.5 (raised face type, at least class 150) - Cast iron flanges as per ANSI 16.1 (flat face type, at least class 125) - The pipe shall be designed according to API676 with regards to the force.
8.5	MILL CIRCUIT PUMPS
a.	Quantity: 2 No's (1w + 1s) for each Wet Ball Mill (Total 4 numbers)
b.	Margins: Flow 10% (minimum) Head 15% (minimum)
c.	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.
d.	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.
e.	The slurry concentration in the pump shall not exceed 55% by weight.
f.	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 from the process water supply
g.	In case of pump with rubber lined casing, the casing should be radially split to allow easy removal of impeller.
h.	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



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S.No.	Description
	applications. The material used by the contractor shall be proven in previous installations.
i.	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.
j.	The design of the shaft shall ensure that the operating speed is at least 20% above the critical speed of the shaft.
k.	The pump shall be provided with seals of proven type and shall be designed for minimization of seal water consumption. The shaft shall be supported on heavy duty ball/roller bearings.
l.	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 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



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S.No.	Description
	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 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. Necessary provision for seal water supply along with complete piping fittings and valves as required shall form integral part of pump supply.
	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.
8.6	AGITATOR
a.	Agitators shall be supplied in tanks and vessels to prevent caking and settlement of particles out of the slurry.
b.	The design of the agitators shall be of proven type.



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S.No.	Description
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.	Agitator blades shall be made with Alloy 926 or better material & shaft can be rubber lined. This does not release the Contractor of the responsibility for selecting the correct materials.
f.	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.
g.	To prevent mechanical blocking load start-up after standstill of pumps, piping and agitators for slurries shall be applied with C-hose connection.
h.	Lifting lugs and eyes and other special tackle shall be provided as necessary to permit easy handling of the agitators and their components.
i.	Static and dynamic (as far as applicable) balancing of all agitators shall be carried out after assembly.
j.	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.
k.	All exposed moving parts shall be covered by guards.
l.	Side entry agitator shall be flange mounted.
m.	The shape of the impeller blades of side 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.
n.	Belt drives (if applied) shall be properly designed to provide a minimum lifetime of 2 years under design conditions.
8.7	MILL CIRCUIT TANK
a.	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



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S.No.	Description						
b.	Tanks shall be made from IS:2062 quality mild steel plates of tested quality. The tanks shall be of welded construction.						
c.	Interior surface of the tanks shall lined with replaceable chlorobuty/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.						
8.8	HYDROCYCLONE						
a.	Quantity: 2 No's. 1 no. for each Wet Ball Mill						
b.	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 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.						
c.	The mill hydro-cyclone set shall have sufficient redundancy. A minimum 10% spare hydro-cyclone shall be provided in each set of hydrocyclone.						
8.9	PIPING / VALVE						
a.	The limestone slurry pipes shall be sized to minimize erosion and avoid settling of the limestone at all operating condition. 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.						
b.	All the pipes handling slurry shall be provided with replaceable rubber lining of proven quality. The slurry pipes shall be lined with replaceable wear resistant natural rubber lining of minimum 6 mm thickness. Additional thickness of 2 mm in rubber lining shall be provided at bends. The Supplier can provide slurry pipes of size lower than 3" made up of FRP material. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Piping</th><th>MOC</th></tr> </thead> <tbody> <tr> <td>Water line</td><td>Carbon steel</td></tr> <tr> <td>Slurry line</td><td>Carbon steel with rubber lining</td></tr> </tbody> </table>	Piping	MOC	Water line	Carbon steel	Slurry line	Carbon steel with rubber lining
Piping	MOC						
Water line	Carbon steel						
Slurry line	Carbon steel with rubber lining						
c.	The isolation valves provided in all the slurry lines shall be of knife gate type/butterfly						



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S.No.	Description
	type. Motorized actuators shall be provided for valves requiring frequent operation as indicated in the relevant scheme.
d.	The valves shall be of proven type and the supplier shall submit a detailed valve schedule for employer's approval. Reference list for previous installations for similar application shall also be furnished to the employer
e.	The isolation valves shall be of knife gate type with rubber seats designed to prevent accumulation of solids on the valve seat.
f.	Supplier shall provide all necessary arrangements for purging & flushing of all the process pipelines, equipments etc.



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8.10 Motor

8.10.1 General

This specification generally covers the requirement for motors involved in limestone grinding system package.

8.10.2 Voltage level:

The voltage level for motors shall be as follows:

S.No.	Rating	Voltage	Frequency and voltage variation
1	Up to 0.2 kw	Single phase 240V AC / Three phase 415V AC	1. 50 Hz- +3% & -5 % 2. 10% combined variation of voltage & frequency.
2	Above 0.2 and up to 200 kw	Three phase 415V AC	

8.10.3 Starting voltage requirement

- Up to 85% of rated voltage for ratings below 110 KW
- Up to 80% of rated voltage for ratings from 110 KW to 200 KW

- Voltage rating for special purpose motors viz. VFD shall be as per manufacturer's standard.

8.10.4 Degree of protection:

S.NO	Item	Indoor	Outdoor
1	Motors	IP 54	IP 55
2	Cable box	IP 54	IP 55

8.10.5 Efficiency class:

Premium efficiency IE3 (For Continuous duty motors up to 200 kw) as per IS 12615, IEC:60034-30

8.10.6 General requirements:

S.No	Parameters	To be confirmed by vendor	Vendor's confirmation
1	Direction of rotation	Suitable for both directions	
2	Class of Insulation	Thermal class 155 (F) insulation	
3	Winding Insulation	The winding insulation process shall be Global Vacuum Pressure Impregnated i.e.	



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		resin poor method		
4	Starting Current	1. Less than or equal to 600 % full load current subject to tolerance as per IS (Normal motor) 2. Less than or equal to 700 % full load current subject to tolerance as per IS (Normal motor)		
5	Starting Voltage	1. Up to 85% of rated voltage for ratings below 110 KW 2. Up to 80% of rated voltage for ratings from 110 KW to 200 KW		
6	Torque requirement	1. Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque. 2. Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.		
7	Type of enclosure	1. Motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tubeventilated (TETV) or Closed air circuit air cooled (CACA) type. 2. VFD driven motors to be offered with forced cooling type with machine mounted fan or pump driven by separate electric motor.		
8	Dimensions of Terminal box for LV motors	Motor MCR	Distance between centre of stud & gland plate (In mm)	
		a. Upto 3 Kw b. Above 3 kw to 7 kw c. Above 7 kw to 13 kw d. Above 13 kw to 24kw e. Above 24 kw to 37kw f. Above 37 kw to 55kw g. Above 55 kw to 90kw	As per manufacturer's practice 85 115 167 196 249 277	
9	Cable glands & Lugs	Double compression type Nickel plated brass cable gland & insulated tinned copper crimping lugs to suit the cable sizes		
10	Paint shade	RAL 5012 (Blue)		
11	Space heaters	Suitable single phase space heaters shall be provided on motors rated 30KW and above. Separate terminal box for space heaters shall be provided		



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8.10.7 Locked rotor withstand time

S.No	Starting time at min permissible voltage	Locked rotor withstand time
1	Upto 20 secs	Under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time
2	More than 20 sec & less than 45 sec	Under hot condition at highest voltage limit shall be at least 5 secs. more than starting time
3	More than 45 sec's	under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time

8.10.8 Special Requirement:

Motor operating through variable frequency drives shall be suitable for inverter duty. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable

8.10.9 Torque Requirements

- Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.
- Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.

8.10.10 Scope Matrix

MOTOR RATING	SCOPE
200 kW or less	BIDDER's SCOPE
Above 200 kW	BHEL SCOPE



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8.11 JUNCTION BOX

8.11.1 GENERAL

This specification generally covers the requirement for Junction boxes involved in limestone grinding system package. The requirements are only indicative. If any additional facility to be provided for satisfactory operation, the same shall be provided by bidder.

8.11.2 DESIGN AND CONSTRUCTIONAL FEATURES

8.11.2.1 JUNCTION BOX:

- JB shall be of Thermoplastic or thermosetting or FRP type.
- The box shall be provided with the terminal blocks, mounting bracket and screws etc.
- The cable entry shall be through galvanized steel conduits of suitable diameter.
- The JB shall be suitable for installing glands of suitable size on the bottom of the box. The JB shall be suitable for surface mounting on ceiling/structures.
- The JB shall be of grey colour RAL 7035. All the metal parts shall be corrosion protected.
- JB's will be provided with captive screws so that screws don't fall off when cover is opened
- JB's mounting brackets should be of powder coated MS.
- Class of protection shall be IP 55.

8.11.2.2 TERMINAL BLOCK

- Terminal blocks shall be 1100V grade, of suitable current rating, made up of unbreakable polyamide 6.6 grade
- The terminals shall be screw type or screw-less (spring loaded) / cage clamp type with lugs.
- All terminal blocks shall be suitable for terminating on each side the required cables/wire size.
- All internal wiring shall be of cu. Conductor PVC wire.



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8.12 INSTRUMENTS

8.12.1 General:

This section covers the specification for instruments involved in limestone grinding system.

Instruments as per attached list (Section 8.12.7) shall be minimum. Instruments that are required for satisfactory operation of the system though not indicated in the list shall also be supplied.

8.12.2 INSTRUMENTS:

8.12.2.1 General:

All transmitters, sensors, switches and gauges for parameters like pressure, level, flow etc. as required for the safe and efficient operation and maintenance of equipment in the system under the scope of specification shall be provided on as required basis.

8.12.2.2 Instrumentation valves:

The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis.

8.12.2.3 The contacts of equipment mounted instruments, sensors, switches etc. for external connection including spare contacts shall be wired out in flexible/rigid conduits, independently to suitably located common junction boxes. The necessary cables, flexible conduits, junction boxes and accessories for the above purpose shall also be supplied. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg./sq.cm.

8.12.3 SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF PRESS AND DP BASED FLOW / LEVEL MEASUREMENTS

Minimum technical requirements shall be as follows: -

8.12.3.1 Microprocessor based 2 wire loop powered electronic transmitter with 4-20 mA DC HART output signal shall be provided.

8.12.3.2 For calibration ranges greater than or equal to 400mmwc, **accuracy** of transmitter shall be ± 0.060 % of calibrated range(min), **stability** 0.25 % of calibrated range for 10 years and 50:1 **turn down**. For calibration ranges less than 400mmwc accuracy shall be ± 0.10 % of calibrated range (min) and 20:1 turndown.



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8.12.3.3 Overpressure rating of transmitter shall be 150% of maximum operating pressure.

8.12.3.4 Transmitter shall have **weather** proof IP-67 metallic housing with durable corrosion resistant coating, integral digital display with self-indicating diagnostics, plug and socket type electrical connection, calibration using HART calibrator, 2/3/5 Valve non integral manifold and rack with canopy.

