



BHEL
Tenders

Government eProcurement System

Tender Details

Date : 15-Mar-2021 12:44 PM



Basic Details

Organisation Chain	Bharat Heavy Electricals Limited BHEL Trichy MM/BOI		
Tender Reference Number	1802100091		
Tender ID	2021_BHEL_2968_1		
Tender Type	Open Tender	Form of contract	Buy
Tender Category	Goods	No. of Covers	2
General Technical Evaluation Allowed	No	ItemWise Technical Evaluation Allowed	No
Payment Mode	Not Applicable	Is Multi Currency Allowed For BOQ	No
Is Multi Currency Allowed For Fee	No	Allow Two Stage Bidding	No

Cover Details, No. Of Covers - 2

Cover No	Cover	Document Type	Description
1	Fee/PreQual/Technical	.pdf	Techno Commercial Bid consisting of Annexure A, Udyam Regi certificate.
2	Finance	.xls	Price Bid. Excel BOQ shall be filled up and uploaded.

Tender Fee Details, [Total Fee in ₹ * - 0.00]

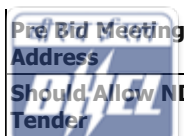
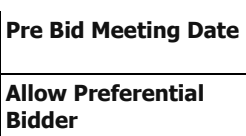
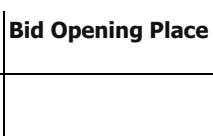
Tender Fee in ₹	0.00		
Fee Payable To	Nil	Fee Payable At	Nil
Tender Fee Exemption Allowed	No		

EMD Fee Details

EMD Amount in ₹	0.00	EMD through BG/ST or EMD Exemption Allowed	No
EMD Fee Type	fixed	EMD Percentage	NA
EMD Payable To	Nil	EMD Payable At	Nil

Work /Item(s)

Title	Stirrer / Agitator with Motor				
Work Description	Stirrer / Agitator with Motor				
Pre Qualification Details	As per nnexure-B				
Independent External Monitor/Remarks	NA				
Show Tender Value in Public Domain	No				
Tender Value in ₹	0.00	Product Category	Miscellaneous Goods	Sub category	NA
Contract Type	Tender	Bid Validity(Days)	120	Period Of Work(Days)	56
Location	BHEL Ptroject Site, Bhusawal, Maharastra	Pincode	425307	Pre Bid Meeting Place	NA

 Pre Bid Meeting Address	NA	 Pre Bid Meeting Date	NA	 Bid Opening Place	NIC portal
 Should Allow NDA Tender	No	 Allow Preferential Bidder	No		

Critical Dates

Publish Date	15-Mar-2021 12:00 PM	Bid Opening Date	25-Mar-2021 02:10 PM
Document Download / Sale Start Date	15-Mar-2021 12:00 PM	Document Download / Sale End Date	25-Mar-2021 02:00 PM
Clarification Start Date	NA	Clarification End Date	NA
Bid Submission Start Date	18-Mar-2021 02:00 PM	Bid Submission End Date	25-Mar-2021 02:00 PM

Tender Documents

NIT Document	S.No	Document Name	Description	Document Size (in KB)	
	1	Tendernotice_1.pdf	RFQ Document	939.39	
Work Item Documents	S.No	Document Type	Document Name	Description	Document Size (in KB)
	1	Tender Documents	PQR.pdf	PQR Annexure B	113.05
	2	Tender Documents	Annexure_A.pdf	Annexure A	752.43
	3	Tender Documents	Specification.pdf	Specification	8258.98
	4	BOQ	BOQ_3037.xls	Price Bid	331.00

Bid Openers List

S.No	Bid Opener Login Id	Bid Opener Name	Certificate Name
1.	sbrajesh@bhel.in	S B Rajesh Kummar	S B RAJESH KUMMAR
2.	mjjiby@bhel.in	M J Jiby	JIBY M J
3.	venkatesh.t@bhel.in	T VENKATESH	T VENKATESH
4.	gsridhar@bhel.in	Sridhar G	G Sridhar

GeMARPTS Details

GeMARPTS ID	M1Y7T9TWN7HV
Description	Stirrer / Agitator with Motor for SCR application
Report Initiated On	13-Mar-2021
Valid Until	12-Apr-2021

Tender Inviting Authority

Name	Sr. Engineer, MM/BOI
Address	MM/BOI, BHEL Trichy

Tender Creator Details

Created By	S B Rajesh Kummar
Designation	SR ENGINEER
Created Date	13-Mar-2021 05:42 PM

Annexure-B

Technical Pre-Qualification Requirement (PQR) for Agitator for Waste Ammonia Dilution System

1. The vendor shall be an established **agitator** supplier and having adequate Engineering, Manufacturing, testing and servicing facilities and shall furnish technical backup documents in proof for above requirements.
2. The vendor shall have experience of having supplied **agitator for waste ammonia dilution system** as per the technical specification for SCR plants or application of similar severity. Supply reference list with details of PO, PO date, customer name shall be submitted.
3. The **agitator** offered shall be from the existing regular supply range of the vendor. Vendor shall provide the product catalogue.
4. Proven track record is required. Minimum One end user certificate for the satisfactory operational performance of their product supplied meeting requirements specified in enquiry specification or greater.

(or)

successfully executed two POs for same item meeting requirements specified in enquiry specification or greater.

Vendor to submit the corresponding datasheets / drawings / technical documents of supplied item as per end user certificate/PO's.

5. In case of ordering, the Vendor shall have the responsibility for the following and same to be confirmed point wise.
 - i) Vendor should have the component replacement responsibility in case of defect / failure.
 - ii) Experts from Vendor's side shall associate in commissioning activities at site, if required.
 - iii) Vendor should ensure the product performance during erection & commissioning and ensure performance guarantee.

6. : Backup document checklist to meet PQR to the fullest satisfaction of BHEL:

S. No	Document description	Check list
1	Documents to meet clause(1)	☐
2	Supply reference document (General reference list) to meet clause (2)	☐
3	Product Catalogues to meet clause (3)	☐
4	Min. one end user certificate (or) Two POs to meet clause (4)	☐
5	Confirmation to clause meet clause (5)	☐

BHARAT HEAVY ELECTRICALS LIMITED

TIRUCHIRAPPALLI-620014

Fuel Systems/PE(FB)



Title Sheet

Technical Purchase Specification for

Agitator / Stirrer along with motor and other accessories

Specification No.: **TSR:021**

Revision No.: 00

Rev No.	Rev. Date	Clause	Description	Prepared	Checked	Approved
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	Name	Signature	Date
Prepared	G Sankar	-sd-	15.12.2020
Checked	V Shankar Naik	-sd-	15.12.2020
Approved	G. Saravanakumar	-sd-	15.12.2020



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motor and other accessories**

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1.0 TECHNICAL SPECIFICATION

1.1 Scope

- This specification defines the minimum requirements for the design, manufacture, testing, preparation for shipment and delivery of materials, engineering documentation, technical direction for construction/installation and startup service for agitator / stirrer along with motor, their auxiliaries and other accessories. The vendor is solely responsible for correct design, engineering, construction and installation of this scope of supply.
- In the event of conflicts between codes, standards, this specification and the customer specifications, the more stringent requirements shall apply and the conflict between these shall be submitted to BHEL in writing. Vendor shall comply with all customer specifications (if applicable) unless BHEL approves the exceptions requested by vendor in writing.
- No deviation or exception from this specification shall be permitted without the written approval of BHEL. Intended deviations shall be separately listed by the vendor and supported by reasons for consideration of BHEL.
- Compliance with this specification shall not relieve the vendor of the responsibility of furnishing equipment and accessories of proper design, materials and workmanship to meet the specified operating conditions.

1.2 Equipment, Materials and services by Vendor

The vendor's scope of supply includes, but is not limited to:

- Equipment and ancillaries as defined in datasheets for agitators, including impellers, shafts, gearboxes, belts, couplings, guards, motors, base plates and instrumentation.
- Dimensioned outline drawings of the agitator assemblies showing equipment weights, nozzle loads and locations and sizes of all mechanical and electrical connections.
- Miscellaneous items such as stainless steel tagging, lifting lug, etc.
- Equipment datasheets are to be completed by the vendor in order to inform the BHEL as to the specifics of the equipment being supplied.
- Special tools required for installation, start-up, operation and maintenance. For example, if a special lifting device is required during shop fabrication, that device must be available at the construction site for installing that piece of equipment.
- Manuals and instructions for storage, installation, commissioning, operating and maintenance, shall be delivered during the supply stage to meet the Drawing and Data Transmittal Schedule (DDTS) requirements.
- Detailed procedures on the handling and storage at the jobsite of all vendor supplied material.
- Vendor shall provide complete engineering drawings and calculations related to the mounting and stresses imposed during the operation of this equipment for BHEL's review. BHEL's review of calculation shall not relieve the vendor of his responsibility in any manner. The fabrication drawings and other documents shall also be submitted in accordance with the bid document.



