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**TECHNICAL SPECIFICATION ROS:9080**

**FOR WATER PUMPS**

**OF NTPC PROJECT**

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**CONFIDENTIAL**

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<b>CUSTOMER</b>	<b>: NTPC</b>
<b>PROJECT</b>	<b>: (3X250)MW BONGAIGAON</b>
<b>APPLICATION</b>	<b>: FLUE GAS DESULPHURIZATION SYSTEM</b>


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**Water Systems**

**Bharat Heavy Electrical Limited**


**Ranipet – 632 406**

	<b>TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC</b>
<b>NTPC:FGD: WATER PUMP</b>	
<b>BONGAIGAON (3X250MW)</b>	

**TECHNICAL SPECIFICATION FOR WATER PUMPS**

Department	Prepared	Checked	Approved
WS	 <b>Abhinav Kumar</b> <b>DM-WS</b>	 <b>Harsh Deep</b> <b>DM-WS</b>	 <b>IMRL Rao</b> <b>Sr. Mgr.-WS</b>
<b>ROS : 9080 Rev00: Dtd: 31July'21</b>		<b>COMMENTS : -----</b>	

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<b>BONGAIGAON (3X250MW)</b>	

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## TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

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### 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



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## 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, Coupling Guard, Drain Plug Vent Valves, Companion Flanges Foundation Bolt and Expansion Bellows (Neoprene) at inlet & outlet, Pressure gauges at inlet & outlet, Y – Type suction strainer & other accessories required for the smooth erection and commissioning of the pumps.
2. First Fill of Consumables, Oil & Lubricants shall be supplied alongwith the main supply.

6.0	TECHNICAL REQUIREMNTS									
1.	The pumps shall be designed for continuous 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 15% 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. The Bidder at site without any implication shall assemble any items supplied loose.									
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.	<p>Pumps shall run smoothly without undue noise and vibration. Peak to peak vibration limits shall be restricted to the following values during operation:</p> <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.	<p>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.</p> <p>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.</p> <p>Motor margin shall be as below</p>									




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	<table> <tr> <th>Pump rated BKW</th><th>Motor rating</th></tr> <tr> <td>&lt;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>&gt;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								
10.	Make of the Bearings: <b>SKF/FAG/ Equivalent subjected</b> to customer approval.								
11.	Make of seal: Flowserve / Eagle Burgmann /Jone Crane / Equivalent subjected to customer approval.								
<b>6.1</b>	<b>CONSTRUCTIONAL FEATURES</b>								
	<b>General:</b>								
	<p>The pumps shall be complete with drive motors, baseplate and other accessories. The constructional features of the pump shall be as follows:</p> <p>a). Pump casing may be radially split. The casing shall be of robust construction. Casing drain and vent connections shall be provided. (If applicable).</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>e). The design of the shaft shall take into consideration the critical speed, which shall be at least 20% more than operating speed.</p> <p>f). Pump bearings shall be of antifriction type. Bearings shall be readily accessible without disturbing the alignment of pump.</p> <p>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.</p> <p>h). Pumps shall be furnished complete with an approved type of flexible - coupling.</p> <p>i). Couplings guards made of expanded metal and bolted to the base plate shall be furnished.</p> <p>j). The common base plate for pumps and motor shall be in one piece and shall be made of fabricated steel.</p> <p>k). Pump speed shall be less than 1500 rpm for pumps of capacity more than 10 m<sup>3</sup>/hr.</p>								

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	<p>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 40% to 120% of the duty point unless otherwise mentioned elsewhere. The maximum efficiency of pump shall preferably be within <math>\pm 10\%</math> of the rated design flow as indicated in data sheets.</p> <p>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.</p> <p>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.</p> <p>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.</p>
<b>A)</b>	<b>Casing, Gland &amp; Stuffing Box</b>
a.	The material of the Casing, Gland & Stuffing Box shall be of <b><u>2.5 Ni Cast iron to IS 210 Grade FG260 or equivalent.</u></b>
b.	The casing and flanges shall be designed to withstand the maximum shut-off pressure developed by the pump.
c.	Lifting provision (Lugs) of pump should be provided.
<b>B)</b>	<b>IMPELLER &amp; Wearing Rings (As applicable)</b>
a.	The Impeller & wearing Rings (as applicable) material shall be of <b><u>Stainless Steel 316</u></b> grade.
<b>C)</b>	<b>SHAFT AND SHAFT SLEEVES</b>
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.
<b>D)</b>	<b>BASE PLATE</b>

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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.
<b>E)</b>	<b>BEARINGS</b>
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
b.	Make of the Bearings: <b>SKF/FAG/ Equivalent subjected</b> to customer approval.
<b>F)</b>	<b>ACCESSORIES:</b>
<b>1.</b>	<b>FASTENERS</b>
I	All fasteners shall be SS316 only irrespective of wetted / non-wetted parts.