8.12.4 ULTRASONIC TYPE LEVEL TRANSMITTER, RADAR TYPE LEVEL TRANSMITTER

Minimum technical requirements shall be as follows: -

8.12.4.1 Microprocessor based 2 wire type, HART protocol compatible, output signal 4-20mA along with superimposed digital signal (based on HART protocol)

8.12.4.2 Accuracy $\pm 0.5\%$ of calibrated span or minimum 5 mm, Load impedance 500 Ohm (minimum)

8.12.4.3 Weather proof IP-65 metallic housing with durable corrosion resistant coating

8.12.4.4 Plug in socket type electrical connection, zero & span adjustment- temper proof remote as well as local from instrument, integral digital display and self-indicating type diagnostic features

8.12.4.5 Power supply 24V DC $\pm 10\%$, calibration using hand held HART calibrator, temperature compensation built in the instrument (applicable for ultrasonic type only),

8.12.4.6 It should be possible to calibrate the instrument without any level in the tank/sump etc. All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations.

8.12.4.7 In case of Guided wave radar (GWR) type level transmitters coaxial probe of SS316L shall be provided. However, Rod probe, cable probe of SS316L can be used for applications wherever coaxial probe is not suitable.

8.12.4.8 External cage and other mounting accessories shall be provided where ever side mounting is required. Where ever top mounting is required, all mounting accessories, stilling well (as required) etc., shall be provided by the contractor.



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8.12.4.9 Four wire type transmitters can be provided for applications where 2- wire transmitter has some technical limitations. However, in such cases isolated 4-20 mA DC (analog) output shall be provided.

8.12.4.10 Power supply required for such transmitters shall be 24V DC.

For applications where transmitter location is not accessible, the transmitter shall have separate sensor unit and electronic unit for such applications. It shall be possible to mount the electronic unit at accessible location.

8.12.4.11 Sonic frequency based transmitters can also be provided under “ultrasonic transmitters” category for powdery medium

8.12.5 SPECIFICATION FOR CORIOLIS FLOW TRANSMITTER

Minimum technical requirements shall be as follows: -

8.12.5.1 Microprocessor based, HART protocol compatible, output signal 4-20mA along with superimposed digital signal (based on HART protocol), accuracy $\pm 0.2\%$ of rate, repeatability $\pm 0.1\%$ of rate, material of wetted parts SS316, material of housing SS304L, weather proof.

8.12.5.2 Degree of protection shall be IP-65, Load impedance 500 Ohm (minimum), zero & span adjustment- temper proof remote as well as local from instrument, integral digital display, calibration using hand held HART calibrator.

8.12.6 LOCAL INSTRUMENT ENCLOSURE & LOCAL INSTRUMENT RACK:

All transmitters, switches, etc. for limestone grinding system and sub system being provided under the contract shall be suitably grouped together and mounted inside (i) local instruments enclosures in case of open areas of the plant and (ii) In local instrument racks in case of covered areas.



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8.12.7 LIST OF INSTRUMENTS:

GRAVIMETRIC FEEDER	SPEED TRANSMITTER
GRAVIMETRIC FEEDER	WEIGHT TRANSMITTER
PROCESS WATER TO MILL SEPARATOR TANK	FLOW TRANSMITTER(MAGNETIC FLOW METER)
PROCESS WATER TO MILL SEPARATOR TANK	CONTROL VALVE (MOTOR)
PROCESS WATER TO WET LIMESTONE GRINDING MILL	FLOW TRANSMITTER (MAGNETIC FLOW METER)
PROCESS WATER TO MILL SEPARATOR TANK	CONTROL VALVE (MOTOR)
MILL SEPARATOR TANK	LEVEL TRANSMITTER (ULTRASONIC TYPE)
MILL CIRCUIT PUMP DISCHARGE	PRESSURE GAUGE (DIAPHRAGM)
MILL CIRCUIT PUMP DISCHARGE	PRESSURE GAUGE (DIAPHRAGM)
MILL HYDRO-CYCLONE	PRESSURE GAUGE (DIAPHRAGM)
MILL CIRCUIT PUMP SUCTION	ON-OFF VALVE (MOTOR)
MILL CIRCUIT PUMP SUCTION	LIMIT SWITCH
MILL CIRCUIT PUMP SUCTION	ON-OFF VALVE (MOTOR)
MILL CIRCUIT PUMP SUCTION	LIMIT SWITCH
MILL CIRCUIT PUMP DISCHARGE	ON-OFF VALVE (MOTOR)
MILL CIRCUIT PUMP DISCHARGE	LIMIT SWITCH
MILL CIRCUIT PUMP DISCHARGE	ON-OFF VALVE (MOTOR)
MILL CIRCUIT PUMP DISCHARGE	LIMIT SWITCH
MILL CIRCUIT PUMP SUCTION DRAIN	ON-OFF VALVE (MOTOR)
MILL CIRCUIT PUMP SUCTION DRAIN	LIMIT SWITCH
MILL CIRCUIT PUMP SUCTION DRAIN	ON-OFF VALVE (MOTOR)
MILL CIRCUIT PUMP SUCTION DRAIN	LIMIT SWITCH
PROCESS WATER TO MILL CIRCUIT PUMP DISCHARGE	ON-OFF VALVE (MOTOR)
PROCESS WATER TO MILL CIRCUIT PUMP DISCHARGE	LIMIT SWITCH
PROCESS WATER TO MILL CIRCUIT PUMP DISCHARGE	ON-OFF VALVE (MOTOR)
PROCESS WATER TO MILL CIRCUIT PUMP DISCHARGE	LIMIT SWITCH
STREAM CHANGE VALVE FOR LIME SLURRY FROM MILL HYDRO-CYCLONE	LIMIT SWITCH
STREAM CHANGE VALVE FOR LIME SLURRY FROM MILL HYDRO-CYCLONE	SOLENOID VALVE
WET LIMESTONE GRINDING MILL CLUTCH CONTROL SYSTEM	CONTROL DEVICE



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8.13 CONTROL CABLE

1.1 KV Grade Control Cables shall have stranded copper conductor and shall be multicore PVC insulated, PVC inner sheathed, armoured / unarmoured, FRLS PVC outer sheathed conforming to IS: 1554. (Part-I).

Cable selection & Sizing:

Control cables shall be sized based on the following considerations:

- (a) The minimum conductor cross-section shall be 1.5 sq.mm.
- (b) The minimum number of spare cores in control cables shall be as follows:

No of cores in cable	Min No of spare cores
2C,3C	NIL
5C	1
7C, 12C	2
14C	3

8.14 INSTRUMENTATION CABLE

General:

This section covers the specification for instrumentation cables involved in limestone grinding system.

Instrumentation cable required for the limestone grinding system shall be supplied till the terminal of the local junction box. Termination of the cables in junction box shall also be in vendor's scope.



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SPECIFICATION OF INSTRUMENTATION CABLE

Common Requirements

S. No.	Property	Requirement
1	Operating Voltage	225 V (peak value)
2.	Codes and standard	All instrumentation cables shall comply with VDE 0815, VDE 0207, Part 4, Part 5, Part 6, VDE 0816, VDE 0472, SEN 4241475, ANSI MC 96.1, IEC 60584, IS-8784, IS-10810 (latest editions) and their amendments read along with this specification.
3.	Continuous operation suitability	At 205 Deg C for Type-C cables & heat resistant cables, at 70 Deg C for all other type of cables.
4.	Marking :-	a. <i>Progressive automatic on-line sequential marking of length in meters to be provided at every one meter on outer sheath.</i> b. Marking to read 'FRLS' to be provided at every 5 meters on outer sheath except for Type-C cable c. Durable marking at intervals not exceeding 625 mm shall include manufacturer's name, insulation material, conductor's size, number of pairs, voltage rating, type of cable, year of manufacturer to be provided on outer sheath.
5.	Allowable Tolerance on overall diameter	+/- 2 mm (maximum) over the declared value in data sheet
6.	Variation in diameter	Not more than 1.0 mm throughout the length of cable.
7.	Ovality at any cross-section	Not more than 1.0 mm
8.	Color	The outer sheath shall be of blue color except for KX & SX extension cables. For KX & SX extension cables color of outer sheath shall be as per ANSI MC 96.1/ IEC 60584.
9.	Others	Repaired cables shall not be acceptable.



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Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	
A. CONDUCTORS				
Cross section area	0.5 sq. mm			
Conductor material	Type KX as per ANSI MC 96.1/ IEC 60584	Type SX as per ANSI MC 96.1/ IEC 60584	Annealed bare copper	
Colour code	As per ANSI MC 96.1/ IEC 60584	As per ANSI MC 96.1/ IEC 60584	As per VDE-815	
Conductor Grade	As per ANSI MC 96.1 / IEC 60584		Electrolytic	
No & dia of strands	7x0.3 mm (nom)			
No. of Pairs	2	2	2/4/8/12/16/24/48	
Max. conductor loop resistance per Km (in ohm) at 20 deg. C	As per ANSI MC 96.1		73.4	
Reference Standard	As per ANSI MC 96.1/ IEC 60584		VDE : 0815	
B. INSULATION				
Material	Extruded PVC type YI 3			
Thickness in mm (Min/Max)	0.25/0.35			
Volume Resistivity (Min) in ohm-cm	1 x 10 ¹⁴ at 20 deg. C & 1x10 ¹¹ at 70 deg. C.			
C. PAIRING & TWISTING				
Max. lay of pairs (mm)	50			
Single layer of binder tape on each pair provided	Each core printed with number or Numbered binder tape to be provided on each pair		Yes	
Bunch (Unit Formation) for more than 4P	N.A		To be provided	
Conductor /pair identification as per	N.A.		To be provided	



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Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	
VDE0815				
D. SHIELDING				
Type of shielding	Al-Mylar tape			
Individual pair shielding	No		To be provided for F-type cable	
Minimum thickness of Individual pair shielding	No		0.028mm (28 micron)	
Overall cable assembly shielding	To be provided			
Minimum thickness of Overall cable assembly shielding	0.055 mm (55 micron)			
Coverage / Overlapping	100% / 20%			
Drain wire provided for individual shield	N.A.		Yes (for F-type) Size- 0.5 sqmm No of strands-7 Dia of strands- 0.3mm Annealed Tin coated copper	
Drain wire provided for overall shield	Yes, Size- 0.5 sqmm, No of strands-7, Dia of strands- 0.3mm, Annealed Tin coated copper			
E. FILLERS (if applicable)				
Non-hygroscopic, flame retardant	To be provided			
F. OUTER SHEATH				
Material	Extruded PVC compound YM1 with FRLS properties			
Minimum Thickness at any point	1.8 mm			
Nominal Thickness at any point	>1.8 mm			
Resistant to water, fungus, termite & rodent attack	Required			



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Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	
Minimum Oxygen index as per ASTM-D-2863	29 %			
Minimum Temperature index as per ASTM-D-2863	250 deg.C			.
Maximum Acid gas generation by weight as per IEC-60754-1	20%			.
Maximum Smoke Density Rating as per ASTM-D-2843	60% (defined as the average area under the curve when the results of smoke density test plotted on a curve indicating light absorption vs. time as per ASTM-D-2843)			
Reference standard	VDE207 Part 5,VDE-816			
G. Electrical Parameters				
Mutual Capacitance Between Conductors At 0.8 KHz (Max.)	200 nF/km		120 nF/km for F type and 100 nF/km for G-type	
Insulation Resistance (Min.)	100 M Ohm/Km			
Cross Talk Figure (Min.) At 0.8 KHz	60 dB		60 dB	
Characteristic Impedance (Max) At 1 KHz	N.A.		320 OHM FOR F-TYPE 340 OHM FOR G-TYPE	.
Attenuation Figure At 1 KHz (Max)	N.A.		1.2 db/km	
H. COMPLETE CABLE				
Complete Cable assembly	Shall pass Swedish Chimney test as per SEN-SS 4241475 class F3.			