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1.3 Equipment, Materials and Services by Others

The scope of supply by others shall be:

- Unloading and storage at the job site.
- Mounting nozzles and anchor bolts.
- Installation.
- Monorails and hoists.
- Structural support steel.
- Electrical wiring, conduits, trays, push buttons and starters external to vendor supplied equipment.
- Control interface and remote alarms.

1.4 Performance Guarantees

Unless otherwise specified in General Purchase Conditions (GPC) regarding guarantee, the following shall govern.

- The equipment provided by the vendor shall operate as a minimum in accordance with the performance data in the datasheet(s) and the noise requirements for a period as determined by the terms and conditions of purchase.
- The equipment shall meet all applicable code requirements so that all required inspections are passed and permits obtained.
- Vendor shall guarantee the equipment for design, materials, workmanship and specified performance for a period as specified in GPC. Defects/ short falls, if any, shall be rectified by the vendor at his cost by repair and/or replacement without any delay.
- BHEL and/or customer may conduct field performance tests during startup and after commercial operation of the installation for a period determined by the terms and conditions of purchase.
- Review of design/drawing by BHEL or release of equipment for shipping in no way release or relieve the vendor of any responsibility for making the supplies in accordance with all provisions of this specification.

1.5 Detailed Requirements of Equipment

1.5.1 General

- All agitator components subjected to process conditions are to be constructed of materials compatible with the process conditions.
- All agitators shall be direct, or belt driven depending upon customer specification (if applicable).
- The material of agitator should not be of copper, zinc, an alloy of zinc or copper. No galvanizing material should be present either.
- Operation of an agitator shall not overload any component of the agitator assembly while running when the liquid level in the vessel is at any point from minimum to full.
- Vendor shall state minimum operating liquid level for all agitators.
- Vendor shall provide a detailed description of any special lifting and/or installation requirements.
- Each agitator shall include:
 - ❖ Mounting plate or flange and complete support system.
 - ❖ Other equipment and material as required to provide a complete unit, including any



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support legs or supports necessary to maintain equipment mounting.

- Vendor shall design the agitator tip speed low enough to be suitable for the intended service. Tip speeds and shaft speeds shall be based on vendor's successful operating experience.
- The agitator shaft diameter shall be sized for two times the calculated diameter.
- Impellers and impeller shafts shall meet the following requirements:
 - ❖ Impeller thrust shall not be transmitted to the motor.
 - ❖ Top mounted agitators shall not use steady bearings within the tank.
 - ❖ Lubricant leakage into the vessel shall be prevented by a dry-well seal for top-entry units.
- Vendor shall determine if tank baffles are required for proper flow pattern.
- Vendor must provide Material Safety Data Sheets (MSDS) for all coatings, paints, lubricants, preservatives or chemicals that will be brought onto the jobsite by the vendor for whatever reason. The MSDS's must be received before equipment is delivered to the jobsite.
- Lifting eye bolts shall be provided for driver, gear box, etc. for ease of lifting and shall be located at the centre of gravity of the part.
- Vendor shall provide proper dowelling between motor and base plate, gear box and mounting stool/base plate for ease of assembly of the agitator unit. Tapered dowels shall be provided.
- Vendor shall provide suitable arrangement for supporting the agitator shaft with impellers during removal of gear box for maintenance and details of such arrangement shall be furnished.
- Vendor shall provide a detailed description of any special lifting and/or installation requirements.
- Vendor shall provide a detailed documentation on the required location of the oxidation air lance to be mounted in the discharge area of the impellers.
- Instructions for assembly and lubrication must accompany each shipment.
- Vendor shall provide detailed documentation with each shipment of the procedures for handling and storage prior to installation and then from installation to commissioning.

1.5.2 Gear Units

- In case where reduction of speed is required, the vendor shall incorporate helical or worm gear reduction unit. Use of V-belt/chain drive shall require the approval of BHEL. Minimum design life of V-belt shall be 25000 hours.
- The gear box rating shall be selected based on minimum gear service factor of 1.5 over the driver's name plate rating. The gear box shall be of heavy duty type and the bearings shall be capable of withstanding maximum radial cum thrust loading which may occur during operation.
- The reduction unit shall be procured from a reputed manufacturer and shall conform to BS: 721 (latest edition) / AGMA or equivalent specification. The accuracy shall be to class A limits of the above specification.

1.5.3 Impellers and Seals

- Impellers with small diameter shall be one piece construction. Impellers with large diameter blades shall be of bolted construction.
- All impellers shall be dynamically balanced.
- Seals, when specified shall be of standard manufacturing range and shall be procured from a reputed manufacturer.



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1.5.4 Bearing housing and bearings

- The bearing housing shall be designed with a span suitable for the maximum radial cum thrust loadings used for the design of the shaft. The housing shall be bolted to the mounting stool and be provided with a precision machined step facing to make a corresponding facing on the stool for the purpose of maintaining alignment and interchangeability.
- All bearings shall be designed for the maximum radial cum thrust loading and any shock loadings expected during operation. The bearings shall have a trouble free operating life of 30,000 hours minimum.

1.5.5 Materials

- Vendor shall indicate the materials of construction for the various parts on the data sheet. However, the vendor shall adhere to the materials as specified by BHEL in the datasheets or elsewhere in the specification and shall quote accordingly. IS, BS, ASTM or other international standards shall be used to specify exact material designations.
- Castings used for any part of agitator assembly ordered under these specifications shall be sound and devoid of shrink or blow holes, scale, blisters and other similar casting defects.
- Unless otherwise specified in the datasheets, material test certificates (chemical analysis and mechanical properties) shall be supplied for impeller, shaft, mounting flange and coupling.

1.5.6 Electric Drives

- Unless stated otherwise, the driver shall be in the scope of agitator vendor. The driver shall conform to the corresponding specifications listed in the enquiry document.
- The electric motor shall be suitable for the electrical area classification indicated in the specification/datasheets.

1.5.7 Terminal Points

The Vendor shall furnish the equipment ready to connect to the BHEL's mounting flanges and electrical conduits.

1.6 Industry Reference Documents (Codes and Standards)

- At a minimum, all work performed and materials provided by the vendor must be in accordance with all applicable federal, state and local laws, ordinances and regulations.
- Pressure containing parts and mounting flanges shall be designed, fabricated, tested and inspected in accordance with the ASME codes, unless otherwise specified.
- The equipment will comply with the applicable portions of the following codes and standards. The applicable revision of each of these Codes and Standards will be the current edition with addenda or the edition adopted by the controlling jurisdiction at the time of the purchase order. In the event of a conflict between these documents and the specification, the vendor shall submit a written request for an interpretation by BHEL. In general, the most stringent requirement shall govern.
 - ❖ American Society of Civil Engineers(ASCE)
 - ❖ American National Standard Institute (ANSI)
 - ❖ American Society Of Testing And Materials (ASTM)
 - ❖ American Society of Mechanical Engineers (ASME)
 - ❖ American Gear Manufacturers Association (AGMA)
 - ❖ Anti-friction Bearing Manufacturers Association (AFBMA)



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- ❖ Institute of Electrical and Electronic Engineers (IEEE)
- ❖ International Organization For Standardization (ISO)
- ❖ National Electrical Code (NEC)
- ❖ National Electrical Manufacturer's Association (NEMA)
- ❖ American Welding Society (AWS)
- ❖ Occupational Safety and Health Administration (OSHA)
- ❖ Underwriters Laboratories (UL)

1.7 Inspection and Testing

1.7.1 Hydrostatic test

Each pressure part stuffing box jacket or seal reservoir of a unpressurized/pressurized sealing lubrication system, etc., shall be hydrostatically tested with water at a pressure not less than one and a half times the maximum operating pressure. The duration of the test shall be 30 minutes. Criteria of acceptance shall be of no leaks.

1.7.2 Mechanical Run Test (in air)

Each agitator unit shall be given a 4 hour mechanical run test in air at vendor's shop. Agitator unit shall be mounted in the same manner as it will operate in the field. During this test, the record shall be made of:

- i. Shaft run out at the free end.
- ii. Dynamic shaft deflection adjacent to the mechanical seal/packing/vapor seal.
- iii. Gear box oil temperature and temperature of bearing housing.
The temperature of gear box oil shall not exceed ambient plus 40 °C and that of bearing housing shall not exceed room temperature plus 20 °C after the temperatures have stabilized.
- iv. Bearing housing vibration check shall be carried out. The maximum acceptable vibration velocity shall be 6 mm/sec.
- v. Noise levels shall be checked and shall be as per clause 1.7.
- vi. Agitator shaft rpm and motor rpm.
- vii. Check of satisfactory operation of shut off and retracting arrangement.

