
TECHNICAL SPECIFICATION ROS: 9073

FOR WATER PUMPS

OF MAHAGENCO PROJECT



CUSTOMER	: MAHAGENCO
PROJECT	: 1X660MW BHUSAWAL
APPLICATION	: FLUE GAS DESULPHURIZATION SYSTEM



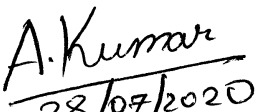
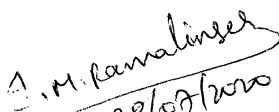
Water Systems

Bharat Heavy Electrical Limited

Ranipet – 632 406.

	TECHNICAL SPECIFICATION FOR WATER PUMPS
MAHAGENCO:FGD: WATER PUMPS:ROS-9073	

TECHNICAL SPECIFICATION FOR WATER PUMPS

Department	Prepared	Checked	Approved
WS	 28/07/2020 Abhinav Kumar Sr. Engineer-WS	 28-07-2020 Harsh Dep Dy. Mgr.-WS	 28/07/2020 IMRL Rao Sr. Mgr. -WS
ROS : 9073 Rev00; Dated : 27/07/2020		COMMENTS : ----	

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.



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

CONTENTS

1.0	PROJECT INFORMATION
2.0	APPLICABLE CODES & REGULATIONS
3.0	WATER ANALYSIS
4.0	INTENT OF SPECIFICATION
5.0	SCOPE OF SUPPLY
6.0	GENERAL REQUIREMENTS
6.1	CONSTRUCTIONAL FEATURES
6.2	POWER SUPPLY
6.3	PAINTING PROCEDURE
6.4	MOTOR
7.0	EXCLUSION
8.0	OTHER SALIENT POINTS
9.0	SPARES, TOOLS & TACKLES
9.1	START UP & COMMISSIONING SPARES
10.0	DEFECT LIABILITY & WARRANTY
11.0	PERFORMANCE GUARANTEE
12.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION
13.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION
14.0	DOCUMENTATION
15.1	ANNEXURE I- SCHEDULE OF GUARANTEES
15.2	ANNEXURE – II- LIST OF DEVIATIONS/EXCEPTIONS TO THE ENQUIRY DOCUMENT
15.3	ANNEXURE –III- A). DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER
	ANNEXURE – III- B). DOCUMENTS TO BE SUBMITTED AFTER CONTRACT
15.4	ANNEXURE-IV : TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING
15.5	ANNEXURE-V: DATA SHEET TO BE FILLED BY VENDOR: (FOR ALL PUMPS)



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

1.0 PROJECT INFORMATION:

As per Annexure A , Clause 1.0

2.0 APPLICABLE CODES & REGULATIONS

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

3.0 WATER ANALYSIS:

As per Annexure A , Clause 3.0

4.0 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 of water pumps along with accessories which is furnished in the Flue Gas Desulphurization system. The following points may be noted.

- a. Each unit is envisaged with one FGD system. The details for the pumps is envisaged in the Annexure A.
- b. Bidder shall assume full unit responsibility for the entire equipment assembly and make all possible efforts to comply strictly with the requirements of this specification and other specifications/attachments to inquiry/order.
- c. In case, deviations are considered essential by the Bidder (after exhausting all possible efforts), the same shall be separately listed in the Bidder's proposal under separate section, titled as "List of Deviations/Exceptions to the Enquiry Document (**Annexure-IV**)".
- d. Any deviation, not listed under the above section, even if reflected in any other portion of the proposal, shall not be considered applicable.
- e. No deviation or exception shall be permitted without the written approval of the purchaser.
- f. Compliance to this specification shall not relieve the Bidder of the responsibility of furnishing equipment and accessories/auxiliaries of proper design, materials and workmanship to meet the specified start up and operating conditions.
- g. In case, the Bidder considers requirement of additional instrumentation, controls, safety devices and any other accessories/auxiliaries essential for safe and satisfactory operation of the equipment, the same shall be recommended along with reasons in a separate section and include the same in scope of supply.
- h. All accessories, items of work, though not indicated but required to make the system complete for its safe, efficient, reliable and trouble free operation and maintenance shall also be in supplier's scope unless specifically excluded.



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

5.0 Scope of Supply & Services

1. All the pumps shall be supplied along with individual drive motor (IE3), Base Plate along with required isolations, Coupling, Foundation Bolt and Expansion Bellows (Neoprene) at inlet & outlet, Pressure gauges at inlet & outlet, suction strainer & other accessories as required.
2. First Fill of Consumables, Oil & Lubricants shall be supplied.

6.0	TECHNICAL REQUIREMNTS									
1.	The pumps shall be designed for Continuous & Parallel operation. The pump shall be centrifugal type capable of delivering the rated flow at rated head as specified in the respective clauses.									
2.	The pump shall be provided with seals of proven type and shall be designed for minimization of seal water consumption. The shaft shall be supported on heavy duty ball/roller bearings.									
3.	All pumps shall be designed to withstand a test pressure of 1.5 times the maximum possible pump shut off pressure under maximum suction pressure conditions									
4.	The Pump flow/head characteristics shall be such that within the operation range the head will continuously increase with decreasing flow, maximum head (shut off head) being at least 10% higher than the duty point head.									
5.	Each pump will have a coupling of adequate size, designed for full load and capable of supporting start –Up an overload moment.									
6.	The Pump coupling motor and base frame shall be supplied in assembled condition. Any items supplied loose shall be assembled by the Bidder at site without any implication.									
7.	Each rotating equipment shall be first statically balanced and then dynamically balanced according to ISO 1940 (in the case of impellers this shall be done before and after mounting of the service rotor shaft).									
8.	Pumps shall run smoothly without undue noise and vibration. Peak to peak vibration limits shall be restricted to the following values during operation: <table><tr><td>Speed</td><td>Antifriction Bearing</td><td>Sleeve Bearing</td></tr><tr><td>1500 rpm and below</td><td>75.0 micron</td><td>75.0 micron</td></tr><tr><td>3000 rpm</td><td>50.0 micron</td><td>65.0 micron</td></tr></table>	Speed	Antifriction Bearing	Sleeve Bearing	1500 rpm and below	75.0 micron	75.0 micron	3000 rpm	50.0 micron	65.0 micron
Speed	Antifriction Bearing	Sleeve Bearing								
1500 rpm and below	75.0 micron	75.0 micron								
3000 rpm	50.0 micron	65.0 micron								
9.	The pumps shall be capable of starting with discharge valve fully open and close condition. Motors shall be selected to suit to the above requirements. Minimum motor margin (as per table below) shall be provided above maximum load demand of the pump in the entire operating range to take care of the system frequency variation and no case less than the maximum power requirement at any condition of the entire characteristic curve of the pump. Continuous Motor rating shall be at 50 deg.C ambient. Motor margin shall be as below <table><tr><td>Pump rated BKW</td><td>Motor rating</td></tr><tr><td><22 kW</td><td>125% of pump rated BKW</td></tr><tr><td>22 kW – 55 kW</td><td>115% of pump rated BKW</td></tr><tr><td>>55 kW</td><td>110% of pump rated BKW</td></tr></table>	Pump rated BKW	Motor rating	<22 kW	125% of pump rated BKW	22 kW – 55 kW	115% of pump rated BKW	>55 kW	110% of pump rated BKW	
Pump rated BKW	Motor rating									
<22 kW	125% of pump rated BKW									
22 kW – 55 kW	115% of pump rated BKW									
>55 kW	110% of pump rated BKW									



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

10.	Make of the Bearings: SKF/FAG/ Equivalent subjected to customer approval.
6.1	CONSTRUCTIONAL FEATURES
	General:
	The pumps shall be complete with drive motors, baseplate and other accessories. The constructional features of the pump shall be as follows: - a). Pump casing may be radially split. The casing shall be of robust construction. Casing drain and vent connections shall be provided. - b). Impeller shall be made in one piece and securely keyed to the shaft. Locking device shall be provided to prevent its loosening during all conditions of operation. - c). Wearing rings shall be of renewable type. Opposed wearing surface shall be of hardened material and shall have a hardness difference of at least 50 BHN. - d). Replaceable shaft sleeves shall be provided to protect the shaft where it passes through bearings and stuffing boxes. The end of the shaft sleeve assembly shall extend through the packing gland. Shaft sleeve shall be securely locked or keyed to the shaft to prevent loosening or rotation. Shaft and shaft sleeves shall be machined and assembled for concentric rotation. - e). The design of the shaft shall take into consideration the critical speed, which shall be at least 20% more than operating speed. - f). Pump bearings shall be of antifriction type. Bearings shall be readily accessible without disturbing the alignment of pump. - g). Packed stuffing boxes shall be of sufficient length to prevent leakage along the shaft and shall be complete with all packing and lantern rings required. - h). Pumps shall be furnished complete with an approved type of flexible - coupling. - i). Couplings guards made of expanded metal and bolted to the base plate shall be furnished. - j). The common base plate for pumps and motor shall be in one piece and shall be made of fabricated steel. - k). Pump speed shall be less than 1500 rpm for pumps of capacity more than 10 m³/hr. - l). The Pump shall be capable of developing the required total head at rated capacity for continuous operation. Also, the pumps shall be capable of being operated to give satisfactory performance at any point on the HQ characteristics curve. The operating range of the pump shall be 30% to 130% of the duty point unless otherwise mentioned elsewhere. The maximum efficiency of pump shall preferably be within $\pm 10\%$ of the rated design flow as indicated in data sheets. - m). The total head capacity curve shall be continuously rising from the operating point towards shut-off without any zone of instability and with a minimum shut-off head of about 15% more than the design head. The power, head and flow characteristics of each pump shall be suitable for parallel operation. The Power characteristics of the pumps shall be of non-overloading type. All rotating parts of the pumps shall be statically and dynamically balanced. The motor shall be rated for continuous operation and confirm to companion electrical specification. However, motor rating shall not be less than the max. power demand throughout the entire range of operation of pump. Design duty point of pump shall match with the average value of maximum and minimum flow rates of the pump in the stable operation zone.



