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

TECHNICAL SPECIFICATION OF AGITATORS FOR NTPC BONGAIGAON

SPECIFICATION NO	:	**FGD:BNGN:AGITATORS**
END CUSTOMER	:	**NTPC**
PROJECT	:	**BONGAIGAON 3X250 MW**
BUYER (EPC)	:	**BHEL RANIPET**
APPLICATION	:	**WET LIMESTONE FGD**

01	09-01-2021	Generally revised	Jyotish Kumar Patel	Shanmuga Sundaram S	V Kesavan
00	23-07-2020	Fresh Release	-Sd- Jyotish Kumar Patel	-Sd- Shanmuga Sundaram S	-Sd- V Kesavan
REV	**Date**	**Description**	**Prepared**	**Checked**	**Approved**

This document is meant for the exclusive purpose of bidding against this specification and shall not be transferred, reproduced or otherwise used for purposes other than that for which it is specifically issued.

I) DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER:

Sl. No.	Description	Offer part	Purpose
1.	Documents for meeting the Pre-Qualification Requirement (3K format has to be submitted along with supporting documents)	Part -1	Qualification requirement for considering the offer
2.	Reference list – Annexure-I	Part -1	Qualification requirement for considering the offer
3.	Compliance to the technical specification (Complete Specification with Signature and Seal along with filled Annexures)	Part-1	Technical evaluation
4.	Data sheet of all Agitators (As per Annexure-II)	Part -1	Technical evaluation
5.	GA drawing, Exploded view with Material of construction, total weight of all Agitators models offered	Part -1	Technical evaluation
6.	Performance curve & TS curve of Agitators	Part -1	Technical evaluation
7.	GA drawing of Electrical motor & Data sheet and performance curves of all motors (As per Annexure-IV)	Part -1	Technical evaluation
8.	Schedule of Guarantees (Annexure-V) specific to the Enquiry	Part -1	Technical evaluation
9.	List of Deviations (Annexure-VI)	Part -1	Technical evaluation
10.	Mandatory Spare list	Part -1	Technical evaluation
11.	Agitator Motor Sizing Calculation (Annexure-III)	Part -1	Technical evaluation
12.	Motor vendor list and mechanical seal vendor list	Part -1	Technical evaluation
13.	Quality Plan	Part -1	Technical evaluation
14.	Start-up & Commissioning Spares	Part -1	Technical evaluation
15.	List of Special Tools	Part -1	Technical evaluation
16.	Catalogue	Part -1	Technical evaluation
17.	Priced offer	**Part -2**	Commercial evaluation

BIDDER SIGN WITH SEAL AND DATE:

II DOCUMENTS TO BE SUBMITTED AFTER CONTRACT:

Sl. No.	Description	Purpose	Delivery Time
1.	GA drawing, Exploded view, sectional view with Material of construction, mechanical seal , gearbox for all Agitator models	NTPC/BHEL approval to start manufacturing	2 week
2.	Data sheet for all Agitator	NTPC/BHEL approval to start manufacturing	2 week
3.	Agitator Performance curve of all Agitators	NTPC/BHEL approval to start manufacturing	2 week
4.	Electrical motor GA drawing & Data sheet and performance curves of all motors	NTPC/BHEL approval to start manufacturing	2 week
5.	Quality plan & Inspection and Test Procedure	NTPC/BHEL approval for inspection	2month after contract
6.	Agitator and Motor Sizing Calculation (Annexure-III)	NTPC/BHEL approval to start manufacturing	2 week
7.	Bending moment calculation	NTPC/BHEL approval to start manufacturing	2 week
8.	Utility Consumption	To arrange utility	2 week
9.	Foundation Data including Anchor plan	To civil design	2 week
10.	Lubricating oil list	Record purpose	4 week
11.	Special tools list	For maintenance	4 week
12.	Installation and assembly procedure	For erection	4 week
13.	Approximate weight of each skid	To arrange lifting device	4 week
14.	Pre Commissioning Check List	For erection	4 week
15.	Operation and Maintenance Manual	For O&M	4 week
16.	Start-up & Commissioning Spares	For commissioning	4 week
17.	List of Special Tools	For arranging	4 week
18.	P & I Diagram (if applicable)	For information	4 week

BIDDER SIGN WITH SEAL AND DATE:

CONTENTS:

MAIN SUPPLY	
1.0	APPLICABLE CODES & REGULATIONS
2.0	INTENT OF SPECIFICATION
3.0	PROVENNESS CRITERIA / QUALIFICATION REQUIREMENTS
4.0	MATERIAL OF CONSTRUCTION
5.0	SCOPE OF SUPPLY
6.0	GENERAL REQUIREMENTS
7.0	PACKING & FORWARDING
8.0	SUPERVISON OF ERECTION, TESTING & COMMISSIONING
9.0	EXCLUSION
10.0	INSPECTION AND TESTING
11.0	PAINTING
12.0	SPARES, TOOLS & TACKLES
13.0	PERFORMANCE GUARANTEE
14.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION
15.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION
16.0	WARRANTY / DEFECT LIABILITY
17.0	FIRST FILL OF CONSUMABLES
18.0	TRAINING
19.0	DELIVERY CONDITION
20.0	DOCUMENTATION

BIDDER SIGN WITH SEAL AND DATE:

1.0 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 Agitator shall follow the latest applicable Indian/International (AISI / ASME/EN/Japanese) Standards.

2.0 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 & performance testing at bidder's works/ site of Agitators along with accessories which is furnished in the Flue Gas Desulphurization plant of NTPC Bongaigaon. The following points may be noted.

a. Agitators are envisaged in various tanks, details of which are given in Technical Information of Agitators.

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. The Bidder shall offer only proven design which meets the Provenness /Pre-qualification requirement. Necessary document evidences as per **Attachment-3K for qualification** shall be submitted along with the bid. If bidder doesn't meet the specified provenness criteria, their offer will be rejected.

d. 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 VI-LIST OF DEVIATIONS OR EXCEPTIONS TO THE ENQUIRY DOCUMENT)**

e. Any deviation, not listed under the above section, even if reflected in any other portion of the proposal, shall not be considered applicable.

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

g. 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.

h. 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.

i. 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.

3.0 PROVENNESS CRITERIA/ QUALIFICAITON REQUIREMENT:

The bidders are required to meet the qualification requirement for the Agitator as per criteria given in Annexure-3K. Bidder shall provide all documents pertaining to 3K. BHEL reserves the right to verify the information provided by vendor. In case the information/ documents provided by the bidder are found to be false/ incorrect the technical offer shall be rejected.

4.0 MATERIAL OF CONSTRUCTION

	Material of construction	Vertical Agitators (Top entry)
i.	Impeller blade	Alloy 926 or better material
ii.	Impeller Hub	Alloy 926 or better material (or) Carbon steel with 6mm thick Bromo/Chloro Butyl Rubber Lining (as per Proven practice)
iii.	Shaft	CS with Rubber Lining (min 6 mm thk Chloro/bromo butyl Rubber)
iv.	Fasteners in wetted parts	Alloy 926 or better material
v.	Fasteners in Non Wetted	GI fastener (40 µ plated) / SS
vi.	Mounting base	Carbon Steel

4.1 POWER SUPPLY DETAILS:

1.	**POWER SUPPLY**	
	The following voltage levels shall apply:	
	3 phase, 3.3 kV AC ,50 Hz	Voltage for motors equal to / bigger than 200KW and for power distribution within the plant.
	3 phase, 415 V, AC , 50 Hz	Standard voltage for power supplies to electric power consumers and motors Above 0.2 KW and upto 200 kW.
	240V AC / 3 phase 415 V AC, 50 Hz	Standard voltage for power supplies to electric power consumers and motors Upto 0.2 kW.
	1. All equipments shall be suitable for rated frequency of 50 Hz with a variation of + 3% & -5%, and 10 % combined variation of voltage and frequency unless specifically brought out in the specification. 2. Bidder shall design and supply the equipment suitable for satisfactory operation under above mentioned power supply condition.	

BIDDER SIGN WITH SEAL AND DATE:

5.0 SCOPE OF SUPPLY

Scope for the bidders shall include Design, Manufacturing, Supply, and Supervision of Erection & Commissioning

Design: Includes basic engineering, detail engineering, preparation and submission of engineering drawings/calculations/datasheets/quality assurance documents/field quality plans, storage instructions, commissioning procedures, 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.

Supervision of Erection & commissioning: Includes supervision of erection & commissioning, supervision of trial operation, training of customer's O&M Personnel.

The scope of supply for AGITATORS(Top Entry-vertical type) shall include but not limited to the following:

Sl. No	Scope	
1.	AGITATOR complete with	
	i.	AGITATOR Blades
	ii.	AGITATOR Shafts
	iii.	Coupling arrangement (Flexible)
	iv.	Gland Packing, Seals, O Rings, Glands
	v.	Shaft Sleeve
	vi.	Lanterns/ Stools (Bearing Housing), Safety Guard
	vii.	Bearings
	viii.	AGITATOR Mounting Flanges with gaskets and fasteners
	ix.	Drive Motor(IE3 efficiency class) with gearbox or belt and pulley arrangement
	x.	Mounting base with gaskets and fasteners for mounting on tank top
	xi.	Painting and Rust Prevention during shipment and construction
	xii.	Supervision of Erection & commissioning at site
	xiii.	Special tools & tackles as applicable
	xiv.	Start-up spares as applicable
	xv.	Installation, operation and maintenance manuals
	xvi.	Any other items required for completeness of the equipment except the items covered in the exclusions.

5.1	TECHNICAL REQUIREMENTS
1.	Agitators shall be supplied in tanks and vessels to prevent caking and settlement of particles out of the slurry, e.g. in the absorber vessel, limestone mill recycle tanks, limestone slurry tank, Auxiliary Absorbent tank, and sumps etc.
2.	All agitators shall be designed for continuous operation unless otherwise specified. The design of the agitators shall be of proven type.
3.	Standard type agitators with suitable characteristics shall be used wherever practical. The

BIDDER SIGN WITH SEAL AND DATE:

	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.
4.	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.
5.	MOC of various agitator parts shall be as per Cl 4.0 . This does not release the bidder of the responsibility for selecting the correct materials.
6.	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. It shall be possible to remove the sealing devices of the Agitators of the absorber vessel without having to drain completely the absorber.
7.	To prevent mechanical blocking load start-up after standstill of pumps, piping and agitators for slurries shall be applied with C-hose connection.
8.	Lifting lugs and eyes and other special tackle shall be provided as necessary to permit easy handling of the agitators and their components.
9.	Static and dynamic (as far as applicable) balancing of all agitators shall be carried out after assembly.
10.	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.
11.	All exposed moving parts shall be covered by guards.
12.	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
13.	Belt drives (if applied) shall be properly designed to provide a minimum lifetime of 2 years under design conditions
14.	It shall be noted that all Agitators (except Absorber Agitator, Auxiliary Absorbent Tank Agitator and Drain Sump Agitator) are meant for keeping the solid particles in suspended mode in liquid with "Full off-Bottom Suspension" of solid particles to 98% of liquid column to virtually "Uniform Solid Concentration". No chemical reaction will take place. R01
15.	Maintaining a uniform concentration over the 95% of liquid column, Absolute sweeping of solid particle from tank bottom is a must for all Agitators. If speed is required to be increased to guarantee the above requirements; the same can be increased by vendor. Bidder's machines that consume less power will be in an advantageous position.
16.	For Absorber, Auxiliary Tank and Drain Sump Agitators : There shall not be any slurry settlement at the Bottom of the Tank and all solids shall be suspended off the tank bottom (i.e. Off Bottom suspension) R01
17.	It is to be noted that in continuous process any deposit at tank bottom is the loss of material which are not getting converted as per process. Hence, total loss of material by sedimentation is a loss to FGD Process & determines the "In efficiency of the Agitator".
18.	Vendor should ensure nil settlement; utilization of solid material shall be a guaranteed parameter and will be assessed in percentage (%) term to net wet of solid mass of inflow or out flow. This is one of the guarantee parameter.

BIDDER SIGN WITH SEAL AND DATE:

19.	Agitator and its driver shall perform on the test stand at shop and on the Agitator's permanent location at site within vibration limit the vibration of combined unit will be the responsibility of Agitator manufacturer. Agitator manufacturer is to ensure that Site performance of vibration is one of the "Acceptance Criteria" of the equipment. Please note vibration at test stand can only be taken as for information.
20.	Every Tank will have a pump whose suction line shall be connected to tank. These pumps are to operate continuously at the lowest operating level which is decided by Process requirement. Hence, the minimum operating level of liquid in every tank for every Agitator is a must to assess the combined operation of Agitator as well as that of pump alone. The Tank water level is indicated as per "Technical Information of Agitators".
21.	Agitator must have low-pitch propeller with low solidity ratio and Power Number of 0.3-0.35 (preferably). The Maximum Input Power at motor terminal shall be considered as a guaranteed parameter under "Schedule of Guaranteed Parameters" in "Annexure-V-Schedule of Guarantees"- and the same shall be calculated for maximum liquid level in tank. A calculation of power specifying the hydraulic power of Agitator, Seal loss, Gear box and Motor internal loss must be submitted along with the offer. A characteristics curve showing power versus liquid level should be submitted from the lowest liquid level, required for Agitator to maximum liquid level in the tank. Motor should be selected based on the highest power demand with a margin (refer clause 5.3.1) at maximum liquid level, taking into account frequency variation.
22.	Bidder shall provide the design and arrangement of baffle plates in circular tanks. Baffle plates are in BHEL scope.
23.	All agitators have to be designed for outdoor condition.
5.2	**CONSTRUCTIONAL FEATURES**
A)	**BLADE AND HUB OF PROPELLER**
I)	The Blade design of the Agitator to be of most efficient design in order to offer least power consumption. The Agitator power consumption is part of the guarantee parameters.
II	Although Agitator will have substantial low speed because of reduction Gear Box, hydraulic unbalance at impeller can cause severe vibration, hence it is mandatory that rotating assembly shall be dynamically balanced to its rated speed.
III	Impeller should be dynamically balanced to Gr: G16: ISO-1940 after rubber lining of shaft.
iv	For circular tanks, the tip diameter of the impeller shall be one-third of the Tank diameter.
v	Two level of impellers have to be offered in case of the following conditions: a) (Slurry Filling Height X specific gravity)/Tank Dia >1, b) (Slurry Filling Height X Specific Gravity)/ Impeller Tip Dia > 4. The tip diameter of both the impellers have to be same for maintaining uniform suspension. The agitators for the following tanks shall be provided with two level of impellers : Limestone slurry storage Tank and Secondary Hydro cyclone Feed tank . However, bidder may propose two level of impellers for other tanks if their standard design permits the same.