1.7.3 Mechanical Run Test (in water)

If specified in the datasheets, the agitator unit shall be given a load test in water at the vendor's shop. The duration of the test shall be 4 hours unless agreed otherwise between BHEL and the vendor. The following parameters shall be recorded during the test:

- i. Dynamic shaft deflection adjacent to the mechanical seal/packing/ vapor seal
- ii. Gear box oil temperature and temperature of bearing housing.
The temperature of gear box oil shall not exceed ambient plus 40 °C and that of bearing housing shall not exceed room temperature plus 20 °C after the temperatures have stabilized.
- iii. Bearing housing vibration check shall be carried out. The maximum acceptable vibration velocity shall be 6 mm/sec.
- iv. Electrical power input to the motor.
- v. Noise levels shall be checked and shall be as per clause 1.7.
- vi. Agitator shaft rpm and motor rpm.



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- vii. Check of satisfactory operation of shut off and retracting arrangement.

1.8 Noise Requirements

- The noise level of unit when measured at 1 meter distance, shall not exceed 85 dBA. In this regard, the vendor shall submit noise emission data for the proposed unit. In a case where the noise levels are not met during the actual testing, the vendor shall suggest the corrective action required and additional cost that will incurred to satisfy the requirement for 85 dBA. This shall be submitted along with the bid document.
- Measurement to be made using the sound measuring criteria specified in the Occupational Safety and Health Administration (OSHA) Standards 29 CFR 1910.95 titled Occupational Noise Exposure.

1.9 Operating Sequences/Duration

The agitators will operate intermittently in conjunction with acid dosing pumps and in a start/stop cycling mode not to exceed the cycles specified by the motor manufacturer.

1.10 Instrumentation and Controls

Instruments and controls are to be supplied as indicated in the datasheet for agitators (if applicable).

1.11 Surface Preparation and Painting

- Unless otherwise specified, equipment constructs of carbon steel shall be surface prepared per SSPC and painted per Vendor's standard on all exposed surfaces, with primer and finish paint, to protect against rust and corrosion during shipping, installation and operation of the equipment.
- Vendor shall finish paint all carbon steel surfaces not to be insulated.
- Materials not subject shall left unpainted.

1.12 Field Service

- At the request of the BHEL, vendor shall depute a field engineering expert to provide technical assistance during construction/installation and commissioning. BHEL will give the vendor sufficient notice prior to the site requirement for field service.
- Vendor stipulations that require a field service engineer or technician, such as inspection prior to equipment startup, shall be indicated in writing.
- The agitator shall be located at a maximum possible distance from the acid dosing pumps.

1.13 Spare Parts

- Vendor shall provide a list of recommended spare parts along with a schedule of replacement of the parts based on the operation and service condition specified.
- Purchase price shall include one full set of construction and commissioning spares plus all special tools required for construction, installation, startup and maintenance to be shipped with the original equipment.
- Vendor shall submit the offers including and excluding the price of the above items.



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DATA SHEET OF Agitator

BHEL Material Code: L17271SR15006001

Enquiry No.

	DESCRIPTION	Units	BHEL	Vendor
	No of agitators		1	
1	Design conditions			
1.1	Agitator Type		Top Entry	
1.2	Tank			
a	Volume (Total)	m ³	10.5	
b	Height	m	2.85	
c	Length by Width	m	3.5X2	
d	Liquid Level Height (Maximum)	m	1.5	
e	Liquid Level Height (Minimum)	m	Seller Fill-in	
f	Baffles (Quantity & Size)	-	Seller Fill-in	
1.3	Liquid Properties			
a	Density	kg/m ³	992	
b	Solids Content	Wt %	0	
c	Temperature	°C	50	
d	pH Range		5 to 9	
e	Maximum Chloride Content	ppm	0	
f	Viscosity	cp	1	
1.4	Oxidation Air Flow (Total to Abs. Reaction Tank)	Nm ³ /hr	NA	
1.5	Power Supply	Vac / Ph / Hz	415 / 3 / 50	
2	GUARANTEED PERFORMANCE			
2.1	No Load Impeller Speed	rpm	*	
2.2	Motor Power Under Load	kW	*	
2.3	On-stream availability	%	*	
2.4	Maximum Noise Level	dBA @ 1 m	<85 dBA	
3	Design			
3.1	Model	-	*	
3.2	Agitator Speed	rpm	*	
3.3	Shaft Diameter	mm	*	
3.4	Shaft Length (Total)	mm	*	
3.5	Shaft (Number of Pieces)	#	*	
3.6	Shaft Material	-	*	
3.7	Impeller Quantity	#	*	
3.8	Impeller Material & Type	-	*	
3.9	Impeller Diameter	mm	*	
4	Gearbox Manufacturer		*	
4.1	Gearbox Model Number		*	
5	Mounting Flange (Size and Type)		*	
6	Gearbox Lubrication Type		*	
7	Special Requirements			
			BHEL	VENDOR
	Prepared		Sankar G	
	Checked & Approved		Shankar Naik V	

* Vendor to fill

This datasheet shall be read along with the general specification for agitator.



BHARAT HEAVY ELECTRICALS LIMITED

HIGH PRESSURE BOILER PLANT, TIRUCHIRAPALLI-620 014

CONTROLS & INSTRUMENTATION/FB

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TECHNICAL SPECIFICATION OF

LT AC MOTORS (SAFE AREA)

SPECIFICATION REFERENCE – TCI : 140, Rev. 12

Revision History

Rev. No.	Date	Description	Prepared	Reviewed	Approved
01 -11		Earlier Revisions	-Sd-	-Sd-	-Sd-
12	22-08-19	General Revisit	<i>M. Mungal</i>	<i>M. Mungal</i>	<i>V. M. S. Srinivas</i>



Sl. No.	Description	Requirement
1	Site Conditions :-	
	Altitude above MSL	500 metres
	Ambient temperature	50° C
	Relative Humidity	100 %
	Atmosphere	Tropical, dusty, salty, corrosive and highly polluted environment.
2	Motor type	Squirrel cage type induction motor suitable for direct on line starting through any type of breaker .
3	Applicable Standards	IS-325, IS-1231, IS-6362, IS-2253, IS-5572, IS-12065, IS-12075, IS/ IEC-60079, IS-12615, IS/ IEC-60529 & IEC-60034. (Latest version of relevant standards shall be referred).
4	Type of Enclosure and degree of protection	Totally Enclosed Fan Cooled (TEFC), IP-55 as per IS/ IEC-60529
5	Duty Cycle	Continuous, S1
6	Energy Efficiency Class	IE-3 as per IS-12615/ IEC60034-30.
7	Rated Voltage & Tolerance	415 V, AC, 3 Phase, ± 10 %.
8	Rated Frequency & Tolerance	50 Hz, ± 5 %
9	Combined voltage & frequency tolerance	10 % (absolute sum)



Sl. No.	Description	Requirement
10	General Requirements	a. All motors shall be so designed that maximum inrush currents, locked rotor and pull out torque, developed at the extreme voltage and frequency variations do not endanger the motor and driven equipment. b. Motor shall be designed to keep the torsional and rotational natural frequencies of vibration, at least 25 percent above the motor rated speed ranges to avoid resonant vibration over the operating speed range of the motor and driven equipment. c. Maximum continuous rating (MCR) of the motor shall have at least 15 % margin over the maximum load demand of the driven equipment including voltage and frequency variation. (Applicable only if vendor supplies motor along with the driven equipment or load).
11	Torque requirements	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% of motor full load torque. Pull Out torque at rated voltage shall not be less than 205 % of full load torque.
12	Requirements during Starting & Running	• Motor shall start with rated load and accelerate to full speed with 80 % rated voltage at motor terminals • The motor shall be capable of withstanding the stresses imposed if started at 110 % rated voltage. • The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75 % rated voltage at motor terminals. • The motor shall be designed to withstand momentary over-load of 60% of full load torque for 15 seconds without any damage. • The motor shall be designed to withstand 120 % of rated speed for 2 minutes without any mechanical damage.
13	Class of Insulation	Class-F insulation with temperature rise limited to Class-B. Temperature rise of the motor shall be limited to 70° C (by resistance method) over an ambient temperature of 50° C.