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

A)	Casing, Gland & Stuffing Box
a.	The material of the Casing, Gland & Stuffing Box shall be of <u>2.5 Ni Cast iron to IS 210 Grade FG or equivalent.</u>
b.	The casing and flanges shall be designed to withstand the maximum shut-off pressure developed by the pump at the pumping temperature.
c.	Lifting provision of pump should be provided.
B)	IMPELLER & Wearing Rings (As applicable)
a.	The Impeller & wearing Rings (as applicable) material shall be of <u>Stainless Steel 316</u> grade.
b.	Impeller as rotating assembly along with all elements should be dynamically balanced according to ISO 1940
C)	SHAFT AND SHAFT SLEEVES
a.	All Shafts & Shaft Sleeves shall be of SS 410 grade. All Pump shafts shall be of ample size to transmit the maximum possible output from the prime mover.
b.	The pump shaft and coupling are to be so dimensioned that the maximum permissible torque of the shaft is higher than the maximum transmissible torque of the coupling.
c.	Shafts shall be conservatively designed to transmit maximum power required and to assure rigidity. Shafts shall be machined and ground to close tolerances and shall be tapered to permit easy removal of the seals and bearings.
D)	BASE PLATE
a.	A common base plate (epoxy coated) shall be provided for pump assembly & Motor and the same shall be rigidly constructed, adequately braced and provided with finish pads for mounting pump.
b.	Suitable holes shall be provided for grouting and these shall be so located that the base plate can be grouted in place without disturbing the pump and motor.
c.	Common base plate for Pump and Motor shall be in the scope of the bidder.
d.	Base plate must be stress-relieved for any residual welding stress and certificate to that effect is to be submitted as per inspection requirement.
E)	BEARINGS
a.	The bearings may be ball, roller or sleeve bearing. If sleeve bearings are used these shall be machined for close running fit. The bearings shall be designed to take the necessary radial load as well as the net axial thrust.



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

F)	ACCESSORIES:
1.	FASTENERS
I	All fasteners to be SS316 only.

6.2 POWER SUPPLY

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.
	- All equipment's 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. - Bidder shall design and supply the equipment suitable for satisfactory operation under above mentioned power supply condition.	

6.3 PACKING AND FORWARDING

1.	Proper packing to be ensured.
	Indigenous Supply: Pump & sub system assembly shall be wrapped in polythene bags & packed in a strong rigid wooden crate. Rain water should not enter into the pump internals during storage in the outer yard of power plant.
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



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

	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.
5.	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.
6.	Each package should have the following inscriptions and signs stenciled with an indelible ink legibly and clearly: - Destination - Package Number - Gross and Net Weight - Dimensions - Lifting places - Handling marks and the following delivery marking
7.	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.
8.	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.
9.	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.
10.	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)
11.	Marking for Safe handling: To ensure safe handling, packing case shall be marked to show the following: - Upright position - Sling position and center of Gravity position - Storage category - Fragile components (to be marked properly with a clear warning for safe handling)
12.	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



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

	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.
13.	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 pump & accessories, BHEL item Code, Gross Weight and Net weight of Supplied items.
14.	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.
6.4	Motor
Refer to technical specification TECI: LT MOTOR: REV 03 Dated: 10.06.2020.	
7.0	EXCLUSION
	The following work associated with the water pumps will be by others: a. Civil foundations b. Walkways, platforms and ladders c. Element handling hoists

8.0	Other Salient Points
1.	Base plate, Foundation Bolts, Pressure Gauges, Companion Flanges, Coupling, Coupling Guards shall be in scope of bidder's supply
2.	Recommended motor power consumption to be provided by bidder.
3.	The pump shall be provided with seals of proven type and shall be designed for minimization of seal water consumption.
4.	Make of Mechanical Seals: Eagle Burgmann/ Flowserve/ John crane only. No other make is acceptable



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

9.0	SPARES, TOOLS & TACKLES
9.1	START UP & COMMISSIONING SPARES
	Start-up & Commissioning Spares shall be part of the main supply of the Water pumps. 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 pump shall come under this category. Bidder shall provide an adequate stock of such start up and commissioning spares to be brought by him to the site for the equipment erection and commissioning. The spares must be available at site before the equipments are energized. The List of such spares to be provided by bidders with their offer.
10.	DEFECT LIABILITY & WARRANTY
1.	The Bidder warrants that the equipments/items shall be free from defects in the design, engineering, materials and workmanship of the Plant and Equipment supplied and of the work executed. The Defect Liability Period shall be Twenty four (24) months from the date of delivery or eighteen (18) months from the date of commissioning, whichever first occurs. If during the Defect Liability Period any defect should be found in the design, engineering, materials and workmanship of the Plant and Equipment supplied or of the work executed by the Bidder, the Bidder shall promptly, in consultation and agreement with BHEL regarding appropriate remedying of the defects, and at its cost, repair, replace or otherwise make good (as the Bidder shall, at its discretion, determine) such defect as well as any damage to the Facilities caused by such defect.
2.	In case of failure of the equipment to meet the guarantee, MAHAGENCO/BHEL reserves the right to reject the equipment. However, MAHAGENCO-BHEL reserves the right to use the equipment until new equipment supplied by bidder meets the guaranteed requirement.



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

11.0	PERFORMANCE GUARANTEE
	All performance tests for Water pumps shall be carried out in accordance with any latest international codes/standards. 1) Bidder shall furnish Performance guarantee for the design, manufacture, material, safe and trouble-free operation of the water pumps and its accessories 2) Bidder shall guarantee and demonstrate the rated capacity of the pump at the rated head. 3) All the wear parts of the pump shall be guaranteed for a minimum wear life of not less than 20000 hrs. 4) Noise level-≤ 85 dB (A) at 1m horizontal distance from equipment/enclosures and 1.5m above operating floor is to be guaranteed. 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. 6) Acceptance tests to be carried out as per the procedure defined by the bidder, which shall be submitted for customer approval. 7) 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.
12.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION:
	As per Annexure A Clause 7.0
13.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION
	As per Annexure A Clause 8.0
14.0	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 evaluation as per Annexure-III A . Annexure-III documents are required for proper evaluation purpose and vendors are requested to comply with above in all respect.
B	DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT
	The Successful bidder shall submit necessary data, documents and drawings for review, approval as specified under Annexure-III B. All necessary GA drawings, sections, sub-assembly drawings, specifications of main and sub components and necessary set of operation & maintenance manual as asked by



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

NTPC must be furnished by bidder in soft and hard copy forms.

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). However all the engineering related information shall be furnished in soft form to BHEL.

15.1 ANNEXURE I- SCHEDULE OF GUARANTEES

Sl. No	Description	Data
1.	Rated capacity of pump m ³ /hr	:
2.	Total head at design capacity M	:
3.	Guaranteed shaft power consumption at rated capacity & head kW	:
4.	Noise level at a distance of 1.0 meter from the equipment at site and 1.5 m above operating floor dB(A)	:
5.	Maximum vibration (peak to peak amplitude at site) microns	:
6.	Equipment Availability (%)	:
7.	Pump Efficiency (%)	:

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

15.2

ANNEXURE-II - LIST OF DEVIATIONS/EXCEPTIONS TO THE ENQUIRY DOCUMENT

Sl No	Clause No	Page No	Description of Deviation

Note: Enlarge the table to incorporate items

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

15.3

ANNEXURE-III

A) DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER:

Sl. No.	Description	No of copies With proposal
1.	Specification duly signed and seal on each page	1
2.	Anchor Plan & Civil foundation Loading details	1
3.	GA drawings of pump assembly	1
4.	Data Sheet	1
5.	Performance curve	1
6.	Test Arrangement & Test procedure	1
7.	Reference plant details	1
8.	Required Electric power & other Utility List	1
9.	Deviation List	1
10.	Scope of Supply	1
11.	Start-up & Commissioning Spares	1

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

B) DOCUMENTS TO BE SUBMITTED AFTER CONTRACT:

Sl. No.	Description	No of copies After award of contract	Delivery Time
1.	Utility Consumption	1	2 weeks after contract
2.	Foundation Data including Anchor plan	1	2 weeks after contract
3.	Performance curve	2	2 weeks after contract
4.	GA Drawing	1	1 month after contract
5.	Cross section detail drawing	1	1 month after contract
6.	Data Sheet	1	2 weeks after contract
7.	Lubricating Chart	1	2 months after contract
8.	Installation and assembly procedure	1	4 months after contract
9.	Inspection Certificate	1	In 2 weeks after test
10.	Manufacturing Schedule	1	2 weeks after contract
11.	Proforma Packing List	1	2 months prior to shipping
12.	Pump and Motor Sizing Calculation	1	2 weeks after contract
13.	Material Test Certificates	2	In 2 weeks after test
14.	Pre Commissioning Check List	2	4 months after contract
15.	Quality Plan	4	1 month after contract
16.	Operation and Maintenance Manual	• 10 hardcopies and 5 electronic copies in English	4 months after contract
17.	Start-up & Commissioning Spares	2	1 month after contract
18.	Test Arrangement & Test procedure	2	1 month after contract

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

15.4

ANNEXURE-IV : TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING

Applicable for Import Supply

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

SIGNATURE OF BIDDER

NAME

DESIGNATION



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

15.5 Annexure-V: Data Sheet to be filled by vendor: (to be filled by bidder for each pump)

Sl. No	Description	Value		
TECHNICAL DETAILS				
1	Make			
2	Model			
3	Application			
4	Design Flow at Rated Speed (m3/hr)			
5	Minimum & Maximum Continuous Flow (m3/hr)			
6	Total Discharge Head @ design flow MWC			
7	Shut off Head @ MWC			
8	NPSH required (minimum) @ MWC			
9	Hydraulic test pr.@ Kg/Sq. Cm			
10	Pump efficiency -			
10.1	At design point %			
10.2	At maximum flow %			
11	Pump shaft power reqd. at design point @ KW			
12	Maximum shaft power required @ KW			
13	Selected motor @ KW			
14	Rated speed & critical speed @ rpm			
15	GD2 of the pump @ kgm2			
16	Operating flow range from design point % : + -			
17	Noise level at duty range dBA at 1.0 m distance			
18	Vibration level -			
18.1	Displacement microns			
18.2	Velocity (Peak) mm/sec			
19	Balancing quality as per ISO 1940 std.			
20	Rotation of shaft viewing from drive end			

	TECHNICAL SPECIFICATION FOR WATER PUMPS MAHAGENCO:FGD: WATER PUMPS:ROS-9073
---	---

21	Tolerance on head and efficiency at rated speed and flow.			
CONSTRUCTIONAL DETAILS				
1.0	Suction / Discharge nozzle			
1.1	Size mm			
1.2	Rating psi			
1.3	Flange drilling standard			
1.4	Nozzle Orientation looking from DE			
2.0	Material of construction / make			
2.1	Pump casing			
2.2	Impeller			
2.3	Shaft			
2.4	Shaft sleeve			
2.5	Wear rings			
2.6	Diffuser			
2.7	Mechanical seal			
2.8	Bearing housing			
2.9	Fasteners			
2.10	Others if any			
3.0	No. of stage			
3.1	Impeller type			
3.2	Impeller diameter Trimmed / Untrimmed			
4.0	Bearings			
4.1	Type			
4.2	Make			
4.3	Lubrication Oil - Specification			
4.4	Lub. Oil Quantity / pump Litre			
5.0	Mechanical seal			
5.1	Type			
5.2	Make			
5.3	Model			
5.4	Drawing No			
6.0	Performance curve references No.			
7.0	Foundation Draws No.			
7.1	Pump Dimension L x W x H in mm			
7.2	Pump Weight in Kg			



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD: WATER PUMPS:ROS-9073

COUPLING				
1.0	Type			
2.0	Make , Model No			
3.0	Coupling guard Material			
4.0	Dimension detail with BOM enclosed			
5.0	Weight in Kg			
BASE FRAME AND ACCESSORIES				
1.0	Material			
2.0	Dimension detail in mm			
3.0	Weight kg :			
GENERAL				
1.0	Shipping package dim. in mm			
2.0	Total assembly weight in Kg			
3.0	Total shipment weight in Kg			

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____

ANNEXURE A

FOR

WATER PUMPS

MAHAGENCO

As Ref. To Spec ROS: 9073



CUSTOMER	: MAHAGENCO
APPLICATION	: FLUE GAS DESULPHURIZATION SYSTEM
PROJECT	: 1X600MW BHUSAWAL



Water Systems

Bharat Heavy Electrical Limited

Ranipet – 632 406.