**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.
	<div>1. All equipment's shall be suitable for rated frequency of 50 Hz with a variation of + 3% &amp; -5%, and 10 % combined variation of voltage and frequency unless specifically brought out in the specification.</div> <div>2. Bidder shall design and supply the equipment suitable for satisfactory operation under above mentioned power supply condition.</div>		

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6.3	PACKING AND FORWARDING
1.	<p>Proper packing to be ensured.</p> <p>Indigenous Supply: Pump &amp; sub system assembly shall be wrapped in polythene bags &amp; 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.</p>
2.	<p>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.</p>
3.	<p>Equipment and materials in wooden cases or crates shall be properly cushioned to withstand the abuse of handling, transportation and storage. Packing shall include preservatives suitable to tropical conditions. All machine surfaces and bearings shall be coated with oxidation preventive compounds. All parts subject to damage when in contact with water shall be coated with suitable grease and wrapped in heavy asphalt or tar impregnated paper.</p>
4.	<p>Crates and packing material used for shipping will become the property of owner.(NTPC)</p>
5.	<p>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.</p>
6.	<p>Each package should have the following inscriptions and signs stenciled with an indelible ink legibly and clearly:</p> <ol style="list-style-type: none"> <li>Destination</li> <li>Package Number</li> <li>Gross and Net Weight</li> <li>Dimensions</li> <li>Lifting places</li> <li>Handling marks and the following delivery marking</li> </ol>
7.	<p>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.</p>
8.	<p>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</p>




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	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: <ol style="list-style-type: none"> <li>Upright position</li> <li>Sling position and center of Gravity position</li> <li>Storage category</li> <li>Fragile components ( to be marked properly with a clear warning for safe handling)</li> </ol>
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 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.	<b>The packing slip shall contain the following information: -</b> 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.
<b>6.4</b>	<b>Motor</b>
Refer to technical specification TECI: LT MOTOR: REV 04; Date : 25.08.2020	
<b>7.0</b>	<b>EXCLUSION</b>
	The following work associated with the water pumps will be by others: <ol style="list-style-type: none"> <li>Civil foundations</li> <li>Walkways, platforms and ladders</li> <li>Element handling hoists</li> </ol>

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<b>8.0</b>	<b>SPARES,TOOLS &amp; TACKLES</b>
<b>8.1</b>	<b>START UP &amp; COMMISSIONING SPARES</b>
	<p>Start-up &amp; Commissioning Spares shall be part of the main supply of the Water pumps. Start-up &amp; 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.</p>
<b>8.2</b>	<b>MANDATORY SPARES</b>
	<p>Bidder to quote for below mentioned mandatory spares with break up price as per Annexure A ( Clause 6.0):</p> <p>Bidder shall quote for the Mandatory Spares List and it will be considered for L1 evaluation. Mandatory Spares Parts items shall be handed over separately and shall not be mixed with the supply of the main equipment parts. Spares shall be sent in pre-decided lots in containers/secure boxes. All boxes/containers are to be distinctly marked in red color with boldly written “S” mark on each face of the containers. Spares shall not be dispatched before dispatch of corresponding main equipment’s. Each item shall be labelled in English and be packed against damage and sealed to prevent deterioration from corrosion.</p>
<b>9.0</b>	<b>DEFECT LIABILITY &amp; WARRANTY</b>
1.	<p>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.</p>
2.	<p>In case of failure of the equipment to meet the guarantee, NTPC/BHEL reserves the right to reject the equipment. However, NTPC/BHEL reserves the right to use the equipment until new equipment supplied by bidder meets the guaranteed requirement .</p>