BIDDER SIGN WITH SEAL AND DATE:

B)	**SEALING ARRANGEMENT OF VERTICAL AGITATORS**
I	Agitator shall be supplied with stuffing box or any proven equivalent or superior sealing type. Mechanical and hydraulic conditions in the seal chamber, required to maintain a stable film at seal face, including temperature, pressure and flow, shall be jointly established by Agitator manufacturer and seal manufacturer, and shall be noted in data sheet submitted in tender. If mechanical seal is offered by bidder, the mechanical seal should be as per ISO-21049 / API 682.
C)	**SHAFT**
	Use of dissimilar material at flange joint shall be avoided to eliminate any crevice corrosion. Spacing of the shaft joint should not be more than 3.0 m for easy assembly if it is more than 40kg. If welding is used for joining two tubes, welding joint must be 100% radio graphed. If split shaft is proposed for larger tanks , shaft flange at the joining interface has to be rubber lined at manufacturer's works and necessary fasteners have to be provided.
D)	**BEARING & BEARING HOUSING IN GEAR BOX**
	Bearing shall be of rolling type radial and thrust bearing (FAG/SKF/Timken make only) as required. Thrust bearing shall be sized for continuous operation under all specified condition.
	Thrust bearing shall provide full load capability if the Agitator's normal direction of rotation is reversed. Up-thrust and Down-thrust load must be taken into account in sizing bearing. Life of the every anti-friction bearing, used in the bearing housing as per manufacturer's design, should have L10 of 25000 hr (minimum).
	Bearing housing should be grease/oil lubricated. If bearing is oil lubricated, constant–level sight-feed oiler of 100cc size or bigger capacity is to be provided. Bearing housing should have oil drain, constant oil level indicator. A provision of one(1) numberG1/2" thread(ISO-228,Part-1)port is required for remote control of temperature of bearing housing oil bath RTD.
	If bearing housing requires cooling water, volume and pressure of cooling water is to be indicated in Technical Data Sheet.
	Lubricating oil will be the responsibility of Gear Box manufacturer. Hence, manufacturer has to make arrangement of first fill of oil at installation and at commissioning stage. Quantity of oil and its grade is to be indicated in Drawing and Operation Manual.
E)	**MATERIALS**
	Agitator components designated as "Full Compliance Material" shall meet the requirements of the industry specification as listed for the material in the table as well as in the specification in the respective section.
	A detail quality plan is to be submitted along with offer for all items marked "Full Compliance Material".
	Final acceptance of the quality plan will be approved by ultimate user (hereafter called NTPC). Hence, it is expected that manufacturer to submit quality plan (QAP) along with the offer. The same shall be followed at post order stage also. QAP should be as per the best practice followed internationally to avoid any conflict of interest.
F)	**Driver (Motor)**

1	Driver shall be sized to meet all specified operating conditions including bearing housing , seal, external gear box and coupling loss(if any).
2	Motor shall be able to accelerate to speed at reduced voltage and frequency as specified in "Site Power Supply Condition" as per Clause: 4.1.
3	It should meet Motor specification enclosed.
G)	**GEAR BOX**
	Gear box should be vertical flange mounted solid shaft type (Vertical Agitators), reducing speed type, specially designed for the requirement of Slurry mixing and to be manufactured by the Agitator supplier. Complete up-thrust and down-thrust, developed by Agitator shall be taken by thrust bearing housing of Gear Box. Rating of at Gear box shall be at least 1.5 times the rated torque of Agitator.
H)	**COUPLING & COUPLING GUARD**
I.	Coupling and coupling guard should be supplied between driver and driven equipment.
II.	Coupling should be designed taking into consideration adequate service factor.
III.	Design rating of the coupling (excluding service factor) should be indicated in data sheet.
IV.	Coupling must be having locking screw so that it does not slide over shaft in due course operation.
V.	Vertical Agitators - Coupling between Motor and Gear Box shall be Spacer-type flexible coupling, made of Cast Iron. Spacer length shall be of sufficient length so than Motor and Gear Box shall be able to run independently at no-load condition by detaching the respective coupling.
VI.	It is desirable that for servicing of seal, coupling half should not be removed. Coupling should be dynamically balanced to Gr: G6.3, ISO-1940.
VII.	Removable coupling guard shall conform to the requirements of all applicable national, industrial or statutory regulations.
I)	**PLATE AND FASTENING BOLTS**
I.	Base plate shall be interpreted as the component of Agitator assembly through which the whole load will be transmitted to the Sole Plate/Nozzle over which the equipment will be mounted. The Base plate shall be fabricated with mild steel of structural quality (UTS=42N/sq mm minimum) with anti-corrosive paint of sufficient dry-film thickness.
II.	Base plate must have provision of leveling on its intended mounting place. Sole plate is not in the scope of supply of Agitator manufacturer. It should be noted that Sole plate will be rubber lined to prevent any leakage of corrosive gases
III.	Alignment between Gear Head Shaft and Agitator shaft shall be within the permissible limit of Gear Box. Similarly, misalignment between Motor shaft and Gear Box Shaft shall be within 0.050 micron (radial) and 2 degree (angular) or better as per requirement of Motor and Gear Box

BIDDER SIGN WITH SEAL AND DATE:

IV.	Sole plate with desired number of hole, will be machined on one side. Sole Plate shall be welded to the structure after leveling, as recommended by Agitator manufacturer and rubber lining is completed before placing the equipment in its desired location.
J)	**OTHER COMPONENTS**
	All fasteners used in wetted condition must be of Alloy 926 or better material so that even if it comes in contact with liquid by swelling of rubber, thread remains unaffected. Raw material of fastener must undergo Inter-granular Corrosion test as per ISO-3651, Part-1 for Nitric Acid test. All fasteners which are coming inside the tank (either direct or indirect contact with slurry) shall be considered as wetted parts and MOC shall be Alloy 926.
	TOP ENTRY AGITATORS IN OTHER SLURRY TANKS & DRAIN PITS:
I.	All Agitators shall be designed for continuous operation.
II.	The Material of Construction (MOC) of Top Entry Agitators shall be as per Cl 4.0
III.	It should be roof mounted.
IV.	Agitators shall be vertical mounted type and shall be driven by motor with reducing speed gear box of rigid type, solid shaft coupling between gear box and agitator and flexible coupling of spacer type coupling between Motor and Gear Box. Both Gear Box and Motor should be vertically/horizontally flange mounted type with a common frame of the whole equipment. The entire thrust load of agitator should be transmitted to the thrust bearing of Gear box.
V.	Cable entry to the Motor terminal box should preferably be from top when motor is vertically mounted at its position and it should be easily accessible.
VI.	Nozzle size, on which Agitator shall be mounted, shall have enough opening to Insert rotating assembly from top.
VII.	Impeller should be dynamically balanced to Gr: G16: ISO-1940 after rubber lining of shaft.

R01

5.3 MOTOR

- **Degree of Protection**

  Degree of protection for various enclosures shall be as follows:

  a) Outdoor motors : IP 55

  b) Cable box-Outdoor area : IP 55

- **Codes and Standards**

  a) Three phase induction motors : IS325

  b) Single phase AC : IEC 60034

- **Painting**

  Paint shade shall be as per RAL5012

- **Efficiency Class**

  Motors have to be of IE3 efficiency class.

BIDDER SIGN WITH SEAL AND DATE:

5.3.1 AC Motors Type

AC Motors:

All AC motor shall be Squirrel cage induction motor and, shall be suitable for direct – on-line starting. Rating of the motor should of Type S1 (Continuously rated) as per ISO-60034, Part-1. Rating of motor must be selected with minimum margin(as per the below table) above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variation:

Agitator Rated BKW	Motor Margin
<22KW	125% of Agitator Rated BKW
22KW-55KW	115% of Agitator Rated BKW
>55KW	110% of Agitator Rated BKW

a. All motors, the maximum temperature rise shall be 70^0 C by resistance method for both class B & F insulation.

b. For motors with starting time up to 20secs at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be 3 second more than the starting time at minimum rated voltage(85%). For motors with starting time more than 20secs and up to 45secs at minimum voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5secs more than starting time at minimum rated voltage(85%). For motors with starting time more than 45secs at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at high voltage limit shall be more than starting time at minimum rated voltage(85%) by at least 10% of the starting time. Speed switch mounted on the motor shall be provided in cases where above requirements are not met.

c. 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.

d. Starting voltage requirement will be 85% of rated voltage up to 1500kw rating motor.

e. Single phase space heaters suitable for 240 v AC shall be provided on motors rated 30kw and above to maintain winding in dry condition when motor is standstill. Separate terminal box for space heater (As per clause no: 5.3.2) and RTDs shall be provided.

f. All motors shall be Totally Enclosed Fan Cooled (TEFC), for Motors below 30 kw, winding shall be suitable for heating at 24v, 1 phase AC.

g. Winding and Insulation shall be of type Non-hygroscopic, Oil and Flame resistant. It shall be capable two hot starts in succession with initially at normal running temperature. The insulation shall be Class B or better.

h. Noise level of all motor shall be limited to 85 dB(A). Vibration shall be limited within the limit prescribed by IS12075, Part-14. Motor shall withstand the vibration produced by driven equipment. Combined vibration of the equipment at site shall only be accepted as per the Schedule of Guarantee Clause, as mentioned in the data sheet.

i. Motor body shall have two earthing points on opposite side.

j. inside the terminal box to suit the conductor size

- Motors up to 1 kw - 8 SWG wire
- 1kw - 30 kw - 25x3 mm GI flat
- 30 kw - 60 kw - 25x6 mm GI flat
- 60 kw & above - 30x 6 mm GI flat

5.3.2 Terminal Box

Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm
UP to 3 KW	As per manufacturer's practice
Above 3 KW - upto 7 KW	85
Above 7 KW - upto 13 KW	115
Above 13 KW - upto 24 KW	167
Above 24 KW - upto 37 KW	196
Above 37 KW - upto 55 KW	249
Above 55 KW - upto 90 KW	277
Above 90 KW - upto 125 KW	331
Above 125 KW-upto 200 KW	203

Terminal boxes of LT motors 160 KW (& above) shall be capable of withstanding system fault level of 31 MVA for 0.12 second.
Ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any tolerance)

- Upto 110KW : 11.0
- Above 110KW & upto 1500KW : 10.0
- Above 1500KW & upto 4000KW : 9.0
- Above 4000KW : 6 to 6.5

5.3.3 Testing of LT Motors

a. LT Motors shall be of type tested quality. For each type and rating of LT Motors, rated above 50KW,the vendor shall submit for Owner's approval the report of all type tests as per relevant standards and carried out within last five (5) years from the date of Purchase Order(PO). These reports should be for the test conducted on the equipments similar to those proposed to be supplied under this contract , and the tests should have been either conducted at an independent laboratory or should have been witnessed by client.

b. In case vendor is not able to submit the report of the type tests, conducted within last five (5) years from the date of PO or in case the type tests report are not found to be meeting the specification requirements, the vendor shall conduct all such tests under this contract free of cost to the ultimate purchaser (or NTPC) and submit the reports for approval.
c. All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.
d. All Motors shall be so designed that maximum inrush currents and locked rotors and pull-out torque developed at extreme voltage and frequency variation do not endanger the motor and driven equipments.
e. Terminal boxes of breaker operated LT Motors above 160kw shall be capable of withstanding system fault level 31MVA for 0.12 second.
f. The size and number of cables to be intimated to successful bidder during detail engineering and the contractor shall provide terminal box suitable for the same.

6.0 GENERAL REQUIREMENTS:

S.No	Description
1.	Metric unit shall be used in the drawings and in the any displays on the equipment's. Special attention should be taken that the unit of pressure shall be in dual scales of kPa and kg/cm^{2}G. For instance the pressure gauges should have dual unit's indication.
2.	Descriptions in the drawings, in the documents, and in the displays shall be in English
3.	All rotating parts such as coupling shall be covered with suitable protective guards. Guards shall be easily removable type.
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 85 dB measured at a distance of 1.0 meters from the source in any direction and 1.5m above operating floor.
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.	Corrosion allowance: Corrosion allowance for entire equipment shall be in accordance with latest applicable Indian / International standard.

BIDDER SIGN WITH SEAL AND DATE:

S.No	Description
10.	Unless otherwise specified , flanges shall be in accordance with ANSI B16.5 Class 150
11.	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.
12.	Rotation arrows shall be cast in or attached with stainless steel plate on each item of rotation equipment at a readily visible location.
13.	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.
14.	Skid Mount/Transportation: Equipment shall be fabricated as skid mount design as much as practical to minimize erection at the site.
15.	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.
16.	Bidder shall provide the necessary gaskets.
17.	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.
18.	Bidder to provide capacity of crane or hoist required for material handling and the details of heaviest component to be handled.
19.	The list of all Bought out items with makes and country of origin to be mentioned along with offer to be submitted.
20.	Quality Plan to be submitted along with the offer.
21.	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.
22.	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.
23.	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 to take up with NTPC for approval.
24.	It shall be the complete responsibility of the successful bidders to obtain "Sub Vendor Approval" from BHEL / NTPC for all equipment's & components. Any delay in sub vendor's approval should not affect the project schedule. If any of the sub vendors does not have the approval of NTPC/

BIDDER SIGN WITH SEAL AND DATE:

S.No	Description
	BHEL, the same may be replaced with another NTPC/BHEL approved sub-vendor only, without any price implications to BHEL.
25.	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 and 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: b. Relevant Standards c. Specifications d. Approved drawings e. Data Sheets f. Calibration certificate for all the measuring instruments g. 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.
26.	During detail engineering, bidder to strictly adhere to BHEL/NTPC drawing formats, document numbering, quality plan & FQP formats
27.	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.
28.	Complete detail engineering drawings, calculations, selection of components etc. shall be reviewed & subject to approval of BHEL/NTPC during detail engineering
29.	Bidder shall furnish necessary inputs & drawings of all equipment in editable Auto CAD/ MS-Word /Excel format.
30.	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.
31.	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 shall also be in the scope of the bidder.
32.	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"

BIDDER SIGN WITH SEAL AND DATE:

S.No	Description
	b. "Not considered in scope of work"
7.0	**PACKING AND FORWARDING**
1.	Proper packing to be ensured. Indigenous Supply: Agitator & sub system assembly shall be wrapped in polythene bags & packed in a strong rigid wooden crate. Rain water should not enter into the Agitator internals during storage in the outer yard of power plant. Imported Supply: All imported supply should be packed as per Sea worthy packing standards PE-TS-888-100-A001. 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.(i.e.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 d. Dimensions e. Lifting places f. Handling marks and the following delivery marking

S.No	Description
8.	Each package or shipping units shall be clearly marked or stenciled on at least two sides as per the dispatch instruction givens during the contract: 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 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 Agitator, 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

BIDDER SIGN WITH SEAL AND DATE:

S.No	Description
	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.
8.0	**SUPERVISION OF ERECTION, TESTING AND COMMISSIONING**
1.	The erection of Agitators will be done by owner as per Erection Manual and check List. However, the bidder shall make visit as per enquiry/PO 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.	The bidder will be informed well in advance for the visit.
3.	All TA/DA, Site Expenses, Travel charges boarding and lodging shall be borne by the bidder and shall be inclusive in supervision portion.
4.	Price comparison for evaluating the lowest bid will be considered all main supply, supervision of E&C charges and mandatory spares price all together.
9.0	**EXCLUSION**
	The following work associated with the Agitators will be by others: a. Walkways, platforms and ladders b. Element handling hoists.
10.0	**INSPECTION AND TESTING**
	The 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 on the Agitators for review by BHEL/NTPC prior to manufacture.
2.	The Bidder shall furnish performance test procedure along with standard. The test procedure will be reviewed and approved by the BHEL/NTPC.
3.	Since there is no standard for "Acceptance Test Procedure" for Agitator, Agitator manufacturer is to submit a test procedure and Quality Plan, clearly indicating that equipment will meet the

S.No	Description
	desired parameter.
4.	Power consumption at motor terminal and vibration of equipment will be conducted at site. Vendor to indicate other material tests that are to be conducted as per their practice in their Quality plan.
5.	No liquid should enter the tube through any flange joint. "O"-ring used in the flange joint will deteriorate at a highly chlorinated and acidic environment of medium at a maximum operating temperature unless right quality of rubber is used. Hydrostatic testing of tube assembly is required at a pressure of twice that of maximum liquid column in any tank or 30m whichever is higher. The hydro test duration will be for a minimum of 1 hr to check sweating at any flange. Hydrostatic test is meant in part for a check of equipment joint at new condition only. It is cannot be considered as a guarantee of functional objective of rubber used.
6.	DYNAMICS
7.1	CRITICAL SPEED
7.1.1	Operation speed of the Agitator motor shall be at least 25% below the first critical speed
7.1.2	Additional to the requirement of the critical speed of Agitator, as specified above. Agitator manufacturer is to analyze the torsional critical speed of combined system of Agitator, Gear Box and Motor to establish that the torsional critical speed is well off the operating speed by 20% from the operating speed.
7.2	VIBRATION SEVERITY
7.2.1	During performance test, unfiltered vibration measurements shall be made with running of Agitator in Air. Measurement shall be taken on the Gear Box thrust bearing housings as well in motor top.
7.2.2	Guaranteed Site vibration of the equipment on its own pedestal, at commissioning with normal level of liquid and with maximum liquid at respective tank, Vibration limit at site will be as per ISO-10816, 1.5-2.3mm/sec even if Motor rating falls below 15kw.
7.2.3	Vibration measurements of bearing housing shall be made in root mean square (RMS) velocity.
7.2.5	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.
8.	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.
9.	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.