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD:WP: BHUSAWAL : ANNEXURE A

CONTENTS

1.0	PROJECT INFORMATION
2.0	PROVENNESS CRITERIA
3.0	WATER ANALYSIS
4.0	PUMP DETAILS
5.0	PAINTING PROCEDURE
6.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION
7.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION
8.0	PACKING AND FORWARDING

	TECHNICAL SPECIFICATION FOR WATER PUMPS
MAHAGENCO:FGD:WP: BHUSAWAL : ANNEXURE A	

1.0 PROJECT INFORMATION

a.	Owner	MAHAGENCO
b.	Buyer	BHEL, Ranipet
c.	Process/Application	Flue Gas Desulphurization
d.	Site Location	Pimpri-Sakam village, Bhusawal taluk, Jalgaon district

A) SITE CONDITIONS

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

B) PROJECT LOCATION AND APPROACH

a	Site Address	BHEL SITE OFFICE 1X660MW BHUSAWAL MAHARASHTRA STATE POWER GENERATION CO. LTD., BHUSAWAL, Maharashtra STATE, INDIA EPC-CONTRACTOR: BHARAT HEAVY ELECTRICALS LIMITED, INDIA
---	--------------	---



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD:WP: BHUSAWAL : ANNEXURE A

2.0 PROVENNESS CRITERIA:

Bidder should have previous experience of design, manufacture, supply, erection and commissioning / supervised erection & commissioning of the Water Pumps as per criteria given in table below and the water pump(s) should have been in successful operation for a period not less than One (1) year prior to Part-I (Techno-commercial) bid opening date"

Sl. No.	Name of Equipment	Type of Equipment	Equipment Rating
1	Water Pumps	Centrifugal pump	80% of the flow & 100% of the head of the offered water Pump(s)

The Bidder shall offer only proven design, which meets the Proveness criteria indicated above. Necessary documentary evidences as per Annexure-I for qualification shall be submitted along with the bid. If bidder does not meet the specified Provenness criteria, they are denied to participate in this tender.

a) REFERENCE LIST as per format shown below

S. No.	Project Name , Customer & Plant capacity	Flow	Head	Motor KW	Qty	Year of Comm g	Performance Certificate/ Documentary Evidence
1.							to be enclosed
2.							to be enclosed

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____

	TECHNICAL SPECIFICATION FOR WATER PUMPS
MAHAGENCO:FGD:WP: BHUSAWAL : ANNEXURE A	

3.0 WATER ANALYSIS

Process water is envisaged for Emergency Quenching. Process water analysis is provided below.

S.no	Constituents	Unit	PROCESS WATER
1.	Calcium as CaCO ₃	ppm	295
2.	Magnesium as CaCO ₃	ppm	77
3.	Sodium as CaCO ₃	ppm	262.9
4.	Potassium as CaCO ₃	ppm	10
5.	Chlorides as CaCO ₃	ppm	210.3
6.	Sulphate as CaCO ₃	ppm	33
7.	Alkalinity as CaCO ₃	Ppm	400
8.	Iron as fe	ppm	1.0
9.	Total silica	ppm	36
10.	pH	----	7.0 – 8.2
11.	Turbidity	NTU	<15

The above Clarified Water is used as Process water for FGD System.

**TECHNICAL SPECIFICATION FOR WATER PUMPS**

MAHAGENCO:FGD:WP: BHUSAWAL : ANNEXURE A

4.0 PUMP DETAILS:

Sl.No	Description	Unit	Process water Pumps	Mist eliminator wash & Emergency Quench pumps
1.	Number of pumps	Nos	1W + 1S	1W + 1 S
2.	Drive Motor		Included in the bidder's scope of supply. The motor make is subjected to customer approval.	
3.	Head of the pump	m	30	60
4.	Capacity of the Pump	m3/ hr.	140	151
5.	Coupling		Direct drive	Direct drive
6.	Type of Pumps		Horizontal centrifugal	Horizontal centrifugal
7.	Specific Gravity	--	1	1
8.	Viscosity	Pa-s	0.003	0.003
9.	Fluid medium	---	Process water	Process water
10.	Water Characteristics		As per Clause No: 3.0	As per Clause No: 3.0
11.	Mode of operation	--	Continuous	Continuous
12.	Maximum operating temperature	°C	45	45
13.	Maximum operating speed	rpm	1500	1500
14.	Service	---	Outdoor. Pump along with motor to be supplied with Canopy.	Outdoor. Pump along with motor to be supplied with Canopy
15	Casing, Gland and stuffing Box		2.5 Ni Cast Iron to IS 210 Grade	
			FG 260 or equivalent.	

	TECHNICAL SPECIFICATION FOR WATER PUMPS
MAHAGENCO:FGD:WP: BHUSAWAL : ANNEXURE A	

16	Impeller (Wear Rings, as applicable)		Stainless Steel-316 grade	
17	Shaft & Sleeves		Stainless Steel-410	
18	Sound (maximum)	dB	85	85
19	Power Consumption (Ceiling Value)	Per KW	22	46

5.0 PAINTING PROCEDURE

3.0 PAINTING PROCEDURE

Surface Preparation : Power Tool Cleaning to SA 2.5 (SSPC-SP10)				
Coating Procedure :				
Sl No.	Coat	Paint	No. of Coats / DFT	Total DFT µm (min)
1.	Primer coat	Catalysed Zn rich Primer with VS of 60% min. complying to SSPC Paint 20 level 2. - One coat	1 Coat/DFT= 75 µm per coat	275 Microns
2.	Finish coat	Two Component High Build high Solid Airphatic Amine Cured Epoxy Coating – Min VS 85%. - Two Coat	1 Coat/DFT= 100 µm per coat	
Shade : Light Blue RAL 5012				

GENERAL NOTES:-

- 1). No painting is required for Galvanized, non-ferrous & stainless steel items, except as indicated above.
- 2). Machined items are to be applied with coat of temporary rust preventive oil.
- 3). All steel structures shall be provided with painting as given in the specification.
- 4). Finish coat to be applied after an interval of min 10 hrs. And within 6 months (after completion of intermediate coat).
- 5). Primer coat on steel shall be applied in shop immediately after blast cleaning by airless spray technique.



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD:WP: BHUSAWAL : ANNEXURE A

6.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION
1.	POWER GUARANTEE: Bidder to specify the guaranteed power consumption at motor input Terminal per Pump operating at the duty point in their offer.
2.	BID EVALUATION CRITERIA FOR POWER CONSUMPTION: Power loading is applicable for the following Pumps 1) Process water Pump 2) Mist Eliminator wash Pump. Ceiling Value For Auxiliary Power Consumption as per SI no. 19 OF Annexure-4 (Pumps Details). Adjustment factor for excess power consumption in INR = {(GPC-CV)/CV} X100 X PL X Total No's of Working Pumps GPC- Guaranteed Power Consumption quoted by bidder in KW CV- Ceiling Value for Guaranteed Power Consumption in KW PL- Power Loading (INR 50,000 /-)
7.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION
	If actual shaft Power Consumption during prove out (or) PG Test operating at the duty point exceeds the value guaranteed by the bidder, liquidated damages for shortfall in performance shall be deducted from contract price as per the formula given below Liquidated damage deductible in INR = {(APC-GPC)/ GPC} X 100 X P X Total No's of Working Pumps Where • GPC- Guaranteed Power Consumption quoted by bidder in KW • APC- Actual Power Consumption in KW • P- Penalty (INR 50,000 /-)



TECHNICAL SPECIFICATION FOR WATER PUMPS

MAHAGENCO:FGD:WP: BHUSAWAL : ANNEXURE A

8.0

PACKING AND FORWARDING

1.

Each Package or shipping units shall be marked or stenciled on at least two sides as Pre Annexure A.

BHEL SITE OFFICE

1X660MW BHUSAWAL

MAHARASHTRA STATE POWER GENERATION CO. LTD., BHUSAWAL,

Maharashtra STATE, INDIA

EPC-CONTRACTOR:

BHARAT HEAVY ELECTRICALS LIMITED, INDIA.

In addition, each package or shipping unit shall have the symbol painted in red on at least two sides of the package, covering one fourth of the area of the side.



PO no ::

DATA SHEET - Cust No :: Project ::

CL. NO	CHARACTERISTICS	Vendor data (To be filled by vendor)
1.0	Application	
1.1	Fan / Load Curve referred	
2.0	Manufacturer	
3.0	Type & frame size	Normal / Energy efficient Frame size:
3.1	Degree of Protection	IP55
4.0	Rated output in kW	
4.1	Rated speed	
5.0	Rated voltage , frequency & phases	415 V AC $\pm 10\%$; 50 Hz $\pm 5\%$; (<u>Check voltage as per enqy</u>), 10% absolute sum - 3 phase
6.0	Full load current	Amps
7.0	Energy efficient	As per IS 12615
8.0	Efficiency & power factor at Full load	Eff-- PF--
9.0	Efficiency & power factor at 75 % load	Eff-- PF--
10.0	Efficiency & power factor at 50 % load	Eff-- PF--
11.0	Duty Cycle	S1 - Continuous
12.0	Rated torque	
13.0	Starting current	600% of full load current
14.0	No load current (with mechanism coupled)	@ RV and Frequency
15.0	Starting torque in % of full load torque	
16.0	Pull up torque in % of full load torque	
17.0	Pull out torque in % of full load torque	
18.0	No load starting time (without mechanism coupled)	
19.0	Locked rotor withstand time at rated voltage	a. Hot b. Cold
20.0	Locked rotor withstand time at minimum starting voltage	a. Hot b. Cold
21.0	Locked rotor withstand time at 110% rated voltage	a. Hot b. Cold
22.0	Starting time at minimum starting voltage with mechanism coupled	
23.0	Starting time at rated voltage with mechanism coupled	
24.0	Maximum permissible starting time	
25.0	Stator thermal time constant	Minutes
26.0	Type & No of terminals brought out	

CI no	CHARACTERISTICS	Vendor Data (To be filled by vendor)
27.0	Stator winding connection	Delta / star
28.0	Class of insulation & temperature rise	Class F; 60°C by thermometer method / 70°C by resistance method.
29.0	Minimum permissible starting voltage	Volts
30.0	Resistance per phase @20 Deg C (Indicative)	Ohms
31.0	No of successive starts in Hot condition	ONE / TWO
32.0	Quantity and power consumption of space heater	Qty== Watts==
33.0	Direction of rotation	Bi-Directional.
34.0	Bearing make & type	Make:: Drive End; Non Drive End;
35.0	Lubricant quantity , grade & recommended interval of lubrication	
36.0	Type of mounting & shaft orientation <u>Terminal Box</u>	Foot mounting; Horizontal.
37.0	Location & angle of rotation	
38.0	Gland size for stator winding	
39.0	Gland size for space heater	Suitable for 2CX2.5 sq.mm(armoured), if applicable.
40.0	Cable entry	
41.0	GD ² of motor (kg-m ²)	
42.0	Total weight of motor (kg).	
43.0	Weight of stator (kg)	
44.0	Weight of rotor (kg)	
45.0	Anticipated bearing life in Hours	
46.0	Method of connection to driven equipment	
47.0	Limiting rotor temperature for determining safe stall time	☐
48.0	RTD for winding/ Bearing	Applicable YES NO
49.0	Grade of balance of motor	
50.0	Standard continuous rating at 40 Deg C ambient.	
51.0	Derated rating of motor at 50 Deg C.	
52.0	a. Locked Rotor KVA b. Ratio of Locked rotor KVA / Rated KW	
53.0	a. Motor Dynamic Load b. Motor Static load	Upward/ Downward— Upward / Downward—
54.0	PAINT SHADE	

Vendor's signature and seal

Rev No ::

Date ::

The following curves are to be enclosed during datasheet approval.