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<b>10.0</b>	<b>PERFORMANCE GUARANTEE</b>
	<p>All performance tests for Water pumps shall be carried out in accordance with any latest international codes/standards.</p> <ol style="list-style-type: none"> <li>1) Bidder shall furnish Performance guarantee for the design, manufacture, material, safe and trouble-free operation of the water pumps and its accessories</li> <li>2) Bidder shall guarantee and demonstrate the rated capacity of the pump at the rated head.</li> <li>3) Noise level-≤85 dB (A) at 1m horizontal distance from equipment/enclosures and 1.5m above operating floor is to be guaranteed.</li> <li>4) 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.</li> <li>5) Acceptance tests to be carried out as per the procedure defined by the bidder, which shall be submitted for customer approval.</li> <li>6) 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.</li> </ol>
<b>11.0</b>	<b>BID EVALUATION CRITERIA FOR POWER CONSUMPTION:</b>
	As per Annexure A Clause 7.0
<b>12.0</b>	<b>LIQUIDATED DAMAGES FOR POWER CONSUMPTION</b>
	As per Annexure A Clause 8.0
<b>13.0</b>	<b>DOCUMENTATION</b>
<b>A</b>	<b>DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER</b>
	<p>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 <b>Annexure-III A</b>. Annexure-III documents are required for proper evaluation purpose and vendors are requested to comply with above in all respect.</p>
<b>B</b>	<b>DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT</b>
	<p>The Successful bidder shall submit necessary data, documents and drawings for review, approval as specified under <b>Annexure-III B</b> . All necessary GA drawings, sections, sub-assembly drawings, specifications of main and sub components and necessary set of operation &amp; maintenance manual as asked by NTPC must be furnished by bidder in soft and hard copy forms.</p> <p>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.</p>





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## 14.1

## ANNEXURE

Sl. No	Description	Data
1.	Rated capacity of pump m <sup>3</sup> /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 –NTPC

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14.2

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

SI No	Clause No	Page No	Description of Deviation

Note: Enlarge the table to incorporate items

SIGNATURE OF BIDDER


-----

NAME

-----

DESIGNATION

-----

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<b>14.3</b>	<b>ANNEXURE-III</b>
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**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	1
2.	Anchor Plan & Civil foundation Loading	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 -----



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## 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 -----

	<b>TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC</b>
<b>NTPC:FGD: WATER PUMP</b>	
<b>BONGAIGAON (3X250MW)</b>	

<b>14.4</b>	<b>ANNEXURE-IV : TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING</b>
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**Applicable for Import Supply**

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

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----

	<b>TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC</b>
<b>NTPC:FGD: WATER PUMP</b>	
<b>BONGAIGAON (3X250MW)</b>	

**14.5 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.			



# TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

NTPC:FGD: WATER PUMP

BONGAIGAON (3X250MW)

20	Rotation of shaft viewing from drive end			
21	Tolerance on head and efficiency at rated speed and flow.			
<b>CONSTRUCTIONAL DETAILS</b>				
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 –NTPC

NTPC:FGD: WATER PUMP

BONGAIGAON (3X250MW)

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 -----



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**ANNEXURE A**

**FOR**

**WATER PUMPS**

**OF NTPC PROJECT**

(As Reference to Tech Spec ROS 9080)

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**CONFIDENTIAL**

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**CUSTOMER : NTPC**  
**APPLICATION : FLUE GAS DESULPHURIZATION SYSTEM**  
**PROJECT : (3X250)MW BONGAIGAON**

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**Water Systems**

**Bharat Heavy Electrical Limited**

**Ranipet – 632 406**



# TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

**NTPC:FGD:WP:BONGAIGAON:ANNEXURE-A**

## CONTENTS

1.0	PROJECT SYNOPSIS
2.0	PROVENNESS CRITERIA:
3.0	WATER ANALYSIS
4.0	PUMP DETAILS
5.0	PAINTING PROCEDURE
6.0	MANDATORY SPARES
7.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION:
8.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION
9.0	WATER TANK LEVEL
10.0	NOISE
11.0	PACKING & FORWARDING



# TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

**NTPC:FGD:WP:BONGAIGAON:ANNEXURE-A**

## 1.0 PROJECT SYNOPSIS-

a.	Owner	NTPC
b.	Buyer	BHEL, Ranipet
c.	Process/Application	Flue Gas Desulphurization
d.	Site Location	Kumguri near Salakati Bongaigaon District of Kokrajhar, Assam State (India)