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9.0	PACKING AND FORWARDING
1.	Proper packing to be ensured. Indigenous Supply: LGS & sub system assembly shall be wrapped in polythene bags & packed in a strong rigid wooden crate. Rain water should not enter into the LGS 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 - VI. 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.
2.	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.
3.	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.
4.	Crates and packing material used for shipping will become the property of owner (NTPC)
5.	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.
6.	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.
7.	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



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	d. Dimensions e. Lifting places f. Handling marks and the following delivery marking
8.	Each package or shipping units shall be clearly marked or stenciled on at least two sides as follows. NTPC NATIONAL CAPITAL THERMAL POWER PROJECTS STAGE – II DADRI, 2 X 490 MW. UTTAR PRADESH 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.
9.	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.
10.	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 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.
11.	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.
12.	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)
13.	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
14.	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 them to the appropriate shipping



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	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.
15.	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 LGS & accessories, BHEL item Code, Gross Weight and Net weight of Supplied items.
16.	Prior to transport from manufacturer's work to destination, components of the unit shall be completely cleaned to remove any foreign particles. Flange faces and other machined surfaces shall be protected by an easily removable rust preventive coating followed by suitable wrapping.
17.	All necessary painting, corrosion protection & preservation measures shall be taken as specified in painting schedule. Supplier shall consider the coastal environment zone which is defined as "very severe" during final finishing/shipping.
18.	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 within 10days of LOI.
19.	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).
20.	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.
10.0	SUPERVISION OF ERECTION, TESTING AND COMMISSIONING
1.	The erection of Limestone Grinding System(LGS) will be done by owner as per Erection Manual and check List. However, the bidder shall make one visit per boiler for the supervision of erection, pre-commissioning & post- commissioning check-up, start-up, testing and trial runs of all the items covered under the scope of supply.
2.	There will be one visit per boiler and totally there will be 2 visits for 2 boilers. The bidder will be informed well in advance for the visit. Bidder shall include 15 working days per visit in the offer with minimum 2 visits.
3.	TA/DA, boarding and lodging shall be borne by the bidder and shall be inclusive in



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	supply portion.
11.0	EXCLUSION
	The following work associated with the LGS system will be by BHEL: a. Supply of main drive HT motor b. Civil foundations c. Walkways, platforms and ladders d. Material handling hoists
12.0	INSPECTION AND TESTING
A)	Minimum Testing requirements to be considered are as below:
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 LGS 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



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	voltage porosity test will be conducted on 100 % of the coated surface.
10.	Quality- Tests
	PUMPS:
i.	UT on shaft forgings (greater or equal to 40mm) and MPI/DPT shall be done on shafts and impeller to ensure freedom from defects.
ii.	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.
iii.	The pump rotating parts shall be subjected to static and dynamic balancing.
iv.	Noise and vibration shall be measured during the performance testing at shop.
v.	For Motors-Type test requirement ref Annexure-I-MOTORS SPECIFICATION
	AGITATORS:
i.	Rubber Lining shall be tested for hardness and spark test
ii.	Impellers shall be tested for dimensional and balancing check
iii.	Gear Boxes shall be tested for run test as per standard practice
	HYDROCYCLONES:
i.	Hydro-cyclones shall be checked by visual, dimensional etc.
	TANKS:
i.	All welds joints shall be DP tested and complete tanks shall be water fill tested.
ii.	All atmospheric storage tanks fabricated and erected at site shall be subjected to tests (Hydro, NDT and Vacuum) according to design code as applicable.
iii.	Rubber lining shall be tested for hardness and spark test, as applicable.
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.	The Bidder shall furnish performance test procedure along with standard. The test procedure will be reviewed and approved by the BHEL/NTPC.



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3.	LGS will be inspected at the Bidder's works before dispatch or where the test facilities are available.
4.	Vibration levels shall be measured during shop running/performance tests.
5.	Contract shaft seals shall be used during shop tests, unless the seal design is unsuitable for the shop-test condition.
6.	LGS shall not be released for shipment, until shop tests data and performance tests curves have been approved by Owner.
7.	Bidder should furnish performance guarantee as per applicable standard guarantee for the design, manufacture, material and safe operation of the equipments.
8.	BHEL shall witness the test at Bidder's works and a notice of minimum three (3) weeks shall be given for attending the inspection.
9.	Bidder to arrange all calibrated gauges, Instruments during inspection.
10.	Mechanical running and the performance test shall be carried out.
13.0	PAINTING
1.	Surface Preparation: Power Tool Cleaning to St3 (SSPC-SP3)
2.	PRIMER COAT: i. Primer: Red Oxide Zinc Phosphate Primer to IS: 12744 (Two coats) – DFT: 60 microns. ii. Intermediate: One coat of Synthetic Enamel intermediate coat to IS 2932; DFT- 50μ
3.	FINISH COAT: One coats of Synthetic Enamel to IS 2932, DFT- 50μ/ coat Total DFT : 50 micron.
4.	COLOUR CODE (based on DIN 2403:2007-05 & DIN 5381) i. Base: To be informed later ii. Lettering: To be informed later.
5.	Corrosion protection, coating and galvanizing, painting shall be taken care by the bidder. Bidder shall submit the painting scheme during detail Engg in line with the specification and shall be subject to approval of BHEL / NTPC.
14.0	SPARES,TOOLS & TACKLES
14.1	START UP & COMMISSIONING SPARES
	Start-up & Commissioning Spares shall be part of the main supply of the LGS. Start-up &



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	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 LGS 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 equipments are energized.
14.2	SPECIAL TOOLS & TACKLES:
	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.
15.0	PERFORMANCE GUARANTEE
	All performance tests for LGS shall be carried out in accordance with any latest international codes/standards. 1) Bidder shall furnish Performance guarantee for the design, manufacture, material, safe and trouble-free operation of the LGS and its accessories 2) Wet ball Mill capacity at rated fineness Bidder shall guarantee and demonstrate each WBM capacity of 19.4 TPH with limestone output fineness of 90% or higher through 325 mesh for the range of limestone quality mentioned in our technical specification. 3) Wet ball Mill wear parts guarantee Contractor shall demonstrate the life of wet ball Mill wear parts in line with requirements stipulated in our 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. 4) Wet ball Mill ball consumption Contractor shall guarantee ball consumption per ton of limestone throughput. Contractor shall furnish the minimum ball diameter below which the balls shall be replaced. 5) The Bidder shall ensure a design of the equipment to achieve an average target availability of 98% for 120 days and average target availability of 95% for 1 year. 6) Noise level ≤ 90 dB (A) at 1m horizontal distance from equipment/enclosures and 1.5m above operating floor is to be guaranteed. 7) Vibration levels measured on the non-rotating parts shall not exceed the zone



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	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. 8) Acceptance tests to be carried out as per the procedure defined by the bidder which shall be submitted for BHEL/ NTPC approval. 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.
16.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION:
1.	POWER GUARANTEE Bidder to specify the total guaranteed power per Limestone Grinding System (LGS) operating at the rated capacity in their offer
2.	BID EVALUATION CRITERIA FOR POWER CONSUMPTION: Total guaranteed power consumption for Limestone Grinding System (LGS) at rated capacity (19.4 TPH) shall be quoted by bidder. Lowest quoted guaranteed power consumption will be taken as base value. Bid prices of other bidders will be loaded @ 197,080 INR for every KW excess over the base value as per the formula given below. Adjustment factor for excess power consumption in INR = (GPC-BV) X PL X 1 No. of Working LGS stream GPC- Guaranteed Power Consumption quoted by bidder in KW BV- base Value i.e. lowest quoted power consumption in KW PL- Power Loading @ 197,080 INR/KW
17.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION
	If actual 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 = (GPC-APC) X P X 1 No. of Working LGS Where • GPC- Guaranteed Power Consumption quoted by bidder in KW • APC- Actual Power Consumption in KW P- Penalty @ 197,080 INR per KW
18.0	WARRANTY
1.	The warranty period shall begin on the date of taking over by NTPC or date of issuance of the provisional acceptance certificate for the unit (whichever occurs first) and shall



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	end after twenty-four (24) months. Provided that the successful bidder shall extend the provisions of this warranty to cover all repaired and replacement parts furnished under the warranty obligations hereunder, subject to the warranty period for the same being for a period of 24 months from the date on which replacement or renewal work is completed.
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 .
19.0	FIRST FILL OF CONSUMABLES:
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 of 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.
20.0	TRAINING
	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.
21.0	CONFLICT
	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.
22.0	DOCUMENTATION



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A	DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER
	The Bidder shall submit all documents, drawings, diagrams and all such information, which are necessary to fully understand the offer for techno – commercial evaluation as per Annexure V. Annexure V documents are required for proper evaluation purpose and vendors are requested to comply with above in all respect.
B	DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT
	The Successful bidder shall submit necessary data, documents and drawings for review, approval as specified under Annexure V. Drawings that are reviewed by the NTPC/ BHEL will be returned to bidder with a transmittal letter with any comments and / or questions marked on the drawings or noted in the letter. All comments and questions must be resolved before a resubmission of drawings / documents. If the design has not developed enough to resolve some of the comments or questions, bidder shall place a “hold” on those items or areas of design. NTPC/ BHEL reserves the right to return drawings unprocessed to bidder if there exists any evidence that bidder has not acknowledged all comments and questions. All necessary GA drawings, 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 and hard copy forms. For all documents softcopy format shall be searchable pdf, however in addition all drawings, diagrams like P&IDS shall be supplied in ACAD or other editable format and all lists in Excel format. Further break up of technical documents will be discussed during finalization of the purchase contract. Unless agreed otherwise, Ten (10) hard copies and five (05) sets of electronic copies of all documents are to be submitted in the English language. Electronic Copies shall be submitted in primary original data format (e.g. DOC, XLS, DWG) as well as in a printable non-proprietary document format (e.g. PDF). Especially P&IDs shall be submitted as DWG files and PDF files. Bidder to ensure submission of hard copies as per NTPC requirement for all engineering drg/doc and for all subsequent revisions along with a soft copy through email to concerned project team. However all the engineering related information shall be furnished in soft form to BHEL.