1. GA drawing , Terminal box arrangement
2. Torque Vs Speed with load curve superimposed.
3. Speed Vs Current
4. Time Vs Current
5. Thermal with stand curve
6. Load Vs Efficiency
7. Load Vs Slip
8. Load Vs Power factor
9. Speed Vs Time
10. Load Vs Current.

The following information shall be specifically provided for motors suitable for VFD drive (if called for in eqny during datasheet approval in addition to datasheet.

1. Stator RESISTANCE
2. Stator leakage reactance
3. Magnetising reactance
4. Rotor resistance referred to stator
5. Rotor reactance referred to stator

Vendor's signature and seal.

Date ::

DOCUMENT TITLE : TECHNICAL SPECIFICATION FOR BOUGHT OUT ITEMS
ITEM : LT MOTOR
PROJECT : BHEL STANDARD

	NAME	DESIGNATION	SIGNATURE	DATE
PREPARED BY	ALAN S G	ET		
REVIEWED BY	NAZEER AHAMED T M	DGM		
APPROVED BY	JEYAMURUGANAND M	AGM		

ISSUED BY EDC – ECI

RECORD OF REVISIONS:

REVISION NUMBER 00	INITIAL RELEASE - Dt. 19.03.2013
REVISION NUMBER 01	
REVISION NUMBER 02	Cl. No: 5- Packing and Drawing included
REVISION NUMBER 03	Cl.No :2.1 Latest Standards updated, Cl. No: 2.20, 2.38, 2.39 added

	<u>SPECIFICATION</u>	<u>VENDOR COMPLIANCE/REMARKS</u>
1	<u>SITE CONDITIONS</u>	
1.1	Altitude above mean sea level	>1000 m.
1.2	Ambient temperature condition	6 to 50°C.
1.3	Relative humidity	100%
1.4	Atmosphere	Tropical ,Dusty, salty, corrosive & highly polluted as in a coal based Thermal power plant.
2	<u>GENERAL</u>	
2.1	Reference standards	IS 15999, IS 12615, IS/IEC-60034,IS 1231, IS 6362, IS 2253, IS 12065, IS 12075
2.2	Design ambient	50 Deg.C
2.3	Application/ Type(Normal/ Energy efficient)	As per Enquiry & PO.
2.4	Duty cycle	Continuous S1
2.5	Rated voltage, frequency & Phases	415 V AC $\pm 10\%$; 50 Hz (+5% to -5%); 3 phase
2.6	Combined variation of Voltage and frequency	10% absolute sum
2.7	Motors efficiency class	As per Enquiry
2.8	Minimum starting voltage	80% of the rated voltage
2.9	Minimum voltage under which motor will run satisfactorily	75% of the rated voltage for 5 minutes
2.10	Capacity to restart (at specified voltage)	i. Two successive starts from cold condition ii. Two HOT restarts starts from Hot condition iii. Three equally spread start per hour
2.11	High speed bus transfer withstand capability	Suitable to withstand 150 % of rated voltage
2.12	Type of balancing for rotor	Dynamic balancing
2.13	Direction of rotation	Suitable for both direction
2.14	Direction of cooling air	Non-drive end to driving end
2.15	Class of insulation	Class F with temperature rise limited to Class B.
2.16	Winding treatment	The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot , humid & tropical climate.
2.17	Allowed winding temperature rise at continuous full load	60°C by thermometer method & 70°C by resistance method
2.18	Accelerating Torque at minimum permissible Starting voltage	10% of full Load Torque

2.19	Pullout Torque at rated voltage	205% of full load torque	
2.20	Ratio of Locked rotor KVA to KW for	As per annexure 'A'	
2.21	Starting current	Less than or equal to 700% full load current subject to tolerance as per IS- Energy efficient	
2.22	Starting time & locked rotor withstand time	The locked rotor withstand time (LRWT) at 110% rated voltage (RV) under HOT condition shall be at least 2.5 sec more than the starting time at 80% of rated voltage for motors with acceleration time upto 20 sec at RV and 5 sec where the accelerating time is more than 20 sec at RV.	
2.23	Momentary overload withstand capability	60% of full load torque for 15 second without any damage.	
2.24	Over speed withstand	120% of rated speed for 2 minutes without any mechanical damage.	
2.25	Hot thermal withstand curve	margin of at least 10% over the full load current	
2.26	Cooling	Totally enclosed fan cooled- IC 411(TEFC)	
2.27	Vibration	The peak amplitude of vibration shall be as per IS 12075	
2.28	Noise level	Within the limits specified by IS 12065 / <80 dB at 1 meter distance from motor.	
2.29	Type of enclosure	TEFC, IP 55 as per IS/IEC 60034-5	
2.30	Type of mounting	Horizontal foot mounted.	
2.31	Bearings	Ball or roller type / bearings effectively sealed against ingress of dust. The bearing shall be so constructed that the loss of lubricating grease is kept to minimum. Sealed bearings are also acceptable	
2.32	Lubricant Type	Grease	
2.33	Bearing life	minimum life of 40000 Working hours	
2.34	Shaft extension	Key slotted bare shaft extension with key at the driving end.	
2.35	Terminal box Type	Weather proof IP 55 as per IS/IEC 60034-5; Capable of being turned through 360° in steps of 90°.	
2.36	Cable gland and lugs	Double compression type nickel plated brass cable glands and insulated tinned copper crimping lugs to suit the cable size i) Size of power cables will be intimated after PO. ii) For space heater cable glands and lugs suitable for 2CX2.5 to be provided	

2.37	Type of terminals	Stud / screw type with plain washers, spring washers / checknuts & lugs	
2.38	Min.Spacing between Gland plate and Center stud(in mm)	As per Annexure 'B'	
2.39	Phase to Phase/Phase to Earth air clearance(in mm) in Terminal Box	As per annexure 'C'	
2.40	Fault level	50KA for 1Sec	
2.41	Painting	As per Enquiry or PO	
2.42	Space heaters:		
2.42.a	i) Motors above 30 kW	Separate space heater suitable for 240V, Single Phase, AC,50 Hz	
2.42.b	ii) Motors below 30 kW	Winding shall be suitable for heating at 24 V, Single phase, AC,50 Hz	
2.43	Terminals for space heater	Refer Annexure E	
2.44	RTD for winding	Two numbers of Thermistors / RTD for each phase as below are to be provided A. Motors above 37 Kw shall have thermistors Or RTD if specifically called for in enquiry. B. Motor rated 160kW and above shall have RTDs	
2.45	Bearing RTD	For motors 132 Kw and above	
2.46	Terminals for RTD/ Thermistor	Thermistors/ RTDs shall be terminated in a auxiliary terminal box. Details shall be furnished in TB diagram.	
2.47	Earthing	Two no of earthing provisions on terminal box and on motor body(on opposite sides)	
2.48	Name plate	As per IS/IEC 60034-8 and Additional data on name plate: a. Bearing DE/ NDE details. b. Year of manufacture	
2.49	Lifting Device	Eye bolt or lugs to facilitate safe lifting	
3	INSPECTION & TESTING	As per applicable quality plan	

4 **DOCUMENTS**

a) Along with offer:	One set of technical data sheet as per the enclosed format and Motor general arrangement drawing giving foundation details, shaft details.	
b) After placement of Purchase order (within 15 days)	Three sets of the following for approval: 1. Technical Data sheet as per the enclosed format of TECI LTMOTOR REV 00- sh 6 to 8 2. Motor general arrangement drawing giving foundation details, shaft details and weight 3. Motor Terminal box arrangement drawing 4. Motor characteristic curves : - Torque vs Speed with load curve superimposed - Speed vs Current - Time vs Current - Thermal with stand' curve - Load vs Efficiency - Load vs Slip - Load vs Power factor - Speed vs Time - Load vs Current 5. Steel crate packing drawing. The following shall be submitted: 1. Guarantee certificate. 2. O & M manuals. 3. Acceleration time and LRWT calculation shall be submitted for review.	