## A) SITE CONDITIONS

<b>1.</b>	<b>Ambient Temperature and Relative Humidity</b>		
	<b>Average Site Condition ASC</b>		
	Ambient Temperature	:	27deg C
	Ambient Temperature (Design)	:	42deg C
	Relative Humidity	:	60%

## B) PROJECT LOCATION AND APPROACH

<b>a</b>	<b>Site Address</b>	<p>BHEL SITE OFFICE (3x250) BONGAIGAON NATIONAL THERMAL POWER CORPORATION DISTRICT OF KOKRAJHAR ASSAM STATE-INDIA</p> <p>EPC-CONTRACTOR- BHARAT HEAVY ELECTRICALS LIMITED, INDIA</p>
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# **TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC**

## **NTPC:FGD:WP:BONGAIGAON: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 Commg	Performance Certificate/ Documentary Evidence
1.							to be enclosed
2.							to be enclosed

SIGNATURE OF BIDDER .....

NAME .....

DESIGNATION .....



# TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

## NTPC:FGD:WP:BONGAIGAON: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 $\text{CaCO}_3$	ppm	188
2.	Magnesium as $\text{CaCO}_3$	ppm	75
3.	Sodium as $\text{CaCO}_3$	ppm	37.5
4.	Potassium as $\text{CaCO}_3$	ppm	0
5.	Total Cations as $\text{CaCO}_3$	ppm	302.7
6.	Chlorides as $\text{CaCO}_3$	ppm	57.7
7.	Sulphate as $\text{CaCO}_3$	ppm	81.25
8.	Bicarbonates as $\text{CaCO}_3$	ppm	164.25
9.	Carbonates as $\text{CaCO}_3$	ppm	0
10.	Nitrates as $\text{CaCO}_3$	ppm	0
11.	Total Anions as $\text{CaCO}_3$	ppm	302.7
12.	Iron as Fe	ppm	0
13.	Silica as $\text{SiO}_2$	ppm	35
14.	pH		7.6-8.0
15.	Turbidity	NTU	25

**Note:** Process water is used from Condenser Cooling (CW) Water system as make and flushing requirement. The CW blow down water system is expected to operate with suitable chemical treatment program using acid, scale & corrosion inhibitor dosing

SIGNATURE OF BIDDER \_\_\_\_\_

NAME \_\_\_\_\_

DESIGNATION \_\_\_\_\_



## TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

NTPC:FGD:WP:BONGAIGAON:ANNEXURE-A

**4.0 PUMP DETAILS:****For 3X250MW BONGAIGAON**

Sl.No	Description	Unit	Process water Pumps	Mist eliminator Wash & Emergency Quench pumps
1.	Number of pumps	Nos	3	3
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	65
4.	Capacity of the Pump	m <sup>3</sup> / hr.	90	180
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	Vendor to Specify	Vendor to Specify
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	
16	Impeller (Wear Rings, as applicable)		Stainless Steel-316 grade	
17	Shaft & Sleeves		Stainless Steel-410	
18	Sound (maximum)	dB	85 @ 1m distance	
19	Pump (η)	%	60%( min.)	60%( min.)
20	Auxiliary Power at motor input terminal	KW	13.6	59



# TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

## NTPC:FGD:WP:BONGAIGAON:ANNEXURE-A

### 5.0 PAINTING PROCEDURE

Surface Preparation : SSPC-SP1 or SP3, Solvent/ Power Tool Cleaning				
Coating Procedure :				
Sl No.	Coat	Paint	No. of Coats / DFT	Total DFT $\mu\text{m}$ (min)
1.	Primer coat	Red Oxide Zinc Phosphate Primer to IS: 12744 (Two coats)	2 Coat/DFT= 30 $\mu\text{m}$ per coat	120 Microns
2.	Finish coat	Two coats of Synthetic Enamel Paint to IS 2932	2 Coat/DFT= 30 $\mu\text{m}$ per coat	
Shade : Smoke Grey Shade No: 692 of IS 5				

#### 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). Primer coat on steel shall be applied in shop immediately after blast cleaning by airless spray technique.
- 5). All threaded and other surfaces of foundation bolts and it's materials, insulation pins, Anchor channels, sleeves shall be coated with temporary rust preventive fluid and during execution of civil works; the drier film of coating shall be removed using organic solvents.
- 6). Painting requirement for all electrical equipment shall be as per details identified in specification for the respective equipment.
- 7). For the portion of steel surfaces embedded in concrete, the surface shall be prepared by Manual cleaning and provided with primer coat of Chlorinated Rubber based Zinc Phosphate Primer of Minimum 50 Micron DFT.
- 8). All Components, wherever plates/sheets of thickness less than or equal to 5mm and rods are used, power tool cleaning to SSPC-SP3/SP2 shall be followed.