23.0 REFERENCE DOCUMENTS

1. Typical Layout & elevation drawing of ball mill building
2. Valve material specification (Doc. No. Dadri:Valve:001)



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24.0

ANNEXURES



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24.2 ANNEXURE – II- TECHNICAL DATA SHEET (to be submitted along with bid)

Sl. No	Description	Data
1.0	GENERAL	
	a. Client	: BHEL-Ranipet
	b. Project	: DADRI (2x 490MW)
	c. Ultimate Customer	: NTPC
	d. Location	: Gautam Budh Nagar, UP, India
	e. Service	: Continuous
	f. Installation	: Inside the Building
	g. Qty –common for both units	: 1 Working + 1 Standby
2.0	MANUFACTURER DETAILS	
	a. Model	: Bidder to provide
	b. Type	: Horizontal
	c. Type of Driver	: Bidder to provide
3.0	OPERATING CONDITION	
	Medium to be handled	: Limestone
4.0	PERFORMANCE DATA	
	a. Capacity TPH	: Bidder to Provide
	b. WBM Dimensions WmXLm M	: Bidder to Provide
	c. efficiency %	: Bidder to Provide
	d. BKW Normal / Maximum KW	: Bidder to Provide
	e. Motor rating KW	: Bidder to Provide
	f. Motor Speed Rpm	: Bidder to Provide
	g. Speed Maximum/ Normal/Minimum rpm	: Bidder to Provide
	h. Noise level dB(A)	: Bidder to Provide
	i. Performance curve	: Bidder to Provide
4.0	CONSTRUCTION DATA	
	a. Manufacturer	:
	b. Model No.	: Bidder to Provide
	c. Journal bearing: Type / Size:	: Bidder to Provide
	d. Thrust bearing: Type / Size:	: Bidder to Provide
	e. Bearing cooling required	: Yes / No - Bidder to confirm
	f. Cooling water required	: Bidder to confirm the quantity
	g. Type of drive	: Direct Drive
	h. Shaft seal	: Mechanical
	i. Size / Code	: Bidder to Provide
	j. Type of coupling	: Bidder to Provide
	k. Service factor	: Bidder to Provide
	l. GD ² at drive shaft end	: Bidder to Provide
	m. Rotation viewed from coupling end	: Clock wise / Counter clock wise
	n. Coupling type	: Yes / No - Bidder to confirm
	o. Coupling make	: Bidder to Provide
	p. Base plate common to WBM, bearing housing,	: Yes / No - Bidder to confirm



TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM NTPC DADRI 2X490MW

DADRI:FGD:LGS:R01

	coupling		
	q. Total weight	kg	: Bidder to Provide
	r. Maximum Erection weight	kg	: Bidder to Provide
5.0	MATERIALS		
a.	Shell	:	Bidder to Provide
b.	Liner	:	Bidder to Provide
c.	Discharge drum	:	Bidder to Provide
d.	Feed Head	:	Bidder to Provide
e.	Discharge head	:	Bidder to Provide
f.	Gear guard cover	:	Bidder to Provide
g.	Air clutch	:	Bidder to Provide
h.	Pinion drive	:	Bidder to Provide
i.	Shaft Seal	:	Bidder to Provide
j.	Base frame	:	Bidder to Provide
6.0	INSPECTION AND TESTING		
a.	Material Test certificates required for : shell, gear, air clutch, main bearing, pinion drive,	:	[R] [O]
b.	DPT & MPI Test for impeller, if applicable	:	[R] [O]
c.	Ultrasonic & Liquid penetrant test for shaft	:	[R] [O]
d.	Dimensional & visual inspection	:	[R] [W]
e.	Vibration test at rated speed	:	[R] [W]
f.	Performance test	:	[R] [W]
g.	Balancing test of Rotor Assembly	:	[R] [O]
h.	Noise level test	:	[R] [W]
i.	[R]: Required, [W]: Witnessed by BHEL/ NTPC representative, [O]: Observed		
7.0	Technical Data		
7.1	Bunker/Silo shut off gates		
a.	Manufacturer	:	Bidder to Provide
b.	Type	:	Bidder to Provide
c.	Material of the gates	:	Bidder to Provide
d.	Motor rating (KW)	:	Bidder to Provide
		:	
7.2	Down spout	:	
a.	Manufacturer	:	Bidder to Provide
b.	inside diameter (mm)	:	Bidder to Provide
c.	Thickness (mm)	:	Bidder to Provide
d.	Height (mm)	:	Bidder to Provide
e.	Material	:	Bidder to Provide
f.	Off set between feeder outlet and centre line of Limestone bunker, if any	:	Bidder to Provide
7.3	Gravimetric feeder		
	Manufacturer	:	Bidder to Provide
	Type	:	Bidder to Provide
	Feeder size	:	Bidder to Provide
	Normal capacity (tonnes/hr)	:	Bidder to Provide
	Maximum capacity (tonnes/hr)	:	Bidder to Provide
	Method of output control	:	Bidder to Provide



TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM NTPC DADRI 2X490MW

DADRI:FGD:LGS:R01

	Speed pulser allowable VA burden	:	Bidder to Provide
	Feeder belt width (mm)	:	Bidder to Provide
	Auxiliary power consumption (KW)	:	Bidder to Provide
	Type of Drive	:	Bidder to Provide
7.3.1	Limestone Feeders	:	
a.	Manufacturer	:	Bidder to Provide
b.	Model Number	:	Bidder to Provide
c.	Method of measurement	:	Bidder to Provide
d.	Range of measurement (kg/hr).	:	Bidder to Provide
7.4	Downspout from feeder outlet to Pulverizer	:	
a.	Manufacturer	:	Bidder to Provide
b.	inside diameter (mm)	:	Bidder to Provide
c.	Thickness (mm)	:	Bidder to Provide
d.	Material	:	Bidder to Provide
e.	Height (mm)	:	Bidder to Provide
f.	Off set between feeder outlet. and centre line of limestone bunker, if any (m)	:	Bidder to Provide
7.5	Limestone Pulverizers	:	
A.	Design Data :	:	
	i) Manufacturer ii) Type and model iii) Total Number of mills iv) Mill maximum capacity (kg/hr) v) Size of raw limestone at mill inlet (mm) vi) Bond Index of Limestone vii) Fineness of pulverized coal through 325 mesh (%) viii) Pulverizer Speed (rpm) ix) Number of mills working x) Mill loading of working mills (% of maximum capacity) when no of mills as per (I) are operating xi) Mill Power Consumption xii) Mill Main Motor Rating (KW) xiii) Main Motor (Voltage/H2/rpm) xiv) Overall dimensions xv) Total weight including motor xvi) Solid Concentration (w/w %) in mill xvii) Method of Classification xviii) Ball Consumption (kg per ton of limestone) xix) Minimum ball diameter below which ball shall be replaced	:	Bidder to Provide
B.	Constructional Features	:	



TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM NTPC DADRI 2X490MW

DADRI:FGD:LGS:R01

	i) Material / Thickness of Mill Wear Liners ii) Guaranteed Wear Life of Wear Liners iii) Estimated labour (in man hours) for replacement of wear liners) iv) Material / Diameter (mm) of Ball	:	Bidder to Provide
C.	Type of drive transmission	:	Bidder to Provide
	i) Make / Model of Gearbox ii) Speed Ratio	:	Bidder to Provide
D.	Type of coupling	:	Bidder to Provide
E.	Pulverizer lube oil system	:	Bidder to Provide
	a) No. of lube oil pumps per pulverizer b) No. of lube oil pumps working c) No. of oil coolers per pulverizer d) No. of oil coolers per working	:	Bidder to Provide
F.	Auxiliary Motor Rating (KW)	:	Bidder to Provide
G.	Mill speed with Auxiliary Motor (rpm)	:	Bidder to Provide
H.	Mill Separator Tank	:	
	i) Capacity (m3) ii) Material/Thickness (mm) iii) Lining Material/Thickness (mm) iv) No. of Agitators	:	Bidder to Provide
I.	Mill circuit Pump	:	
	i) No. per mill ii) No. of stand-by pumps iii) Make/Model iv) Impeller Type v) Material/Thickness (mm) of Impeller and lining vi) Casing Type vii) Material/Thickness (mm) of Casing/Lining viii) Rated Flow Head (m3/hr / mWCI) ix) Slurry Solid concentration (w/w %)	:	Bidder to Provide
J.	Agitators	:	
	i) No./Make/Model ii) Type iii) Speed (rpm) iv) Drive Mechanism v) Shaft Material vi) Material / Thickness (mm) of Impeller / Lining vii) Power Consumption viii) Motor Rating (KW) ix) Motor Speed (rpm)	:	Bidder to Provide



TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM **NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

MILL DATA SHEET (1/2)				Dwg. No.			1	3
				Rev.	1	2	3	4
1	Customer	BHEL		Date				
2	Project	NTPC - Dadri 2x490 MW FGD		Designed				
3	Order			Checked				
4	Item No.			Approved				
5	Service			No. Req'd	Working		Spare	
6				Total				
7	Regulation	Codes/Standards		Location.	☐ Indoor	☐ Outdoor		
8	Process Data							
9	Milling Capacity	t/h dry	at Limestone Milling System Outlet (Guaranteed by Vendor)					
10	Feed Material							
11	Lump Size of Feed Material	Less than mm at Limestone Milling System inlet						
12	Limestone Hardness (Wi)	kW/Metric-ton						
13	Product Size	wt% slurry	mesh (μm)	% passing limestone				
14								
15	Drying Heat Source	N/A		Moisture Content of Feed Material		wt%		
16	Chemical Composition of Limestone			Bulk Density of Feed Material		kg/l		
17	CaCO ₃			Density of Feed Material		kg/l		
18	MgCO ₃			Repose Angle of Feed Material		degree		
19	SiO ₂			Mill Recirculation load				
20	Al ₂ O ₃							
21	Fe ₂ O ₃							
22	MnO							
23	SO ₃							
24	Others	Balance						
25	Flow Sheet	Refer to Mill Data Sheet (2/2)						
26								
27	Drum							
28	Size	mmDia. x	mmLength	Rotor Rev.		RPM		
29	Thickness	mm		Hold Up Volume		m ³		
30	Liner Inner Dia.	mm		Ball Size		mm		
31	Critical Speed			Ball Quantity				
32	Speed Reducing Gear			Air Clutch				
33	Reduction Ratio			Max. Transfer Torque				
34	Material							
35								
36	Drum	Ball		Bearing Metal				
37	Liner	Gear						
38	Utilities							
39	Cooling Water	Req'd	m ³ /h	Pressure loss		Not larger than MPa		
40	Inlet temperature	°C		Supply press.		MPa		
41	Outlet temperature	°C		Design Pressure		MPa		
42								
43	Process Water	m ³ /h						
44	Guarantee							
45	Allowable Sound Pressure level	dB(A) at		m distance				
46	Information							
47	Blanks shall be filled out by the Vendor.							
48	*1) Cooling Water is	Water (		Water Feed Pressure at B.L. is min.		MPaG)		
49	*2) Process Water is	Filtrate						
50								
51	Cooling Water Composition							
52	pH							
53	Temp.	°C						
54	Conductivity	W/m°C						
55	Cl	mg/l						
56	SO ₄	mg/l						
57	Ca	mg/l						
58	Mg	mg/l						
59	Na	mg/l						
60								
61								
62								
63								
64								
65								
66								



TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM **NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

		Dwg. No.	3 / 3			
MILL DATA SHEET (2/2)		Rev.	1	2	3	4
		Date				
		Designed				
		Checked				
		Approved				
1 Customer	BHEL	Date		Checked		
2 Project	NTPC - Dadri 2x490 MW FGD	Designed		Approved		
3 Order		No. Req'd	Working		Spare	
4 Item No.		Total				
5 Service		Location.	☐ Indoor	☐ Outdoor		
6 Regulation	Codes/Standards					
Process Data						
Stream No.	1	2	3	4	5	6
Fluid	Lump Limestone	Limestone Ball Mill Overflow	Hydrocyclone Feed	Hydrocyclone Underflow Return	Process water to Ball Mill	Process water to Mill Tank
Total Flow (m³/h)						
Total Flow (kg/h)						
Temp (°C)						
Solids (wt%)						
Solids Comp. (wt%)						
CaSO₄·2H₂O						
CaCO₃						
Fly Ash						
Others						
Total						
pH	--					
Cl⁻ (mg/l)	--					
Stream No.	7	8	9	10	11	12
Fluid	Limestone Product Slurry					
Total Flow (m³/h)						
Total Flow (kg/h)						
Temp (°C)						
Solids (wt%)						
Solids Comp. (wt%)						
CaSO₄·2H₂O						
CaCO₃						
Fly Ash						
Other						
Total						
pH						
Cl⁻ (mg/l)						
Remarks						
Blanks shall be filled out by the Vendor. *1 Power consumption of motor shall be guaranteed for the design condition where limestone flow rate at milling system outlet is . t/h(dry base).						



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

24.3 ANNEXURE III- SCHEDULE OF GUARANTEES

Sl. No	Description	Data
1.	Rated capacity of Wet Ball Mill (WBM) TPH	: Bidder to Provide
2.	Limestone output fineness at rated capacity % thro 325 mesh	: Bidder to Provide
3.	Guaranteed power consumption at rated capacity kW	: Bidder to Provide
4.	Life of wet ball Mill wear parts Hours	: Bidder to Provide
5.	Guarantee ball consumption per ton of limestone throughput g/Ton	: Bidder to Provide
6.	Noise level at a distance of 1.0 meter horizontally from the equipment and 1.5 m above operating floor at site dB(A)	: Bidder to Provide
7.	Maximum vibration (peak to peak amplitude at site) microns	: Bidder to Provide
8.	Equipment Availability (%)	
	Equipment Availability for 120 days %	: Bidder to Provide
	Equipment Availability for 1 year %	: Bidder to Provide

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.

SIGNATURE OF BIDDER

NAME

DESIGNATION



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

24.4

ANNEXURE – IV- LIST OF DEVIATIONS/EXCEPTIONS TO THE ENQUIRY DOCUMENT

SI No	Clause No	Page No	Description of Deviation

Note: Enlarge the table to incorporate items

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

24.5

ANNEXURE -V

A) DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER:

Sl. No.	Description	No of copies With proposal
1.	Enquiry Specification (signed)	1
2.	Price Sheet	1
3.	Anchor Plan & Civil foundation Loading details	1
4.	General Arrangement drawings indicating dimensional data with civil loads and pocket details	
5.	Data Sheet	1
6.	Performance curve	1
7.	P & I Diagram	
8.	Terminal point details	
9.	Annexure to qualification requirement- Annexure 3K.	1
10.	Proforma Packing List	1
11.	Shortest Manufacturing Time	1
12.	Approximate weight of each skid	1
13.	Reference plant details	1
14.	Required Electric power & other Utility List	1
15.	Deviation List	1
16.	General Assembly Drawing	1
17.	WBM and Motor Sizing Calculation	1
18.	Cross-sectional Drawing	1
19.	Sub-Vendor List / Make of all bought out items.	1
20.	Scope of Supply	1
21.	Quality Plan	1
22.	Spare List (Recommended)	1
23.	Start-up & Commissioning Spares	1
24.	List of Special Tools	1
25.	Delivery Schedule	1
26.	Test Arrangement & Test procedure	1
27.	T-S curve	1



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

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28.	Hoist/Crane requirement	1
29.	Catalogue	1
30.	Rotor GD ² (kg-m2)	1
31.	Calculation of Motor rating, Bearing capacity and selection of coupling	1
32.	Bill of material along with material and code.	1
33.	Overall space and headroom requirement with details of handling during Erection, operation & maintenance of the equipment	1
34.	Erection, Operation & Maintenance manual with lubrication schedule	1
35.	Procedure for shop / site performance tests	1
36.	Hoist / Crane requirement.	1
37.	Reference list of similar projects executed.	1
38.	Training program and schedule for BHEL/NTPC personnel	1
39.	Equipment maintenance schedules	1

B) DOCUMENTS TO BE SUBMITTED AFTER CONTRACT:

Sl. No.	Description	No of copies After award of contract	Delivery Time
1.	Utility Consumption	1	2 weeks after contract
2.	Foundation Data including Anchor plan	1	2 weeks after contract
3.	General arrangement drawings indicating dimension	1	2 weeks after contract
4.	Performance curve	2	2 weeks after contract
5.	Assembly drawings of each equipment	1	1 month after contract
6.	Cross section detail drawing	1	1 month after contract
7.	Data Sheet	1	2 weeks after contract
8.	Annexure to qualification requirement- Annexure 3K.	1	2 weeks after contract
9.	Lubricating oil list	1	2 months after contract
10.	Special tools list	1	2 months after contract



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

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Sl. No.	Description	No of copies After award of contract	Delivery Time
11.	Installation and assembly procedure	1	4 months after contract
12.	Inspection and Test Procedure	1	1 month after contract
13.	Inspection & Test record	1	In 2 weeks after test
14.	Inspection Certificate	1	In 2 weeks after test
15.	Sub vendors List	1	2 weeks after contract
16.	Manufacturing Schedule	1	2 weeks after contract
17.	Progress report	1	Every month
18.	Proforma Packing List	1	2 months prior to shipping
19.	Approximate weight of each	1	2 months after contract
20.	Required Electric power	2	2 weeks after contract
21.	WBM Sizing Calculation	1	2 weeks after contract
22.	Calculation for HT Motor power requirement for sizing HT Motor	1	2 weeks after contract
23.	Material Test Certificates	2	In 2 weeks after test
24.	Pre Commissioning Check List	2	4 months after contract
25.	Scope of Supply	2	2 weeks after contract
26.	Quality Plan	4	1 month after contract
27.	Operation and Maintenance Manual	10 hardcopies and 5 electronic copies in English	4 months after contract
28.	Spare List (Recommended)	1	1 month after contract
29.	Start-up & Commissioning	2	1 month after contract
30.	List of Special Tools	1	1 month after contract
31.	Delivery Schedule	1	2 weeks after contract
32.	Test Arrangement & Test procedure	2	1 month after contract
33.	T-S curve	2	2 weeks after contract
34.	P & I Diagram	2	2 weeks after contract
35.	Catalogue	2	2 weeks after contract
36.	Motor Data	1	1 month after contract
37.	Recommended repair procedure etc.	1	1 month after contract



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

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Sl. No.	Description	No of copies After award of contract	Delivery Time
38.	Any unique installation instructions shall be noted on the submitted drawings or be provided as a separate document prior to the submission of the Operation and Maintenance Manual.	1	1 month after contract
40.	Erection schedule and component list.	1	1 month after contract

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

24.6

ANNEXURE-VI TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING

TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING

Refer to Specification No: PE-TS-888-100-A001 for detailed specification on Seaworthy packing.

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

24.7 ANNEXURE-VII INSPECTION & TESTING

INSPECTION & TESTING

Refer to all clauses for Inspection & testing requirements.

SIGNATURE OF BIDDER

NAME

DESIGNATION



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

24.8 ANNEXURE-VIII HEALTH & SAFETY MANAGEMENT MANUAL

HEALTH & SAFETY MANAGEMENT MANUAL

Refer to all clauses for Health & Safety requirements.

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



PART –II

O&M Spares and O&M Services For 10 years



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

25	O & M Services for 10 Years Operation – Annual Maintenance Contract (AMC). O & M Services of Limestone Grinding System & its accessories to be taken up by Bidder at DADRI Site. The O & M services will be for a period of 10 years. <u>SCOPE OF O & M Services:</u> A) <u>Annual Maintenance Contract (AMC):</u> 1. The Bidder to carry out maintenance of Limestone Grinding System & accessories supplied for a period of 10 years. The contract shall cover both preventive maintenance & Minor / Major Overhauls. 2. All services call shall be attended at the earliest. 3. All spare parts required for the upkeep of the equipment's (Limestone Grinding System & it's accessories) to be stocked in advance or arranged within 2 - 3 days' time to ensure trouble free operation & to meet the 95 % availability as per specification. 4. The Bidder has to take necessary approval from site In-charge for carrying out necessary maintenance operation. 5. The bidder shall provide qualified technicians for carrying out the AMC at site. Necessary site support will be provided by BHEL. TA/DA, boarding and lodging of such technicians attending to AMC requirements shall be borne by the bidder and shall be included in AMC scope. B) <u>O & M Spares:</u> 1. All spares required for the upkeep of the equipments for 10 years operation is in the scope of the bidder. 2. The bidder will submit a separate list of spares required for AMC from a) 3- 4 years operation. b) 5-7 years operation. c) 8- 10 years operation Note: 0 -2 years covered in warranty clause. 3. The following is the minimum spare parts along with their break up price to be stocked by the bidder, if applicable. 1) Feeders a) Belt : 4 Sets b) Belt Drive Motor: 1 Nos c) Belt Drive Reducer : 2 Nos d) Speed Reducer Assembly : 1 set e) Weighing Instruments: 1 set f) Feeder Weighing Roll : 1 No g) Gravimetric Feeder Gate Actuator Assembly: 1 No h) Counter Assembly of feeder complete: 1 No
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**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

i) Feeder head pulley assembly: 1 No

j) Inlet span roller assembly: 6 No

2) Limestone Mills

a) Mill Wear Parts (Liners) & Grinding Element: 1 set

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 higher whole number.