Sl. No.	Description	Requirement
14	Stress withstanding capability during Bus Transfer	The motor may be subjected to sudden application of 150 % rated voltage during bus transfer, due to the phase difference between the incoming voltage and motor residual voltage.
15	Capacity to restart for rated voltage	a. Two successive starts from cold condition. b. Three equally spread starts per hour. c. Two hot starts in succession, with motor initially running at normal temperature.
16	Starting Current	The starting current (% of FLC) shall be limited as per the standard IS-12615.
17	Locked Rotor Condition	The ratio of Locked Rotor KVA at rated voltage to rated KW shall not exceed as indicated below (without any further tolerance) For Motor rating < 110KW : 11
18	Locked Rotor with-stand time	For motor with starting time up to 20 seconds at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 seconds more than starting time.
		For motor with starting time more than 20 seconds but not exceeding 45 seconds at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 seconds more than the starting time.
		For motor with starting time more than 45 seconds at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be 10% more than the starting time
		Vendor to provide Speed switches mounted on the motor shaft in case the above requirement is not met with.
19	Type of balancing of rotor	Dynamic balancing
20	Method of cooling	IC-0411 as per IS-6362
21	Direction of cooling air flow	NDE side to DE Side



Sl. No.	Description	Requirement
22	Winding wire	Enameled Copper Wire, Grade-2, as per IS-13730, Part-3. Windings shall be non-hygroscopic, oil resistant and flame resistant.
23	Treatment on Winding Insulation	Winding Insulation shall be given tropical and fungicidal treatment for operation of motor in hot, humid & tropical climate.
24	Noise level	Noise level shall be limited to 85 dB at 1 metre distance.
25	Vibration level	The peak amplitude of vibration shall be as per IS-12075 (Limits of Severity-Normal grade shall be followed).
26	Shaft extension	Motor shall be provided with key slotted bare shaft extension, with key at the drive end.
27	Terminal box	Weather proof terminal box shall be provided as per IS/ IEC-60079. The terminal box shall be capable of being turned through 360° in steps of 180° or 90°. Shall meet IP 55 protection class requirements as per IS60529. 1 No. Earth terminal shall be provided inside the terminal box. Minimum Distance between centre of the terminal stud & the gland plate and Minimum inter-phase/ phase-earth air clearance shall be provided as per IS standards. Terminal box shall have adequate space to terminate the Power cable applicable to the motor by using suitable lugs. Connection diagram shall be marked inside the terminal box.
28	Cable Entries, Cable Glands & Lugs	Cable entries, Cable glands and Lugs shall be provided suitable for the power cable size as indicated in the annexure (project specific transmittal). Double Compression type, brass with nickel plated, weather proof cable glands shall be provided – Quantity to be matched with the number of entries. 6 Nos. of Tinned Copper Lugs shall be provided.



Sl. No.	Description	Requirement
29	Terminals	Separate Terminals for Space heaters and Windings with suitable connecting links shall be supplied.
30	Body Earth	Shall have 2 Nos. of earth points (Threaded hole with suitable GI Bolt) at appropriate location (in motor base frame).
31	Space heater for motors rated 30 KW and above	Separate space heater suitable for 240 V AC, Single Phase supply shall be provided.
32	Lifting device	Eye bolt.
33	Project specific requirements	Vendor to take care of the project specific requirements indicated in the annexure - "Project specific transmittal".
34	Name Plates	Motor shall have name plate as per relevant IS and in addition, Manufacture's name, frame size, Energy Efficiency class, Insulation class shall also be indicated.
35	Quality assurance, Inspection & Testing	Motors up to 30 KW, Inspection by Vendor meeting the IS/ IEC standard requirements, as applicable. Routine & type test reports shall be submitted for review and acceptance by BHEL. For Motors >30 KW, Inspection by BHEL/ Third party Inspection TPI agency as per BHEL/ Customer approved VQP/ RQP. Routine tests will be witnessed by BHEL/ TPI. Type test reports shall be submitted for review and acceptance by BHEL. In case the vendor is not able to submit report of the type test(s) conducted within last 5 years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the vendor shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract, free of cost to the Owner and submit the reports for approval.



Sl. No.	Description	Requirement
36	Type test reports	Type test reports shall be produced for the following tests as per the requirements spelt in the standards, • Measurement of resistance of windings of stator. • No load test at rated voltage to determine input current power and speed • Full load test to determine efficiency, power factor and slip. • Temperature rise test. • Momentary excess torque test. • High voltage test. • Test for vibration severity of motor. • Test for noise levels of motor. • Test for degree of protection. • Over speed test. • Energy Efficiency test.
37	Confirmation and Documents to be submitted by the vendor, during Purchase Enquiry.	Vendor to indicate the references of the technical specification, project specific annexure and indicate “No Deviation” in the Sub-Delivery Enquiry deviation form. Any deviation shall only be indicated in the Sub-Delivery Enquiry deviation form. Deviations indicated elsewhere in the offer will not be considered.
38	Documents to be submitted by the vendor for approval by BHEL/ Customer, after placement of purchase order.	3 Sets of the following :- a. Final technical Data sheet as per the format submitted by BHEL. b. Motor GA drawing indicating details of foundation, shaft dimensions and terminal box arrangement with complete dimensions. c. Motor Characteristic curves (Torque Vs. Speed, Current Vs. Speed, Speed Vs. time, Current Vs. time, Efficiency and PF Vs. load, Thermal withstand characteristic) d. O & M manuals.
39	Packing	The packing shall be suitable for safe transport, safe delivery at site and shall avoid damages due to environmental conditions during storage at site.



Sl. No.	Description	Requirement
40	Painting	Paint shade shall be as per the purchase enquiry. The finish shall be corrosion resistant, epoxy based paint.

Controls & Instrumentation/ Fossil Boilers
Project Specific Transmittal for LT ACmotors and DCmotors

Transmittal Ref.: TR:LT AC-DC MOTOR:1727

Project Details :

Project/ Rating : BHUSAWAL TPP, 1 X 660 MW

Customer Number : 1727

Annexure to the technical specification of LT ACMotor and DCMotor

Energy efficient level: IE3 as per IS12615 – 2011 (For LT ACMotors).

Table-1, Power cable size for LT ACmotors:-

Vendor to provide the cable entry and supply cable-glands, lugs as per the technical specification requirement and suitable for the power cable sizes as indicated below. The cable sizes indicated below are tentative. The actual power cable size based on the run length will be intimated during technical evaluation stage.

Sl. No.	From (KW)	To (KW)	Power Cable size in sq. mm. (#)
1.	0.01	3.7	3C-2.5mm ² (CU)
2.	3.71	9.3	3C-10mm ² (AL)
3.	9.31	22	3C-25mm ² (AL)
4.	22.1	37	3C-50mm ² (AL)
5.	37.1	55	3C-95mm ² (AL)
6.	55.1	75	3C-150mm ² (AL)
7.	75.1	90	3C-240mm ² (AL)
8.	90.1	132	2-3C-240mm ² (AL)

Table-2 (applicable to LT AC, Flame proof Motors only) :-

Sl. No.	Motor rating (KW)	Minimum Distance between centre of motor terminal and the gland plate (mm)
1	Up to 3 KW	As per manufacturers' practice
2	Above 3 KW – Up to 7 KW	85
3	Above 7 KW – Up to 13 KW	115

4	Above 13 KW – Up to 24 KW	167
5	Above 24 KW – Up to 37 KW	196
6	Above 37 KW – Up to 55 KW	249
7	Above 55 KW – Up to 90 KW	277
8	Above 90 KW – Up to 125 KW	331

Table-3 Applicable for LT AC motors :-

Minimum inter-phase and phase-earth air clearance for LT AC motors with lugs installed shall be as follow

Sl. No.	Motor MCR in KW	Clearance (in mm)
1	Up to 110 KW	10
2	Above 110 KW – Up to 150 KW	12.5

Table-4 (Power cable size for DCmotors) :-

Vendor to provide the cable entry and supply cable-glands, lugs as per the technical specification requirement and suitable for the power cable sizes as indicated below. The cable sizes indicated below are tentative. The actual power cable size based on the run length will be intimated during technical evaluation stage.

Sl. No.	Full Load current (Amp)	Power Cable, Armoured, Aluminium Conductor
1.	16	2C-50mm ² (AL)
2.	20	2C-50mm ² (AL)
3.	25	2C-50mm ² (AL)
4.	35	2C-95mm ² (AL)
5.	50	2C-95mm ² (AL)
6.	63	2R-2C-95mm ² (AL)
7.	80	2R-2C-95mm ² (AL)
8.	100	2R-2C-95mm ² (AL)

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1.0 <u>SCOPE</u> 1 . 1 This section covers the general requirements of the drive motors for power station auxiliary equipment. 1 . 2 Motors shall be furnished in accordance with both this general specification and the accompanying driven equipment specification. 1 . 3 In case of any discrepancy, the driven equipment specification shall govern etc. 2.0 <u>STANDARDS</u> 2 . 1 All motors shall conform to the latest applicable IS, IEC and CBIP Standards/ Publications except when otherwise stated herein or in the driven equipment specification. 2 . 2 Major standards, which shall be followed, are listed below other applicable Indian Standards for any component part even if not covered in the listed standards shall also be followed (a) IS-325 (b) IS-12615 (c) IEC-34 3.0 <u>SERVICE CONDITIONS</u> 3 . 1 The motors will be installed in hot, humid and tropical atmosphere, highly polluted at places with coal dust and/or fly ash canopy to be provided to all outdoor install motors. 3 . 2 Unless otherwise noted, electrical equipment/system design shall be based on the service conditions and auxiliary power supply given in the annexure to this specification.		