SIGNATURE OF BIDDER \_\_\_\_\_

NAME \_\_\_\_\_

DESIGNATION \_\_\_\_\_



# TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

## NTPC:FGD:WP:BONGAIGAON:ANNEXURE-A

<b>6.0</b>	<b>MANDATORY SPARES</b>
	<p>Bidder to quote for below mentioned mandatory spares with break up price :</p> <ol style="list-style-type: none"> <li>1. Complete Impeller Assembly - 1 nos for each type &amp; size.</li> <li>2. Casing Wear Rings - 1 set for each type.</li> <li>3. Bearings - 1 Set</li> <li>4. Motor- 1 No. of each type</li> </ol> <p>Note: Any change in size material design etc. that obviates one to one replacement of the part shall be considered a different type. Unless otherwise stated a set shall mean complete replacement for one equipment.</p>
<b>7.0</b>	<b>BID EVALUATION CRITERIA FOR POWER CONSUMPTION:</b>
1.	<b>POWER GUARANTEE:</b> Bidder to specify the guaranteed power consumption at motor input terminal per Pump operating at the duty point in their offer.
2.	<p><b>BID EVALUATION CRITERIA FOR POWER CONSUMPTION:</b> Power loading is applicable for the following Pumps</p> <ol style="list-style-type: none"> <li>1) Process water Pump</li> <li>2) Mist Eliminator wash.</li> </ol> <p>In case, Guaranteed Shaft power offered by the bidder exceeds the base value specified (Auxiliary Power at motor Input as per clause 4.i.19 &amp; 4.ii.19), his bid price will be loaded for excess power consumption as per the formula given below.</p> <p>Adjustment factor for excess power consumption in USD = (GPC-BV) X PL X No's of Working pumps. Exchange rate as applicable on price bid opening date will be considered</p> <p>GPC- Guaranteed Power Consumption quoted by bidder in KW BV- Base Value for Guaranteed Power Consumption in KW PL- Power Loading per KW shall be USD 3272/-</p>
<b>8.0</b>	<b>LIQUIDATED DAMAGES FOR POWER CONSUMPTION</b>
	<p>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.</p> <p>Liquidated damage deductible in USD = (APC-GPC) X P X Total No's of Working pumps</p>





# TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

## NTPC:FGD:WP:BONGAIGAON:ANNEXURE-A

Where

- GPC- Guaranteed Power Consumption quoted by bidder in KW
- APC- Actual Power Consumption in KW
- P- Penalty per KW : USD 3272 /-

Contractor's aggregate liability to pay liquidated damages for failure to attain the functional guarantee shall not exceed twenty five percent (25%) of the Contract Price.