Where :

GWL = Guaranteed wear life of Mill Wear Parts as offered by the bidder.

b) Mill Motor: NA

c) Auxiliary Motor: 1 No

d) Gear Box Internals (Including Bearings & seals) : 2 Sets

e) Complete Gear Box : 1 set

f) Mill Motor Bearings : 1 Set

g) Lube oil/grease system

a. Pump Assembly: 2 no of each type

b. Motor: 1 no of each type

c. Pressure regulator: 1 no of each type

d. Filters: 2 no's of each type

e. Pump & Motor Coupling: 1 no of each type

3) Slurry Valves: 4 no of each type and size

4) Slurry Line Bends: 4 no of each type and size

5) Hydro-cyclones

a) Hydro-cyclone isolation valve: 10% of each type or 1 no whichever is higher

b) Hydro-cyclone: 10% of each type or 1 no whichever is higher

c) Hydro-cyclone rubber lining: 10% of each type or 1 no whichever is higher

6) Slurry Pumps

a) Impeller assembly: 4 no of each type

b) Casing Liners: 1 no of each type

c) Seals: 4 set of each type

d) Bearings: 1 no of each type

e) Motor: 1 no of each type

f) Motor-Pump coupling: 1 no of each type

7) Mill Separator Tank Agitator:

a) Impeller Assembly: 1 no of each type

b) Bearing Assembly: 2 no of each type

c) Motor: 1 no of each type

d) Belt & Pulley (if applicable) : 2 no of each type

e) Gear Box Assembly(if applicable): 1 no of each type



**TECHNICAL SPECIFICATION OF LIMESTONE GRINDING SYSTEM
NTPC DADRI 2X490MW**

DADRI:FGD:LGS:R01

C) GENERAL

1. The AMC (A) & O & M Spares (B) are part of the scope for 10 years up keep of the equipments.
2. Maintenance charges – AMC (A) & O&M Spares (B) together will be paid yearly on a pro-rata basis for 10 years.
3. The AMC (A) & O&M Spares (B) rate to be quoted separately with the main offer.
4. The Price offer for supply of Limestone Grinding System & 10 years AMC (A) & O&M Spares (B) of Limestone Grinding System & its accessories will be considered for Evaluation.
5. All spares to be used during AMC under this contract shall be strictly inter-changeable with the parts for which they are intended for replacements.

VALVE MATERIAL SPECIFICATION

S. No.	Kinds of Valve	Operation	Service Line
1	Butterfly	ON-OFF	Process Line, Drain Line -a)
2	Diaphragm	ON-OFF	Washing Line, Drain Line, Sampling Line of Process Line -b)
3	Pinch	Regulation control -c)	pH meter inlet Line (if required)
4	Ball (Ceramic)	Regulation control -c)	Meter feed recirculation line (if required)

- a) For 50 and large piping
- b) For 25 piping
- c) Valve position will be fixed manually during commissioning period. Further adjustment is not required.

The following types of valves shall be used for Isolation Valve

- (a) Gate Valve for Utility Line (For General)
- (b) Butterfly Valve for Process Line and Utility Line (For General)
- (c) Knife Gate valve for Process Line (For washing)
- (d) Ball Valve for Utility Line (For General)
- (e) Diaphragm valve for Process Line (for Washing and others)

The following types of valves shall be used for Control Valve

- (a) Globe Valve for Utility Line (For General)
- (b) Needle Valve for Process Line (in case of sensitive control)
- (c) Pinch valve for Process Line (in case of little control)
- (d) Ceramic Ball Valve for Process Line (for General)
- (e) Butterfly Valve for Utility Line (for General)

The following connection type shall be applied for each valve

- (a) DN50 and Smaller: Socket weld, Screwed
- (b) DN65 and Larger: Butt weld, Flanged

Slurry Valves Specification:**1) Butterfly Valve:****Type: 1 – Butterfly Valve**

Class No :AA40, Fluid Name: Limestone Slurry, Process Water

1.	DN50 - DN150	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	A351-CF8M
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER LEVER.
2.	DN50 - DN150	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	A351-CF8M
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER AIR CYLINDER
3.	DN50 - DN150	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	A351-CF8M
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER ELECTRIC MOTOR WITH L.SWITCH
4.	DN200 - DN300	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	A351-CF8M
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER WHEEL WITH GEAR
5.	DN200 - DN300	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	A351-CF8M
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER AIR CYLINDER

6.	DN200 - DN300	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	A351-CF8M
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER ELECTRIC MOTOR WITH L.SWITCH

Type: 2 – Butterfly Valve

Class No :AA60, Fluid Name: Gypsum Slurry, Filtrate Slurry, Waste Water

1.	DN50 - DN150	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	HASTEALLOY-C
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER LEVER.
2.	DN50 - DN150	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	HASTEALLOY-C
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER AIR CYLINDER
3.	DN50 - DN150	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	HASTEALLOY-C
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER ELECTRIC MOTOR WITH L.SWITCH
4.	DN200 – DN600	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	HASTEALLOY-C
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER WHEEL WITH GEAR

5.	DN200 – DN600	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	HASTEALLOY-C
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER AIR CYLINDER
6.	DN200 – DN600	Valve Rating:	ASME-B16.34 CL.150
		Body:	A126-B
		Trim:	A351-CF8M
		Lining:	EPDM
		Bonnet	FF
		Connection:	WAFER
		Operation type:	WAFER ELECTRIC MOTOR WITH L.SWITCH

2) Ball Valve

Type: 1 – Ball Valve

Class No :AA40, Fluid Name: Limestone Slurry, Process Water

DN25 - DN150	Valve Rating:	ASME-B16.34 CL.150
	Body:	CERAMIC
	Trim:	CERAMIC
	Connection:	FF
	Operation type:	BALL LEVER/ FULL BORE

Type: 2 – Ball Valve

Class No :AA60, Fluid Name: Gypsum Slurry, Filtrate Slurry, Waste Water

DN25 - DN150	Valve Rating:	ASME-B16.34 CL.150
	Body:	CERAMIC
	Trim:	CERAMIC
	Connection:	FF
	Operation type:	BALL LEVER./ FULL BORE

3) Diaphragm Valve

Type: 1 – Diaphragm Valve

Class No :AA40, Fluid Name: Limestone Slurry, Process Water

DN25 – DN80	Valve Rating:	CL.150
	Body:	A126 Gr B
	Trim:	CHLOROPRENE RUBBER
	Lining:	RUBBER
	Connection:	FF
	Operation type:	Hand Wheel / Weir Type

Type: 2 – Diaphragm Valve

Class No :AA60, Fluid Name: Gypsum Slurry, Filtrate Slurry, Waste Water

DN25 – DN80	Valve Rating:	CL.150
	Body:	A126 Gr B
	Trim:	EPDM
	Lining:	RUBBER
	Connection:	FF
	Operation type:	Hand Wheel / Weir Type

4) Pinch Valve**Type: 1 – Pinch Valve**

Class No :AA40, Fluid Name: Limestone Slurry, Process Water

DN25 – DN150	Valve Rating:	CL.150
	Body:	A126 Gr B
	Trim:	CHLOROPRENE RUBBER
	Lining:	RUBBER
	Connection:	FF
	Operation type:	Hand Wheel

Type: 2 – Pinch Valve

Class No : AA60, Fluid Name: Gypsum Slurry, Filtrate Slurry, Waste Water

DN25 – DN150	Valve Rating:	CL.150
	Body:	A126 Gr B
	Trim:	CHLOROPRENE RUBBER
	Lining:	RUBBER
	Connection:	FF
	Operation type:	Hand Wheel

The above data is basic design data and may vary based on selected vendor's recommendations.

Annexure –I		एनटीपीसी NTPC													
CLAUSE NO.	INTENT OF SPECIFICATION														
4.00.00	QUALIFYING REQUIREMENTS FOR EQUIPMENTS/SYSTEMS														
4.01.00	Provenness criteria for critical equipment, auxiliaries, systems and bought out items: The Bidder / Bidder's sub-vendor(s) is required to meet the Provenness criteria and/or qualification requirement for critical equipment, auxiliaries, system and bought out items as per criteria stipulated below:														
4.01.01	Wet Limestone Grinding Mills for the Wet Limestone based Flue Gas Desulphurisation (FGD) System offered by the Bidder shall be only from such manufacturer(s) who has previously designed (either by itself or under collaboration / licensing agreement), manufactured / got manufactured the respective equipment(s) of the type, application and minimum equipment rating as stipulated below such that the respective equipment(s) should have been in successful operation in at least one (1) plant for a period not less than one(1) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder: <u>Type and Rating for Qualification</u> <table><tr><th>Sl. No.</th><th>Name of Equipment</th><th>Type of Equipment</th><th>Application</th><th>Equipment Rating</th></tr><tr><td>(d)</td><td>Wet limestone Grinding mills</td><td>Horizontal Wet Ball mill</td><td>Wet Limestone based FGD application in Coal fired power plant</td><td>80% of the offered Ball mill capacity with pulverizing fineness not less than 90% thru 325 mesh</td></tr></table>					Sl. No.	Name of Equipment	Type of Equipment	Application	Equipment Rating	(d)	Wet limestone Grinding mills	Horizontal Wet Ball mill	Wet Limestone based FGD application in Coal fired power plant	80% of the offered Ball mill capacity with pulverizing fineness not less than 90% thru 325 mesh
Sl. No.	Name of Equipment	Type of Equipment	Application	Equipment Rating											
(d)	Wet limestone Grinding mills	Horizontal Wet Ball mill	Wet Limestone based FGD application in Coal fired power plant	80% of the offered Ball mill capacity with pulverizing fineness not less than 90% thru 325 mesh											
4.01.03	Bidder shall offer and supply only the type of the above equipment(s) for which he himself or the manufacturer proposed by the bidder for the above equipment(s) is qualified. A JV / Subsidiary Company formed for manufacturing and supply of equipment(s) as listed at clause no. 4.01.01 above in India, can also manufacture such equipment(s), provided that it has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.01.01 above (or the technology provider of the qualified equipment manufacturer) for the respective equipment(s). Before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system for such equipment(s). Further, in such a case, such qualified equipment manufacturers should have, directly or indirectly through its holding company/ subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/ Subsidiary company , which shall be maintained for a lock-in period of seven (7) years from the date of														