BIDDER SIGN WITH SEAL AND DATE:

S.No	Description
10.	Test certificates shall be issued for each lot of raw material used in the coating, corresponding to specific weight and traction resistance.
11.	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.
12.	For surfaces with rubber lining, Coating thickness shall be checked at 100%. A High voltage porosity test will be conducted on 100 % of the coated surface.
13.	Out of all Agitators One Number of each type will be inspected at the Bidder's works before dispatch or where the test facilities are available.
14.	The Bidder shall conduct performance test for the remaining Agitators and submit the reports.
15.	Contract shaft mechanical seals shall be used during shop tests, unless the seal design is unsuitable for the shop-test condition, if applicable.
16.	Agitators shall not be released for shipment, until shop tests data and performance tests curves have been approved by Owner.
17.	Bidder should furnish performance guarantee as per applicable standard guarantee for the design, manufacture, material and safe operation of the equipments.
18.	BHEL shall witness the test at Bidder's works and a notice of minimum three (3) weeks shall be given for attending the inspection.
19.	Bidder to arrange all calibrated gauges, Instruments during inspection.
20.	Mechanical running and the performance test shall be carried out. Bidder to arrange Motor of same / higher rating for the shop test and inspection.
11.0	**PAINTING**
1.	**Painting details for agitator support:-** **Surface Preparation : Blast Cleaning SA 2.5** **PRIMER COAT:** ***a.*** Primer: One coat of Two component moisture curing zinc (ethyl) silicate primer coat (Min 80% metallic zinc content in dry film, solid by volume minimum 60% ±2). Zinc dust composition and properties shall be as per Type II as per ASTM D520-00 DFT- 70µ Intermediate : One coat of Two component polyamide cured epoxy with MIO content (containing lamellar MIO Min 30% on pigment, solid by volume min. 80%±2) DFT- 100µ . **FINISH COAT:** Two coats of two pack aliphatic isocyanate cured acrylic polyurethane paint to IS 13213 solid by volume min.55%±2) DFT- 35µ/ coat With gloss retention (SSPC paint spec no.36, ASTM D4587, D2244, D523 of level 2 after min. 1000 hrs exposure, gloss less than 30 and colour change less than 2.0Δ E) **COLOUR CODE** Base: To be informed during contract stage

BIDDER SIGN WITH SEAL AND DATE:

S.No	Description
	Lettering: To be informed during contract stage
2.	Rust preventive paint after inspection at shop floor before dispatch shall be in bidder's scope
3.	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.
12.0	**SPARES,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.
12.1	**START UP & COMMISSIONING SPARES**
	Start-up & Commissioning Spares shall be part of the main supply of the Agitators. Start-up & commissioning spares are those spares which may be required during the start- up and commissioning of the equipment/system. All spares required for successful operation till commissioning of Agitator shall come under this category. Bidder shall provide an adequate stock of such start up and commissioning spares to be brought by him to the site for the equipment erection and commissioning. The spares must be available at site before the equipment's are energized. The List of such spares to be provided during bidding stage
12.2	**RECOMMENDED SPARES**
	Bidders shall also furnish the recommended spares list along with the offer required for 3 years of normal operation of the plant and should be independent of the list of the mandatory spares. Prices of recommended spares will not be used for evaluation of the bids. The price of these spares will remain valid up to 6 months after placement of Notification of Award for the main equipment
12.3	**MANDATORY SPARES:**
	Bidder to quote for the mandatory spares as per the Mandatory Spare list given for a specific project. Bidder shall quote for the "Initial Spares Part List", and it will be considered for L1 evaluation. Initial spare parts items shall be handed over separately and shall not be mixed with the supply of the main equipment parts. Spares shall be sent in pre-decided lots in containers/secure boxes. All boxes/containers are to be distinctly marked in red color with boldly written "S" mark on each face of the containers. Spares shall not be dispatched before dispatch of corresponding main equipment's. Each item shall be labelled in English and be packed against damage and sealed to prevent deterioration from corrosion. The protection shall be sufficient for a minimum of 10 years'

S.No	Description
	storage in a dry weatherproof building. All spares supplied under this contract shall be strictly inter-changeable with the parts for which they are intended for replacements. All the Initial spares shall be manufactures along with the main equipment components as a continuous operation as per same specification and quality plan. 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.
13.0	**PERFORMANCE GUARANTEE**
	a) All performance tests for Agitators shall be carried out in accordance with any latest international codes/standards. b) Bidder shall furnish Performance guarantee for the design, manufacture, material, safe and trouble-free operation of the Agitators and its accessories c) 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. d) Noise level ≤85 dB (A) at 1m horizontal distance from equipment/enclosures and 1.5m above operating floor is to be guaranteed. e) 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. f) Acceptance tests to be carried out as per the procedure defined by the bidder which shall be submitted for BHEL/ NTPC approval. g) 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.
14.0	**BID EVALUATION CRITERIA FOR POWER CONSUMPTION:**
1.	**POWER GUARANTEE** Bidder to specify the total guaranteed power per Agitators operating at the rated capacity in their offer.
2.	**BID EVALUATION CRITERIA FOR POWER CONSUMPTION:** Only agitators which are in continuous operation will be considered for power consumption. Bidder. Agitators which are considered for power loading are given in Annexure document. Base value for power consumption is given in "Technical Information of Agitators" . Bid prices of other bidders will be loaded for every KW excess over the ceiling value as per the formula given below.

BIDDER SIGN WITH SEAL AND DATE:

S.No	Description
	Adjustment factor for excess power consumption for each agitator= (GPC-BV) X PL GPC- Guaranteed Power Consumption quoted by bidder in KW BV- Base Value . Bidder shall refer to the "Technical Information of Agitators" PL- Power Loading per KW . Bidder shall refer to the "Technical Information of Agitators" Base value and Power Loading will be as per the "Technical Information for Agitators". However, the maximum loading will be limited to 10% of the equipment value.
15.0	**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 = (APC-GPC) X P X Total no of Working agitators Where GPC- Guaranteed Power Consumption quoted by bidder in KW APC- Actual Power Consumption in KW N- Total Number of Agitators P- Penalty per KW **Note :** **1.** LD will be levied after conducting performance test as above subjected to the maximum 10% of the main equipment value. LD will be adjusted from the pending bills payable to the bidder. 2.For conducting PG test at project site for demonstrating the guaranteed parameters of Agitator, vendor has to make their own arrangement for TA/DA and hotel charges, which is to be considered while submitting the offer.
16.0	**WARRANTY/DEFECT LIABILITY**
1.	The Bidder warrants that the equipment's/items shall be free from defects in the design, engineering, materials and workmanship of the Plant and Equipment supplied and of the work executed. The Warranty Period shall be twenty four (24) months from the date of Supply or eighteen (18) months from the date of commissioning, whichever first occurs. If during the Warranty/Defect Liability Period any defect should be found in the design, engineering, materials and workmanship of the Plant and Equipment supplied or of the work executed by the Bidder, the Bidder shall promptly, in consultation and agreement with BHEL regarding appropriate remedying of the defects, and at its cost, repair, replace or otherwise make good (as the Bidder shall, at its discretion, determine) such defect as well as any damage to the Facilities caused by such defect.
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 .

BIDDER SIGN WITH SEAL AND DATE:

S.No	Description
17.0	**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 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.
18.0	**TRAINING**
	Successful bidder shall provide comprehensive training for NTPC/BHEL Engineering, O&M, Erection & Commissioning staffs at site covering all aspects of the Agitators - Operation & Maintenance, Troubleshooting etc.
19.0	**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.
20.0	**DOCUMENTATION**
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 Offer. 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 in this specification. 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

S.No	Description
	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 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.

ANNEXURE-I – REFERENCE LIST

Project :

Enquiry No :

REFERENCE LIST as per format shown below. (Atleast two reference plant details for Horizontal and Vertical Agitators)

S.No	Project Name , Customer & Plant capacity	Coal fired Yes/No	Wet Limestone Based FGD Yes/No	Model	Size of Tank	Type / Hor / Vertical	Speed rpm	Year of Commg	Qty

Note :

Bidders shall submit reference list of Horizontal and Vertical agitators for various tanks as per the format given above.

BIDDER SIGN : _____

DESIGNATION : _____

DATE : _____

BIDDER SIGN WITH SEAL AND DATE:

Annexure-II TECHNICAL DATASHEET OF AGITATORS (TO BE FILLED FOR EACH AGITATOR)

Project :

Enquiry No :

Sl.no	General	Units	DATA
1.1	Project		
1.2	Ultimate Customer		
1.3	Location		
1.4	Order Number/Enquiry No		
1.5	Agitator Name		
1.6	Service		
1.7	Installation		
1.8	No. of Agitator per Tank		
1.9	Total No's of Agitator for all the units		
1.10	Type of Agitator		TOP ENTRY/SIDE ENTRY
1.11	Model Number		
1.12	No of Stage(No of propeller per Agitator)		
1.13	Mounting of Agitator		
1.14	Mounting of Gear Head		
1.15	Mounting of Motor		
2	**Performance Details**		
a.	Input power at Motor terminal at highest frequency and Maximum liquid level in tank	KW	
b.	Input power at Motor terminal at Normal frequency (50Hz) and Normal liquid level in tank	KW	
c.	Motor rating	KW	
d.	Rated speed	rpm	
e.	Critical Speed	rpm	
f.	Tip speed	m/s	
g.	Direction of rotation of Motor and Gear box viewed from Motor non-driving end		
h.	Direction of rotation of Agitator viewed from Gear head end		
i.	Minimum submergence required over blade centre line for continuous operation	mm	
j,	Impeller diameter	mm	
k.	Minimum clearance required below impeller centre line	mm	
l.	Maximum liquid level over propeller centre line up to which Agitator can work without overloading of motor at 50Hz	mm	
3	**Construction Features**		
3.1	Impeller		
	a) Type		
	b) Diameter(tip to tip)	mm	
	c) Hub diameter	mm	
	d) No of blade per Impeller		
	e) Thickness of blade	mm	
3.2	Tube thickness, if any	mm	
3.3	Shaft diameter at coupling (GH-Agitator)	mm	
3.4	Length of Top shaft	mm	
3.5	Connection Details		
	· Blade to Hub:		
	· Hub to Shaft/Tube		
	· Line Shaft to Line shaft		
	· Line shaft to top shaft		
3.6	Bearings in Gear Head		

	Thrust bearings Housing		
	a) Type		
	b) Make		
	Bearing Number		
	· Radial Bearing		
	· Radial Bearing		
	· Thrust Bearing		
	c) Type of lubrication		
	d) Lubricator		
3.7	Coupling between Agitator & Gear Head		
	a) Type		
	b) Make & Model No.		
	c) Rating	KW/rpm	
3.8	Stuffing Box/Mechanical Seal		
	a) Type		
	b) Details of gland packing		
	c) No of packing		
	d) Cooling water		
	e)Lubrication type		
	f)Qty of grease and interval of lubrication.		
4	**Material of Construction**		
a.	Blade of Impeller		
b.	Hub of Impeller		
c.	Base Plate/Gear head Stand		
d.	Line Shaft & Line shaft Coupling		
e.	Impeller Shaft		
f.	Top Shaft		
g.	Gland Sleeve		
h.	Location of Thrust bearing		
i.	Coupling guard		
j.	Fasteners in Wet region		
k.	Fasteners in Dry region		
l.	Stuffing Box		
m.	Gland		
n.	Gland packing		
5	Weight		
	a) Bare Agitator weight Kgs		
	b)Rotating Assembly weight Kgs		
	c) Motor weight Kgs		
	d) Gear Head weight Kgs		
	e)Wt. of the equipment, (a+c+d)		
	f) Heaviest single piece component of Agitator to be handled. Kgs		

BIDDER SIGN WITH SEAL AND DATE:

Annexure-III MOTOR SIZING CALCULATION (TO BE FILLED FOR EACH AGITATOR)

Project :

Enquiry No :

S.No	Parameters		Data
1	Tank size (Dimension in m)		
2	Specific Gravity of Slurry	ρ	
3	IMPELLER TIP DIA(in m)	d	
4	AGITATOR SPEED(RPM)	n	
5	POWER NO OF THE AGITATOR	Np	
6	NO OF IMPELLER STAGES	I	
7	AGITATOR POWER(P)	Np*ρ * d^5 *n^3 * I	
8	GEARBOX EFFICIENCY	η1	
9	BEARING TRANSMISSION EFFIFICIENCY	η2	
10	EFFICIENCY DUE TO ANY OTHER LOSSES	η3	
11	MECHAINCAL POWER REQUIRED(X)	X= P/(η1*η2*η3)	
12	MOTOR EFFICIENCY	η	
13	Rated Input Power at Motor Terminal at Normal water level and at Normal voltage and Frequency or Agitator BKW	Agitator BKW = X/η	
14	MOTOR POWER (KW)	Motor margin shall be designed as per the following guidelines : a) If Agitator Rated BKW <22KW , the Motor Rating shall be 125% of Agitator Rated BKW b) If Agitator Rated BKW from 22KW to 55KW , then Motor Rating shall be 115% of Agitator Rated BKW c) If Agitator Rated BKW >55KW , then Motor Rating shall be 110% of Agitator Rated BKW	

Annexure-IV MOTOR DATASHEET FOR AGITATORS (TO BE FILLED FOR EACH AGITATOR)

Project :

Enquiry No :

SLNO	Description	DATA
A.	**GENERAL**	
1.	Manufacturer & Country of origin.	
2.	Equipment driven by motor	"Name of the Agitator"
3.	Motor type	
4.	Quantity	
B.	**DESIGN AND PERFORMANCE DATA**	
1.	Frame size	
2.	Type of duty	
3.	Type of enclosure /Method of cooling/ Degree of protection	
4.	Applicable standard to which motor generally conforms	
5.	Efficiency class as per IS 12615(IE3)	
6.	(a)Whether motor is flame proof	
	(b)If yes, the gas group to which it conforms as per IS:2148	
7.	Type of mounting	
8.	Direction of rotation as viewed from DE END	
9.	Standard continuous rating at 40 deg.C. Ambient temp. as per Indian Standard (KW)	
10.	Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)	
11.	Maximum continuous load demand of driven equipment in KW	
12.	Rated Voltage (volts)	
13.	Permissible variation of :	
	a. Voltage (Volts)	
	b. Frequency (Hz)	
	c. Combined voltage and frequency	
14.	Rated speed at rated voltage and frequency(RPM)	
15.	At rated Voltage and frequency:	
	a. Full load current	
	b. No load current	
16.	Power Factor at	
	a. 100%/75%/50% load	
	b. NO load	

BIDDER SIGN WITH SEAL AND DATE:

	c. Starting.	
17.	Efficiency at rated voltage and frequrecy,	
	a.100% load	
	b. 75% load	
	c. 50% load	
18.	Starting current (amps) at	
	a. 100 % voltage	
	b. 85% voltage	
	c. 80% voltage	
19.	Minimum permissible starting Voltage (Volts)	
20.	Starting time with minimum permissible voltage/80%/ 100%/ 110%	
	a. Without driven equipment coupled	
	b. With driven equipment coupled	
21.	Safe stall time with 100% ,110% & 80% of rated voltage	
	a. From hot condition	
	b. From cold condition	
22.	Torques :	
	a. Starting torque at min. permissible voltage(kg-mtr.)/ rated voltage	
	b. Pull up torque at rated voltage.	
	c. Pull out torque	
	d. Min accelerating torque (kg.m) available at lowest permissible starting voltage	
	e.Rated torque (kg.m)	
23.	Stator winding resistance per phase (ohms at 20 Deg.C.)	
24.	GD2 value of motors	
25.	No of permissible successive starts when motor is in hot condition	
26.	Locked Rotor KVA Input	
27.	Locked Rotor KVA/KW	
28.	Vibration limit :Velocity (mm/s)	
29.	Noise level limit (dBA)	
C.	**CONSTRUCTIONAL FEATURES**	
1.	Stator winding insulation	
	a. Class & Type	
	b. Winding Insulation Process	
	c. Tropicalised (Yes/No)	
	d. Temperature rise over specified maximum ambient temperature of 50 deg C	

BIDDER SIGN WITH SEAL AND DATE:

	e. Method of temperature measurement	
	f. Stator winding connection	
2.	Main Terminal Box	
	a. Type	
	b. Location(viewed from NDE side)	
	c. Entry of cables(bottom/side)	
	d. Recommended cable size(To be matched with cable size envisaged by owner)	
	e. Fault level (MVA),Fault level duration(sec)	
	f. Cable glands & lugs details (shall be suitable for power cable)	
3.	Type of DE/NDE Bearing	
4.	Motor Paint shade	
5.	Weight of	
	a. Motor stator (KG)	
	b. Motor Rotor (KG)	
	c. Total weight (KG)	
D.	**List of accessories.**	
1. 3.	Space Heaters (Nos./Power in watts/supply voltage)	
2.	Terminal Box for Space Heater (Yes/No)	
3.	Speed switch (Yes/No)	
	No of contacts and contact ratings of speed switch	
4.	Insulation of bearing (Yes/No)	
5.	Noise reducer(Yes/No)	
6.	Grounding pads	
	i) No and size on motor body	
	ii) Nos on terminal Box	
7.	Any other fitments	
E.	**List of curves.**	
	Torque speed characteristic of the motor	
	Thermal withstand characteristic	
	Starting. current Vs. Time	
	Starting. current Vs speed	
	P.F. and Effi. Vs Load	

BIDDER SIGN WITH SEAL AND DATE:

Annexure-V-Schedule of Guarantees (TO BE FILLED FOR EACH AGITATOR)

Project:

Enquiry No:

Sl. No.	Description	Unit	Data
1	Rated Input Power at Motor Terminal at Normal water level and at Normal voltage and Frequency (*)	KW	
2	Possible Rate of deposit of solid particles at tank bottom of total solid particle inflow/outflow	%	
2	Noise level at a distance of 1.0 meter from the equipment at site	dB(A)	85
3	Maximum vibration velocity at site (RMS)- shall be per ISO 10816	mm/sec	
4	Life of Agitator components parts from the date of Commissioning for continuous operation		24 months
5	Anti-friction Bearing		25000 hrs.

BIDDER SIGN : _____

DESIGNATION :_____

DATE :_____

Annexure-VI-- LIST OF DEVIATIONS OR EXCEPTIONS TO THE ENQUIRY DOCUMENT

Project :

Enquiry No:

*We hereby accept to the Technical Specification for agitators and **all the parameters for this project**

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

(OR)

*The following are the technical deviations to the specification:

Sl No	Clause No	Page No	Description of Deviation

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

*Strike out whichever is not applicable

BIDDER SIGN WITH SEAL AND DATE:

ANNEXURE- 3K : Qualifying Requirements for Agitators

Bidder has to meet the Qualification requirement given by NTPC and the same is reproduced below.

The following terminology shall be followed for 3K Document:
a)Bidder means BHEL
b)Bidder's sub-vendor means Agitator Manufacturer.
c)Employer or owner means NTPC

Agitator Vendor shall meet the below qualification requirement of NTPC .