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----

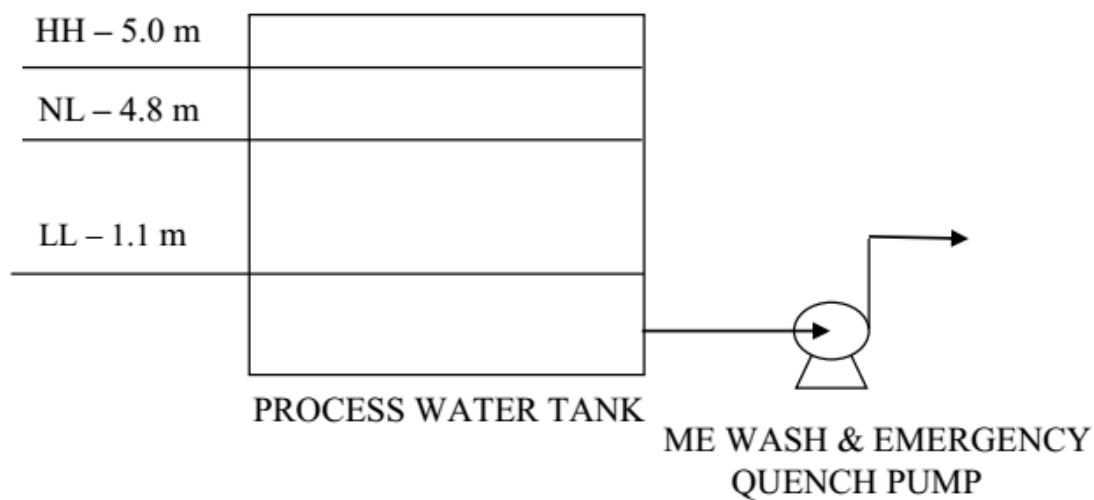
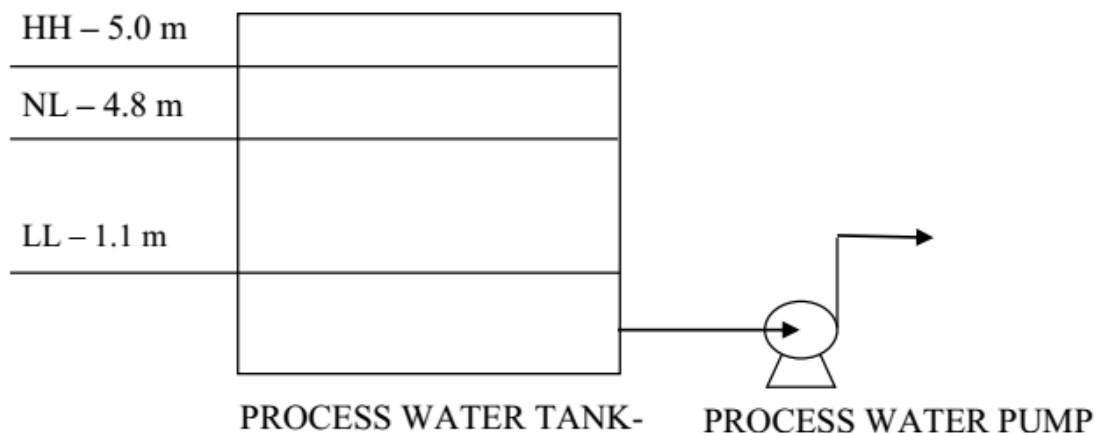


# TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

NTPC:FGD:WP:BONGAIGAON:ANNEXURE-A

## 9.0 TANK WATER LEVEL

Process water Tank Level is provided below:-



LL: Low Low Level; NL: Normal/Operating Level; HL: High High Level

SIGNATURE OF BIDDER .....

NAME .....

DESIGNATION .....



## TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

**NTPC:FGD:WP:BONGAIGAON:ANNEXURE-A**

### 10.0 Noise

Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 651 or BS 5969 or is 9779.

Sound pressure shall be measured all around the equipment at a distance of 1.0 m horizontally from the nearest surface of any equipment/ machine and at a height of 1.5 m above the floor level in elevation.

A minimum of 6 points around each equipment shall be covered for measurement. Additional measurement points shall be considered based on the applicable standards and the size of the equipment. The measurement shall be done with slow response on the “A” - weighting scale. The average of “A”-Weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 micro bar shall not exceed the guaranteed value. corrections for background noise shall be considered in line with the applicable standards. All the necessary data for determining these corrections, in line with the applicable standards, shall be collected during the tests

SIGNATURE OF BIDDER \_\_\_\_\_

NAME \_\_\_\_\_

DESIGNATION \_\_\_\_\_



## TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC

## NTPC:FGD:WP:BONGAIGAON:ANNEXURE-A

11.0	PACKING AND FORWARDING
1.	<p>Each Package or shipping units shall be marked or stenciled on at least two sides as Pre Annexure A.</p> <p>BHEL SITE OFFICE (3x250) BONGAIGAON NATIONAL THERMAL POWER CORPORATION DISTRICT OF KOKRAJHAR ASSAM STATE-INDIA</p> <p>EPC-CONTRACTOR- BHARAT HEAVY ELECTRICALS LIMITED (INDIA)</p> <p>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.</p>

SIGNATURE OF BIDDER -----




NAME -----

DESIGNATION -----



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TECI: LT MOTOR: REV 04  
PAGE 1 OF 10  
EFFECTIVE DATE : 25.08.2020