CLAUSE NO.	एनटीपीसी NTPC INTENT OF SPECIFICATION
4.01.05	incorporation of such Joint Venture/ Subsidiary or upto the end of defect liability period of the contract, whichever is later. (i) In case the Bidder or the proposed sub-vendor is not manufacturer of proven Wet limestone Grinding mills as per clause 4.01.01 (d) above but is a manufacturer of dry Grinding mills for power or cement industry of minimum 20 T/h capacity, the Bidder or the proposed sub-vendor can also manufacture Wet limestone Grinding mills, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Wet limestone Grinding mills in India with such manufacturer who meet the requirements stipulated at clause 4.01.01 (d) above for the Wet limestone Grinding mills. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments. In addition, the Bidder along with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Wet limestone Grinding mills. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 10 Million (Indian Rupees Ten Million only) for each project. OR (ii) In case, the bidder or proposed sub vendor is not a manufacturer of proven Wet Limestone Grinding Mills as per clause 4.01.01 (d) above, but have designed, manufactured & supplied dry Grinding Ball Tube mills for at least 500 MW pulverized coal fired power plant, the Bidder or the proposed sub-vendor can also manufacture Wet limestone Grinding Mills provided it has a licensing agreement with a Wet limestone Grinding mills manufacturer who meet the requirements stipulated at clause 4.01.01 (d) above for the Wet limestone Grinding mills and provides extended warranty of three (3) years for the Wet Limestone Grinding Mills. In such a case Bidder shall provide an additional on demand bank guarantee for INR 10 Million (Indian Rupees Ten Million only) for each project.
4.01.08	Before taking up the manufacturing of such equipment(s) as per clause 4.01.02, 4.01.03, 4.01.04, 4.01.05(i), 4.01.06 & 4.01.07 above, the Bidder / its sub vendor(s) must create (or should have created) manufacturing and testing facilities at its works as per Collaborator / licenser's design, manufacturing and quality control system for such equipments duly certified by the Collaborator / licensor. Further, the Collaborator / Licensor shall provide (or should have provided) all design, design calculation, manufacturing drawings and must provide (or should have provided) technical and quality surveillance assistance and supervision during manufacturing, erection, testing, commissioning of equipments.
4.01.09	Bidder shall offer and supply only the type of the above equipment(s) for which it, itself or the manufacturer / Collaborator(s) / Licensor(s) proposed by the Bidder for the above equipment(s) is qualified.

4.01.10

The Employer reserves the right to fully satisfy himself regarding capability and capacity of Bidder / its sub-vendor(s) and the proposed arrangement and may prescribe additional requirement before allowing manufacture of the equipment listed above for this contract.

Note to clause 4.01.01

(1) Whenever the term 'coal fired' is appearing above, "Coal" shall be deemed to also include bituminous coal/brown coal/Anthracite Coal/lignite.

FOR
NCTPP DADRI ST-II (2X490 MW)
BIDDING DOCUMENT NO. CS-6130/0330-109-9

Bidder's Name and Address:

To
Contract Services-II
NTPC Limited
Noida-201301

Summary of Critical Equipment indicated under clause 4.01.00, sub-Section-I, Part-A of Section-VI.

Equipment Name	Sub-Vendor Name	Collaborator's Name, if applicable	Seeking Qualification as per clause... Sub-Section-I, Part-A of Section-VI
Booster Fans			*4.01.01 / *4.01.02 / *4.01.03
*Slurry Recirculation Pumps			*4.01.01 / *4.01.03 / *4.01.07
Oxidation Blowers			*4.01.01 / *4.01.03 / *4.01.04
Wet limestone Grinding mills			*4.01.01 / *4.01.03 / *4.01.05 (i) / 4.01.05 (ii)
Slurry Pumps			*4.01.01 / *4.01.03
Agitators			*4.01.01 / *4.01.03 / *4.01.06
Vacuum Belt filters			*4.01.01 / *4.01.03

Note : *Strike-off whichever is not applicable.

1. If qualification sought as per clause 4.01.01, sub-Section-I-A, Part-A of Section-VI then the details of the sub vendor (manufacturer) shall be filled by the bidder in the format A to G.

2. If the qualification sought as per the clause 4.01.02, sub-section-I-A, Part-A of Section-VI, then the details of proposed sub vendor (i.e manufacturer of such equipments for at least 490 MW unit rating) shall be filled individually by the bidder in the format A and the details of collaborator who meets the requirement stipulated at 4.01.01, sub-section-I-A, Part-A of Section-VI shall also be filled by the bidder in the format A separately. Further, in case of qualification vide clause 4.01.02, sub-section-I-A, Part-A of Section-VI a copy of valid ongoing collaboration and technology transfer agreement for design, engineering, manufacturing, supply of such equipment in India with the collaborator who meets the requirement stipulated at 4.01.01, sub-section-I-A, Part-A of Section-VI shall also be furnished.
3. If the qualification sought as per the clause 4.01.03, sub-section-I-A, Part-A of Section-VI then the details of JV/Subsidiary Company formed for manufacturing of such equipments in India shall be furnished individually for each equipment by the bidder such as,
 - i) Copy of document of incorporation of JV/Subsidiary company in India
 - ii) Copy of valid ongoing collaboration and technology transfer agreement for design, engineering, manufacturing, supply of such equipment in India with the collaborator who meets the requirement stipulated at 4.01.01, sub-section-I-A, Part-A of Section-VI.
 - iii) Copy of document of at least 26% equity participation of qualified equipment manufacturer in the Indian JV company/subsidiary company directly or indirectly through its holding company /Subsidiary company, which shall be maintained for a lock -in period of seven (7) years from the date of incorporation of such JV/subsidiary or up to the end of defect liability period of the contract which ever is later.

Further, the details of collaborator or technology provider of the qualified equipment manufacturer who meets the requirement stipulated at 4.01.01, sub-section-I-A, Part-A of Section-VI shall be filled by the Bidder in the format A to G (format given at 1.00.00). In addition to that, the sub vendor along with the Indian JV company/subsidiary company, qualified equipment manufacturer and its holding company/subsidiary company as applicable shall furnish the DJU.

*** strike out whichever is not applicable.**

1.00.00

(Applicable for Bidder/his sub vendors seeking qualification as per clause no. 4.01.01, Sub section-I, Part-A of Section-VI. Bidder shall furnish the required data only for those equipments / auxiliaries which are proposed to be sourced under this route.)

We, hereby furnish the data on proveness criteria for critical equipment, auxiliaries, systems and Bought Out Items such as Wet Limestone Grinding Mills which have been designed (either by self manufacturer or under valid ongoing collaboration and technology transfer agreement), *manufactured/ *got manufactured and supplied by us /Manufacturer (or manufactured/ got manufactured & supplied by our proposed sub-vendors) and these are in successful operation in at least one (1) plant for a period not less than one year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder. The details of type and minimum equipment rating of such equipment are given below :

D. Wet limestone Grinding mills: We declare that, we/our Sub-Vendor, have designed (either by itself or under collaboration / licensing agreement), *manufactured/*got manufactured and supplied at least one (1) number of Wet limestone Grinding mill of minimum 80% of the offered Ball mill capacity with pulverizing fineness not less than 90% thru 325 mesh, working in Wet limestone based FGD application in Coal fired power plant and which has been in successful operation for minimum one(1) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder, as per the details furnished below:

Sl. No.	Description	Reference Work
1.	Name of the reference plant & location:	
2.	Client name and his address:	
3.	Whether power plant is coal fired	-*Yes/*No
4.	Whether operating in a Wet Limestone based FGD application in Coal fired power plant	-*Yes/*No
5.	Name of equipment manufacturer & address:	
6.	Date of commission of the equipments:	
7.	Model no. of the equipment:	
8.	Brief Technical particulars of the equipments:	
9.	Capacity-	TPH with pulverizing fineness not less than 90% thru 325mesh

Sl. No.	Description	Reference Work
10.	Whether the equipment(s) are in successful operation in atleast one (01) plant for a period not less than one (01) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder	- *Yes/*No
11.	Flue gas Desulphurization system details:	*Technical extract/ *paper letter/ *email/ *Drawing from user or *contract document or *scheme or *any document in public domain enclosed at annexure....to Attachment-3K
12.	Scope of Work:	*Letter of Award or *Contract or *P.O. enclosed at Annexure.....to Attachment-3K
13.	Performance details:	*Certificate/*Letter/*E-mail from End user enclosed at Annexure.....to Attachment-3K

* Strike off whichever is not applicable.

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

2.02.00

We further confirm that details in respect of collaboration / valid licencing agreement for the aforesaid equipment as per 2.01.00 above who meets the requirement stipulated at clause 4.01.01, sub-section-I, Part-A, Section-VI are enclosed at **Annexure-.....** to this Attachment. The data in respect of proveneness criteria for these equipment which are in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below. We further confirm that we/ our sub vendor(s) have created manufacturing and testing facilities at our/ their works as per collaborator's/ Licensor's design, manufacturing & quality control system for these equipment(s)/ Auxiliary(ies).

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

*3.00.00

Applicable for JV Company/Subsidiary Company meeting proveneness criteria as per clause no. 4.01.01, Sub section-IA, Part-A of Section-VI.

3.01.00

We, hereby confirm that JV company/ Subsidiary company (Strike off whichever is not applicable) formed for manufacturing and supply of equipment(s) (Wet Limestone Grinding Mills) has a valid ongoing collaboration and technology transfer agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.01.01 of sub-section-I, Part-A, Section VI of bidding documents (or the technology provider of the qualified equipment manufacturer).
Further, in such a case, such qualified equipment manufacturers is having, directly or indirectly through its holding company/subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/subsidiary company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture / Subsidiary or up to the end of defect liability period of the contract, whichever is later. Before taking up the manufacturing of such equipment(s) (Wet Limestone Grinding Mills), we/ our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.

We further confirm that details in respect of collaboration / valid licencing agreement for the aforesaid equipment(s) (Wet Limestone Grinding Mills) who meets the requirement stipulated at clause 4.01.01, sub-section-I, Part-A, Section-VI for are enclosed at **Annexure-.....** to this Attachment.

*5.00.00

Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.01.05 (i), Sub section-I, Part-A of Section-VI.

5.01.00

We, hereby confirm that *we/*our sub-vendors is a manufacturer of Dry Grinding Mills for minimum 20 T/h capacity. (Details of references enclosed at Annexure)

(Data to be furnished in line with format given at 1.00.00 of this Attachment))

5.02.00

We further confirm that details in respect of collaboration / valid licencing agreement for the Wet Grinding Mills between *us/*our sub-vendors, as per 5.01.00 above, and with qualified Wet Grinding Mill manufacturer, who meets the requirement stipulated at clause 4.01.01, sub-section-I, Part-A, Section-VI are enclosed at **Annexure-.....** to this Attachment. The data in respect of provenness criteria for the qualified Wet Grinding Mill manufacturer, which is in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below.

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

We further confirm that before taking up the manufacturing of such Wet Grinding Mill *we/ *our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.