NTPC CL No	DESCRIPTION			
4.01.00	The Bidder / Bidder's sub-vendor(s) is required to meet the provenness criteria and/or qualification requirement for critical equipments, auxiliaries, systems and bought out items as per criteria stipulated below			
4.01.01	Agitators 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 as on Part-I bid opening date:			
	Type and Rating for Qualification			
	Name of Equipment	**Type of Equipment**	**Application**	**Equipment Rating**
	Agitators	Vertical	Wet Limestone based FGD application in Coal fired power plant	Agitator rating not less than that supplied for 500 MW or higher size unit for similar application
4.01.03	A JV / Subsidiary Company formed for manufacturing and supply of equipment(s) as listed at clause no. 4.01.01 above in India, shall also be considered qualified for manufacturing 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			

	incorporation of such Joint Venture/ Subsidiary or upto the end of defect liability period of the contract, whichever is later
4.01.06	In case the Bidder or the proposed sub-vendor is not manufacturer of proven Agitators as per clause 4.01.01(f) above but is a manufacturer of Agitators for similar process/duty application in petrochemical or metals and mining industry, the Bidder or the proposed sub-vendor shall also be considered qualified for manufacturing Agitators, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Agitators in India with such manufacturer who meets the requirements stipulated at clause 4.01.01(f) above for the Agitators. 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
04.01.07	In case the Bidder or the proposed sub-vendor is a manufacturer of Pumps, the Bidder or the proposed sub-vendor shall also be considered qualified for manufacturing Slurry Recirculation Pumps and Slurry Pumps, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meets the requirements stipulated at clause 4.01.01(b) above for the Slurry Recirculation Pumps and at clause 4.01.01(e) above for the Slurry Pumps. 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 equipment.
04.01.08	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 / Licenser 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.
04.01.09	Bidder shall offer and supply only the type of the above equipment(s) for which it, itself or the manufacturer / Collaborator(s) / Licenser(s) proposed by the Bidder for the above equipment(s) is qualified.
04.01.10	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 : Whenever the term 'coal fired' is appearing above, "Coal" shall be deemed to also include bituminous coal/brown coal/Anthracite Coal/lignite.
	REMARKS: Agitator vendor shall furnish the 3K- form as per the enclosed format along with all supporting documents. The offer will be considered only after obtaining approval from the end-customer(NTPC) and the above conditions for qualification criteria may be relaxed subject to the end-customer's approval for the vendors participating in this enquiry.

The following terminology shall be followed for 3K:
Bidder means BHEL
Bidder sub vendor means the Agitator manufacturer
Employer or Owner means NTPC

FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE
FOR
BONGAIGAON 3X250 MW
BIDDING DOCUMENT NO. CS-0011-109(5)-9

Bidder's Name and Address:

To
Contract Services-I
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/*4.01.07
Agitators			*4.01.01 /*4.01.03 /*4.01.06
Vacuum Belt filters			*4.01.01 /*4.01.03

Signature of authorized signatory.....

Note : *Strike-off whichever is not applicable.

1. If qualification sought as per clause 4.01.01, sub-section-I, 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, Part-A of Section-VI, then the details of proposed sub vendor (i.e manufacturer of such equipment for at least 195 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, 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, 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, Part-A of Section-VI shall also be furnished.

3. If the qualification sought as per the clause 4.01.03, sub-section-I, Part-A of Section-VI then the details of JV/Subsidiary Company formed for manufacturing of such equipment 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, 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, 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 Letter of Support as per the format enclosed at Annexure-I.

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

Signature of authorized signatory.....

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 Booster Fans, *Slurry Recirculation Pumps, Oxidation Blowers, Wet Limestone Grinding Mills, Slurry Pumps, & Agitators 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 :

A. **For Booster Fans:** 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 Booster Fan of required flow & head of the offered Booster Fan with Fan Speed 900 rpm (maximum), Axial type with variable pitch control working in a 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.	No. of units and capacity in MW of unit:	
4.	Whether equipment operating in a coal fired power plant	-*Yes/*No
5.	Name of equipment manufacturer & address:	

Signature of authorized signatory.....

F. **Agitators:** 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 Agitators with rating not less than that supplied for 500 MW or higher size unit for similar application, Vertical/Horizontal type 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.	No. of units and capacity in MW of unit:	
4.	Whether power plant is coal fired	-*Yes/*No
5.	Whether operating in a Wet Limestone based FGD application in coal fired power plant	-*Yes/*No
6.	Name of equipment manufacturer & address:	
7.	Date of commission of the equipments:	
8.	Model no. of the equipment:	
9.	Brief Technical particulars of the equipments:	
10.	Agitators supplied for	.....MW unit size

Signature of authorized signatory.....

Sl. No.	Description	Reference Work
11.	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
12.	Flue gas Desulphurization system details:	*Technical extract/ *paper letter/ *email/ *Drwaing from user or *contract docu ment or *scheme or *any document in public domain enclosed at annexure....to Attachment-3K
13.	Scope of Work:	*Letter of Award or *Contract or *P.O. enclosed at Annexure.....to Attachment-3K
14.	Performance details:	*Certificate/*Letter/*E-mail from End user enclosed at Annexure.....to Attachment-3K

*** Strike off whichever is not applicable.**

Signature of authorized signatory.....

***2.00.00** **Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.01.02, Sub section-I, Part-A of Section-VI.**

2.01.00 We, hereby confirm that we/our sub-vendors are a regular manufacturer of Booster Fan for units of atleast 195 MW rating and the details in this regard on provenness criteria as per clause **4.01.01**, sub-section-I, Part-A, Section-VI are hereby furnished below:

***Bidder to 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)

Signature of authorized signatory.....

*3.00.00 **Applicable for JV Company/Subsidiary Company meeting provenness criteria as per clause no. 4.01.03, Sub section-I, 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) (*Booster Fans, *Slurry Recirculation Pumps, *Oxidation Blowers, *Wet Limestone Grinding Mills, *Slurry Pumps, *Agitators, *Vacuum Belt Filters) 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) (*Booster Fans, *Slurry Recirculation Pumps, *Oxidation Blowers, *Wet Limestone Grinding Mills, *Slurry Pumps,*Agitators, *Vacuum Belt Filters), 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) (*Booster Fans, *Slurry Recirculation Pumps, *Oxidation Blowers, *Wet Limestone Grinding Mills, *Slurry Pumps, *Agitators, *Vacuum Belt Filters) 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.

Signature of authorized signatory.....

***4.00.00** **Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.01.04, Sub section-I, Part-A of Section-VI.**

4.01.00 We, hereby confirm that *we/*our sub-vendors is a manufacturer of Blowers/compressors for minimum 50 NM_3/min capacity. (Details of references enclosed at Annexure .....)

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

4.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the Oxidation Blower between *us/*our sub-vendors, as per 4.01.00 above, and with qualified Oxidation Blower manufacturer, who meets the requirement stipulated at clause **4.01.01**, sub-section-I, Part-A, Section-VI are enclosed as per **Annexure-I** to this Attachment. The data in respect of proveneness criteria for the qualified Oxidation Blower manufacturer, 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 the Oxidation Blowers.

We further confirm that before taking up the manufacturing of such Oxidation Blower *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 Oxidation Blowers 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.

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

Signature of authorized signatory.....

***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 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 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 Letter of Support as per the format enclosed at Annexure-I.

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

Signature of authorized signatory.....

***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 .....)

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

6.02.00 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

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

*7.00.00 **Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.01.06, Sub section-I, Part-A of Section-VI.**

7.01.00 We, hereby confirm that *we/*our sub-vendors is a manufacturer of a manufacturer of Agitators for similar process/duty application in petrochemical or metals and mining industry. (Details of references enclosed at Annexure .....)

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

7.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the Agitator between *us/*our sub-vendors, as per 6.01.00 above, and with qualified Agitator 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 Agitator 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.

We further confirm that before taking up the manufacturing of such Agitator, *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.

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

Signature of authorized signatory.....

***8.00.00** **Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.01.07, Sub section-I, Part-A of Section-VI.**

8.01.00 We, hereby confirm that *we/*our sub-vendors is a manufacturer of a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.01.01 (e), sub-section-I, Part-A, Section-VI.
(Details of references enclosed at Annexure .....)

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

8.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the *Slurry Recirculation Pumps/*Slurry Pumps, between *us/*our sub-vendors, as per 7.01.00 above, and with qualified Slurry Recirculation Pump 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 Slurry Recirculation Pump 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.

We further confirm that before taking up the manufacturing of such *Slurry Recirculation Pumps/*Slurry Pumps, *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.

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

CLAUSE NO.	TECHNICAL REQUIREMENTS

MOTORS

1.00.00 **GENERAL REQUIREMENTS**

1.01.00 For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% shall be considered. The equipment shall operate in a highly polluted environment.

1.02.00 All equipments shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.

1.03.00 Contractor shall provide fully compatible electrical system, equipments, accessories and services.

1.04.00 All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.

1.05.00 The auxiliary AC voltage supply arrangement shall have 6.6 kV and 415V systems. It shall be designed to limit voltage variations as given below under worst operating condition :

(a) 6.6 kV +/- 6%

(b) 415/240V +/- 10%

1.06.00 The voltage level for motors shall be as follows :-

a)	Upto 0.2KW	:	Single phase 240V AC / 3 phase 415V AC
b)	Above 0.2KW and upto 200KW	:	3 phase 415V AC
c)	Above 200KW	:	6.6 kV

1.07.00 Fault level shall be limited to 40kA RMS for 1 second for 6.6kV system and 45 kA RMS 1 second for 415V system. 415V system shall be solidly grounded and 220 VDC system shall be isolated type.

CLAUSE NO.	TECHNICAL REQUIREMENTS
1.08.00	Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.
1.09.00	The responsibility of coordination with electrical agencies and obtaining all necessary clearances shall be of the contractor.
1.10.00	Degree of Protection
	Degree of protection for various enclosures as per IS:13947 shall be as follows :-
	i) Indoor motors - IP 54
	ii) Outdoor motors - IP 55
	iii) CW motors (in case of screen prot. Drip proof) - IP 23
	iv) Cable box - indoor area - IP 54
	v) Cable box - outdoor area - IP 55
2.00.00	**CODES AND STANDARDS**
	1) Three phase induction motors : IS:325, IEC:60034
	2) Single phase AC motors : IS:996, IEC:60034
	3) Crane duty motors : IS:3177, IEC:60034
	4) DC motors/generators : IS:4722
3.00.00	**TYPE**
3.01.00	**AC Motors:**
	(a) Squirrel cage induction motor suitable for direct-on-line starting.
	(b) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.
3.02.00	DC Motors Shunt wound.

CLAUSE NO.	TECHNICAL REQUIREMENTS
4.00.00	**RATING**
	(a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor.
	(b) Whenever the basis for motor ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.
5.00.00	**TEMPERATURE RISE**
	Air cooled motors
	70 deg. C by resistance method for both class B&F insulation.
	Water cooled
	80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both class B&F insulation.
6.00.00	**OPERATIONAL REQUIREMENTS**
6.01.00	**Starting Time**
6.01.01	For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.
6.01.02	For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.
6.01.03	For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.
6.01.04	Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.

CLAUSE NO.	TECHNICAL REQUIREMENTS
6.02.00	**Torque Requirements**
6.02.01	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.
6.02.02	Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.
6.03.00	**Starting voltage requirement**
	(a) 85% upto 1500KW
	(d) 80% from 1501 KW to 4000KW
	(e) 75% > 4000KW
7.00.00	**DESIGN AND CONSTRUCTIONAL FEATURES**
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided.
7.02.00	All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). CW motors can be screen protected drip proof (SPDP) type. Motors located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below
	(a) Fuel oil area : Group - IIB
	(b) Hydrogen generation plant area : Group - IIC (or Group-I, Div-II as per NEC)
7.03.00	Winding and Insulation
	(a) Type : Non-hygroscopic, oil resistant, flame resistant
	(b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature
	(c) 6.6 kV : Class F : with winding temperature rise limited to

CLAUSE NO.	TECHNICAL REQUIREMENTS
	AC motors : Class B. They shall withstand 1.2/50 microsec. switching surges of 4U+5 KV (U=Line voltage in KV). The coil inter-turn insulation shall be suitable for 0.3/3 micro sec. surge of 20KV followed by 1 min power frequency high voltage test of appropriate voltage. on inter turn insulation.
	(d) 415V AC & 220V DC motors : Class B or better
7.04.00	Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.
7.06.00	Noise level for all the motors shall be limited to 85dB(A). Vibration shall be limited within the limits prescribed in IS:12075 . Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and two numbers duplex platinum resistance type temperature detectors.
7.08.00	Motor body shall have two earthing points on opposite sides.
7.09.00	HT motors can be offered with either elastimould termination or dust tight phase separated double walled (metallic as well as insulated barrier) cable boxes. In case elastimould terminations are offered, then protective cover and trifurcating sleeves shall also be provided. In case cable box is offered, then Employer shall provide termination kit. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided in case of cable boxes.
7.10.00	The spacing between gland plate & centre of terminal stud shall be as per Table-I.
7.11.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.

CLAUSE NO.	TECHNICAL REQUIREMENTS
7.12.00	The motors shall be suitable for bus transfer schemes provided on the 6.6 kV/ 415V systems without any injurious effect on its life.
7.13.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.
7.14.00	6.6KV motor Terminal Box shall be suitable for fault level of 500MVA for 0.12 sec. Terminal boxes of breaker operated LT motors above 160KW shall be capable of withstanding system fault level of 31MVA for 0.12 second.
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box suitable for the same.
7.16.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) (a) Upto 110KW: 11.0 (b) Above 110KW & upto 1500KW: 10.0 (c) Above 1500KW & upto 4000KW: 9.0 (d) Above 4000KW: 6 to 6.5
8.00.00	**TYPE TEST**
8.01.00	**HT MOTORS**
8.01.01	The contractor shall carry out the type tests as indicated in the "LIST OF TYPE TESTS TO BE CONDUCTED " on the equipment mentioned there in. The Bidder shall indicate the charges for each of these type tests separately in the relevant schedule of BPS and the same shall be considered for the evaluation of the Bids. The type test charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the Owner's Engineer.
8.01.02	The type tests shall be carried out in presence of the Owner's representative, for which minimum 15 days notice shall be given by the Contractor. The Contractor shall obtain the Owner's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.

CLAUSE NO.	TECHNICAL REQUIREMENTS
8.01.03	In case the contractor has conducted such specified type test(s) within last five years as on the date of bid opening, he may submit the reports of the type tests indicated in the "LIST OF TYPE TESTS TO BE CONDUCTED " to the owner for waival of conductance of such type test(s).These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The Owner reserves the right to waive conducting of any or all of the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.
8.01.04	Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within last five years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. In case the Contractor is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests under this contract free of cost to the Owner and submit the reports for approval.
8.01.05	**LIST OF TESTS TO BE CONDUCTED** **The following type tests shall be conducted on each type and rating of HT motor** (a) No load saturation and loss curves upto approximately 115% of rated voltage (b) Measurement of noise at no load. (c) Momentary overload test (subject to test bed constraint). (d) Full load test (e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., core temp., coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.

CLAUSE NO.	TECHNICAL REQUIREMENTS
	(f) Surge withstand test on the sample coil after placing it in stator core at (4U + 5 KV) and with at least five impulse of 1.2/50 micro sec. Wave, where U is the line to line voltage in kV.
	(g) Surge-withstand test at 20KVp with 0.3/3 micro sec. wave on each type of 6.6 KV motor coils respectively with at least five such impulses, followed by one minute power frequency high voltage test on turn to turn insulation, after cutting the coil and bringing out the turns suitably. The power frequency test voltage shall be decided during detailed engineering.
8.01.06	**LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED** **The following type test reports shall be submitted for each type and rating of HT motor**
	(a) Degree of protection test for the enclosure followed by IR, HV and no load run test.
	(b) Terminal box-fault level withstand test for each type of terminal box of HT motors only.
	(c) Type test report on Elastimold terminal connector as per ANSI/IEEEE-386-1985
8.02.00	**LT Motors**
8.02.01	LT motors shall be of type tested quality. For each type & rating of LT motors rated above 50 KW, the contractor shall submit for Owner's approval the reports of all the type tests as per relevant standards and carried out within last five years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.
8.02.02	In case the Contractor is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests under this contract free of cost to the Owner and submit the reports for approval.
8.03.00	All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

CLAUSE NO.	TECHNICAL REQUIREMENTS

TABLE - I

DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS

Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm
UP to 3 KW	**As per manufacturer's practice.**
Above 3 KW - upto 7 KW	85
Above 7 KW - upto 13 KW	115
Above 13 KW - upto 24 KW	167
Above 24 KW - upto 37 KW	196
Above 37 KW - upto 55 KW	249
Above 55 KW - upto 90 KW	277
Above 90 KW - upto 125 KW	331
Above 125 KW-upto 200 KW	203

For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm

NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:.