DOCUMENT TITLE : TECHNICAL SPECIFICATION FOR BOUGHT OUT ITEMS				
ITEM : LT MOTOR				
PROJECT : BHEL STANDARD				
	NAME	DESIGNATION	SIGNATURE	DATE
PREPARED BY	ALAN S G	ET		25/8/20
REVIEWED BY	NAZEER AHAMED T M	DGM		25/8/20
APPROVED BY	JEYAMURUGANAND M	AGM		25/8/20
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: 2.20, 2.21, 2.38, 2.39, 2.43 added			
REVISION NUMBER 04	Cl.No: 2.3, 4(b) - ECI:DATASHEET:LTMOTOR:00 added			

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	<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 the document LT MOTOR:PROJECT SPECIFIC DETAILS
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 the document LT MOTOR:PROJECT SPECIFIC DETAILS
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



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2.19	<b>Pullout Torque at rated voltage</b>	205% of full load torque	
2.20	<b>Ratio of Locked rotor KVA to KW for</b>	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS	
2.21	<b>Starting current</b>	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS	
2.22	<b>Starting time &amp; locked rotor withstand time</b>	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	<b>Momentary overload withstand capability</b>	60% of full load torque for 15 second without any damage.	
2.24	<b>Over speed withstand</b>	120% of rated speed for 2 minutes without any mechanical damage.	
2.25	<b>Hot thermal withstand curve</b>	margin of at least 10% over the full load current	
2.26	<b>Cooling</b>	Totally enclosed fan cooled- IC 411(TEFC)	
2.27	<b>Vibration</b>	The peak amplitude of vibration shall be as per IS 12075	
2.28	<b>Noise level</b>	Within the limits specified by IS 12065 / <85 dB at 1 meter distance from motor.	
2.29	<b>Type of enclosure</b>	TEFC, IP 55 as per IS/IEC 60034-5	
2.30	<b>Type of mounting</b>	Horizontal foot mounted.	
2.31	<b>Bearings</b>	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	<b>Lubricant Type</b>	Grease	
2.33	<b>Bearing life</b>	minimum life of 40000 Working hours	
2.34	<b>Shaft extension</b>	Key slotted bare shaft extension with key at the driving end.	
2.35	<b>Terminal box Type</b>	Weather proof IP 55 as per IS/IEC 60034-5; Capable of being turned through 360° in steps of 90°.	
2.36	<b>Cable gland and lugs</b>	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	

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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 the document LT MOTOR:PROJECT SPECIFIC DETAILS	
2.39	Phase to Phase/Phase to Earth air clearance(in mm) in Terminal Box	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS	
2.40.	Fault level	50KA for 1Sec	
2.41	Painting	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS	
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	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS	
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	<b>INSPECTION &amp; TESTING</b>	As per applicable quality plan	



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#### 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)	<p>Three sets of the following for approval:</p> <ol style="list-style-type: none"> <li>1. Technical Data sheet as per the enclosed format ECI:DATASHEET:LTMOTOR:00</li> <li>2. Motor general arrangement drawing giving foundation details, shaft details and weight</li> <li>3. Motor Terminal box arrangement drawing</li> <li>4. Motor characteristic curves : <ul style="list-style-type: none"> <li>Torque vs Speed with load curve superimposed</li> <li>Speed vs Current</li> <li>Time vs Current</li> <li>Thermal with stand curve</li> <li>Load vs Efficiency</li> <li>Load vs Slip</li> <li>Load vs Power factor</li> <li>Speed vs Time</li> <li>Load vs Current</li> </ul> </li> <li>5. Steel crate packing drawing.</li> </ol> <p>The following shall be submitted:</p> <ol style="list-style-type: none"> <li>1. Guarantee certificate.</li> <li>2. O &amp; M manuals.</li> <li>3. Acceleration time and LRWT calculation shall be submitted for review.</li> </ol>	

#### 5 PACKING

	<ol style="list-style-type: none"> <li>a) As per Drawing No:- 3-00-114-39893</li> <li>b) The packing shall meet the Transport, Environment &amp; Storage hazards.</li> <li>c) As per Packing Procedure QA:CI: STD:PR:03 or as per Manufacturer's Standard Practice subject to approval.</li> </ol>	
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**NOTES:**