In addition, the Bidder along with our sub-vendors, as per 5.01.00 above (if applicable) and the qualified Wet Grinding Mill manufacturer and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed at **Annexure-III of Attachment-3K.**

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

*6.00.00

Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.01.05 (ii), Sub section-I, Part-A of Section-VI.

6.01.00

We, hereby confirm that *we/*our sub-vendors have designed, manufactured & supplied dry Grinding Ball Tube mills for at least 500 MW pulverized coal fired power plant. (Details of references enclosed at Annexure)

6.02.00

(Data to be furnished in line with format given at 1.00.00 of this Attachment))

We further confirm that details in respect of valid licencing agreement for the Wet Grinding Mills between *us/*our sub-vendors, as per 6.01.00 above, and with qualified Wet Grinding Mill manufacturer, who meets the requirement stipulated at clause 4.01.01,

sub-section-I, Part-A, Section-VI are enclosed at **Annexure-.....** to this Attachment. The data in respect of proveneness criteria for the qualified Wet Grinding Mill manufacturer, which is in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below.

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

We further confirm that *we/*our sub-vendors shall provide an extended warranty of three (3) years for the Wet Limestone Grinding Mills provide an additional on demand bank guarantee for INR 10 Million (Indian Rupees Ten Million only) for each project.

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

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ANNEXURE-I

FORM OF DEED OF JOINT UNDERTAKING TO BE PROVIDED
FOR WET LIMESTONE GRINDING MILLS
AS PER CLAUSE 4.01.05 (i) OF SUB-SECTION-I, PART A, SECTION VI
(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

DEED OF JOINT UNDERTAKING TO BE EXECUTED BY THE BIDDER/CONTRACTOR, QUALIFIED INDIAN MANUFACTURING COMPANY MEETING THE REQUIREMENTS SPECIFIED AT CLAUSE NO. 4.01.05 (i) OF SUB-SECTION-I, PART A, SECTION VI ALONGWITH QUALIFIED EQUIPMENT MANUFACTURER OF WET LIMESTONE GRINDING MILLS MEETING THE REQUIREMENTS AS PER CLAUSE 4.01.01 (d) OF SUB-SECTION-I, PART A, SECTION VI FOR SUCCESSFUL PERFORMANCE OF WET LIMESTONE GRINDING MILLS IN WHICH EXECUTANT OF THE DJU ARE JOINTLY AND SEVERALLY LIABLE FOR THE SUCCESSFUL PERFORMANCE OF THE WET LIMESTONE GRINDING MILLS

The DEED OF UNDERTAKING executed this day of by M/s a Company incorporated under having its Registered Office at (hereinafter called the "Bidder/Contractor", which expression shall include its successors, administrators, executors and permitted assigns) AND

**M/s a dry Grinding mills manufacturer as per the requirement of clause 4.01.05 (i) of sub-section-I, Part-A, Section-VI, incorporated under having its Registered Office at (hereinafter called the "Qualified Indian Manufacturing Company"), which expression shall include its successors, administrators, executors and permitted assigns) AND

M/s a Wet limestone Grinding mill manufacturer meeting the requirements of clause 4.01.01 (d) of sub-section-I, Part-A, Section-VI incorporated under having its Registered Office at (hereinafter called the "Qualified Equipment Manufacturer", which expression shall include its successors, administrators, executors and permitted assigns) AND

in favour of NTPC Limited, A Government of India Enterprise, incorporated under the Companies Act, 1956, having its Registered Office at NTPC Bhawan, Scope Complex, 7, Institutional Area, Lodhi Road, New Delhi-110003 INDIA (hereinafter called "NTPC" or "Employer" which expression shall include its successors, administrators, executors and assigns).

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply, transportation to site, construction, installation, testing, commissioning and conductance of guarantee tests for the for **NCTPP DADRI** (hereinafter referred to as "Plant") vide its Bidding Document No. **CS-6130/0330-109-9**.

AND WHEREAS vide clause 4.01.05 (i) of Sub-Section-I, Part A, Section VI of bidding documents, it has been specified that a Qualified Indian Manufacturing Company can also manufacture equipment listed at clause no. 4.01.01 (d) of Sub-Section-I, Part A, Section VI for which it is qualified, provided that it has a valid ongoing collaboration and technology transfer agreement for design, engineering, manufacturing of Wet limestone Grinding mill in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.01.01(d) of Sub-Section-I, Part-A, Section-VI of bidding documents. Before taking up the manufacturing of Wet limestone Grinding mill, the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/ licensor's design, manufacturing and quality control system for Wet limestone Grinding mill. In addition, the Bidder/Contractor along with the Qualified Indian Manufacturing Company, qualified equipment manufacturers shall furnish DJU for each equipment in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment.

WHEREAS M/s(Bidder/Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for for **NCTPP DADRI** (hereinafter referred to as "Plant") vide its Bidding Document No. **CS-6130/0330-109-9**.

AND WHEREAS M/s (Qualified Indian Manufacturing Company) meets the requirement of clause 4.01.05(i) of sub-section-I, Part-A, Section-VI and has a valid ongoing collaboration and technology transfer agreement for design, engineering, manufacturing, supply of(Name Of Equipment) in India with M/swho meets the requirements stipulated at clause 4.01.01 of Sub-Section-I, Part A, Section-VI of bidding documents.

AND WHEREAS M/s (Qualified Equipment Manufacturer) meets the requirements of clause 4.01.01 of sub-section-I, PartA, Section-VI for(Name Of Equipment).

The Bidder/Contractor along with the *Qualified Indian Manufacturing Company , Qualified Equipment Manufacturers, are required to jointly execute and furnish prior to the placement of order for (Name of equipment), an irrevocable Deed of Joint Undertaking and be jointly and severally responsible and bound unto the Employer for successful performance of the ...
(Name of Equipment)

for **NCTPP DADRI (Name of Project)**.....) fully meeting the stipulated technical requirements, guaranteed parameters and characteristics as per the Bidding Documents, in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company and the Bidder/Contractor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the successful performance of the (Name of Equipment).
2. In case of any breach of the Contract committed by the Qualified Indian Manufacturing Company, we the Bidder/Contractor and Qualified Equipment Manufacturer do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the (Name of Equipment) and undertake to carryout all the obligations and responsibilities under this Deed of Joint Undertaking in order to discharge the Qualified Indian Manufacturing Company obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the (Name of Equipment), we the Bidder/Contractor and Qualified Equipment Manufacturer jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/ his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Indian Qualified Indian Manufacturing Company / Bidder/Contractor before proceeding against the Qualified Equipment Manufacturer nor any extension of time or any relaxation given by the Employer to the Qualified Indian Manufacturing Company / **Bidder/Contractor shall prejudice any rights of the Employer under this Deed of Joint Undertaking to proceed against the Qualified Equipment Manufacturer.
3. The liability of the Contractor, his sub-vendor and Associate/Collaborator shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipment.
4. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows:
 - (a) We the Qualified Equipment Manufacturer shall ensure that complete design, manufacturing, quality assurance and installation of the (Name of Equipment) is carried out inline with our manufacturing & quality drawings and procedures and shall be fully responsible for its compliance so as to ensure satisfactory, reliable, safe and trouble free performance of (Name of Equipment).

Further, we, the Qualified Equipment Manufacturer shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Qualified Indian Manufacturing Company's works and/ or at Employer's project site.

Further, the Qualified Equipment Manufacturer shall depute their technical experts from time to time to the Qualified Indian Manufacturing Company's works/ Employer's project site as required by the Employer and agreed to by Qualified Indian Manufacturing Company to facilitate the successful performance of the (Name of Equipment) as stipulated in the aforesaid Contract.

Further, the Qualified Equipment Manufacturer shall ensure proper design, manufacture, installation, testing and successful performance of the (Name of Equipment) under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Qualified Equipment Manufacturer shall advise the Qualified Indian Manufacturing Company suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

(b) In the event Indian Qualified Indian Manufacturing Company /Contractor fail to demonstrate that the (Name of Equipment) meets the guaranteed parameters and demonstration parameters as specified in the contract, the Qualified Equipment Manufacturer shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.

(c) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the (Name of Equipment) and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor and Qualified Indian Manufacturing Company and Qualified Equipment Manufacturer.

5. We, the Bidder/Contractor and Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Deed of Joint Undertaking shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.

6. The Bidder/Contractor and Qualified Equipment Manufacturer will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
 7. In case of Award, in addition to the Contract Performance Security for the Contract, the Qualified Equipment Manufacturer shall furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 10 Million (Indian Rupees Ten Million)** and it shall be guarantee towards the faithful performance /compliance of this Deed of Joint Undertaking in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.
 8. Any dispute that may arise in connection with this Deed of Joint Undertaking shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This Deed of Joint Undertaking shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
 9. We, the Bidder/Contractor and Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company shall form an integral part of the Contracts from the date of signing of this Deed of Joint Undertaking. We further agree that this Deed of Joint Undertaking shall continue to be enforceable till its validity.
 10. That this Deed of Joint Undertaking shall be operative from the effective date of signing of this Deed of Joint Undertaking.
- IN WITNESS WHEREOF, the Bidder/Contractor and Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1. WITNESS

For M/s ...

(Bidder/Contractor)

(Signature Name)
Representative)

(Signature of the Authorised

(Official Address)

Name ...

Designation ...

Common Seal of the
Company ...

1. WITNESS

For M/s ...
(Qualified Indian Manufacturing Company)

(Signature of the Authorised

(Signature Name)
Representative) ...

(Official Address)

Name...

Designation ...

Common Seal of the

Company ...

1. WITNESS

For M/s ...
(Qualified Equipment Manufacturer)

(Signature of the Authorised
Representative) ...

(Signature Name)

(Official Address)

Name...

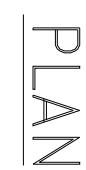
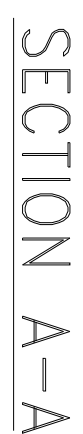
Designation ...

Common Seal of the
Company ...

Note : Power of Attorney of the persons signing the said Deed of Joint Undertaking is to be furnished. *

Contractor/Sub-Vendor shall strike out, whichever is not applicable

** copy of priced purchase order for the equipment/system shall be furnished by the Bidder.



LEGEND:-

FCU	- FINISHED GROUND LEVEL
FTL	- FINISHED FLOOR LEVEL
T.O.P	- TOP OF PLATFORM
T.O.C	- TOP OF CONCRETE
B.O.B	- BOTTOM OF BASE PLATE
OPENING	- OPENING
NA	- NON-APPLICABLE
THK.	- THICK
TYP.	- TYPICAL
LSST	- LUGGING SURFACE STORAGE TANK
LS SLOD	- LUGGING STORAGE SLOD
EMB	- BALL MILL BUILDING

- REF. DWGS

[illegible]