Motor MCR in KW	Clearance
UP to 110 KW	10mm
Above 110 KW and upto 150 KW	12.5mm
Above 150 KW	19mm

REF: BONG 3X250MW:FGD:AGITATORS

FGD:BNGN:AGITATORS:R01

REV	DATE	DESCRIPTION	PREPARED	CHECKED & APPROVED
0	23-07-2020	Fresh Issue	Manoj Kumar	P NAVEEN REDDY

PROJECT INFORMATION:

a.	Owner	NTPC
b.	Capacity (MW)	3X250 MW
c.	Buyer	BHEL, Ranipet
c.	Process/Application	Flue Gas Desulphurization

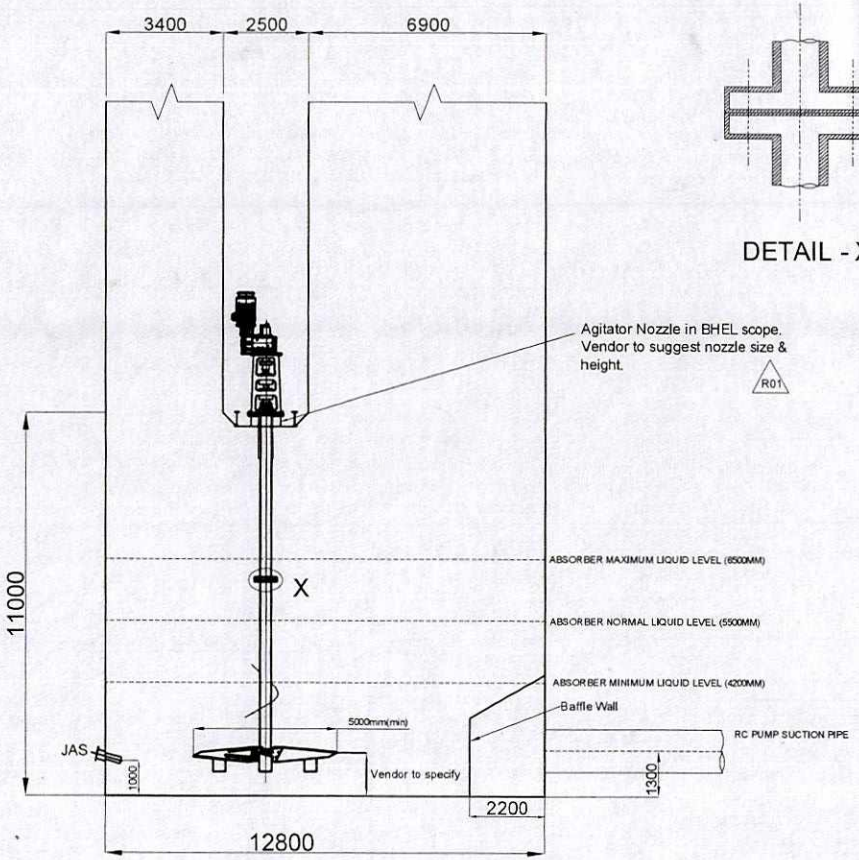
PROJECT LOCATION

a.	Country	India
b.	State/Division	Assam
c.	District	Kokrajhar

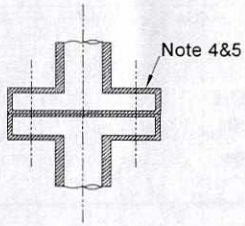
TECHNICAL INFORMATION OF AGITATOR

SLNO	Description	ABSORBER AGITATOR	AUXILIARY ABSORBENT TANK AGITATOR	LIMESONE SLURRY STORAGE TANK AGITATOR	PRIMARY HYDROCYCLONE FEED TANK AGITATOR	SECONDARY HYDROCYCLONE FEED TANK AGITATOR	FILTRATE WATER TANK AGITATOR	WASTE WATER TANK AGITATOR	LIME FEED TANK AGITATOR	ABSORBER AREA DRAIN SUMP AGITATOR	GYPSUM AREA DRAIN SUMP AGITATOR	LIMESTONE AREA DRAIN SUMP AGITATOR
1	Agitaor slno	1	2	3	4	5	6	7	8	9	10	11
2	Parameters											
a.	Type	Vertical Type	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)
b.	Medium to be handled	Gypsum slurry	Gypsum slurry	Limestone slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry
c.	Mechanical Seal Type	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required
d.	Duty	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
e.	Agitator location	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor
f.	Operation	Continuous.	Whenever FGD is under maintenance	Continuous.	Continuous.	Continuous.	Continuous.	Continuous.	Continuous.	Continuous.	Continuous.	Continuous.
3	Tank Details											
a.	Tank shape	Rectangular	Circular	Circular	Circular	Circular	Circular	Circular	Circular	Rectangular	Rectangular	Rectangular
b.	Tank Name	ABSORBER	AUXILIARY ABSORBENT TANK	LIMESTONE SLURRY STORAGE TANK	PRIMARY HYDROCYCLONE FEED TANK	SECONDARY HYDROCYCLONE FEED TANK	FILTRATE WATER TANK	WASTE WATER TANK	LIME FEED TANK AGITATOR	ABSORBER AREA DRAIN SUMP	GYPSUM AREA DRAIN SUMP	LIMESTONE AREA DRAIN SUMP
c.	Capacity of slurry (in m3)	908.16 m^3	2052 m^3	1215 m^3	296 m^3	2652 m^3	683 m^3	746 m^3	2.4 m^3	13 m^3	17 m^3	11 m^3
d.	Dimension (m)	12.9 W x12.8 L x11.0 H	16.5 Dia X 10.173 H	11.5 Dia X 12.29 H	7.0 Dia X8.2 H	16.0 Dia X13.6 H	10 Dia X9.06 H	10 Dia X9.775 H	1.4 Dia X1.69 H	3 W X3 L X1.6 H	4 W X3 L X1.6 H	3.0 W X2.0 L X2.1 H
e.	MOC of Agitator	Impeller blades shall be made of Alloy 926 or better material. Agitator shaft shall be carbon steel Rubber Lined.	Impeller blades shall be made of Alloy 926 or better material. Agitator shaft shall be carbon steel Rubber Lined.	Impeller blades shall be made of Alloy 926 or better material. Agitator shaft shall be carbon steel Rubber Lined.	Impeller blades shall be made of Alloy 926 or better material. Agitator shaft shall be carbon steel Rubber Lined.	Impeller blades shall be made of Alloy 926 or better material. Agitator shaft shall be carbon steel Rubber Lined.	Impeller blades shall be made of Alloy 926 or better material. Agitator shaft shall be carbon steel Rubber Lined.	Impeller blades shall be made of Alloy 926 or better material. Agitator shaft shall be carbon steel Rubber Lined.	Impeller blades shall be made of Alloy 926 or better material. Agitator shaft shall be carbon steel Rubber Lined.	Impeller blades shall be made of Alloy 926 or better material. Agitator shaft shall be carbon steel Rubber Lined.	Impeller blades shall be made of Alloy 926 or better material. Agitator shaft shall be carbon steel Rubber Lined.	Impeller blades shall be made of Alloy 926 or better material. Agitator shaft shall be carbon steel Rubber Lined.
f.	Minimum liquid level in the tank	4.2	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.6	0.6	0.6
g	Normal liquid level in the tank	5.5	9.4	11.5	7.5	13.0	8.5	9.3	1.3	1.3	1.3	1.7
h.	Maximum liquid level in the tank	6.5	9.6	11.7	7.7	13.2	8.7	9.5	1.5	1.4	1.4	1.8
i.	Quantity of Agitators per Tank	2 No's	1	1	1	1	1	1	1	1	1	1
j.	No of Tanks	3	1	2	1	1	1	1	1	3	1	1
k.	Total Quantity for three units	6	1 No's	2 No's	1 No.	1 No.	1 No.	1 No.	1 No.	3 No's	1 No.	1 No.
3	Slurry Analysis											
a.	Slurry to be handled	Gypsum slurry	Gypsum slurry	Limestone slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Lime slurry	Gypsum slurry	Gypsum slurry	Limestone slurry
b.	Maximum solid particle size	150 mesh (104 μ)	150 mesh (104 μ)	150 mesh (104 μ)	150 mesh (104 μ)	150 mesh (104 μ)	150 mesh (104 μ)	150 mesh (104 μ)	150 mesh (104 μ)	6-7 mm	6-7 mm	6-7 mm
c.	Normal solid particle size, d50	325 mesh (43 μ)	325 mesh (43 μ)	325 mesh (43 μ)	325 mesh (43 μ)	325 mesh (43 μ)	325 mesh (43 μ)	325 mesh (43 μ)	325 mesh (43 μ)	6-7 mm	6-7 mm	6-7 mm
d.	Solid to be handled	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	Limestone + impurities	gypsum along with Limestone & other impurities	Gypsum Slurry & other impurities	Gypsum Slurry & other impurities	gypsum along with Limestone & other impurities	Hydrated Lime	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	Limestone + impurities
e.	Chloride concentration	max 30000 ppm	max 30000 ppm	max 20000 ppm	max 30000 ppm	max 30000 ppm	max 30000 ppm	max 30000 ppm	<100 ppm	max 20000 ppm	max 20000 ppm	max 20000 ppm
f.	Hardness of particle	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale
g.	Slurry concentration, wt%	30%	30%	30 wt%	30 wt%	16.60%	11%	3%	3%	30%	30%	30 wt%
h.	Sp. Gravity of slurry	1.201	1.201	1.214	1.201	1.098	1.055	1.01	1.1	1.202	1.202	1.214
i.	Sp. Gravity of Lime Stone & Gypsum	2.32(avg)	2.32(avg)	2.80 (avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.80 (avg)
j.	Viscosity of Slurry	10 cP	10 cP	30 cP	10 cP	4 cP	4 cP	3 cP	8-15 cP	10 cP	10 cP	10 cP
k.	pH	4 to 8	4 to 8	5 to 8	4 to 8	4 to 8	4 to 8	4 to 8	4 to 8	4 to 8	4 to 8	5 to 8
l.	SiO_2 Content	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l
m.	Temperature	Normal -59.2 deg C; Design-70 deg C.	Normal -59.2 deg C; Design-70 deg C.	Normal -45 deg C; Design-70 deg C.	Normal -59.2 deg C; Design-70 deg C.	Normal -59.2 deg C; Design-70 deg C.	Normal -59.2 deg C; Design-70 deg C.	Normal -59.2 deg C; Design-70 deg C.	Normal -45 deg C; Design-60 deg C.	Normal -59.2 deg C; Design-70 deg C.	Normal -59.2 deg C; Design-70 deg C.	Normal -45 deg C; Design-60 deg C.
4	Minimum Diameter of the Impeller(tip to tip) in mm	5000	5500	3800	2300	5300	3300	3300	500	800	800	800
5	No of stages of impeller (min)	1	1	2	1	2	1	1	1	1	1	1
6	Power loading for auxiliary power consumption	Applicable	not applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable
7	Power loading per KW	3272 USD	-	3272 USD	3272 USD	3272 USD	3272 USD	3272 USD	3272 USD	3272 USD	3272 USD	3272 USD
8	Penalty per KW	3272 USD	-	3272 USD	3272 USD	3272 USD	3272 USD	3272 USD	3272 USD	3272 USD	3272 USD	3272 USD
9	Base value for power loading (KW)	45	-	45	15	40	15	15	5	5	5	5

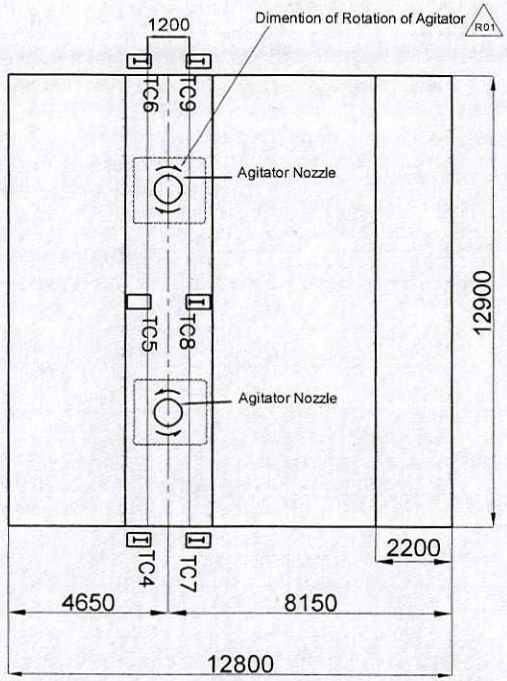
FGD:BNGN:AGITATORS:R01



Elevation view



DETAIL - X



Plan view

NOTE:

1. 2 Nos of Agitators in Absorber Tank
2. Vendor has to specify the location of the agitator inside the Absorber
3. Vendor shall note that only 1200mm space is available at the top of the tank.
4. Flanges at coupling shall be rubber lined at vendor works along with the shaft.
5. Fasterners connecting the flanges shall be Alloy 926. For each bolt (alloy926), 2Nos of alloy 926 washers, 2Nos of rubber washer and 1 No of Alloy 926 nut to be provided.

REV.	DESCRIPTION	CREATED BY	CHECKED BY	APPROVED BY	DATE
00					2020.07.27

PROJECT: Bongaigaon 3x250MW- FGD SYSTEM PACKAGE
FLUE GAS DESULPHURIZATION SYSTEM

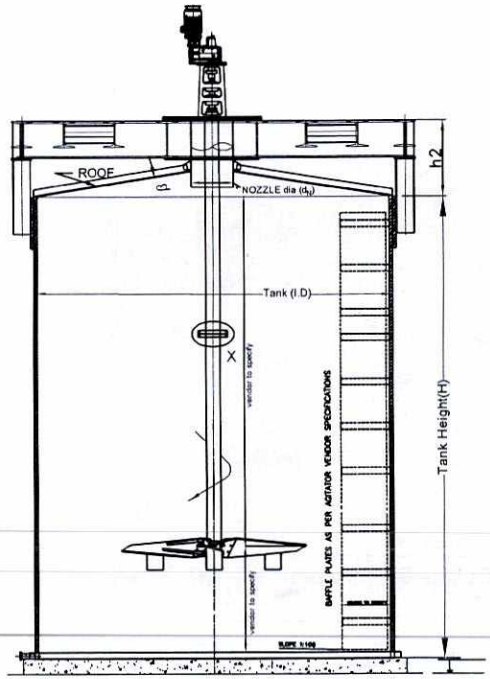
EMPLOYER: NTPC Limited

FGD CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD.

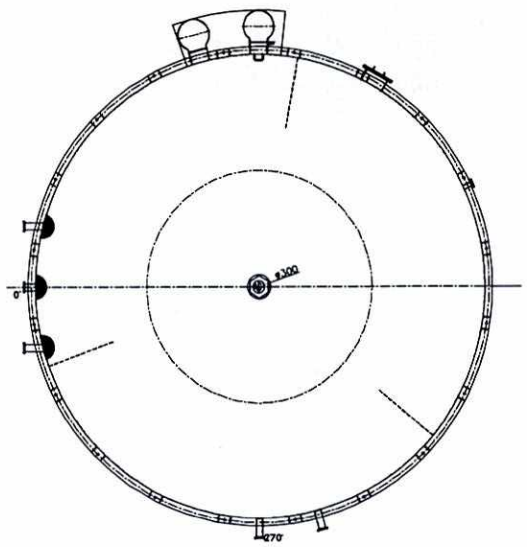
Prepared | Date: NTS | Type | Format: A2
Checked | Title: ARRANGEMENT OF ABSORBER TANK AGITATOR
Approved | Approved (CF GOA)
Date: 2020.07.27 | No. of Sheet: 01 | Sheet No.: 1 of 1
Language: en

ALL DIMENSIONS ARE IN MILLIMETRES

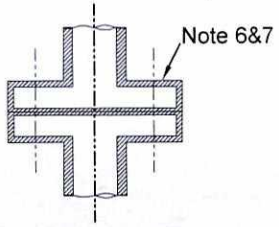
FGD:BNGN:AGITATORS:R01



ELEVATION



PLAN



DETAIL - X

S.NO	Tank Name	Tank Dia in mm(ID)	Total Height in mm (H)	HEIGHT (h_2) in mm*	TANK NOZZLE DIA in mm (d_N)*	Roof Slope Approx β
1	AUXILIARY ABSORBENT TANK AGITATOR	16500	10173	500	700	1 deg
2	LIMESTONE SLURRY STORAGE TANK AGITATOR	11500	12290	360	700	1 deg
3	PRIMARY HYDROCYCLONE FEED TANK AGITATOR	7000	8200	1200	323.9	5 deg
4	SECONDARY HYDROCYCLONE FEED TANK AGITATOR	16000	13600	600	700	1 deg
5	FILTRATE WATER TANK AGITATOR	10000	9060	432	600	1 deg
6	WASTE WATER TANK AGITATOR	10000	9775	325	600	1 deg
7	LIME FEED TANK AGITATOR	1400	1690	330	340	1 deg

NOTE:-

1. Diameter of the Agitator blade and height of agitator rod has to be specified by Vendor.
2. * Tentative Dimensions.
3. Vendor has to design the agitator by considering the slope of the Tank Roof and Nozzle height
4. Location of the baffle plate along with sizes to be specified by vendor, BHEL will provide the baffles plates.
5. Arrangement of agitator is typical.
6. Flanges at coupling shall be rubber lined at vendor works along with the shaft.
7. Fasteners connecting the flanges shall be Alloy 926. For each bolt (alloy926), 2Nos of alloy 926 washers, 2Nos of rubber washer and 1 No of Alloy 926 nut to be provided.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 3X250MW-NTPC-BONGAIGOAN FLUE GAS DESULPHURIZATION SYSTEM

BHARAT HEAVY ELECTRICALS LTD.,
UNIT: BOILER AUXILIARIES PLANT.
RANIPET - 632 406.