5 **PACKING**

	a) As per Drawing No:- 3-00-114-39893 b) The packing shall meet the Transport, Environment & Storage hazards. c) As per Packing Procedure QA:CI: STD:PR:03 or as per Manufacturer's Standard Practice subject to approval.	
--	--	--

ANNEXURE 'A'(FOR NTPC)

Ratio of Locked rotor KVA to KW	
i) 50KW to 110KW	11
ii) 110KW to 200KW	9

ANNEXURE 'B'(FOR NTPC)

Min.Spacing between Gland plate and Center stud(in mm)	
upto 3KW	As per manufacturer's practice
above 3KW and upto 7KW	85
above 7KW and upto 13KW	115
above 13KW and upto 24KW	167
above 24KW and upto 37KW	196
above 37KW and upto 55KW	249
above 55kw and upto 90KW	277
above 90KW and upto 125KW	331
above 125KW and upto 200KW	203

ANNEXURE 'C'(FOR NTPC)

Phase to Phase/Phase to Earth air clearance(in mm) in Terminal Box	
upto 110	10
above 110kw and upto 150KW	12.5
above 150KW	19

ANNEXURE 'D'

ADDITIONAL DATA TO BE INCLUDED IN DATASHEET (FOR NTPC)	
GRADE OF BALANCING OF MOTOR	
STANDARD CONTINUOUS RATING AT 40DEG.C AMBIENT	
DERATED RATING OF MOTOR AT 50DEG.C	
NO LOAD CURRENT OF MOTOR AT RATED VOLTAGE AND FREQUENCY	
STARTING TORQUE VALUE IN KGM	
LOCKED ROTOR KVA @ RATED KW	
POWER FACTOR AND EFFICIENCY AT 75% LOAD	
POWER FACTOR AND EFFICIENCY AT 50% LOAD	

PRODUCT STANDARD
ELECTRICAL, CONTROLS & INSTRUMENTATION
BAP / BHEL / RANIPET – 632 406

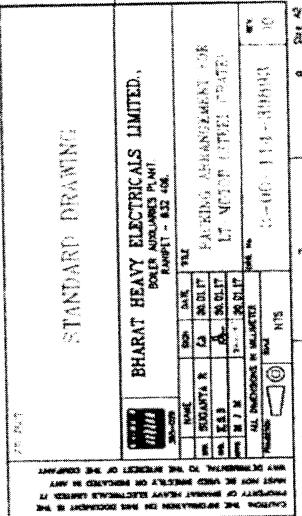
TECI: LT MOTOR: REV 03
PAGE 7 OF 8
EFFECTIVE DATE : 10.06.2020

ANNEXURE 'E'

SPACE HEATER TERMINAL	
FOR NTPC	Separate terminal box shall be provided
FOR NON-NTPC	Separately terminated in the main terminal box

BAP / BHEL / RANIPET - 632 406

EFFECTIVE DATE : 10.06.2020



Gandhi Parimalam K C

From: Gandhi Parimalam K C <gandhi@bhel.in>
Sent: Thursday, August 13, 2020 12:54 PM
To: Mandadi Venkateswarlu(Manager/MM-FGD/BAP); 'Ragupathy V'
Cc: K Renjith(Dy Manager/QC- NDTL/BAP); Rakesh Kumar Madhu(Dy Manager/QA_MECH/BAP); R Arunachalam(Dy GM/QA_MECH/BAP); Harsh Deep(Dy Manager/WS(CON)/BAP); Anjitha Jayan V(Sr Engineer/WS(EC&I)/BAP); V N Santha Kumar(Dy GM/WS(EC&I)/BAP); I M Ramalingeswara Rao(Sr Manager/WS(CON)/BAP)
Subject: CQR and Quality Requirements for LT Motors (Up to 160KW) for Process Water & Mist Eliminator Wash Water Pumps-MAHAGENCO Bhusawal FGD - Indent no: RFW00911-reg
Attachments: RFW00911 Comments.pdf; MAHAGENCO Bhusawal FGD Project _Process Water & Mist Eliminator Wash Water Pumps_LT MOTORS up to 160KW_Foreign Vendor.pdf; MAHAGENCO Bhusawal FGD Project _Process Water & Mist Eliminator Wash Water Pumps_LT MOTORS up to 160KW_Indegenious Vendor.doc; MAHAGENCO Bhusawal FGD Project _Process Water & Mist Eliminator Wash Water Pumps_LT MOTORS up to 160KW_Indegenious Vendor.pdf; MAHAGENCO Bhusawal FGD Project _Process Water & Mist Eliminator Wash Water Pumps_LT MOTORS up to 160KW_Foreign Vendor.doc; MQP Format_MAHAGENCO Bhusawal FGD_LT Motors (upto 160 kW) used in Process Water & Mist Eliminator Wash Water Pumps.docx; MQP Format_MAHAGENCO Bhusawal FGD_LT Motors (upto 160 kW) used in Process Water & Mist Eliminator Wash Water Pumps.pdf; Indicative MQP for MAHAGENCO Bhusawal Process Water & Mist Eliminator Wash Water Pumps_ LT Motor Up to 160KW- Inf purpose only.pdf; Indicative MQP for MAHAGENCO Bhusawal Process Water & Mist Eliminator Wash Water Pumps_ LT Motor Up to 160KW- Inf purpose only.xlsx

Dear Sir.,

Sub: Procurement of Process Water & Mist Eliminator Wash Water Pumps for MAHAGENCO Bhusawal FGD (1x660 MW) - BHEL
W.O No: R4U8

Ref : (i) Indent no: RFW00911

(ii) QA- Mechnaical Quality Requirement vide training email dt 11.08.2020

Further to the above, we are furnishing Quality Requirements w.r.t Electrical for LT Motors being used in Process Water & Mist Eliminator Wash Water Pumps - MAHAGENCO Bhusawal FGD Project.

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

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

Sl no	Description & Quality Requirements	Specific confirmation by the vendor (Confirmed/Not Confirmed)
-------	------------------------------------	--

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(Energy Efficient**) Up to 160KW used in Process Water & Mist Eliminator Wash Water Pumps (DOC.NO: BAP/QR/R4U8/Bhusawal/ LTM/ PWMEW Pumps:001 Rev no.00 dt 11.08.2020) and send us the same to follow / ensure all the requirements in the event of an order. **LT Motors should be of Energy Efficiency class as per Technical specification/drg/datasheet (as applicable) for this Enquiry.	
02	OEM vendor shall ensure Credentials of design and Manufacturing capabilities w.r.t. LT Motors by their LT Motor manufacture.	
05	No material shall be dispatched without BHEL/ Ultimate Customer – MAHAGENCO (Maharashtra State Power Generation Corporation Limited) inspection or its Appointed Inspection Agency - CHP/MDCC clearances.	

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

Sl no	Description & Quality Requirements	Specific confirmation by the vendor (Confirmed/Not Confirmed)
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(Energy Efficient**) Up to 160KW used in Process Water & Mist Eliminator Wash Water Pumps (DOC.NO: BAP/QR/R4U8/Bhusawal/ LTM/ PWMEW Pumps:002 Rev no.00 dt 11.08.2020) and send us the same to follow / ensure all the requirements in the event of an order. **LT Motors should be of Energy Efficiency class as per Technical specification/drg/datasheet (as applicable) for this Enquiry.	
02	OEM vendor shall ensure Credentials of design and Manufacturing capabilities w.r.t. LT Motors by their LT Motor manufacture.	
03	No material shall be dispatched without BHEL/ Ultimate Customer – MAHAGENCO (Maharashtra State Power Generation Corporation Limited) inspection or its Appointed Inspection Agency - 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 Requirement – Mechanical furnished by Shri Renjith K., Manager/QA (Mech), OEM Vendors offers will be acceptable w.r.t Quality Requirements.

Important Notes:

1. **We have noted that Mahagenco indicated that up to 160 KW to be treated as LT motor and more than 160KW to be treated as HT motor**
2. Engg shall ensure customer approved LT Motor data sheet/drg/spec (As applicable) to obtain CHP/MDCC from MAHAGENCO.
3. Engg. shall ensure Energy Efficiency class for LT Motors as per Technical specification/drg/datasheet (as applicable) for this Enquiry.
4. MM shall ensure customer approvals details if any with commercial for these LT motors being a non NTPC project - MAHAGENCO Bhusawal (1 X 660 MW) and order shall be placed only on customer approved vendors (if applicable) to avoid any conflict during execution since MAHAGENCO will never yield for non-approved vendors and also LT motors are to be inspected by both BHEL/Mahagenco or its appointed inspection agency.

The offer file is returned

With kind regard

KC Gandhi Parimalam

Shri VN Shantahkumar / Miss Anjitha.....Refer the discussion our Mr Ramnandha had on the above including type test requirements indicated in our Engg spec and with that of Mahagenco Spec and also pl take care like IE2 or IE 3 requirement if any including data sheet/BOM/Drg appl and also LT motor rating restricted to 160KW etc since these LT motors are to be inspected by both BHEL/Mahagenco or its appointed inspection agency.

From: Renjith K [<mailto:renjith@bhel.in>]

Sent: Tuesday, August 11, 2020 9:23 AM

To: V Ragupathy(Sr Manager/PUR(FGD1&C)/BAP) <vrp@bhel.in>

Cc: Rakesh Kumar Madhu(Dy Manager/QA_MECH/BAP) <rkmadhu@bhel.in>; R Arunachalam(Dy GM/QA_MECH/BAP) <arunachalam@bhel.in>; N S Prabhakaran(Dy. Engineer/QC-SD & ADMN/BAP) <nsp@bhel.in>; K C Gandhi Parimalam(Dy GM/QA-ELEC/BAP) <gandhi@bhel.in>

Subject: Process Water Pump & Mist Eliminator pump for Bhusawal - reg

Sir,

Kindly find attached QA (Mechanical) recommendation for Process water pump & Mist eliminator pump for Bhusawal.
File handed over to QA (Electrical) today.

Regards,

Renjith K
Manager / QA (Mechanical)
BHEL Ranipet
Mobile - 9791516114

Annexure-I

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) Up to 160kW (For INDIGENOUS OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/T-1/BTG+BoP EPC Contract/Amendment to LOA/No.1974 did 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) - Up to 160kW used in <u>Process Water Pumps & Mist Eliminator Wash Water Pumps for FGD application</u> MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)	DOC.NO: BAP/QR/R4U8 LTM/ /Bhusawal/ PWMEW Pumps: 001 Rev NO.: 00 PAGE : Page 1 of 6 DATE: 11.08.2020	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl.	DESCRIPTION	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd), Quality Requirements ITEM: LT Motors (Energy Efficient**) Up to 160KW	##Specific confirmations by the vendor

01	Type Test Requirements	A. Vendor shall conduct all the type tests for LT Motors as listed in SL NO: 01 (D) below and accordingly submit the type test reports. 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) should have been witnessed by BHEL AIA (BHEL Appointed Inspection Agency) / BHEL /Ultimate client MAHAGENCO at respective LT Motor Manufacturer of OEM vendor. B. 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 MAHAGENCO and submit the reports for review & approval. C. Type Test reports review and approval by BHEL AIA (BHEL Appointed Inspection Agency) / BHEL / Ultimate client MAHAGENCO and its consultant DCPL is must in line with MAHAGENCO and its consultant DCPL approved data sheet / BOM/GA Drawing etc.	
-----------	-------------------------------	--	--

Annexure-I

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) Up to 160kW (For INDIGENOUS OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/T-1/BTG+BoP EPC Contract/Amendment to LOA/No.1974 did 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) - Up to 160kW used in <u>Process Water Pumps & Mist Eliminator Wash Water Pumps for FGD application</u> MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)	DOC.NO: BAP/QR/R4U8 LTM/ /Bhusawal/ PWMEW Pumps: 001 Rev NO.: 00 PAGE : Page 2 of 6 DATE: 11.08.2020	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl.	DESCRIPTION	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd), Quality Requirements ITEM: LT Motors (Energy Efficient**) Up to 160KW	##Specific confirmations by the vendor