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3 . 3	For motor installed outdoor and exposed to direct sunrays, the effect of solar heat shall be considered in the determination of the design ambient temperature	
4.0	<u>TYPE AND RATING</u>	
4 . 1	<u>A.C. MOTORS</u>	
4 . 1 . 1	Motors shall be general purpose, constant speed, squirrel cage, three phase, induction type.	
4 . 1 . 2	All motors shall be rated for continuous duty. They shall also be suitable for long period of inactivity.	
4 . 1 . 3	The motor name-plate rating at 50°C shall have at least 10% margin over the input power requirement of the driven HT equipment at rated duty point unless stated otherwise in driven equipment specification or in general electrical specification.	
4 . 1 . 4	The motor characteristics shall match the requirements of the driven equipment so that adequate starting, accelerating, pull up, break down and full load torques are available for the intended service.	
4 . 1 . 5	All LT motors used in this project are proposed to be energy efficient type suitable for EFF1 efficiency rating.	
4 . 1 . 6	The motor name plate rating shall have at least 10% margin over the input power requirement of the HT driven equipment and 15% for LT driven equipments at rated duty point. This clause is applicable, only vendor supplies motor along with load.	
4 . 1 . 7	Motors located in hazardous area shall be flame proof type.	
4 . 2	<u>D.C. MOTORS</u>	
4 . 2 . 1	D.C. Motor provided for emergency service shall be shunt/compound wound type.	
4 . 2 . 2	Motor shall be sized for operation with fixed resistance starter for maximum reliability.	

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4.2.3 Starter panel complete with all accessories shall be included in the scope of supply. 4.3 For equipment installed outdoor and exposed to direct sun rays, the effect of solar heat shall be considered in determining the design ambient temperature. 5.0 <u>PERFORMANCE</u> 5.1 <u>RUNNING REQUIREMENTS</u> 5.1.1 Motor shall run continuously at rated output over the entire range of voltage and frequency variations as given in the annexure. 5.1.2 The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75% rated voltage at motor terminals. 5.1.3 The motor shall be designed to withstand momentary overload of 60% of full load torque for 15 second without any damage. 5.1.4 Motor shall not be stalled if the supply voltage drops to 70% of the rated voltage for 2 seconds duration. 5.2 <u>STARTING REQUIREMENTS</u> Motor shall be designed for direct online starting at full voltage. Starting current shall not exceed 6 times full load current for all auxiliaries except boiler feed pump where the starting current shall be limited to 4.5 times. No further tolerances are applicable on starting current specified above for HT motors 5.2.1 The motor shall be capable of withstanding the stresses imposed if started at 110% rated voltage 5.2.2 Motor shall start with rated load and accelerate to full speed with 80% rated voltage at motor terminal except BFP motor. In case of BFP motor, it shall		

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be 75% rated voltage. Minimum starting requirement for mill motor (double cage) shall be 85% rated voltage at motor terminals. 5 . 2 . 3 Motor shall be capable of three equally spread starts per hour, two starts in quick succession from cold condition and one restart from hot condition. Cranking motor shall be capable of six equally spread starts per hour, three starts in quick succession from cold condition and one restart from hot condition. The coal conveyor and crusher motors shall be suitable for 3 consecutive hot starts with maximum 20 starts per day. Pump motor subject to reverse rotation shall be designed to withstand the stresses encountered when starting with shaft rotating at 125% rated speed in reverse direction. 5 . 2 . 4 HT pump motors shall be suitable to start with forward rotation. 5 . 2 . 5 The motors shall be designed to withstand 120% of rated speed for 2 minutes without any mechanical damage 5 . 3 <u>STRESS DURING BUS TRANSFER.</u> 5 . 3 . 1 The motor may be subjected to sudden application of 150% rated voltage during bus transfer, due to the phase difference between the incoming voltage and motor residual voltage. 5 . 3 . 2 The motor shall be designed to withstand any torsional and/or high current stresses, which may result, without experiencing any deterioration in the normal life and performance characteristics. 5 . 4 <u>LOCKED ROTOR WITHSTAND TIME</u> 5 . 4 . 1 The locked rotor withstand time under hot condition at 110% rated voltage shall be more than motor starting time by at least 2.5 seconds for motors up to 20 seconds starting time and by 5 seconds for motor with more than 20 seconds starting time.		

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5 . 4 . 2	Starting time mentioned above is at minimum permissible voltage of 80% rated voltage.	
5 . 4 . 3	Hot thermal withstand curve shall have a margin of at least 10% over the full load current of the motor to permit relay setting utilizing motor rated capacity	
6.0	<u>SPECIFIC REQUIREMENTS</u>	
6 . 1	<u>ENCLOSURE</u>	
6 . 1 . 1	All indoor motor enclosures shall conform to the degree of protection IP-55 unless otherwise specified and outdoor motor enclosure shall confirm to degree of IPW-55. Motor for outdoor or semi-outdoor service shall be of weather-proof construction.	
6 . 1 . 2	For hazardous area approved type of increased safety enclosure shall be furnished.	
6 . 2	<u>COOLING</u>	
6 . 2 . 1	The motor shall be self ventilated type, either totally enclosed fan cooled (TEFC) or closed air circuit air- cooled (CACA).	
6 . 2 . 2	In case water cooling is required for very large motors, prior approval of the customer is to be obtained before proceeding ahead with design & manufacture.	
6 . 3	<u>WINDING AND INSULATION</u>	
6 . 3 . 1	All insulated winding shall be of copper.	
6 . 3 . 2	All motors shall have class F insulation but limited to class B temperature rise.	
6 . 3 . 3	Windings shall be impregnated to make them non-hygroscopic and oil resistant.	

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6 . 4 <u>TROPICAL PROTECTION</u> 6 . 4 . 1 All motors shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion. 6 . 4 . 2 All fittings and hardwares shall be corrosion resistant. 6 . 5 <u>BEARINGS</u> 6 . 5 . 1 Motor shall be provided with antifriction bearings, unless sleeve bearings are required by the motor application. 6 . 5 . 2 Vertical shaft motors shall be provided with thrust and guide bearings. Thrust bearing of tilting pad type is preferred. 6 . 5 . 3 Bearings shall be provided with seals to prevent leakage of lubricant or entrance of foreign matters like dirt, water etc. into the bearing area. 6 . 5 . 4 Sleeve bearings shall be split type, ring oiled, with permanently aligned, close running shaft sleeves. 6 . 5 . 5 Grease lubricated bearings shall be prelubricated and shall have provisions for in-service positive lubrication with drains to guard against over lubrication. 6 . 5 . 6 Oiled bearing shall have an integral self cooled oil reservoir with oil ring inspection ports, oil sight glass with oil level marked for standstill and running conditions and oil fill and drain plugs. 6 . 5 . 7 Forced lubricated or water cooled bearing shall not be used without prior approval of Owner. 6 . 5 . 8 Lubricant shall not deteriorate under all service conditions. The lubricant shall be limited to normally available types with IOC equivalent. 6 . 5 . 9 Bearings shall be insulated as required to prevent shaft current and resultant bearing damage.		

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6.6	<u>NOISE & VIBRATION</u> 6.6.1 The noise level shall be as per statutory acceptance (IS/IEC). 6.6.2 The peak amplitude of the vibration shall be within IS/IEC specified limits.	
6.7	<u>MOTOR TERMINAL BOX</u> 6.7.1 Motor terminal box shall be phase segregated (PSTB) type and located in accordance with Indian Standards clearing the motor base- plate/ foundation. 6.7.2 Terminal box shall be capable of being turned 360 Deg. in steps of 180 Deg. For HT motors and 90 Deg. for LT motors unless otherwise approved. 6.7.3 The terminal box shall be split type with removable cover with access to connections and shall have the same degree of protection as motor. 6.7.4 The terminal box shall have sufficient space inside for termination/connection of XLPE insulated armoured aluminium cables. 6.7.5 Terminals shall be stud or lead wire type, substantially constructed and thoroughly insulated from the frame. 6.7.6 The terminals shall be clearly identified by phase markings, with corresponding direction of rotation marked on the non-driving end of the motor. 6.7.7 The terminal box shall be capable of withstanding maximum system fault current for duration of 0.25 sec. 6.7.8 For 11kV and 33kV motor, the terminal box shall be phase-segregated type. The neutral leads shall be brought out in a separate terminal box (not necessarily phase segregated type) with shorting links for star connection. 6.7.9 Motor terminal box shall be furnished with suitable cable lugs and double compression brass glands to match with cable used. 6.7.10 The gland plate for single core cable shall be non-magnetic type.	