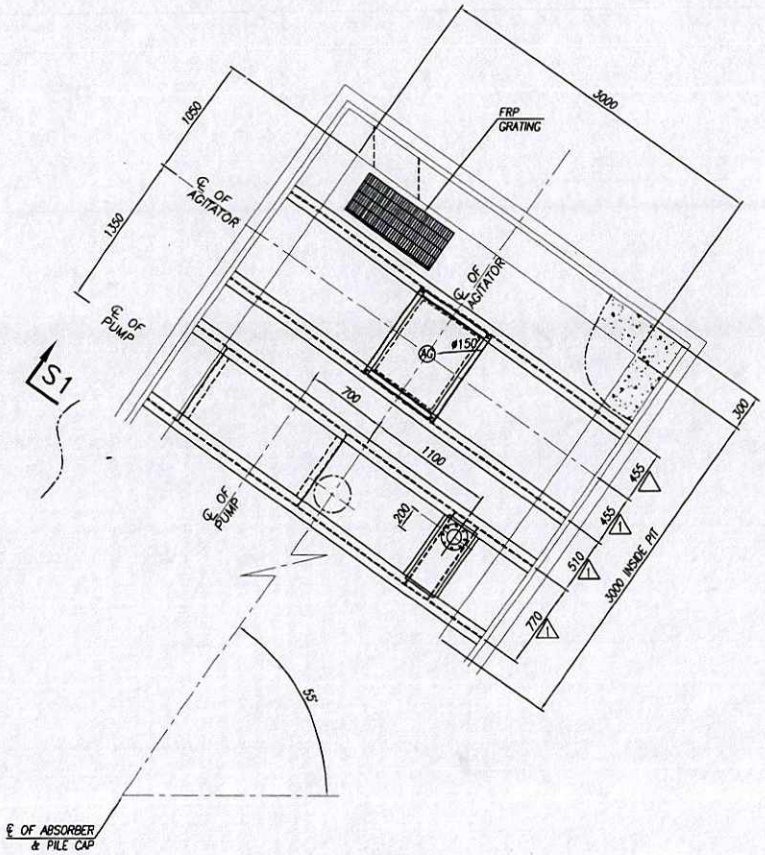
	NAME	SIGN	DATE	NO.OF VAR.
DRN	SRIDHAR			
CHD	SASHI			
APPD	SK DASH			

DEPT / CODE	GRADE OF UNTOL.DIM PR: QA: 500	SCALE	WEIGHT (KG).	REF. TO ASSY/OLD DRG.	ITEM NO.	NO. OF ITEMS

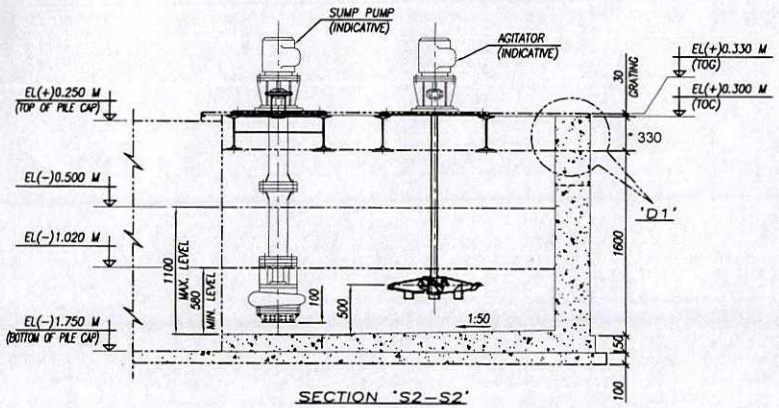
TITLE	CARD CODE	DRAWING NO.	REV
GA OF CIRCULAR TANKS WITH AGITATOR		4-FW-000-00227	00

Size A3

FGD:BNGN:AGITATORS:R01



PLAN
@ EL(+)0.300 M
DRAIN PIT FOR ABSORBER DRAIN & PUMP HOUSE



SECTION 'S2–S2'

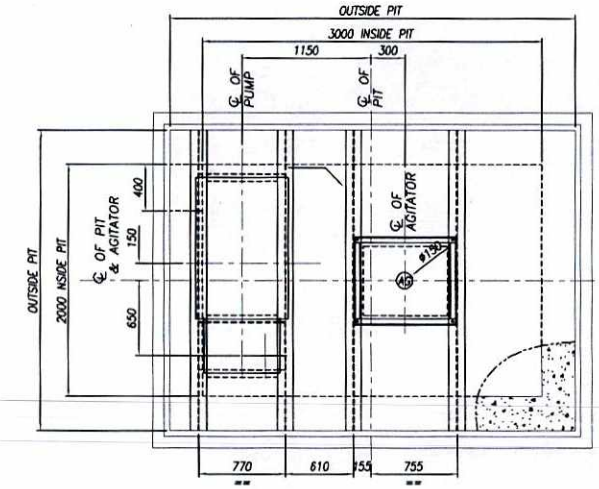
SI No.	AGITATOR NOZZLE SIZE	Equipment
01	340	AGITATORS

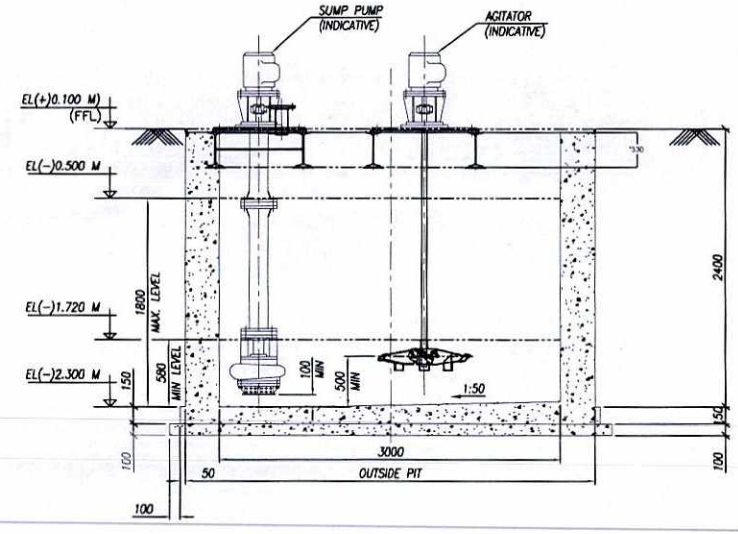
NOTE:

1. Diameter of the Agitator blade and height of agitator ROD has to be specified by Vendor.
2. * Tentative Dimensions.

PROJECT : BONGAIGOAN-3X250MW-FLUE GAS DESULPHURIZATION SYSTEM			
NTPC Limited			
NTPC DRG NO. 4610-101-03RP-PVM-B-039			REV. 00
BHARAT HEAVY ELECTRICALS LTD. UNIT: BOILER AUXILIARIES PLANT.	NAME	SIGN	DATE
	DRWN SRIDHAR	–	
	CHD SASHI	–	
	APPD SK DASH	–	
BHEL DRG NO. : 4-FW-000-00047			REV. 00
TITLE : GA OF ABSORBER DRAIN PIT			
DUCON DRG NO.	SCALE : 1:30		
DC109-5038-ME-05-010		SHEET 00 OF 00	REV. 01

FGD:BNGN:AGITATORS:R01





SI No.	AGITATOR NOZZLE SIZE	Equipment
01	340	AGITATORS

NOTE:

1. Diameter of the Agitator blade and height of agitator ROD has to be specified by Vendor.
2. * Tentative Dimensions.

PROJECT : BONGAIGOAN-3X250MW-FLUE GAS DESULPHURIZATION SYSTEM

NTPC Limited
(A GOVERNMENT OF INDIA UNDERTAKING)
ENGINEERING DIVISION, NOIDA U.P.

NTPC DRG NO. --- REV.

BHARAT HEAVY ELECTRICALS LTD.
UNIT: BOILER AUXILIARIES PLANT.
RANIPET - 632 406.

	NAME	SIGN	DATE
DRWN	SRIDHAR		
CHD	SASHI		
APPD	SK DASH		

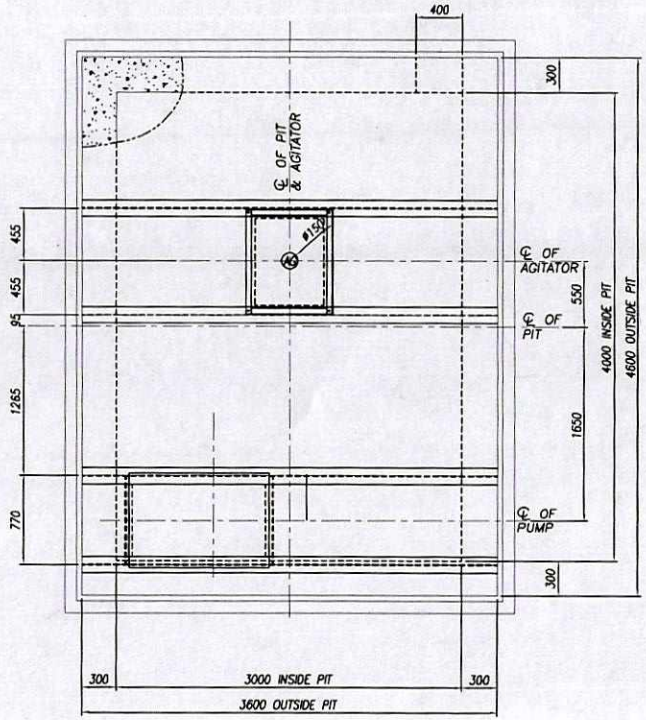
TITLE : GA OF BALL MILL AREA DRAIN PIT

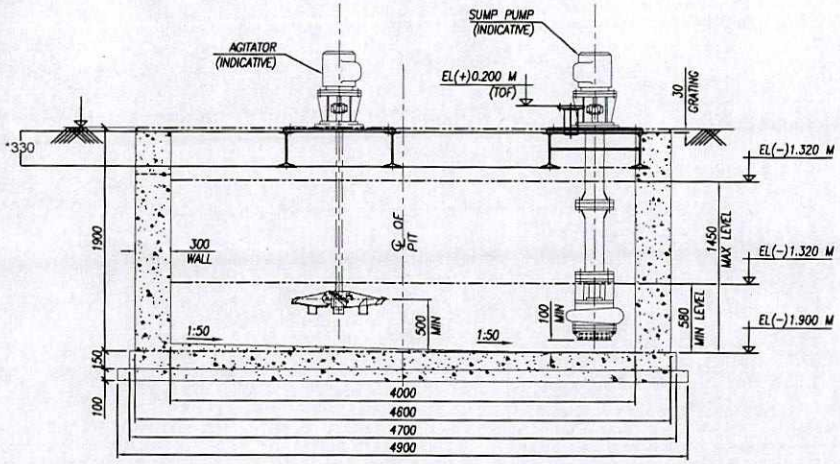
DUCON DRG NO. DC109-5038-ME-05-038

SCALE : 1:30

SHEET 01 OF 01 REV. 01

FGD:BNGN:AGITATORS:R01





NOTE:

1. Diameter of the Agitator blade and height of agitator ROD has to be specified by Vendor.

2. * Tentative Dimensions.

Sl No.	AGITATOR NOZZLE SIZE	Equipment
01	340	AGITATORS

REV.	DESCRIPTION	DRAWN	DESIGN	CHKD.	C	M	E	C&I	APPD	DATE
					CLEARED BY					
										11.08.10
										19.06.10

CUSTOMER NO. : ---

PROJECT : BONGAIGOAN-3X250MW-FLUE GAS DESULPHURIZATION SYSTEM

NTPC Limited

NTPC DRG NO. 4610-101-03RP-PVM-B-049 REV. 00

BHARAT HEAVY ELECTRICALS LTD. UNIT: BOILER AUXILIARIES PLANT. HANUFET - 632 406.

	NAME	SIGN	DATE
DRWN	---		-
CKD	---		-
APPD	---		-

BHEL DRG NO. : 4-FW-000-00066 REV. 00

DUCON TECHNOLOGIES, INC. "SERVING THE INDUSTRY SINCE 1936" FARMINGDALE, NEW YORK 11735, U.S.A. (631) 694-1700 FAX.(631) 420-8888

	NAME	SIGN	DATE
DRWN	S NASIR		19.06.2010
CKD	S PATIL		19.06.2010
APPD	B KANAN		19.06.2010

TITLE : GA OF GYPSUM DEWATERING BUILDING DRAIN PIT

DUCON DRG NO. DC109-5038-ME-05-029

SCALE : 1:30

SHEET 01 OF 01 REV. 01

Bharat Heavy Electricals Limited
Ranipet-632406, India.
Quality Assurance(Mech)

To,

Shri. V Raghupathy, SM/Purchase — BAP: QA-Mech: BONG: AGT: 109
Kind Attn: Shri M Venkateswarlu, Mgr/Purchase — Dt. 18-09-2020

Item Name	Indent No	Indent Dt.	PGMA	Technical Specification
AGITATORS	RFW00880	15.09.2020	FW241	BNGN: AGITATORS, Rev: 00. DT: 23.07.2020
	RFW00881	15.09.2020	FW241	
	RFW00882	15.09.2020	FW720	
	RFW00883	15.09.2020	FW241	
	RFW00884	15.09.2020	FW997	

QA- Mechanical comments as follows:

"Customer/NTPC has informed that in case the item is covered under Sub-QR list, the proposed vendors for the same shall be accepted by QA after acceptance of vendor by NTPC Engg."

1. Since Agitators appears under Sub-QR item, Sub-QR approved vendor by NTPC Engg. acceptable to Quality also.
2. Inspection and testing shall be done as per approved Quality plan, Quality plan to be approved by Customer/ NTPC after review of BHEL.
3. Painting shall be as per Customer approved Painting schedule.
4. Arrange MQP from sub QR Cleared vendor for taking up with Customer for their review and approval. Find herewith-attached typical MQP (QP NO.FGS:720/00, DT: 12.02.2019). This MQP is indicative only and actual Quantum of Check/Stage may differ based on Project/Customer requirement and their approved MQP.
5. Already NTPC approved latest MQP for similar application if available with Vendor may be shared for obtaining faster approval from Customer/Customer Consultant.
6. All the Agitators shall be inspected at supplier works as per approved QP/Approved Drawing/Approved datasheet and Specification.
7. BHEL Authorized representatives shall have the right to witness the necessary inspection and testing of goods mentioned in the PO. The supplier shall inform BHEL in advance about the readiness of the goods for inspection and testing. Inspection / Inspection wavier / approval by BHEL does not absolve Supplier's responsibility for conformity of the specification as per the terms of PO. Material Test Certificates shall be submitted to BHEL.
8. Annexure 'Q' and BOI's Details shall be part of enquiry File and shall be filled by Supplier with their duly sign and seal.
9. **Vendor Quality Plan shall contain following Inspection Notes:**
   a. Latest version of standards & Specification shall be applied.
   b. Materials shall be procured in compliance to Functional Technical specification.
   c. Gauges and measuring instruments with valid calibration only shall be used.
   d. Inspection / Inspection wavier / approval by BHEL does not absolve Supplier's responsibility for conformity of the specification as per the terms of PO.
   e. BHEL /BHEL Authorized representatives shall have the right to witness the necessary inspection and testing of goods mentioned in the PO.
   f. In case of Vendor Drawing & Datasheet, it needs approval by BHEL Engineering.
   g. This QP shall be read along with relevant PO, BHEL Specification / Approved Drawing / Datasheet.

18/09/2020

Prepared by.
18/09/2020
Dy. Mgr / QA

Page 01 of 01.

Reviewed & Approved by.
Renjith K
Mgr / QA

Venkateswarlu M

From: Ramnandha M-BAP <ramnandha@bhel.in>
Sent: Tuesday, September 22, 2020 12:01 PM
To: RAGUPATHY; Mandadi Venkateswarlu, Manager/MM-FGD/BAP
Cc: K C Gandhi Parimalam, Dy GM/QA-ELEC/BAP; V Kesavan, Dy GM/9762_FGD/BAP; Shanmuga; Jyotish Kumar Patel, Sr Engineer/9762_FGD/BAP; Pradeep Kumar Behera(Assistant Engineer Gr. I/9762_FGD/BAP); K Renjith, Manager/QC- NDTL/BAP; Rakesh Kumar Madhu, Dy Manager/QA_MECH/BAP; N S Prabhakaran, Dy. Engineer/QC-SD & ADMN/BAP
Subject: CQR and Quality Requirements for LT Motors (Up to 200KW) for Agitators-NTPC Bongaigaon (3x250 MW) FGD- Indents RFW00880, RFW00881, RFW00882, RFW00883, RFW00886
Attachments: RE: Supply of Agitators for Bongaigon FGD 3X250MW_QR- (Quality Recomendat... (628 KB); CQR_NTPC BONGAIGAON_AGITATOR_LT MOTORS up to 200KW_Foreign Vendor.pdf; CQR_NTPC BONGAIGAON _AGITATORS_LT MOTORS up to 200KW_Indigenous Vendor.pdf; Indicative MQP for NTPC BONGAIGAON_ AGITATOR_LT Motor Up to 200KW- Inf purpose only.pdf; NTPC MQP FORMAT Bongaigaon LT MOTORS FOR AGITATAOR.pdf; Endorsement Sheet for NTPC BONGAIGAON_ LT Motors -AGITATORS.pdf

Dear Sir.,
Sub: Procurement of Agitators for NTPC Bongaigaon (3x250 MW) FGD Project
Ref:- 1) Indent no: RFW00880, RFW00881, RFW00882, RFW00883, RFW00886 for NTPC Bongaigaon (3x250 MW) FGD Project - BHEL W.O No: G305, G306 and G307
2) Quality requirements furnished by QA-Mechanical vide mail to MM dt 18.09.2020 (copy attached)

* * *

W.r.t above, following are the Quality Requirements for the supply of LT Motors being used in Agitators meant for NTPC Bongaigaon (3x250 MW) FGD Project.