01	Type Test RequirementContd	D. The following Type test reports to be submitted covering the following for LT Motors as per relevant BIS (Bureau of Indian Standard) - BIS 325 /IS 12615/ IEC 60034 etc - Insulation Resistance Test - Measuring of resistance of winding of stator and wound rotor (if applicable) - No load test at rated voltage to determine input current, power and speed. - Locked Rotor Readings of Voltage, Current and Power Input at a Suitable Reduced Voltage - Reduced Voltage Running up Test at no-load (for squirrel cage motor up to 37 kW only) - Open circuit voltage ratio of wound rotor motor (in case slip ring motors) - Locked Rotor Test (for Motors Having Output Rating Up to 37 kW) - Full load test to determine efficiency power factor and slip - Temperature rise test. - Momentary excess load test - High voltage test - Test for vibration severity of motor - 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). - Over speed test - Degree of Protection Tests (Minimum Ingress Protection - IP 55). Type test certificate shall be acceptable, if the test is conducted for IP-55 degree of protection on motors of similar frame size within last 10 years. - Fault Withstand Test for main terminal box. Type test certificate shall be acceptable, if the test is conducted on exactly identical terminal box within last 3 years. - Type test reports for motors located in fuel oil area having flame proof enclosures as per BIS 2148/ IEC 60079-1 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 (Energy Efficient) Up to 160kW**
(For INDIGENOUS OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/T-1/BTG+BoP EPC Contract/Amendment to LOA/No.1974 dtd 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)		CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) -Up to 160kW used in Process Water Pumps & Mist Eliminator Wash Water Pumps for FGD application MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)		DOC.NO: BAP/QR/R4U8 /Bhusawal/ LTM/ PWMEW Pumps: 001 Rev NO.: 00 PAGE : Page 3 of 6 DATE: 11.08.2020	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd), Quality Requirements ITEM: LT Motors (Energy Efficient**) Up to 160KW		##Specific confirmations by the vendor	
02	Quality Plan Requirement	1. MQP is applicable for these LT Motors and accordingly Actual LT Motor Manufacturer and OEM shall submit the MQP for BHEL and ultimate customer MAHAGENCO and its consultant DCPL approval. 2. If any of LT Motor manufacturer is having, ultimate customer MAHAGENCO and its consultant DCPL approved MQP (Manufacturing Quality Plan) / NTPC approved RQP (Reference Quality Plan) and having validity, the same is applicable for these LT Motor for inspection subject to obtaining ultimate customer MAHAGENCO and its consultant DCPL formal approval in the event of an order. 3. If LT Motor Manufacture / OEM vendor does not have MQP/RQP, they should submit a fresh MQP to BHEL/MAHAGENCO (in BHEL format) for review & approval. (copy attached).			
03	BHEL / ultimate Customer – MAHAGENO approved vendors	LT Motors are to be procured only from Ultimate Customer - MAHAGENCO approved vendors and no deviation on this specific customer requirement is acceptable.			
04	Inspection Methodology to be adopted at Actual LT Motor Manufacture works by OEM vendor	LT Motors (below 60 KW) – Inspection Categorization: II All Routine Tests (including Test for noise level and Test for vibration as Routine Tests) and Type tests on LT Motors are to be ensured by OEM vendor & witnessed by BHEL/BHEL AIA (BHEL authorized inspection Agency) at LT Motor manufacturer 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 BIS (Bureau of Indian Standard) - BIS 325 / IS 12615/IEC 60034 etc and all the Routine Test and Type Test Reports with Inspection report (IR) to be submitted for BHEL/Ultimate Customer – MAHAGENCO and its consultant DCPL for review and to obtain inspection and dispatch clearance.			

Annexure-I
CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient) Up to 160kW**
(For INDIGENOUS OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/T-1/BTG+BoP EPC Contract/Amendment to LOA/No.1974 dtd 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)		CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) -Up to 160kW used in Process Water Pumps & Mist Eliminator Wash Water Pumps for FGD application MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)		DOC.NO: BAP/QR/R4U8 /Bhusawal/ LTM/ PWMEW Pumps: 001 Rev NO.: 00 PAGE : Page 4 of 6 DATE: 11.08.2020	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd), Quality Requirements ITEM: LT Motors (Energy Efficient**) Up to 160KW		##Specific confirmations by the vendor	
04	Inspection Methodology to be adopted at Actual LT Motor Manufacture works by OEM vendor...Contd	From 60KW and up to 160KW – Inspection Categorization: I All Routine(including Test for noise level and Test for vibration as Routine Tests) & Type Tests 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-MAHAGENCO for inspection & witnessing including review of Degree of Protection Test Reports as per approved MQP /RQP / approved data sheet / drg / spec / as per relevant BIS (Bureau of Indian Standard) - BIS 325 /IS 12615/ IEC 60034 etc 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 – MAHAGENCO and its consultant DCPL for review and to obtain inspection and dispatch clearance. BHEL/ BHEL AIA (BHEL authorized inspection Agency) / Ultimate Customer-MAHAGENCO 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 BIS (Bureau of Indian Standard) - BIS 325 /IS 12615/ IEC 60034 etc. No material shall be dispatched without BHEL / BHEL AIA and Ultimate Customer – MAHAGENCO 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 -MAHAGENCO and its consultant DCPL 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 – MAHAGENCO including for type test witnessing 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.			

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) Up to 160kW

(For INDIGENOUS OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/T-1/BTG+BoP EPC Contract/Amendment to LOA/No.1974 dtd 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) -Up to 160KW used in <u>Process Water Pumps &</u> <u>Mist Eliminator Wash</u> <u>Water Pumps for FGD</u> <u>application</u> MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)	DOC:NO: BAP/QR/R4U8 /Bhusawal/ LTM/ PWMEW Pumps: 001 Rev NO.: 00 PAGE : Page 5 of 6 DATE: 11.08.2020	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
---	--	--	--

Sl. No.	Description	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd)., Quality Requirements	##Specific confirmations by the vendor
---------	-------------	--	--

ITEM: LT Motors (Energy Efficient**) Up to 160KW		
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 (iii) TCs identified by BHEL/MAHAGENCO 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 MAHAGENCO (Maharashtra State Power Generation Corporation Ltd) 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 dgrs.

09	Important notes	<u>Inspection Categorization: I</u> Inspection by BHEL/BHEL AIA and also by Ultimate Customer – MAHAGENCO based on MQP/RQP approved and as in sl no:04 <u>Inspection Categorization: II</u> Inspection by Main contractor (BHEL) / BHEL AIA based on Ultimate Customer – MAHAGENCO approved MQP/RQP & 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 – MAHAGENCO 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.	
---	--

Annexure-I

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient) Up to 160kW**

(For INDIGENOUS OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/JT-1/IBTG+BoP EPC Contract/Amendment to LOA/No.1974 dtd 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEN) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) - Up to 160kW used in <u>Process Water Pumps &</u> <u>Mist Eliminator Wash</u> <u>Water Pumps for FGD</u> <u>application</u> MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)	DOC.NO: BAP/QR/R4U8 /Bhusawal/ LTM/ PWMEW Pumps; 001 Rev NO.: 00 PAGE : Page 6 of 6 DATE: 11.08.2020	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
---	---	--	--

Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd.). Quality Requirements	##Specific confirmations by the vendor
---------	-------------	--	--

[illegible]

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 – MAHAGENCO (Maharashtra State Power Generation Corporation Limited) specific requirements.

Annexure-II

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient) Up to 160kW**

(For FOREIGN (OUTSIDE INDIA) OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/T-1/BTG+BoP EPC Contract/Amendment to LOA/No.1974 dtd 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)		CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) - Up to 160kW used in <u>Process Water Pumps and Mist Eliminator Wash Water Pumps for FGD application</u> MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)	DOC.NO: BAP/QR/R4U8/Bhusawal/ LTM/ PWMEW Pumps: 002 Rev NO.: 00 PAGE : Page 1 of 6 DATE: 11.08.2020 ##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd), Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors (Energy Efficient**) - Up to 160kW

01	Type Test Requirements	A. Vendor shall conduct all the type tests for LT Motors as listed in SL NO: 01 (D) below and accordingly submit the type test reports. 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) should have been witnessed by BHEL AIA (BHEL Appointed Inspection Agency) / BHEL (or) Ultimate client MAHAGENCO at respective LT Motor Manufacturer of OEM vendor.	
		B. 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 MAHAGENCO and submit the reports for review & approval.	
		C. Type Test reports review and approval by BHEL AIA (BHEL Appointed Inspection Agency) / BHEL / Ultimate client MAHAGENCO and its consultant DCPL is must in line with MAHAGENCO and its consultant DCPL approved data sheet / BOM/GA Drawing etc.	

Annexure-II

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient) Up to 160kW**

(For FOREIGN (OUTSIDE INDIA) OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/T-1/BTG+BoP EPC Contract/Amendment to LOA/No.1974 dtd 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)		CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) - Up to 160kW used in <u>Process Water Pumps and Mist Eliminator Wash Water Pumps for FGD application</u> MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)	DOC.NO: BAP/QR/R4U8/Bhusawal/ LTM/ PWMEW Pumps: 002 Rev NO.: 00 PAGE : Page 2 of 6 DATE: 11.08.2020 ##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd), Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors (Energy Efficient**) - Up to 160kW

01	Type Test Requirement(Contd)	D. The following Type test reports to be submitted covering the following for LT Motors as per relevant BIS (Bureau of Indian Standard) - BIS 325/IS 12615/ IEC 60034 etc i. Insulation Resistance Test ii. Measuring of resistance of winding of stator and wound rotor (if applicable) iii. No load test at rated voltage to determine input current, power and speed. iv. Locked Rotor Readings of Voltage, Current and Power Input at a Suitable Reduced Voltage v. Reduced Voltage Running up Test at no-load (for squirrel cage motor up to 37 kW only) vi. Open circuit voltage ratio of wound rotor motor (in case slip ring motors) vii. Locked Rotor Test (for Motors Having Output Rating Up to 37 kW) viii. Full load test to determine efficiency power factor and slip ix. Temperature rise test. x. Momentary excess load test xi. High voltage test xii. Test for vibration severity of motor xiii. 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). xiv. Over speed test xv. Degree of Protection Tests (Minimum Ingress Protection - IP 55). Type test certificate shall be acceptable, if the test is conducted for IP-55 degree of protection on motors of similar frame size within last 10 years. xvi. Fault Withstand Test for main terminal box. Type test certificate shall be acceptable, if the test is conducted on exactly identical terminal box within last 3 years. xvii. Type test reports for motors located in fuel oil area having flame proof enclosures as per BIS 2148/ IEC 60079-1 E. The TCs/Test reports shall also be given as PDF file with index sheet & page control through Email & Soft Copy (File size to less than 9MB).	
02	Quality Plan Requirement	a. MQP (Manufacturing Quality Plan) is applicable for these LT Motors and accordingly Actual LT Motor Manufacture shall submit the MQP in BHEL format for review and approval by BHEL / Ultimate Customer – MAHAGENCO and its consultant DCPL.	