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6.7.1.1 Due to any reason, if the terminal box is found to be not suitable for the approved cable size for either HT/LT motors, then the bidder shall arrange necessary adopter box to facilitate the termination of cables. The adopter box shall be of the same short circuit rating and specifications as the main terminal box. The adopter box shall be located as near as possible to the main terminal box. The interconnecting cabling between adopter box and main terminal box along with providing suitable cable glands and termination kits as applicable shall also be done by the bidder. 6.8 <u>GROUNDING</u> 6.8.1 The frame of each motor shall be provided with two separate and distinct grounding pads complete with tapped hole, GS bolts and washer 6.8.2 The grounding connection shall be suitable for accommodation of ground conductors as follows : <table border="0" style="margin-left: 40px;"> <tr> <td>Motor above 90 kW</td> <td>:</td> <td>75 x 10 mm GS Flat</td> </tr> <tr> <td>Motor above 30 kW up to 90 kW</td> <td>:</td> <td>50 x 6 mm GS Flat</td> </tr> <tr> <td>Motor above 5 kW up to 30 kW</td> <td>:</td> <td>25 x 6 mm GS Flat</td> </tr> <tr> <td>Motor up to 5 kW</td> <td>:</td> <td>8 SWG GS Wire</td> </tr> </table> 6.8.3 The cable terminal box shall have a separate grounding pad 6.9 <u>RATING PLATE</u> In addition to the minimum information required by IS, the following information shall be shown on motor rating plate: (a) Temperature rise in Deg.C under rated condition and method of measurement. (b) Degree of protection.			Motor above 90 kW	:	75 x 10 mm GS Flat	Motor above 30 kW up to 90 kW	:	50 x 6 mm GS Flat	Motor above 5 kW up to 30 kW	:	25 x 6 mm GS Flat	Motor up to 5 kW	:	8 SWG GS Wire
Motor above 90 kW	:	75 x 10 mm GS Flat												
Motor above 30 kW up to 90 kW	:	50 x 6 mm GS Flat												
Motor above 5 kW up to 30 kW	:	25 x 6 mm GS Flat												
Motor up to 5 kW	:	8 SWG GS Wire												

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(c) Bearing identification no. and recommended lubricant. (d) Location of insulated bearings.		
6 . 1 0 <u>CONSTRUCTION</u>		
6 . 1 0 . 1 Stator Core		
The Stator Core Lamination shall be made of high-grade silicon/magnetic steel sheet varnished on both sides and pressed to form rigid core.		
6 . 1 0 . 2 Rotor		
The rotor construction shall be such that in case of dislodging of the rotor bar from the end ring, it should not come out and hit the stator core/stator winding and damage.		
7.0 <u>ACCESSORIES</u>		
7 . 1 <u>GENERAL</u>		
Accessories shall be furnished, as listed below, or if otherwise required by driven equipment specification or application		
7 . 2 <u>SPACE HEATER</u>		
7 . 2 . 1 Motor of rating 30 kW and above shall be provided with space heaters, suitably located for easy removal or replacement.		
7 . 2 . 2 The space heater shall be rated 240 V, 1 phase 50 Hz and sized to maintain the motor internal temperature above dew point when the motor is idle.		
7 . 3 <u>TEMPERATURE DETECTORS</u>		
7 . 3 . 1 All 11kV and 3.3kV motors shall be provided with twelve (12) nos. Simplex type winding temperature detectors, four (4) nos. per phase.		

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	7.3.2 11kV and 3.3kV motor bearing shall be provided with duplex type temperature detectors. 7.3.3 The temperature detector mentioned above shall be resistance type, 3 wire, platinum wound, 100 Ohms at 0°C. 7.3.4 Leads of all simplex type motor winding RTDS and motor bearing RTDS shall be wired up to respective switchgear metering & protection compartment. From which one set of RTDS will be connected to numerical protection relay and another set shall be kept free for DCS connectivity. 7.3.5 Five numbers of Temperature detectors / thermistors shall be provided for L.T. Motors above 90 kW (3 nos. Winding temperatures & 2 nos. bearing temperatures). 7.4 <u>INDICATOR/SWITCH</u> 7.4.1 Dial type local indicator with alarm contacts shall be provided for the following : (a) 11kV and 3.3kV motor bearing temperature (b) Hot and cold air temperature of the closed air circuit for CACA and CACW motor 7.4.2 Flow switches shall be provided for monitoring cooling water flow of CACW motor and oil flow of forced lubrication bearing, if used. 7.4.3 Alarm switch contact rating shall be minimum 0.5 A at 220V D.C. and 15A at 240V A.C. 7.5 <u>CURRENT TRANSFORMER FOR DIFFERENTIAL PROTECTION</u> 7.5.1 Motor 1000 KW and above shall be provided with three differential current transformers mounted over the neutral leads within the enclosure. Loose 3 nos. CT for mounting on switchgear side shall be in bidder's scope.	

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7.5.2 The arrangement shall be such as to permit easy access for C.T. testing and replacement. Current transformer characteristics shall match Owner's requirements to be intimated later.		
7.6	<u>ACCESSORY TERMINAL BOX</u>	
7.6.1	All accessory equipment such as space heater, temperature detector, current transformers etc., shall be wired to and terminated in terminal boxes, separate from and independent of motor (power) terminal box.	
7.6.2	Accessory terminal box shall be complete with double compression brass glands and pressure type terminals to suit cable connections.	
7.7	<u>DRAIN PLUG</u>	
	Motor shall have drain plugs so located that they will drain the water, resulting from the condensation or other causes from all pockets of the motor casing.	
7.8	<u>LIFTING PROVISIONS</u>	
	Motor weighing 25 Kg. or more shall be provided with eyebolt or other adequate provision of lifting.	
7.9	<u>DOWEL PINS</u>	
	The motor shall be designed to permit easy access for drilling holes through motor feet or mounting flange for installation of dowel pins after assembling the motor and driven equipment.	
7.10	<u>PAINTING</u>	
	Motor including fan shall be painted with corrosion proof paints of colour shade (RAL-7032).	
8.0	<u>TESTS</u>	
8.1	<u>ROUTINE AND TYPE TEST:</u>	

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Tests are to be conducted for HT and LT motors 60kW and above in presence of Mahagenco representative and contractor as per IS: 325 and required copies of test certificates are to be furnished for approval and despatch clearance. In addition, following tests shall have to be carried out on the motors in presence of MAHAGENCO representative & contractor on LT & HT motors. For Motors below 60kW type and routine test conducted as per IS325 shall be witnessed by contractor and test certificate shall be submitted for review of Mahagenco & Dispatch clearance								
8 . 1 . 1 <u>FOR HT MOTORS:</u> (a) Impulse test by 1.2 / 50 micro sec. On sample coil of Stator winding insulation as type test as per IEC-671/IS 14422,1995 test voltages as under <table><tr><td>Voltage rating of motor</td><td>Impulse Test Voltage</td></tr><tr><td>3.3 kV</td><td>: 18 kV peak</td></tr><tr><td>11 kV</td><td>: 49 kV peak</td></tr></table> (b) Tan delta, charging current and dielectric loss measurements on each phase of motor stator winding as routine test (c) Polarization Index Test as per IS:7816 as routine test (d) Tan delta measurement on coils (e) Surge withstand test for inter turn insulation. (f) Test to diagnose rotor bar failure during manufacture. Tests indicated at (d), (e), (f) shall be carried out during manufacture of the coils and shall be furnished for verification .			Voltage rating of motor	Impulse Test Voltage	3.3 kV	: 18 kV peak	11 kV	: 49 kV peak
Voltage rating of motor	Impulse Test Voltage							
3.3 kV	: 18 kV peak							
11 kV	: 49 kV peak							
8 . 1 . 2 <u>FOR HT & LT MOTORS:</u> (a) Test for suitability of IP55/ IPW– 55 as per IS 4691 as type test. Type test certificate for first numeral shall be acceptable in lieu to test,								

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provided the test motor is identical to motor being supplied. Second numeral test shall be carried out on one motor of each type and rating. (b) Fault Withstand Test for main terminal box as type test. Type test certificate shall be acceptable, if the test is conducted on exactly identical terminal box within last three years. (c) Test for noise level as routine test. (d) Test for vibration as routine test. (e) Overspeed test as type test. 8 . 2 <u>TEST WITNESS:</u> Test shall be performed in presence of Owner/Purchaser's representative so desired by the Owner/Purchaser. The Contractor shall give at least fifteen (15) days advance notice of the date when the tests are to be carried out.		