Specific confirmation / documents shall be obtained from all the OEM vendors.

I. W.r.t INDIGENOUS OEM VENDORS ONLY.

Sl no	Description & Quality Requirements	Specific (Confir
01	OEM vendor shall meet all the requirements as in Annexure-I and also OEM Vendor shall endorse (Signature and Stamp in all the pages) in attached CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW used in Agitators (DOC.NO: BAP/QR/G305/G306/G307/BONGAIGAON/LTM/ AGITATOR: 001 Rev. No.00 dt 22.09.2020) and send us the same to follow / ensure all the requirements in the event of an order.	
02	OEM vendor shall ensure Credentials of design and Manufacturing capabilities w.r.t. LT Motors by their LT Motor manufacture.	

03	OEM Supplier shall submit other details like that they are already approved vendor by **Ultimate Customer – NTPC (National Thermal Power Corporation Limited)** specifically for proposed supply of LT Motor against BHEL/Ranipet. The details of PO already executed preferably through various other BHEL units for any NTPC projects with CHP/MDCC including technical catalogue, PO received so far for similar supply of LT Motors may also be submitted.	
04	Accordingly OEM vendor shall be suitably informed that If **Ultimate Customer – NTPC (National Thermal Power Corporation Limited)** vendor approvals is not there / not available, then their offer will not be considered for further processing / ordering for the supply of LT Motors to take care of overall equipment/system requirements.	
05	No material shall be dispatched without BHEL/ **Ultimate Customer – NTPC (National Thermal Power Corporation Limited)** inspection - CHP/MDCC clearances.	

II.W.r.t FOREIGN (OUTSIDE INDIA) OEM VENDORS ONLY

Sl no	Description & Quality Requirements	Specific (Confir
01	OEM vendor shall meet all the requirements as in Annexure-II and also OEM Vendor shall endorse (Signature and Stamp in all the pages) in attached CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW used in Agitators (DOC.NO: BAP/QR/G305/G306/G307/BONGAIGAON/LTM/ AGITATOR: 002 Rev. No.00 dt 22.09.2020) and send us the same to follow / ensure all the requirements in the event of an order.	
02	OEM vendor shall ensure Credentials of design and Manufacturing capabilities w.r.t. LT Motors by their LT Motor manufacture.	
03	OEM Supplier shall submit other details like that they are already approved vendor by **Ultimate Customer – NTPC (National Thermal Power Corporation Limited)** specifically for proposed supply of LT Motor against BHEL/Ranipet. The details of PO already executed preferably through various other BHEL units for any NTPC projects with CHP/MDCC including technical catalogue, PO received so far for similar supply of LT Motors may also be submitted.	
04	Accordingly OEM vendor shall be suitably informed that If **Ultimate Customer – NTPC (National Thermal Power Corporation Limited)** vendor approvals is not there / not available, then their offer will not be considered for further processing / ordering for the supply of LT Motors to take care of overall equipment/system requirements.	
05	No material shall be dispatched without BHEL/ **Ultimate Customer – NTPC (National Thermal Power Corporation Limited)** inspection - CHP/MDCC clearances.	

Subject to the above specific confirmation from all the OEM vendors (ie for sl no: I & II) and also for Engg (both Electrical and Mechanical) requirements including Quality Requirements furnished by QA-Mechanical vide mail to MM dt 18.09.2020 (copy attached), OEM Vendors offers will be acceptable w.r.t Quality Requirements.

Purchase shall ensure all the above Quality requirements while releasing the PO on successful bidder on specific confirmation from all the OEM vendors on the above .

Important Note:

Engg shall ensure customer approved LT Motor data sheet/drg/spec (As applicable) to obtain CHP/MDCC from NTPC.

Regards
Ramnandha M
ET-Quality Assurance- Electrical and C&I
BHEL-BAP Ranipet
Ph: 3126

Annexure-I

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW

(For INDIGENOUS OEM VENDOR ONLY)

PROJECT: NTPC BONGAIGAON THERMAL POWER PROJECT (3 X 250 MW) **(WO No. G305, G306, G307)** **CONTRACTOR: BHEL - RANIPET** **CONTRACT NO:** CS-4610-101-2-FC-COA-5066-AMDT-04 for Bongaigaon FGD (3 x 250MW **SUB CONTRACTOR (OEM) & ADDRESS:** **(To be filled by OEM VENDOR)**	**CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) - Up to 200KW used in AGITATORS** **NTPC BONGAIGAON Thermal Power Project (3 x 250 MW) (WO No. G305, G306, G307)**	**DOC.NO:** **BAP/QR/G305/G306/G307/BONGAIGAON/ LTM/ AGITATOR: 001** **Rev NO.: 00** **PAGE : Page 1 of 6** **DATE: 22.09.2020**	**##Enquiry No:** **## OEM Supplier Name & Address:** **##Offer reference:** **##Date:** **Contact Official Name:** **Mobile no:** **Email id:**

Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation)., India Quality Requirements	##Specific confirmations by the vendor
		ITEM: LT Motors (IE3) Up to 200KW	
01	**Type Test Requirements**	*A.* Vendor shall submit the type test reports of all the type tests as listed in SL NO: 01 (D) below and carried out within 10 years from the data of ultimate NTPC COA Amendment 4 dt 11.11.2019. These reports should be for the test conducted on the identical/similar LT Motors to those proposed to be supplied under this enquiry and test (s) either should have been conducted at an independent laboratory (or) should have been witnessed by BHEL AIA (BHEL Appointed Inspection Agency) / BHEL (or) Ultimate client NTPC at respective LT Motor Manufacture of OEM vendor.	
		B. However, if vendor is not able to submit the similar / identical type test report as per above condition (or) in the case of type test reports are not found to be meeting the specification requirement, the vendor shall conduct all the tests at no additional cost to BHEL either at third party lab (or) own lab in the presence of BHEL AIA (BHEL Appointed Inspection Agency) / BHEL /Ultimate client NTPC and submit the reports for review & approval.	
		C. Type Test reports review and approval by BHEL AIA (BHEL Appointed Inspection Agency) / BHEL / Ultimate client NTPC is must in line with NTPC approved data sheet / BOM/GA Drawing etc.	

Annexure-I

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW

(For INDIGENOUS OEM VENDOR ONLY)

PROJECT: NTPC BONGAIGAON THERMAL POWER PROJECT (3 X 250 MW) **(WO No. G305, G306, G307)** **CONTRACTOR: BHEL - RANIPET** **CONTRACT NO:** CS-4610-101-2-FC-COA-5066-AMDT-04 for Bongaigaon FGD (3 x 250MW **SUB CONTRACTOR (OEM) & ADDRESS:** **(To be filled by OEM VENDOR)**	**CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) - Up to 200KW used in AGITATORS** **NTPC BONGAIGAON Thermal Power Project (3 x 250 MW) (WO No. G305, G306, G307)**	**DOC.NO:** **BAP/QR/G305/G306/G307/BONGAIGAON/ LTM/ AGITATOR: 001** **Rev NO.: 00** **PAGE : Page 2 of 6** **DATE: 22.09.2020**	**##Enquiry No:** **## OEM Supplier Name & Address:** **##Offer reference:** **##Date:** **Contact Official Name:** **Mobile no:** **Email id:**

Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation)., India Quality Requirements	##Specific confirmations by the vendor
		ITEM: LT Motors (IE3) Up to 200KW	
01	**Type Test Requirement …….Contd**	D. The following Type test reports to be submitted covering the following for above 50KW LT Motor as per relevant Indian standards etc i. Measuring of resistance of winding of stator and wound rotor (if applicable) ii. No load test at rated voltage to determine input current, power and speed. iii. Open circuit voltage ratio of wound rotor motor (in case slip ring motors) iv. Full load test to determine efficiency power factor and slip v. Temperature rise test. vi. Momentary excess load test vii. High voltage test viii. Test for vibration severity of motor ix. Test of noise levels of motor (**Noise level for all the motors shall be limited to 85dB(A) except for BFP motor for which the maximum limit shall be 90dB(A).)** x. Over speed test xi. Degree of Protection Tests (Minimum Ingress Protection - IP 55). xii. Type test reports for motors located in fuel oil area having flame proof enclosures as per relevant Indian standards.	
		E. The TCs / Type Test reports shall also be given as PDF file with index sheet & page control through Email & Soft Copy (File size to less than 9MB).	

Annexure-I

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW

(For INDIGENOUS OEM VENDOR ONLY)

PROJECT: NTPC BONGAIGAON THERMAL POWER PROJECT (3 X 250 MW) **(WO No. G305, G306, G307)** **CONTRACTOR: BHEL - RANIPET** **CONTRACT NO:** CS-4610-101-2-FC-COA-5066-AMDT-04 for Bongaigaon FGD (3 x 250MW **SUB CONTRACTOR (OEM) & ADDRESS:** **(To be filled by OEM VENDOR)**	**CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) - Up to 200KW used in AGITATORS** **NTPC BONGAIGAON Thermal Power Project (3 x 250 MW) (WO No. G305, G306, G307)**	**DOC.NO:** **BAP/QR/G305/G306/G307/BONGAIGAON/ LTM/ AGITATOR: 001** **Rev NO.: 00** **PAGE : Page 3 of 6** **DATE: 22.09.2020**	**##Enquiry No:** **## OEM Supplier Name & Address:** **##Offer reference:** **##Date:** **Contact Official Name:** **Mobile no:** **Email id:**

Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation)., India Quality Requirements	##Specific confirmations by the vendor
		ITEM: LT Motors (IE3) Up to 200KW	
02	**Quality Plan Requirement**	**1.** RQP or MQP is applicable for these LT Motor. **2.** RQP/MQP (Manufacturing Quality Plan) is applicable for these LT Motors and accordingly Actual LT Motor Manufacture and OEM shall submit the RQP/MQP in ultimate customer – NTPC format. **3.** If any of LT Motor manufacture is having, ultimate customer NTPC approved MQP (Manufacturing Quality Plan) / RQP (Reference Quality Plan) and having validity, the same is applicable for these LT Motor for inspection subject to obtaining ultimate customer NTPC formal approval in the event of an order through endorsement sheet approval route as in sl no: 4 below **4.** Accordingly, LT Motor Manufacture & OEM supplier shall submit the filled up Endorsement sheet (copy attached) with ultimate customer approved MQP/RQP with signature & seal in the event of a Purchase Order from BHEL. **5.** If LT Motor Manufacture / OEM vendor does not have MQP/RQP, they should submit a fresh MQP to BHEL/NTPC (in NTPC format) for review & approval. (copy attached).	
03	**BHEL / Ultimate Customer – NTPC approved vendors**	LT Motors are to be procured only from following Ultimate Customer - NTPC approved vendors and no deviation on this specific requirement is acceptable. ➢ KEC / Bengaluru (Up to 200KW) & Hubli (Up to 90KW) ➢ CGL/Ahemednagar (Up to 200KW) ➢ SIEMENS/Mumbai (Up to 200KW) ➢ ABB/Faridabad (Up to 55KW) and Bengaluru (Up to 200KW) ➢ BBL/Mumbai (Up to 200KW) ➢ NGEF/ Hubli (Up to 15KW) ➢ Marathon / Kolkatta (Up to 200KW) ➢ Jyothi / Vadodara (Up to 200KW) ➢ Laximi Hydralics Private Limited (LHPL) / Solapur (Up to 200KW)	

Annexure-I

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW

(For INDIGENOUS OEM VENDOR ONLY)

PROJECT: NTPC BONGAIGAON THERMAL POWER PROJECT (3 X 250 MW) **(WO No. G305, G306, G307)** **CONTRACTOR: BHEL - RANIPET** **CONTRACT NO:** CS-4610-101-2-FC-COA-5066-AMDT-04 for Bongaigaon FGD (3 x 250MW **SUB CONTRACTOR (OEM) & ADDRESS:** **(To be filled by OEM VENDOR)**	**CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) - Up to 200KW used in AGITATORS** **NTPC BONGAIGAON Thermal Power Project (3 x 250 MW) (WO No. G305, G306, G307)**	**DOC.NO:** **BAP/QR/G305/G306/G307/BONGAIGAON/ LTM/ AGITATOR: 001** **Rev NO.: 00** **PAGE : Page 4 of 6** **DATE: 22.09.2020**	**##Enquiry No:** **## OEM Supplier Name & Address:** **##Offer reference:** **##Date:** **Contact Official Name:** **Mobile no:** **Email id:**

Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation)., India Quality Requirements	##Specific confirmations by the vendor
		ITEM: LT Motors (IE3) Up to 200KW	
04	**Inspection Methodology to be adopted at Actual LT Motor Manufacture works by OEM vendor**	**LT Motors up to 30KW – Inspection Categorization: III** All Routine tests on LT Motors are to be ensured by OEM Vendor & same are to be inspected & witnessed by OEM Vendor / BHEL / BHEL AIA (BHEL authorized inspection Agency) at LT Motor manufacture works as per approved MQP & approved data sheet / drg / spec/ as per relevant Indian standards and all the Routine Test Reports with Inspection report (IR) to be submitted for BHEL/Ultimate Customer – NTPC for review and to obtain inspection and dispatch clearance .	
		LT Motors (30KW to 50KW) – Inspection Categorization: II All Routine Tests on LT Motors are to be ensured by OEM vendor & witnessed by BHEL/BHEL AIA (BHEL authorized inspection Agency) at LT Motor manufacture works including review of Type Test Reports and Degree of Protection Test Reports (IP 55) as per approved MQP & approved data sheet/drg/spec / as per relevant Indian standards and all the Routine Test Reports with Inspection report (IR) to be submitted for BHEL/Ultimate Customer – NTPC for review and to obtain inspection and dispatch clearance .	
		Above 50KW and up to 200KW – Inspection Categorization: I All Routine & Type Tests if any on LT Motors are to be ensured by OEM Vendor and same shall be offered to BHEL/ BHEL AIA (BHEL authorized inspection Agency) / Ultimate Customer-NTPC for inspection & witnessing including review of Degree of Protection Test Reports as per approved MQP /RQP with endorsement sheet / approved data sheet / drg / spec / as per relevant Indian standards and all the Routine Test Reports , Type test Reports including Degree of protection test report with Inspection report (IR) to be submitted for BHEL/Ultimate Customer – NTPC for review and to obtain inspection and dispatch clearance.	
		BHEL/ BHEL AIA (BHEL authorized inspection Agency) / Ultimate Customer-NTPC to witness / perform inspection at LT Motor Supplier works and submit all the inspection documents and routine & Type test reports including Degree of Protection Test Reports (IP 55) as per approved MQP & approved data sheet / drg / spec / as per relevant Indian standards.	

Annexure-I

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW

(For INDIGENOUS OEM VENDOR ONLY)

PROJECT: NTPC BONGAIGAON THERMAL POWER PROJECT (3 X 250 MW) **(WO No. G305, G306, G307)** **CONTRACTOR: BHEL - RANIPET** **CONTRACT NO:** CS-4610-101-2-FC-COA-5066-AMDT-04 for Bongaigaon FGD (3 x 250MW **SUB CONTRACTOR (OEM) & ADDRESS:** **(To be filled by OEM VENDOR)**	**CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) - Up to 200KW used in AGITATORS** **NTPC BONGAIGAON Thermal Power Project (3 x 250 MW) (WO No. G305, G306, G307)**	**DOC.NO:** **BAP/QR/G305/G306/G307/BONGAIGAON/ LTM/ AGITATOR: 001** **Rev NO.: 00** **PAGE : Page 5 of 6** **DATE: 22.09.2020**	**##Enquiry No:** **## OEM Supplier Name & Address:** **##Offer reference:** **##Date:** **Contact Official Name:** **Mobile no:** **Email id:**

Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation)., India Quality Requirements	##Specific confirmations by the vendor
		ITEM: LT Motors (IE3) Up to 200KW	
04	**Inspection Methodology to be adopted at Actual LT Motor Manufacture works by OEM vendor..... Contd**	No material shall be dispatched without BHEL / BHEL AIA and Ultimate Customer – NTPC Inspection and dispatch clearance.	
05	**Painting Requirements**	Painting requirement like paint shade and painting thickness including no of coats if any are to be ensured by the OEM vendor for these LT Motors as per BHEL/ Ultimate Customer -NTPC approved data sheet/drg/spec (As applicable).	
06	**Packing**	Packing shall be as per Specification / Drg. / Data sheet including sea worthy packing if any to avoid any transit & handling damages.	
07	**For Inspection call**	Inspection call by OEM Vendor for LT Motor inspection at Actual LT Motor Manufacture works to be raised for BHEL/BHEL AIA inspection / Ultimate Customer – NTPC including for type test witnessing if any to be ensured / addressed to Mr R Kesavan., DGM (QC-Proc)., Mobile no: +91 9443006303., Email id: kesavan@bhel.in and Mr Kovarathanan., DM (QC-Proc)., Mobile no: +91 8903502628., Email id: kovak@bhel.in including for inspection related activities for immediate response / resolution.	
08	**Document Package / Dossier**	Specific confirmation for Document Package in the event of an order (3 hard copies + soft copies in PDF file) is to be given containing the following with proper linkages (.) (i) Index Sheet (ii) MQP/RQP/Endorsement sheet (iii) TCs identified by BHEL/NTPC for record for "CHP" (Customer Hold Point) Verification & Witness "W" portion as given in MQP / RQP / MQP (as applicable). (iv) Final Inspection Report + TC (v) BHEL AIA (BHEL Appointed Inspection Agency) / BHEL report + TC (vi) Ultimate customer NTPC (National Thermal Power Corporation) CHP (Customer Hold Point) / MDCC (Material Dispatch Clearance Certificate) (vii) Type test reports conducted/submitted with approval with approved data sheet and BOM with actual make used with Customer approved drgs.	