Annexure-II

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient) Up to 160kW**

(For FOREIGN (OUTSIDE INDIA) OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/T-1/BTG+BoP EPC Contract/Amendment to LOA/No.1974 dtd 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) - Up to 160kW used in <u>Process Water Pumps and Mist Eliminator Wash Water Pumps for FGD application</u> MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)	DOC.NO: BAP/QR/R4U8/Bhusawal/ LTM/ PWMEW Pumps: 002 Rev NO.: 00 PAGE : Page 3 of 6 DATE: 11.08.2020	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd.), Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors (Energy Efficient**) - Up to 160kW

02	Quality Plan Requirement ...contd	b. If any of LT Motor manufacture is having, ultimate customer MAHAGENCO approved MQP (Manufacturing Quality Plan)/ NTPC approved RQP and having validity, the same is applicable for these LT Motor for inspection purposes subject to obtaining ultimate customer MAHAGENCO and its consultant DCPL formal approval in the event of an order.	
		c. If LT Motor Manufacture / OEM vendor does not have MQP, they should submit a fresh MQP to BHEL/MAHAGENCO (in BHEL format) for review & approval. (copy attached).	
		d. Typical Indicative MQP is attached for inf and & guidance purposes only and it is not final and binding on BHEL / Ultimate Customer MAHAGENCO.	
03	Inspection Methodology to be adopted at Actual LT Motor Manufacture works by OEM vendor	a. All LT Motors are to be inspected by BHEL AIA (BHEL authorized inspection Agency) at LT Motor manufacture works as per approved MQP & approved data sheet/drg/spec/ as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IS 12615/ IEC 60034 etc by BHEL / Ultimate Customer-MAHAGENCO	
		b. All Type tests & Routine Tests are to be witnessed by BHEL AIA (BHEL authorized inspection Agency) at LT Motor manufacture works as per approved MQP & approved data sheet/drg/spec / as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IS 12615/ IEC 60034 etc by BHEL / Ultimate Customer-MAHAGENCO	
		c. BHEL AIA (BHEL authorized inspection Agency) / Ultimate Customer-MAHAGENCO will also ensure LT Motor type tests reports review including Degree of Protection Test Reports & acceptance as per approved MQP & approved data sheet / drg / spec / as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IS 12615/ IEC 60034 etc.	
		d. BHEL AIA (BHEL authorized inspection Agency)) / Ultimate Customer-MAHAGENCO 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 BIS (Bureau of Indian Standard) - BIS 325 / IS 12615/IEC 60034 etc.	

Annexure-II

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient) Up to 160kW**

(For FOREIGN (OUTSIDE INDIA) OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/T-1/BTG+BoP EPC Contract/Amendment to LOA/No.1974 dtd 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient**) - Up to 160kW used in <u>Process Water Pumps and Mist Eliminator Wash Water Pumps for FGD application</u> MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)	DOC.NO: BAP/QR/R4U8/Bhusawal/ LTM/ PWMEW Pumps: 002 Rev NO.: 00 PAGE : Page 4 of 6 DATE: 11.08.2020	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd.), Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors (Energy Efficient**) - Up to 160kW

03	Inspection Methodology to be adopted at Actual LT Motor Manufacture works by OEM vendor...contd	<u>LT Motors (below 60 KW) – Inspection Categorization: II</u> All Routine Tests (including Test for noise level and Test for vibration as Routine Tests) and Type tests on LT Motors are to be ensured by OEM vendor & witnessed by BHEL/BHEL AIA (BHEL authorized inspection Agency) at LT Motor manufacturer 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 BIS (Bureau of Indian Standard) - BIS 325 / IS 12615/ IEC 60034 etc and all the Routine Test and Type Test Reports with Inspection report (IR) to be submitted for BHEL/Ultimate Customer – MAHAGENCO and its consultant DCPL for review and to obtain inspection and dispatch clearance.	
		<u>From 60KW and up to 160KW – Inspection Categorization: I</u> All Routine(including Test for noise level and Test for vibration as Routine Tests) & Type Tests 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-MAHAGENCO for inspection & witnessing including review of Degree of Protection Test Reports as per approved MQP /RQP / approved data sheet / drg / spec / as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IS 12615/IEC 60034 etc 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 – MAHAGENCO and its consultant DCPL for review and to obtain inspection and dispatch clearance.	
		All the checks / tests /review of documents / inspection & witnessing at LT Motor Manufacture by OEM /BHEL / BHEL AIA (BHEL authorized inspection Agency) / Ultimate Customer-MAHAGENCO are under OEM scope and any cost implication arising out of due to conducting checks / tests including for witnessing of any of the tests at Actual LT Motor Manufacture Works (or) at third party etc by BHEL / BHEL AIA / Ultimate Customer – MAHAGENCO are in the scope of OEM Supplier only. As such No extra cost if any will be admissible and paid in the event of an order and also during execution of the contract.	
		No material shall be dispatched without BHEL / BHEL AIA and Ultimate Customer – MAHAGENCO Inspection and dispatch clearance.	

Annexure E-II
CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient) Up to 160kW**

(For FOREIGN (OUTSIDE INDIA) OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/T-1/BTG+BoP EPC Contract/Amendment to LOA/No.1974 dtd 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for <u>LT MOTORS (Energy Efficient**) - Up</u> <u>to 160kW used in</u> <u>Process Water Pumps and</u> <u>Mist Eliminator Wash</u> <u>Water Pumps for FGD</u> <u>application</u> MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)	DOC NO: BAP/QR/R4U8/Bhusawal/ LTM/ PWMEW Pumps: 002 Rev NO.: 00 PAGE : Page 5 of 6 DATE: 11.08.2020	##Quantity No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contract Official Name: Mobile no: Email id:
SI. NO.	DESCRIPTION	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd)., Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors (Energy Efficient) - Up to 160kW**

ITEM: LT Motors (Energy Efficient)**) - Up to 100kW		
04	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 –MAHAGENCO and its consultant DCPL approved data sheet/drg/spec (As applicable)
05	Packing	Packing shall be as per Specification / Drg. / Data sheet including sea worthy packing if any to avoid any transit & handling damages
06	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 – MAHAGENCO including for type test witnessing 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.
07	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 (iii) TCs identified by BHEL/MAHAGENCO 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 MAHAGENCO (Maharashtra State Power Generation Corporation Ltd) 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-II

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS (Energy Efficient) Up to 160kW**

(For FOREIGN (OUTSIDE INDIA) OEM VENDOR ONLY)

PROJECT: MAHAGENCO 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8) MAHAGENCO CONTRACT NO: DG/BSL U-6/2011/T-1/BTG+BoP EPC Contract/Amendment to LOA/No.1974 dtd 31.12.2018 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for <u>LT MOTORS (Energy Efficient**) - Up</u> <u>to 160kW used in</u> <u>Process Water Pumps and</u> <u>Mist Eliminator Wash</u> <u>Water Pumps for FGD</u> <u>application</u> MAHAGENCO Bhusawal 1 x 660 MW (BHEL W.O no: R4U8)	DOC.NO.: BAP/QR/R4U8/Bhusawal/ LTM/ PWMEW Pumps: 002 Rev NO.: 00 PAGE : Page 6 of 6 DATE: 11.08.2020	#Enquiry No: # OEM Supplier Name & Address: #Offer reference: #Date: Contract Official Name: Mobile no: Email id:
SI. NO.	DESCRIPTION	BHEL and Ultimate Customer - MAHAGENCO (Maharashtra State Power Generation Corporation Ltd.), Quality Requirements	#Specific confirmations by the vendor

ITEM: LT Motors (Energy Efficient) - Up to 160kW**

08	Important notes	ITEM: LT Motors (Energy Efficient**) - Up to 100kv <u>Inspection Categorization: I</u> Inspection by BHEL/BHEL AIA and also by Ultimate Customer – MAHAGENCO based on MQP/RQP approved and as in sl no:03 <u>Inspection Categorization: II</u> Inspection by Main contractor (BHEL) / BHEL AIA based on Ultimate Customer – MAHAGENCO approved MQP/RQP & based on inspection as in sl no:03
		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 – MAHAGENCO 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.

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 – MAHAGENCO (Maharashtra State Power Generation Corporation Limited) specific requirements.

BHEL BAP/ RANIPET / TAMIL NADU INDIA		OEM SUPPLIER		MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 160KW) - FGD Application						MQP:E:LTM:BHUSAWAL :FGD PWMEW PUMPS :001		
		To be filled by OEM Supplier								REV:NO:00		
		LT MOTOR Manufacture		DATE: 12.08.2020			Page :					
		To be filled by OEM Supplier										
S1.No.	COMPONENT/ASSEMBLY/OPERATION/TESTS	CHARACTERISTIC	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF REC	D	AGENCY M	BHEL/ BHEL AIA	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	
INCOMING INSPCTIONS:												
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 / MAHAGENCO Spec & Apprd Datasheet	BHEL / MAHAGENCO 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	
1.2	Aluminum Ingots	1.Chemical composition	Major	Chemical	1 sample/lot	--do--	--do--	Supplier Tc		P	V	EC gr purity: -99.6%
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		MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 160KW) - FGD Application					MQP:E:LTM:BHUSAWAL :FGD PWMEW PUMPS :001			
		To be filled by OEM Supplier							REV:NO:00			
		LT MOTOR Manufacture							DATE: 12.08.2020			
		To be filled by OEM Supplier							Page :			
S1.No.	COMPONENT/ASSEMBLY/OPERATION/TESTS	CHARACTERISTIC	CLASS	TYPE OF CHECK	QUANTITY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF REC	D	M	BHEL/BHEL AIA	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	
INPROCESS INSPCTIONS:												
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 resistance	Major	Electrical	100%	--do--	--do--	Inspection Record	P	V		
2.4	Final Assembly	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		MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 160KW) - FGD Application					MQP:E:LTM:BHUSAWAL :FGD PWMEW PUMPS :001 REV:NO:00 DATE: 12.08.2020 Page :			
		LT MOTOR Manufacture										
		To be filled by OEM Supplier										
S1.No.	COMPONENT/ASSEMBLY/OPERATION/TESTS	CHARACTERISTIC	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF REC	D	AGENCY		REMARKS
										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 / MAHAGENCO Spec, GA Drawing & Apprd Datasheet and IS/IEC 60034 (As applicable)	BHEL / MAHAGENCO 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.Noise level measurement	Major	Measurement	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	