- 01 LT MOTOR SHALL BE WRAPPED WITH BUBBLED PLASTIC SHEET
- 02 STEEL CRATE SIZE - OVERALL SIZE OF MOTOR (A, B & H)
- 03 MATERIAL - STEEL CRATE
- 04 LT MOTOR ONE IN EACH CRATE
- 05 STEEL CRATE SHALL WITH STAND MECHANICALLY AFTER MULTIPLE LANDING PORTER VESSEL WORKS BHEL STORES (LOSS/STE STORES).
- 06 MATERIAL CODE PROJECT NAME, MOTOR WEIGHT SHALL BE PAINTED EXHAUST ON ANY TWO SIDES OF FRAME FOR IDENTIFICATION
- 07 PACKING SLIP INDICATING MOTOR P.O DETAILS, MATERIAL CODE WEIGHT SHALL BE AFFIXED TO MOTOR FRAME FOR IDENTIFICATION
- 08 THIS PACKING DRAWING IS TYPICAL AND SHALL SUIT THE MOTOR WEIGHT SUPPLIED.
- 09 THE PACKING DRAWING INDICATING SIZE AND MATERIAL USED SHALL BE SUBMITTED ALONG WITH DATASHEET FOR BHEL APPROVAL

**PROJECT**

**STANDARD DRAWING**

**BHARAT HEAVY ELECTRICALS LIMITED,**  
BOLAR AUJARIES PLANT.  
RANIPET - 632 406.

NO.	NAME	DATE	DATE	DATE
01	STAGARYA R	01.01.17	01.01.17	01.01.17
02	K.S.S	01.01.17	01.01.17	01.01.17
03	M.J.M	01.01.17	01.01.17	01.01.17

ALL DIMENSIONS IN MILLIMETER

PROJ. NO. 3-00-114-38893

REV. 00

CAUTION: THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

**TOP VIEW**  
(SMC 2535)

**BOTTOM VIEW**  
(SMC 2535) (TYP)

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ECI: DATASHEET: LTMOTOR: 00

# TECHNICAL DATA SHEET OF LT MOTOR

P.O No:

DATA SHEET - Customer 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 $\pm$ 10% AC; 50 Hz $\pm$ 5%; ( Check voltage as per Enquiry) 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	As per IS standards
14.0	No load current (with mechanism coupled)	(at Rated.V 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	



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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	
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 at 20Deg C ( Indicative )	Ohms
31.0	No of successive starts in Hot condition	
32.0	Quantity and power consumption of space heater	Quantity:          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	

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36.0	Type of mounting & shaft orientation	Foot mounting; Horizontal.
	<u>Terminal Box</u>	
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 <sup>2</sup> of motor (kg-m <sup>2</sup> )	
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 <input type="checkbox"/> NO <input type="checkbox"/>
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	Upward/ Downward—
	b. Motor Static load	Upward / Downward—
54.0	PAINT SHADE	

Vendor's signature and seal

Rev No :

Date :

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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

**LT MOTOR: PROJECT SPECIFIC DETAILS****INDENT NO:RFW11266 & RFW11267****Customer No: G305, G306 & G307**

<b>ENERGY EFFICIENT</b>	IE3
<b>SUPPLY</b>	Supply: 415V + 10%, 3 Phase, 50 Hz, +3% & -5%. System fault level of 50kA rms for 1s
<b>STARTING CURRENT</b>	As per IS12615
<b>RATIO OF LOCKED ROTOR KVA TO KW</b>	
i) 50KW to 110KW	11
ii) 110KW to 200KW	9
<b>MIN. SPACING BETWEEN GLAND PLATE AND CENTER STUD(IN MM)</b>	
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
<b>PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE(IN MM) IN TERMINAL BOX</b>	
upto 110	10
above 110kw and upto 150KW	12.5
above 150KW	19
<b>ADDITIONAL DATA TO BE INCLUDED IN DATASHEET</b>	
GRADE OF BALANCING OF MOTOR	
STANDARD CONTINUOUS RATING AT 40DEG.C AMBIENT	
DERATED RATING OF MOTOR AT 50DEG.C(DESIGN POINT)	
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	
<b>SPACE HEATER TERMINAL</b>	Separate terminal box shall be provided
<b>PAINTING</b>	During datasheet approval.
<b>Rating</b>	a) Above 0.2 kw and up to 200kw : 3Ph, 415V AC b) Above 200 kW: 6.6 kV