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
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CONSULTANT : PROCON ENGINEERS

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AC & DC MOTOR DATASHEET – A			
SR. NO.	ITEM	UNIT	
1.0	<u>AUXILIARY POWER SUPPLY</u>		
1.1	<u>H.T. SUPPLY</u>		
	11kV, 3Ø, 3W, 50 Hz non-effectively earthed		Motors rated 1000 kW and above
	Fault level 44 kA symm		
	33kV, 3Ø, 3W, 50 Hz non-effectively earthed		Motors above 160 kW and below 1000 kW
	Fault level 40 kA symm		
1.2	<u>L.T. SUPPLY</u>		
	415V, 3Ø, 3W, 50 Hz effectively earthed		Motors below and including 160kW
	Fault level 50 kA symm		
	240V, 1Ø, 2W, 50 Hz effectively earthed		Lighting, space heating, A.C. control & protective devices
1.3	<u>D.C. SUPPLY</u>		
	220V, 2W, unearthed		D.C. alarm, control & protective devices
	Fault level 25* kA.		
	Indicative only, the actual value will be decided by the Bidder, after substantiating the same by calculation		
2.0	<u>RANGE OF VARIATION</u>		

CONSULTANT : PROCON ENGINEERS

 MAHARASHTRA STATE POWER GENERATION CO. LTD. Maharashtra State Power Generation Co. Ltd.		Volume: IV-A	
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SR. NO.	ITEM	UNIT	
2.1	<u>A.C. SUPPLY:</u>		
	Voltage		± 10%
	Frequency		± 5%
	Combined Voltage & frequency		± 10% (absolute sum)
	During starting of large motor, the voltage may drop to 80% of the rated voltage for a period of 60 seconds. All electrical equipment while running shall successfully ride over such period without affecting system performance		
2.2	<u>D.C. SUPPLY</u>		
	Voltage		198 to 240 Volt -15% to +10%

CONSULTANT : PROCON ENGINEERS



An ISO 9001
Company

Bharat Heavy Electricals Limited
(High Pressure Boiler Plant)
Tiruchirappalli-620 014, Tamil Nadu, India
Dept: MATERIALS MANAGEMENT/BOI

Annexure – A- Terms and Conditions

ACCEPTANCE OF TECHNO - COMMERCIAL TERMS AND CONDITIONS BY THE BIDDERS

Description of the Equipment:		Stirrer / Agitator with Motor
Projects		Bhushawal-6 1x660MW Project
BHEL Tender No. & Date		1802100091 dated 13.03.2021
<i>To be filled by bidder</i>		
Sl. No.	Terms and conditions	Vendor's confirmation
1 (a)	Technical: Supply of items shall be as per the below mentioned specifications: 1. AGITATOR TECHNICAL SPECIFICATION TSR:021/REV 00, 2. TECHNICAL SPECIFICATION OF LT AC MOTORS TCI: 140, REV 12. 3. PROJECT SPECIFIC TRANSMITTAL FOR BHUSAWAL PROJECT TR:LT AC-DC MOTOR: 1727	
1 (b)	Bidder to submit Vendor Quality Plan (VQP) in case of ordering. Inspection by BHEL/ BHEL approved TPIA/Customer	
1 (c)	Evaluation Method: Evaluation will be on Total cost to BHEL basis for ordering on respective L1 bidder.	
1 (d)	Vendor shall quote as per attached price and unpriced schedule format only.	
1 (e)	Vendor offers will considered for price bid opening subject to fulfilment of techno commercial suitability and approval of vendor firm by end customer.	
2 (a)	Firm Price: The quoted / finalised rates shall be Firm till execution of the supplies. Offer with PVC clause will not be considered.	
2 (b)	The tender will be operated in two part bid system. One-part consisting of Technical bid with Commercial terms & conditions and other part is Price Bid. Based on the above and other conditions, as well as technical capability, vendors will be short-listed. The Techno-commercial bid will be opened on the due date and based on the suitability of techno-commercial bid, the price Bid of the techno-commercial suitable qualified vendors will be considered and opened on a suitable date with due intimation to vendors.	
3 (a)	Delivery term: The quote shall be on FOR Bhusawal Project Site destination basis, inclusive of Packing, forwarding, Freight also to yours account.	
4 (a)	Payment terms: Payment term is 100% direct payment after 60 days from the date of dispatch against site acknowledgement	
4 (b)	Loading Criteria (Indigenous) No deviation is permitted in payment term. Any deviation to the above payment term is liable for rejection.	

5 (a)	Liquidated damages: Delivery of the goods specified in the purchase order should be made within the time prescribed. Failure to dispatch the materials in the time as per the delivery quoted in our Purchase Order would make the supplier liable to an un-conditional LD at the rate of 0.5% of the total order value per week of the delay or part thereof subject to a maximum of 10% of the total order value. In case of PO placements, required documents have to be submitted for approval within 15 days from the date of PO & reply for any further clarification has to be within 7 days. Any delay beyond the above specified period will be considered during LD calculation.	
5 (b)	Loading Criteria: LD / Penalty: Any deviation on BHEL LD / Penalty clause, loading (Basic material Value) will be applied to the extent to which it is not agreed by the bidder.	
6 (a)	Guarantee / Warranty Period: Guarantee clause 24 months from the date of supply or 18 months from the date of actual put in use, whichever is earlier.	
6 (b)	Repair & replacements: Within the guarantee period vendor has to replace / rectify the defective/ damaged items on free of cost within a reasonable time of reporting from our end.	
6 (c)	Loading Criteria: Guarantee / Warranty Period: No Deviation is permitted. If still vendor offered any deviation on the Guarantee / warranty period, it may lead to rejection of offer.	
7 (a)	Taxes & Duties: All Taxes, Duties, Service Taxes etc. payable as extra to the quoted price should be specifically stated in offers along with CST & TIN No / Tariff No. etc., failing which the purchaser will not be liable for payment of such Taxes and Duties. Our TIN No. 33243560005, TNGST No. 3560005, CST. No. 239383 Dt. 11-06-1991 & BHEL ECC No. AAACB4146PXM012, Assessment circle Tiruverumbur. BHEL TRICHY Unit GST NO : 33AAACB4146P2ZL.	
7 (b)	Kindly indicate the GST No of your Firm	
7 (c)	Kindly Indicate the HSN Code for all items	
7 (d)	Please indicate the applicable GST % (IGST)	
8	Risk purchase: If the supplier fails to deliver the goods within the delivery specified in the Purchase Order, BHEL will be entitled to terminate the contract and to Purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or despatch within the delivery period mentioned in the Purchase Order.	
9	Delivery Period: 8 weeks from the Documents approval from Customer /BHEL. CV test	

	report to be submitted for BHEL review and approval before final inspection.	
10	Invoice date/ Bill of Lading date/ Airway Bill date/ Lorry way bill date/ Railway Receipt date, whichever is later will be considered for LD calculation.	
11	Documents are to be submitted along with technical bid (Part-1) 01. Covering letter 02. Unpriced offer. 03. Filled technical specification 04. Filled BHEL Terms and condition sheet (Annexure-A) 05. Catalogue's 06. Detailed BOQ of the package. Documents are to be submitted along with Price bid (Part-2) 01. Priced offer Note: All the pages of documents are to be signed and stamped by authorized signatory of the company. Any query during enquiry stage shall be replied within three days failing which offer may be rejected as non-responsive	
12	Vendor shall quote as per attached price and Unpriced Schedule format only.	
13	Offer Validity: 120 days minimum from techno commercial bid opening (Part-1)	
14	O & M manuals: BHEL require 1 sets of printed O & M manuals with 3 soft copies in CD-ROM at no cost to be sent to BHEL/ Trichy.	
15	MSE VENDOR: <i>i. If L1 vendor is an MSE vendor entire project package will be ordered on L1 vendor.</i> <i>ii. If a Non MSE vendor is coming as L1, then L1 prices will be counteroffered on MSE vendor who is quoting price within the price band L1+15% and if they are agreeing, purchase order will be awarded for full/complete supply of total tendered value to MSE.</i> <i>iii. If more than one MSE vendors are available in the L1+15% price band then lowest of the MSE vendor will be selected for counteroffering. If lowest MSE vendor is not accepting it will be counteroffered to the next MSE vendor in the price band and so on.</i> <i>iv. Finally if none of the MSE vendor in the price band is not accepting it will be ordered on L1 non MSE vendor.</i> Payment for MSE Indigenous vendors will be as per MSMED Act, 2006 Declaration of UAM number by MSE bidders is mandatory. Failing which, such bidders will not be able to enjoy the benefits as per Public Procurement	

	Policy for MSEs Order, 2012. MSE suppliers can avail the intended benefits only if they submit along with the offer, attested/notarized copies of either 1. EM II certificate having deemed validity (five years from the date of issue of acknowledgement in EM II) or 2. Valid NSIC certificate or EM II certificate along with CA certificate (Format enclosed) applicable for the year, certifying quantum of investment in plant and machinery within the permissible limits as per the act for relevant status (MICRO or SMALL) where the deemed validity of EM II is over. <i>Date to be reckoned for determining the deemed validity will be the last date of technical bid submission (Part 1 in case of two part bid).</i> Non submission of such documents will lead to consideration of their bid at par with other bidders. No benefit shall be applicable for this enquiry, in case of any deficiency in the above required documents or in case the documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal even if submitted earlier. Documents should be notarized or attested by a Gazetted officer. <i>Definitions of MSEs owned by SC/ST is under:</i> • <i>In case of proprietorship firm, proprietor must be SC/ST.</i> • <i>In case of partnership firm, the SC/ST partners must be holding at least 51% shares in the unit.</i> • <i>In case of private limited companies, at least 51% share must be held by SC/ST promoters.</i> Authorised Offices to Issue SC/ST certificate. The caste/Tribe/Community certificate issued by the following authorities in the prescribed form for SCs/STs can be considered. • District Magistrate / Additional District Magistrate / Collector / Deputy Commissioner / Additional Deputy Commissioner / Deputy Collector / 1st class stipendiary magistrate / Sub divisional Magistrate / Taluka Magistrate / Executive magistrate / Extra Assistant commissioner. • Chief Presidency magistrate / Additional chief presidency magistrate/Presidency magistrate. • Revenue Officer not below the rank of thasildar. • Sub-Divisional officer of the area where the individual and / or his family normally resides. <i>To avail the benefits of MSE under SC/ST category, the related documents as stated above should be submitted along with tender documents.</i>	
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16	Response to Tenders for Indigenous supplier will be entertained only if the vendor has a valid GST registration number which should clearly have mentioned in the offer. If any specific exemption is available, a declaration with due supporting documents need to be furnished for considering the offer.	
17	Supplier shall mention their GSTN registration number in all their invoices and invoices shall be in the format as specified/prescribed under GST laws. Invoices shall necessarily contain Invoice number (in case of multiple numbering system is being followed for billing like SAP invoice no, commercial invoice no etc., then the Invoice No which is linked/uploaded in GSTN network shall be clearly indicated), item description as per PO, Quantity, Rate, Value, applicable taxes with nomenclature (like IGST, SGST, CGST & UTGST) separately, HSN/ SAC Code, etc.	
18	All invoices shall bear the HSN Code for each item separately (Harmonized System of Nomenclature)/ SAC code (Services Accounting Code).	
19	Invoices will be processed only upon completion of statutory requirement and further subject to following: Vendor declaring such invoice in Form GST ANX-1 Receipt of Goods or Services and Tax invoice by BHEL	
20	As the continuous uploading of tax invoices in GSTN portal (in GST ANX-1) is available for all (i.e. both Small & Large) tax payers under proposed new GST Return System, all invoices raised on BHEL may be uploaded immediately in GST portal on despatch of material /rendering of services. The supplier shall ensure availability of Invoice in GST portal before submission of invoice to BHEL. Invoices will be admitted by BHEL only if the invoices are available in GSTN portal (in BHEL's GST ANX-2).	
21	In case of discrepancy in the data uploaded by the supplier in the GSTN portal or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note or debit note (details also to be uploaded in GSTN portal) for the shortages or rejections in the supplies or additional claims, within the calendar month informed by BHEL.	
22	In cases where invoice details have been uploaded by the vendor but failed to remit the GST amount to GST Department (Form PMT-08 or Form GST RET-01 to be submitted) within stipulated time, then GST paid on the invoices pertaining to the month for which GST return not filed by the vendor will be recovered from the vendor along with the applicable interest (currently 24% p.a) and all subsequent bills of the vendor will not be processed till filing of the GST return by the vendor	
23	In case GST credit is denied to BHEL due to non-receipt or delayed receipt of goods and/ or tax invoice or expiry of timeline prescribed in GST law for availing such ITC, or any other reasons not attributable to	

	BHEL, GST amount claimed in the invoice shall be disallowed to the vendor.	
24	Where any GST liability arising on BHEL under Reverse Charge (RCM), the vendor has to submit the invoices to BHEL well within the timeline prescribed in GST Law, to enable BHEL to discharge the GST liability. If there is a delay in submission of invoice by the vendor resulting in delayed payment of GST by BHEL along with Interest, then such Interest payable or paid shall be recovered from the vendor.	
25	Under GST regime, BHEL has to discharge GST liability on LD recovered from suppliers/contracts. Hence applicable GST shall also be recoverable from suppliers/contractors on LD amount. For this Tax Invoice will be issued by BHEL indicating the respective supply invoice number.	
26	GST TDS will be deducted as per Section 51 of CGST Act 2017 and in line with Notification 50/2018 – Central Tax dated 13.09.2018. GST TDS certificate which will be generated in GST portal subsequent to vendor accepting the TDS deduction in the GST portal, will be issued to the vendor.	
27	A declaration to the effect that all invoice particulars are/were uploaded in the GSTN network/ portal & all tax liability as per GST rules and regulations have been and will be discharged, shall be mentioned in the invoice. If not mentioned in the invoice, a separate declaration shall be submitted as per the requirement of BHEL	
28	<u>Fraud Prevention Policy</u> Bidder along with its associate /collaborators /sub-contractors /sub-vendors / consultants / service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.	
29	<u>Cartel Formation</u> All the firms should desist from forming cartel as the practice is prohibited under Section 3(3) (a) & (d) of the competition Act 2002. If any such instance is observed during this tender will attract disciplinary action as per BHEL policies.	
30	<u>Resolution of Disputes</u> a. If dispute or difference of any kind shall arise between the Purchaser/Consignee and the supplier in connection with or relating to the contract, the parties shall make every effort to resolve the same amicably by mutual consultations. b. Venue of Arbitration: The venue of arbitration shall be the place from where the contract has been issued, i.e., BHEL Trichy. c. Jurisdiction of the court will be from the place where the tender enquiry document has been issued, i.e., Trichy, India	
31	<u>Force Majeure clause</u> a. Notwithstanding the provisions contained in other clauses, the supplier shall not be liable for imposition of any such sanction so long	

	the delay and/or failure of the supplier in fulfilling its obligations under the contract is the result of an event of Force Majeure. For purposes of this clause, Force Majeure means an event beyond the control of the supplier and not involving the supplier's fault or negligence and which is not foreseeable and not brought about at the instance of the party claiming to be affected by such event and which has caused the non – performance or delay in performance. Such events may include, but are not restricted to, wars or revolutions, hostility, acts of public enemy, civil commotion, sabotage, fires, floods, explosions, epidemics, quarantine restrictions, strikes excluding by its employees, lockouts excluding by its management, freight embargoes and Acts of GOD. b. If a Force Majeure situation arises, the supplier shall promptly notify the Purchaser/Consignee in writing of such conditions and the cause thereof within twenty-one days of occurrence of such event. Unless otherwise directed by the Purchaser/Consignee in writing, the supplier shall continue to perform its obligations under the contract as far as reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event. c. If the performance in whole or in part or any obligation under this contract is prevented or delayed by any reason of Force Majeure for a period exceeding sixty days, either party may at its option terminate the contract without any financial repercussion on either side. d. In case due to a Force Majeure event the Purchaser/Consignee is unable to fulfil its contractual commitment and responsibility, the Purchaser/Consignee will notify the supplier accordingly and subsequent actions taken on similar lines described in above sub-paragraphs.	
Note	1. In the event of our customer order covering this tender being cancelled /placed on hold / otherwise modified, BHEL would be constrained to accordingly cancel / hold / modify the tender at any stage of execution. 2. BHEL may negotiate the L1 rate, if not meeting our budget / estimated cost. BHEL may re-float the tender opened, if L1 price is not acceptable to BHEL. Any deviation in specified commercial terms- Annexure-A, will lead to rejection of offer. 3. Any other Techno –Commercial Terms indicated by the vendor in their offer elsewhere will be ignored. BHEL will proceed with tender evaluation as per Annexure A only.	