BHEL BAP/ RANIPET / TAMIL NADU INDIA		OEM SUPPLIER To be filled by OEM Supplier		MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 160KW) - FGD Application					MQP:E:LTM:BHUSAWAL :FGD PWMEW PUMPS :001 REV:NO:00 DATE: 12.08.2020 Page :		
		LT MOTOR Manufacture To be filled by OEM Supplier									
S1.No.	COMPONENT/ASSEMBLY/OPERATION/TESTS	CHARACTERISTIC	CLASS	TYPE OF CHECK	QUANTUM 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.
3.2 TYPE TESTS ###											
3.3	Preservation and Packing	1.Completeness	Major	Review	100%	--do--	--do--	Inspection Record		P	V
		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 witness type tests and review the type test reports during including degree of Protection Test report (IP 55) for acceptance in line with BHEL/ Ultimate Customer - MAHAGENCO approved Data sheet/Drg/Spec for LT Motors. OEM / LT Motor Manufacture shall conduct all these type tests in presence of BHEL/BHEL AIA /Ultimate Customer MAHAGENCO without any cost implication to BHEL/Ultimate Customer - MAHAGENCO within reasonable time. 1. Insulation Resistance Test 2. Measurement of Resistance of Stator 3. No Load test at Rated Voltage 4. Locked Rotor Readings of Voltage, Current and Power Input at a Suitable Reduced Voltage 5. Reduced Voltage Running up Test at no-load (for squirrel cage motor up to 37 kW only) 6. Open circuit voltage ratio of wound rotor motor (in case slip ring motors) 7. Locked Rotor Test (for Motors Having Output Rating Up to 37 kW) 8. Full load test to determine efficiency power factor and slip 9. Temperature Rise Test 10. Momentary Exceeds Torque Torque Test 11. High Voltage Test 12. Test for Vibration Severity 13. Test for Noise Level Measurement 14. Over Speed Test 15. Fault withstand test for Main Terminal Box 16. Degree of Protection TC (IP 55)											
LEGEND: OEM = Original Equipment Supplier M = LT Motor Manufacture - BHEL AIA = BHEL AUTHORISED INSPECTION AGENCY GA Drawing : General Arrangement Drawing MAHAGENCO - MAHARASHTRA STATE POWER GENERATION CORPORATION LIMITED (Ultimate Customer) OEM SUPPLIER : (To be Filled up by OEM Supplier) LT MOTOR Manufacture : (To be Filled up by OEM Supplier)											

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

To,

Shri V Raghupathy, Sr.Mgr. /FGD-Purchase

TPC: FGD: WP: BHUS/QA-MECH:124

Dt. 10-08-2020

INDENT NO:	RFW00911 / 00
PGMA	FW702
Project	MAHAGENCO BHUSAWAL UNIT-6
ENGG. SPEC.	MAHAGENCO:FGD:WATER PUMPS: ROS-9073, REV: 00 DATED 27.07.2020
Item:	Process Water Pump & Mist Eliminator Pumps & Acc.

Quality department comments as follows:

1. BHEL approved Vendors are applicable.
2. Inspection at Manufacturer works applicable by BHEL/BHEL TPI as per SQP.
3. Painting shall be done as per BHEL approved Painting scheme.
4. Manufacturer shall provide their acceptance with duly signed and their stamp on our SQP attached herewith. (SQP NO. HZ PUMP:610/00 DT:29.12.2019)
5. Annexure-Q shall be a part of the enquiry file.
6. Packing shall be as per BHEL approved packing schedule.
7. Vendor shall confirm following for inspection purpose.
 - 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 / Drawing / Approved Datasheet


Renjith K

Manager / QA (Mech)

 Ranipet		MANUFACTURER'S NAME & ADDRESS BHEL- RANIPET /BHEL APPD SUPPLIERS		STANDARD QUALITY PLAN Item/subsystem: HORIZONTAL CENTRIFUGAL PUMP		PROJECT: STANDARD								
COMPONENT & OPERATION 2		CHARACTERISTICS 3		CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6 M B/C		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9 D	AGENCY 10 M B C		REMARKS 11	
IN PROCESS INSPECTION														
5	CASING & WEAR AREA	DIMENSIONAL HYDROSTATIC TEST OF CASTING	MAJOR CRITICAL		MEASURE PRESSURE TEST	100% 100%	20%	MANUFACTURING DRAWING SEE NOTE 2	NO LEAKAGE	IR	✓	P	V	
6	IMPELLER	DIMENSIONAL DYNAMIC BALANCING	MAJOR CRITICAL		MEASURE MEASURE	100% 100%	20%	MANUFACTURING DRAWING ISO 1940, GR. 6.3		IR	✓	P	V	SEE NOTE -1
7	DPT OF MACHINED AREA OF CASINGS & IMPELLER	SOUNDNESS OF CASTING	MAJOR		NDT-DPT	100%		MANUFACTURER PROCEDURE		DPT Report	✓	P	V	SEE NOTE-1
8	SHAFT & SLEEVES	DIMENSIONAL SOUNDNESS	MAJOR CRITICAL		VISUAL ULTRASONIC TEST	100% 100%		MANUFACTURING DRAWING RELEVANT PROCEDURE		IR UT Report	✓ ✓	P P	V W	FOR SHAFT DIA ≥ 50 MM ONLY (EXCEPT THREADED PORTION) SEE NOTE-1
FINAL INSPECTION														
		DP TEST ON MACHINED AREA	MAJOR		DP TEST	100%		RELEVANT PROCEDURE		DPT Report	✓	P	V	-

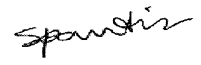
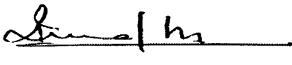
M - Manufacturer / Subcontractor, B - BHEL /BHEL Authorized Inspection Agency, C- End Customer , P - perform, V - Verification of reports, IR - Inspection Report. W - Witness, TC - Test certificate, DP- Dye penetrant. DR - Dimensional report. MTC- Material test Certificate. * Record, identified with "tick" (✓) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by  Sanjib Pandit (AE/QA)	Reviewed by  Rakesh Kr Madhu(Dy. Mgr/QA)	Approved by  K C Gandhiparimalam(DGM/QA)
--	---	--	---

 Ranipet		MANUFACTURER'S NAME & ADDRESS BHEL- RANIPET /BHEL APPD SUPPLIERS		STANDARD QUALITY PLAN Item/subsystem: HORIZONTAL CENTRIFUGAL PUMP		QP NO: HZ PUMP:610 Rev:00 Date:29.12.2019 Page 3 of 4		PROJECT: STANDARD					
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6 M B/C		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9 D	AGENCY 10 M B C			REMARKS 11

9	PUMP ASSEMBLY	DIMENSIONAL	MAJOR	MEASURE	100%	100%	APPROVED G.A. DRAWING	IR	√	P	V	-	
10	PERFORMANCE TEST WITH JOB	Q VS H	CRITICAL	MEASURE	100%	100%	APPROVED PERFORMANCE TEST PROCEDURE & APPROVED DATA SHEET	IR	√	P	W	-	REFER NOTE-3
		Q VS P						IR		P	W	-	REFER NOTE-4
		Q VS E						IR		P	W	-	REFER NOTE-4
		NOISE LEVEL						IR		P	W	-	REFER NOTE-4
11	NPSHR TEST	NPSHR TEST	CRITICAL	MEASURE	100%	1 NO / MODEL	APPROVED NPSHR TEST PROCEDURE	IR	√	P	W	-	REFER NOTE-6
12	PAINTING AND PACKING	TYPE OF PAINT, APPEARANCE, DFT CONFORMANCE TO PACKING SPECIFICATION	MAJOR	VISUAL & MEASURE	100%		TECHNICAL SPECIFICATION MANUFACTURE STANDARD PRACTICE	IR	√	P	V	-	

NOTES:

1	For these checks. Witness (M) by Main supplier and End Customer shall be based on the following criteria
	For Pump Motor rating less than equal to 60 KW. Both Main Supplier & End Customer shall only verify the Test Reports of the check by Supplier. For Pump motor rating more than 60 KW Main Supplier shall witness the check & End Customer shall verify the Test Reports.
2	For Performances Test of Pumps Witness (W) by Main supplier and End Customer shall be based on the following criteria
3	For Pumps motor rating less than equal to 60KW , the performance test of 1 pump per type (min. 1) offered for inspection. Per visit shall be randomly selected for witness by main supplier. For pumps motor rating more than 60 KW but less than 110KW the performance test of 20% of the total no of pumps of each type (min.10 offered for inspection per visit shall be randomly selected for witness by Main supplier as well as End Customer. For pumps, motor rating more than 110 KW and pumps for firefighting applications the performance test of 50% of total no of pumps of each type offered for inspection per visit shall be randomly selected for witness by main supplier as well as End Customer.
4	Noise & Vibration level shall be recorded during shop test for reference purpose only. However values as per approved data sheet / technical specification to be guaranteed at site
5	In case of abnormal noise , pump shall be stripped and shall be re-offered for performance test after correction
6	For pump motor rating less than equal to 110 KW, both Main supplier & End Customer shall review the test reports of the NSPH test witnessed by Vendor / Third party Agency . During Final Evaluation For Pump motor rating more than 110 KW both Main supplier & End Customer shall witness NPSH test. However in case NPSH test has been carried out previously on the same model as of the certified Pump and was witnessed by End Customer then retest of the npsH test is not required & End Customer shall only review such NPSH Test Report during final inspection.
Notes:	a. All the inspection/ test reports shall be submitted to Inspection agency for review and record purpose. b. Latest revision of Drawings, specification and standard shall be used. c. Materials shall be procured in compliance to Functional Technical Specification.

M – Manufacturer / Subcontractor, B – BHEL /BHEL Authorized Inspection Agency, C- End Customer , P - perform, V - Verification of reports, IR – Inspection Report. W - Witness, TC - Test certificate, DP- Dye penetrant. DR – Dimensional report. MTC- Material test Certificate. * Record, identified with "tick" (√) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by
	 Sanjib Pandit (AE/QA)	 Rakesh Kr Madhu(Dy. Mgr/QA)	 K C Gandhiparimalam(DGM/QA)

 Ranipet		MANUFACTURER'S NAME & ADDRESS BHEL- RANIPET /BHEL APPD SUPPLIERS		STANDARD QUALITY PLAN Item/subsystem: HORIZONTAL CENTRIFUGAL PUMP			PROJECT: STANDARD				
				QP NO: HZ PUMP:610 Rev:00 Date:29.12.2019 Page 4 of 4							
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6 M	B/C	REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9 D	AGENCY 10 M B C	REMARKS 11

d. Gauges and measuring instruments with valid calibration only shall be used.

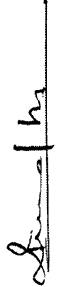
e. Inspection / Inspection waiver / approval by BHEL does not absolve Supplier's responsibility for conformity of the specification as per the terms of PO.

f. BHEL /BHEL Authorized representatives shall have the right to witness the necessary inspection and testing of goods mentioned in the PO.

g. In case of Vendor Drawing, it needs approval by BHEL Engineering.

h. This QP Shall be read along with relevant PO, BHEL Specification/Drawing/Approved Datasheet.

i. This QP is applicable for Mandatory spare supply also specific to the item/project wise.

M – Manufacturer / Subcontractor, B – BHEL /BHEL Authorized Inspection Agency, C- End Customer , P – perform, V – Verification of reports, IR – Inspection Report. W – Witness, TC – Test certificate, DP- Dye penetrant. DR – Dimensional report. MTC- Material test Certificate. * Record, identified with "tick" (✓) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by  Sarjib Pandit (AE/QA)	Reviewed by  Rakesh Kr Madhu(Dy. Mgr/QA)	Approved by  K C Gandhiparimalam(DGM/QA)
--	---	--	---