Annexure-I

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW

(For INDIGENOUS OEM VENDOR ONLY)

PROJECT: NTPC BONGAIGAON THERMAL POWER PROJECT (3 X 250 MW) **(WO No. G305, G306, G307)** **CONTRACTOR: BHEL - RANIPET** **CONTRACT NO:** CS-4610-101-2-FC-COA-5066-AMDT-04 for Bongaigaon FGD (3 x 250MW **SUB CONTRACTOR (OEM) & ADDRESS:** **(To be filled by OEM VENDOR)**	**CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) - Up to 200KW used in AGITATORS** **NTPC BONGAIGAON Thermal Power Project (3 x 250 MW) (WO No. G305, G306, G307)**	**DOC.NO:** **BAP/QR/G305/G306/G307/BONGAIGAON/ LTM/ AGITATOR: 001** **Rev NO.: 00** **PAGE : Page 6 of 6** **DATE: 22.09.2020**	**##Enquiry No:** **## OEM Supplier Name & Address:** **##Offer reference:** **##Date:** **Contact Official Name:** **Mobile no:** **Email id:**

Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation)., India Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors (IE3) Up to 200KW

09	**Important notes**	**Inspection Categorization: I** **Inspection by BHEL/BHEL AIA and also by Ultimate Customer – NTPC based on MQP/RQP approved and as in sl no:04** **Inspection Categorization: II** **Inspection by Main contractor (BHEL) / BHEL AIA based on Ultimate Customer – NTPC approved MQP/RQP & based on inspection as in sl no:04** **Inspection Categorization: III** **COC by Main contractor (BHEL) to Ultimate Customer – NTPC based on inspection as in sl no:04.**	
		Any cost implication for conducting checks / tests including for witnessing of any of the tests at Actual LT Motor Manufacture Works by BHEL / BHEL AIA / Ultimate Customer – NTPC is in the scope of OEM Supplier only and no extra cost if any will be admissible in the event of an order and also during execution of the contract.	

10 **Motor details**

Vendor shall furnish following LT Motor (upto 200 kW) details for AGITATORS applicable for this enquiry.

NTPC BONGAIGAON Thermal Power Project (3 x 250 MW).

S. No	Agitators	LT Motor		
		Rating (in kW)	Quantity (in nos)	Make
1	Absorber Agitator			
2	Auxiliary Absorbent Tank Agitator			
3	Limestone Slurry Storage Tank Agitator			
4	Primary Hydro-cyclone Feed Tank Agitator			
5	Secondary Hydro-cyclone Feed Tank Agitator			
6	Filtrate Water Tank Agitator			
7	Waste Water Tank Agitator			
8	Lime Dosing Tank Agitator			
9	Absorber Area Drain Agitator			
10	Gypsum Area Drain Agitator			
11	Limestone Area Drain Tank Agitator			
12	Other LT Motors involved in the system (if any)			

OEM Supplier signature with seal

Necessarily to be filled up & submitted by the OEM vendor at the time of offer itself otherwise the offer may not be considered w.r.t Quality Requirements against LT Motors being BHEL/ ultimate customer – NTPC (National Thermal Power Corporation Limited) specific requirements.

ENDORSEMENT SHEET FOR QP

REFERENCE / *STANDARD* / FIELD QUALITY PLAN (RQP / SQP/*RFQP/SFQP*)

TO BE FILLED IN BY SUPPLIER AT TIME OF SUBMISSION		To be filled in by NTPC
PROJECT NAME	NTPC BONGAIGAON- FGD (3X250 MW) (BHEL W.O No: G305, G306, G307)	*2REVIEW & ENDORSEMENT BY NTPC* PROJECT SPECIFIC QP NUMBER ALLOTTED QP NO: REV. NO.: 00 DT :
CONTRACT NO.:	CS-4610-101-2-FC-COA-5066-AMDT-04 for Bongaigaon FGD (3x250 MW)	
MAIN SUPPLIER	M/S.BHEL, RANIPET , TAMIL NADU., INDIA	
MANUFACTURER WORKS & ADDRESS	(TO BE FILLED BY OEM / LT MOTOR SUPPLIER	
ITEM /EQUIPMENT / SYSTEM/ SUB-SYSTEM DETAILS i.e. MODEL TYPE/SIZE/RATING etc.	LT MOTOR(IE3) - AGITATOR	
APPROVED QP NO.: RQP/SQP/RFQP/SFQP	(TO BE FILLED BY OEM / LT MOTOR SUPPLIER	

Confirmation by Main Supplier (TICK WHICHEVER APPLICABLE)	*(TICK APPLICABLE)*
I. That the item/ component is identical to that considered for SQP approval. √	The *MQP/RQP/SQP* is endorsed for this project without any change
II. That there are minor changes in the item/ component with respect to that considered for MQP/RQP/SQP approval, however the same do not affect the contents of MQP/RQP/SQP	
III. That there are minor changes in the item/ component with respect to that considered for MQP/RQP/SQP *approval, however the same affect the* MQP/RQP/SQP *slightly, as indicated below / in attached sheet.*	The SQP is endorsed for this project with changes as indicated.
	DISTRIBUTION OF ENDORSEMENT OF A) *MQP/RQP/SQP*: *1. MAIN SUPPLIER (WITH A COPY OF MQP/RQP/SQP)* *2. MANUFACTURER* *3. RIO* *4. CQA-SPL* *5. CQA-O/C* B) RFQP/SFQP: *1. MAIN SUPPLIER (with a copy of MQP/RQP/SQP* *2. MANUFACTURER* *3. NTPC FQA (with a copy of MQP/RQP/SQP* *4. NTPC Erection (with a copy of MQP/RQP/SQP* *5. CQA-SPL* *6. CQA-O/C*

SIGN.: (Main Supplier) *DATE:*	(TO BE FILLED BY OEM / LT MOTOR SUPPLIER *SIGN.: (Manufacturer)* *DATE:*	NTPC (Reviewed /Approved by/ Date & Seal)

BHEL BAP/ RANIPET / TAMIL NADU INDIA	OEM SUPPLIER To be filled by OEM Supplier LT MOTOR Manufacture To be filled by OEM Supplier	MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 200KW) - FGD Application	MQP:E:LTM:NTPC BONGAIGAON :AGITATOR:001 REV:NO:00 DATE: 22.09.2020 Page :

S1.No.	COMPONET/ASSEMBLY/OPERATION/TESTS	CHARACTE-RISTIC	CLASS	TYPE OF CHECK	QUANUTM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF REC		AGENCY		REMARKS
									D	M	BHEL/ BHEL AIA	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.		12.
INCOMING INSPCETIONS:												
1.1	Enamelled round copper conductor(Dual coated)MM	1.Overall diameter	Major	Mechanical	1 sample/lot	IS 13730 1993 Part 13 / IEC 60317-0-1-2008 (As applicable)	IEC 60317-0-1 2008	Plant format		P	V	
		2.Bare conductor diameter	Major	Mechanical	1 sample/lot	BHEL / NTPC Spec & Apprd Datasheet	BHEL / NTPC Spec & Apprd Datasheet	Plant format		P	V	
		3.BDV test	Major	Electrical	1 sample/lot	--do--	--do--	Plant format		P	V	
		4.Elongation	Major	Mechanical	1 sample/lot	--do--	--do--	Plant format		P	V	
		5.Continuity（insulation）	Major	Electrical	1 sample/lot	--do--	--do--	Insp report/ Supplier TC		P	V	
		6.Tan Delta (If applicable)	Major	Electrical	1 sample/lot	--do--	--do--	Insp report/ Supplier TC		P	V	EC gr purity：-99.6%
1.2	Aluminum Ingots	1.Chemical composition	Major	Chemical	1 sample/lot	--do--	--do--	Supplier Tc		P	V	
1.3	FAN	1.Diameter（ID&OD）	Major	Mechanical	1 sample/lot	--do--	--do--	Inspection Report		P	V	
1.4	Bearings（SKF OR FAG）	1.Type & Make	Major	Visual	100%	--do--	--do--	Inspection Record		P	V	
		2.Dimensions - ID,OD&width	Major	Mechanical	1 sample/lot	--do--	--do--	Inspection Record		P	V	
1.5	Terminal Block	1.Dimensions	Major	Mechanical	Plant std.	--do--	--do--	Inspection Report		P	V	
		2.Proof voltage test	Major	Electrical	Plant std.	--do--	--do--	Inspection Report		P	V	

BHEL BAP/ RANIPET / TAMIL NADU INDIA	OEM SUPPLIER To be filled by OEM Supplier LT MOTOR Manufacture To be filled by OEM Supplier	MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 200KW) - FGD Application	MQP:E:LTM:NTPC BONGAIGAON :AGITATOR:001 REV:NO:00 DATE: 22.09.2020 Page :

S1.No.	COMPONET/ASSEMBLY/OPERATION/TESTS	CHARACTE-RISTIC	CLASS	TYPE OF CHECK	QUANUTM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF REC	AGENCY			REMARKS
									D	M	BHEL/ BHEL AIA	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.		12.
INPROCESS INSPCETIONS:												
2.1	Stator core	1.Core length dia	Major	Mechanical	100%	--do--	--do--	Inspection Record		P	V	
		2.Core locking	Major	Visual	100%	--do--	--do--	Inspection Record		P	V	
		3.Rigidity of core	Major	Mechanical	100%	--do--	--do--	Inspection Record		P	V	
2.2	Die cast rotor	1.Core length	Major	Mechanical	100%	--do--	--do--	Inspection Record		P	V	
		2.Blow holes	Major	Mechanical	100%	--do--	--do--	Inspection Record		P	V	
2.3	Wound stator （if applicable）	1.Resistance	Major	Electrical	100%	--do--	--do--	Inspection Record		P	V	
		2.H.V.Test	Major	Electrical	100%	--do--	--do--	Inspection Record		P	V	
		3.Insulation resisitance	Major	Electrical	100%	--do--	--do--	Inspection Record		P	V	
2.4	Final Assembiy	1.Completeness	Major	Visual	100%	--do--	--do--	Inspection Record		P	V	
		2.Runout in case of flanged motors	Major	Mechanical	100%	--do--	--do--	Inspection Record		P	V	
		3.Mounting dimensions	Major	Mechanical	100%	--do--	--do--	Inspection Record		P	V	

BHEL BAP/ RANIPET / TAMIL NADU INDIA	OEM SUPPLIER To be filled by OEM Supplier LT MOTOR Manufacture To be filled by OEM Supplier	MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 200KW) - FGD Application	MQP:E:LTM:NTPC BONGAIGAON :AGITATOR:001 REV:NO:00 DATE: 22.09.2020 Page :

S1.No.	COMPONET/ASSEMBLY/OPERATION/TESTS	CHARACTE-RISTIC	CLASS	TYPE OF CHECK	QUANUTM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF REC		AGENCY		REMARKS
									D	M	BHEL/ BHEL AIA	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.		12.
FINAL INSPCETION AND TESTING:												
3.1	**Routine Test**	1.Resistance Measurement on winding & space heater	Major	Electrical	100%	BHEL / NTPC Spec, GA Drawing & Apprd Datasheet and IS/IEC 60034 (As applicable)	BHEL / NTPC Spec, GA Drawing & Apprd Datasheet and IS/IEC 60034 (As applicable)	Inspection Record		P	W	
		2.HV Test	Major	Electrical	100%	--do--	--do--	Inspection Record		P	W	
		3.Phase sequence & direction of rotation	Major	Electrical	100%	--do--	--do--	Inspection Record		P	W	
		4.No load run test	Major	Electrical	100%	--do--	--do--	Inspection Record		P	W	
		5.Vibration test	Major	Mechanical	100%	--do--	--do--	Inspection Record		P	W	
		6.Name plate recheck	Major	Visual	100%	--do--	--do--	Inspection Record		P	W	
		7.Paint shade thickness & adhesion	Major	Visual & Measurement	100%	--do--	--do--	Inspection Record		P	W	
		8.Moutings & Overall dimensions	Major	Mechanical	100%	--do--	-do-	Inspection Record		P	W	
3.2	**TYPE TESTS ###**											
3.3	Preservation and Packing	1.Completeness	Major	Review	100%	--do--	--do--	Inspection Record		P	V	

BHEL BAP/ RANIPET / TAMIL NADU INDIA	OEM SUPPLIER To be filled by OEM Supplier LT MOTOR Manufacture To be filled by OEM Supplier	MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 200KW) - FGD Application	MQP:E:LTM:NTPC BONGAIGAON :AGITATOR:001 REV:NO:00 DATE: 22.09.2020 Page :

S1.No.	COMPONET/ASSEMBLY/OPERATION/TESTS	CHARACTE-RISTIC	CLASS	TYPE OF CHECK	QUANUTM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF REC	AGENCY			REMARKS
									D	M	BHEL/ BHEL AIA	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.		12.
		2.Motors covered with polythene sheets	Major	Visual	100%	--do--	--do--	Inspection Record		P	V	
		3.Packing	Major	Visual	100%	--do--	--do--	Inspection Record		P	V	

TYPE TEST REQUIREMENTS FOR LT MOTOR INCLUDING DEGREE OF PROTECTION TEST REPORT (IP 55)

BHEL/BHEL AIA (Authorised Inspection Agency) shall review the Identical design type test report during including degree of Protection Test report (IP 55) for acceptance in line with BHEL/ Ultimate Customer - NTPC approved Data sheet/Drg/Spec for LT Motor rating up to 50KW and BHEL/Ultimate Customer NTPC approved type test report for LT Motor rating more than 50KW and up to 200KW. If not available for Similar / Identical Design of any of the LT Motor motor, then OEM / LT Motor Manufacture shall conduct all these type tests at Third party lab / Goverment Approved Lab / Own lab in presence of BHEL/BHEL AIA / without any cost implication to BHEL/Ultimate Customer - NTPC within reasonable time.

1. Measurement of Resistence of Stator
2. No Load test at Rated Voltage
3,. Pull out test
4.Temperature Rise Test
5.Momentary Excees Torque Torque Test
6.High Voltage Test
7.Test for Vibration Severity
8.Test for Noise Level Measurement
9. Over Speed Test
10. Degree of Protection TC (IP 55)

LEGEND: **OEM = Orgional Equipement Supplier M = LT Motor Manufacture -**
BHEL AIA = BHEL AUTHORISED INSPECTION AGENCY
GA Drawing : General Arrangment Drawing
NTPC - NATIONAL THERMAL POWER CORPORATION (Ultimate Customer)
OEM SUPPLIER : (To be Filled up by OEM Supplier)
LT MOTOR Manufacture : (To be Filled up by OEM Supplier)

OEM SUPPLIER WITH OEM MFGR.'s LOGO (TO BE FILLED BY OEM SUPPLIER)	LT MOTOR MANUFACTURER'S NAME AND ADDRESS (TO BE FILLED BY OEM / LT MOTOR MANUFACTURE)	MANUFACTURING QUALITY PLAN ITEM: LT MOTOR(IE3) UP TO 200KW FOR FGD APPLICATION SUB-SYSTEM: FGD - AGITATOR	QP NO. : AGITATOR :LT MOTOR:001 REV.NO.: 00 DATE: PAGE: …. OF….	PROJECT: NTPC Bongaigaon 3 x 250MW (BHEL W.O no: G305,G306 and G307) FGD PACKAGE NTPC CONTRACT NO: CS-4610-101-2-FC-COA-5066-AMDT-04 for Bongaigaon FGD (3 x 250 MW) MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (TO BE FILLED BY OEM SUPPLIER)

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C / N					M	C	N	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	** 10.			11.

		LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: OEM MANUFACTURER/LT MOTOR SUB-SUPPLIER C: MAIN SUPPLIER – BHEL/BHEL AIA , N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: NTPC SHALL IDENTIFIED IN COLUM "N" AS ' W"		DOC. NO.: REV…… CAT…..		
OEM MANUFACTURER/ LT MOTOR SUPPLIER	MAIN (BHEL) SUPPLIER		FOR NTPC USE			
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL