

NTPC

3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

**TECHNICAL SPECIFICATION
FOR
MISCELLANEOUS PUMPS**

Specification No. : PE-TS-434-100-N001 (REV. 00)



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI BUILDING, SECTOR 16 A
NOIDA - 201301**



TITLE:
**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**
SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-100-N001**
SECTION:
SUB-SECTION:
REV. NO. **00** DATE 25/04/2019
SHEET **1** OF **1**

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THIS TECHNICAL SPECIFICATION CONSISTS OF FOLLOWING SECTIONS:

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Notes:

1) For detailed list of documents to be submitted by bidder in their technical offer, please refer cl. no. 15.00.00 of Section-IIA.

2) For detailed list of documents to be submitted by vendor after award of contract, please refer Datasheet-C of Section-IIA.



TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

SPECIFIC TECHNICAL REQUIREMENTS

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SECTION - I

SPECIFIC TECHNICAL REQUIREMENTS

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TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-100-N001**

SECTION: **I**

SUB-SECTION: **IA**

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SUB-SECTION – IA

SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)



TECHNICAL SPECIFICATIONS MISCELLANEOUS PUMPS SPECIFIC TECHNICAL REQUIREMENTS	Specification No. : PE-TS-434-100-N001, Rev.00			
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1.0 SCOPE

- 1.1 This enquiry covers the design, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-contractors works, proper packing for delivery and installation checks & supervision of replacement of gland packing with Mechanical Seal arrangement (if applicable) at site for Miscellaneous Pumps along with mandatory spares complete with all accessories as per the requirements specified in this specification, PG Test at site and any other services, etc. if called for in the succeeding sections of the specification for following project:

A. 3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

The above project is referred as '3X800 MW PATRATU' elsewhere in the Specification for ease of reference.

- 1.2 The miscellaneous pumps covered under this specification shall be grouped under various group/ type as under:

A. Horizontal (Group-I)

- i. Horizontal Pumps - Type-I (Design Flow < 300 Cu.M/Hr.)

B. Horizontal (Group-II)

- i. Horizontal Pumps - Type-II (Design Flow > 300 Cu.M/Hr.)

NOTE:-

1. The bidder shall include complete supplies for Pump Type as above in his scope. Part supplies offered for the Pump Type shall disqualify the bidder's offer for that Pump Type.
2. Pump details shall be as per Data Sheet-A at Section-ID.
3. If stated specifically in NIT, bidder shall include complete supplies for Project/Group as above in his scope. Part supplies offered for the Project/Group shall disqualify the bidder's offer for that Project/Group.

- 1.3 The miscellaneous pumps and drives covered under this specification for various projects are as per Annexure-1 of this section. HT drives, wherever applicable and irrespective of motor ratings, shall be issued free of cost by BHEL. The details of pumps with HT drives shall be as per Annexure-2 of this section.

The Capacity, Head, Materials of construction, Mandatory spares and other particulars of these pumps, are detailed in Data Sheet-A at Section-ID of the specification.

- 1.4 For detailed scope of supply & services refer Standard technical Specification for Horizontal Centrifugal pumps specified under Section-II of this specification.

- 1.5 Electrical scope between BHEL and Vendor for Miscellaneous pumps and drives of this specification shall be as per Annexure-1 of Section-IB of this specification.

LT drives shall be energy efficient as per subsequent clauses mentioned elsewhere in the specification. **However wherever IE2 compliant motors are applicable same shall be provided with IE3 compliance.**

1.6 DELIVERY:

Delivery of miscellaneous pumps shall be as per NIT requirement.

2.0 Horizontal Pumps:

- 2.1 Specific requirements for horizontal pumps shall be as per end customer's specification attached as Annexure-3 of this section.

- 2.2 In case, shaft sleeve is threaded a water slinger shall be provided on the Pump Shaft to avoid ingress of leaked water (if any due to failure of sealing arrangement for shaft sleeve) to Bearing.

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2.3 In case of axial split casing Multistage pumps, minimum factor of safety of '2' times shall be considered for bearing capacity selection and pump design.

2.4 For all HT Motor driven pumps, bidder shall provide duplex temperature elements and its mounting provisions for pump bearing temperature measurement. Specification for temperature element is attached in Section-IC.

3.0 Mechanical run test along with Performance test shall be carried out on all pumps to determine the vibration levels, noise levels etc. at Vendor works. **Vibration, Noise and Parallel run test for all pumps shall also be conducted by bidder at site as per approved PG Test Procedure, inline with CI no. 3.04 of Section-IIA of this specification.** However, test value at site shall be used for the acceptance of the equipment. Pump vendor shall bring necessary instruments for conductance of site performance test. If the site performance is found not meeting the requirements in any respect as specified, then the equipment shall be rectified or replaced by the vendor, without any commercial implication to BHEL.

4.0 Deleted

5.0 Additional Dispatch Requirements:

MDCC after final inspection shall be provided to vendor on the basis of following:-

5.1 List of items packed in each box with description & quantity.

5.2 Photograph of each box in open & closed condition.

5.3 Bidder to include handling instructions in engineering drg/doc and packing to be done in such a way to avoid damage of items in transit and long storage at site and same shall be approved in contract stage by BHEL/Customer

6.0 Drawing/Document Submission Schedule:

PACKAGE	BHEL DRG NO	DRG TITLE	Drg Sch for Vendors	Remarks
MISC.PUMPS (HORIZONTAL TYPE-I)	Primary Documents			
	PE-V7-434-100-N001	TDS AND PERFORMACE CURVES-MISC. PUMPS (HORIZONTAL TYPE-I)	R-0 within 20 days from LOI/PO & subsequent revisions within 10 days of comments received from BHEL.	
	PE-V7-434-100-N002	GENERAL ARRANGEMENT AND CROSS SECTIONAL-PUMPS (HORIZONTAL TYPE-I)		
	PE-V7-434-100-N003	TDS AND CURVES OF MOTORS FOR MISC. PUMPS (HORIZONTAL TYPE-I)		
	PE-V7-434-100-N004	QP-MISC PUMPS (HORIZONTAL TYPE-I)		
	PE-V7-434-100-N005	QP- MOTORS (HORIZONTAL TYPE-I)		
	Secondary Documents			
	PE-V7-434-100-N006	MOTOR TYPE TEST DOC (if applicable) (HORIZONTAL TYPE-I)	R-0 within 20 days of Cat-I(or)II approval on motor document.	
	PE-V7-434-100-N007	O& M MANUAL -HORZ. PUMPS (HORIZONTAL TYPE-I)	Within 30 days from MDCC	

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	PE-V7-434-100-N008	PG TEST PROCEDURE -HOR. PUMPS (If Applicable) (HORIZONTAL TYPE-I)	R-0 within 20 days of Cat-I(or)II approval on pump document.	
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PACKAGE	BHEL DRG NO	DRG TITLE	Drg Sch for Vendors	Remarks
MISC.PUMPS (HORIZONTAL TYPE-II)	Primary Documents			
	PE-V7-434-100-N011	TDS AND PERFORMANCE CURVES-MISC. PUMPS (HORIZONTAL TYPE-II)	R-0 within 20 days from LOI/PO & subsequent revisions within 10 days of comments received from BHEL.	
	PE-V7-434-100-N012	GENERAL ARRANGEMENT AND CROSS SECTIONAL-PUMPS (HORIZONTAL TYPE-II)		
	PE-V7-434-100-N013	TDS AND CURVES OF MOTORS FOR MISC. PUMPS (HORIZONTAL TYPE-II)		
	PE-V7-434-100-N014	QP-MISC PUMPS (HORIZONTAL TYPE-II)		
	PE-V7-434-100-N015	QP- MOTORS (HORIZONTAL TYPE-II)		
	Secondary Documents			
	PE-V7-434-100-N016	MOTOR TYPE TEST DOC (if applicable) (HORIZONTAL TYPE-II)	R-0 within 20 days of Cat-I(or)II approval on motor document.	
	PE-V7-434-100-N017	O& M MANUAL -HORZ. PUMPS (HORIZONTAL TYPE-II)	Within 30 days from MDCC	
	PE-V7-434-100-N018	PG TEST PROCEDURE -HOR. PUMPS (If Applicable) (HORIZONTAL TYPE-II)	R-0 within 20 days of Cat-I(or)II approval on pump document.	

7.0 The pumps shall meet the technical requirements of Section-I as well as Section-II. In the event of any contradiction of Section-II with Section-I, the Section-I will prevail. In case of any contradiction in different clauses/parts of Section-I, the most stringent requirement shall prevail.

TECHNICAL SPECIFICATIONS

MISCELLANEOUS PUMPS

SPECIFIC TECHNICAL REQUIREMENTS

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Annexure-1

List of Miscellaneous Pumps and drives for :

A. 3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

Sl. No.	Pump Description	Total Qty.	Type of Pumps
A.	Horizontal Pumps (Type-I)		
1	DM WATER MAKE UP PUMPS	4 nos.	Horizontal
2	BOILER FILL PUMPS	2 nos.	Horizontal
3	RAW WATER ASH PUMPS	2 nos.	Horizontal
4	HVAC M/U WATER PUMP	2 nos.	Horizontal
B.	Horizontal Pumps (Type-II)		
1	ECW (TG AUX.) PUMPS	9 nos.	Horizontal
2	ECW (SG AUX'S) PUMPS	6 nos.	Horizontal
3	ECW COMMON STATION AUX'S PUMPS	2 nos.	Horizontal
4	ACW PUMPS	9 nos.	Horizontal
5	AHS COOLING PUMPS	2 nos.	Horizontal
6	ACW COMMON STATION AUX. PUMPS	2 nos.	Horizontal
7	CONDENSATE TRANSFER PUMPS	3 nos.	Horizontal
8	RAW WATER PT PUMPS	3 nos.	Horizontal
9	APH WASH PUMPS	2 nos.	Horizontal
10	SERVICE WATER PUMP	2 nos.	Horizontal
11	FGD MAKE-UP WATER PUMPS	2 nos.	Horizontal
12	ACW MAKE-UP WATER PUMPS	2 nos.	Horizontal



TECHNICAL SPECIFICATIONS
MISCELLANEOUS PUMPS
SPECIFIC TECHNICAL REQUIREMENTS

Specification No. : PE-TS-434-100-N001, Rev.00

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Annexure-2

Following HT drives for 3X800MW NTPC PATRATU STPS EXPANSION PHASE-1, irrespective of Motor ratings shall be issue free, by BHEL:

A. Horizontal Pumps (Type-I):

- 1 BOILER FILL PUMPS

B. Horizontal Pumps (Type-II):

- 1 ECW (TG AUX.) PUMPS
- 2 ECW (SG AUX'S) PUMPS
- 3 ECW COMMON STATION AUX'S PUMPS
- 4 ACW PUMPS
- 5 AHS COOLING PUMPS
- 6 ACW COMMON STATION AUX. PUMPS
- 7 APH WASH PUMPS
- 8 SERVICE WATER PUMP

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Annexure-1 to "Auxiliary Water System"			
	HORIZONTAL CENTRIFUGAL PUMPS			
1.00.00	SCOPE			
	General requirements in respect of design, material, constructional features, manufacture, inspection, testing the performance at the Vendor's/ Sub-Vendor's works and delivery to site erection, field testing and commissioning of Horizontal Centrifugal Pumps.			
2.00.00	CODES AND STANDARDS			
2.01.00	Design, material, construction manufacture inspection and performance testing of Horizontal Centrifugal Pumps shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. The equipment supplied shall comply with the latest applicable Indian standards listed below. Other National Standards are acceptable, if they are established to be equal or superior to the Indian Standards.			
2.02.00	List of Applicable Standards			
	i) IS : 1520 - Horizontal Centrifugal Pumps for clear cold fresh water.			
	ii) IS : 5120 - Technical requirements of roto-dynamic special purpose pumps			
	iii) API - 610 - Centrifugal pumps for general refinery service.			
	iv) IS : 5639 - Pumps Handling Chemicals & corrosion liquids.			
	v) IS : 5659 - Pumps for process water			
	vi) HIS - Hydraulic Institute Standards; USA			
	vii) ASTM-I-165-65- Standards Methods for Liquid Penetration Inspection.			
2.03.00	In case of any contradiction with aforesaid standards and the stipulations as per the technical specifications as specified hereinafter the stipulations of the technical specifications shall prevail.			
3.00.00	DESIGN REQUIREMENTS			
3.01.00	The maximum efficiency of pumps shall be preferably within + 10% of the rated design flow indicated in data sheets.			
3.02.00	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 15% more than design head.			
3.03.00	Pumps of a particular category shall be identical and shall be suitable for parallel operation with equal load division. The head Vs capacity and BHP Vs capacity characteristics should match to ensure even load sharing and trouble free operation throughout the range. Components of identical pumps shall be interchangeable.			
3.04.00	Pumps shall run smoothly without undue noise and vibration. Peak to peak vibration limits shall be restricted to the following values during operation.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2		SUB SECTION-A-15 ACW SYSTEM
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CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	Speed	Antifriction bearing	Sleeve bearing	
	1500 rpm and below	75.0 micron	75.0 micron	
	3000 rpm	50.0 micron	65.0 micron	
	The noise level shall not exceed 85 dBA. Overall sound pressure level reference 0.0002 microbar (the standard pressure reference for air sound measurement) at a distance of 1M from the equipment surface.			
3.05.00	The pumps shall be capable of starting with discharge valve fully open and close condition.			
4.00.00	DESIGN CONSTRUCTION			
4.02.00	Pump casing shall have radially/axially split type construction. The casing shall be designed to withstand the maximum shut - off pressure developed by the pump at the pumping temperature.			
4.03.00	Pump casing shall be provided with a vent connection and piping with fittings & valves Casing drain as required shall be provided complete with drain valves, piping and plugs. It shall be provided with a connection for suction and discharge pr. Gauge as standard feature.			
4.04.00	Impeller Impeller shall be closed or semi-closed as specified elsewhere and designed in conformance with the detailed analysis of the liquid being handled. The impeller shall be secured to the shaft, and shall be retained against circumferential movement by keying pinning or lock rings.			
4.05.00	Impeller/ Casing Wearing Rings Replaceable type wearing rings shall be provided at suitable locations pumps. Suitable method of locking the wearing ring shall be used.			
4.06.00	Shaft The critical speed shall be well away from the operating speed and in no case less than 130% of the rated speed.			
4.07.00	Shaft Sleeves Shaft sleeves shall be fastened to the shaft to prevent any leakage or loosening shaft and shaft sleeve assembly should ensure concentric rotation.			
4.08.00	Bearings Heavy duty bearings, adequately designed for the type of service specified in the enclosed pump data sheet and for long, trouble - free operation shall be furnished. The bearings offered shall be capable of taking both the radial and axial thrust coming into play during operation. In case, sleeve bearings are offered additional thrust bearings shall be provided. Anti-friction bearings of standard type, if provided, shall be selected for a minimum life 16,000 hours of continuous operation at maximum axial and a radial loads and rated speed.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-15 ACW SYSTEM	Page 39 of 55

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
4.09.00	Proper lubricating arrangement for the bearings shall be provided such that lubricating element does not contaminate the liquid pumped. Where there is a possibility of liquid entering the bearings suitable arrangement in the form of deflectors or any other suitable arrangement must be provided ahead of bearing assembly. Bearings shall be easily accessible without disturbing the pump assembly. A drain plug shall be provided at the bottom of each bearing housing.			
	Stuffing Boxes Stuffing boxes of packed ring construction type shall be provided wherever specified. Packed ring stuffing boxes shall be properly lubricated and sealed as per service requirements and manufacturer's standard. If external gland sealing is required, it shall be done from the pump discharge. The Bidder shall provide the necessary piping, valves, fitting etc. for the sealing connection.			
4.10.00	Mechanical Seals: Wherever specified in pump data sheet, mechanical seals shall be provided The sealing face should be highly lapped surfaces of material known for their low frictional co-efficient & resistance to corrosion against the liquid being pumped.			
4.11.00	Pump Shaft Motor Shaft Coupling The Pump and motor shaft shall be connected with a adequately sized flexible coupling of proven design with a spacer to facilitate dismantling of the pump without disturbing the motor.			
4.12.00	Base Plate A common base plate mounting both for the pump and motor shall be furnished. The base plate shall be of fabricated steel and of rigid construction, suitable ribbed and reinforced.			
4.13.00	Assembly and Dismantling Assembly and dismantling of each pump with drive motor shall be possible without disturbing the grouting base plate or alignment.			
4.14.00	Drive Motor (Prime Mover) The KW rating of the drive shall be based on continuously driving the connected equipment for the conditions specified. In case, where parallel operation of the pumps is specified, the actual motor rating is to be selected considering overloading of the pump in the event of tripping of operating pumps. Continuous motor rating (at 50 deg. Cent, ambient) for pump shall be at least 10% above the maximum load demand of the driven equipment in the complete range.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-15 ACW SYSTEM	Page 40 of 55

CLAUSE NO.		QUALITY ASSURANCE												एन टी पी सी NTPC
EQUIPMENT COOLING WATER SYSTEM														
TEST / CHECKS														
ITEM / COMPONENTS		Material Test	WPS/PQR/Welder Qualification	DPT/MPI	Assembly Fit Up	Visual & Dimensional Check	UT	RT	Hydraulic / Water Fill	Balancing	Type Test	Performance Test	Other Test	
A	PLATE TYPE HEAT EXCHANGER		Y	Y ³	Y	Y			Y					
A.1	Heat Transfer Plates	Y ¹		Y ²		Y								Y ⁷
A.2	Gaskets	Y				Y								
A.3	Cover Plates (Front & Rear)	Y ¹				Y	Y ⁶							
A.4	Tie Rods	Y ¹		Y ⁴			Y ⁶							
B	HORIZONTAL CENTRIFUGAL PUMP				Y	Y						Y ¹⁰		
B.1	Casing	Y ¹		Y ⁴		Y			Y ⁸					
B.2	Impeller	Y ¹		Y ⁴		Y				Y ⁹				
B.3	Shaft	Y ¹		Y		Y	Y ⁶			Y ⁹				
NOTES														
1 One per heat / HT batch														
2 DP Test shall be conducted for 10% of the lot of HT plates. However, in case of any defect, entire lot shall be tested and only defect free plates shall be accepted.														
3 100% DP Test shall be conducted on butt welds and 10% DPT on fillet weld after final run.														
4 100% DPT shall be carried out on machined surfaces.														
5 UT shall be done on plates with thickness 25 mm or above.														
6 UT shall be done on shaft / tie rod with diameter 50 mm or above.														
7 After pressing each HT plate shall be subjected to either of the following tests, as per Manufacturer Practice a) Light Box Test b) Vacuum Test c) Air Chamber Test														
8 All pressure retaining parts shall be hydrostatically tested at 200% of pump rated head or 150% of shut – off head, whichever is higher, for at least 30 minutes. No leakage is allowed.														
9 Static and Dynamic Balancing shall be carried out on complete rotor assembly.														
10 All pumps shall be tested at rated speed, for head, flow capacity, efficiency and power consumption for the entire operating range i.e. from shut off head to maximum flow. A minimum of 7 readings shall be taken to plot the curve, with one reading at design flow. Testing standard shall be HIS (Hydraulic Institute Standard) of USA. Performance test shall be carried out with contract motor, wherever Liquidated Damages are to be ascertained based on performance test at shop.														
11 For Pipes, Valves and RE Joints refer LP Piping System requirements.														
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)				TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.:CS-9585-001-2				SUB – SECTION-E-15 ECW SYATEM				Page 1 of 1		

CLAUSE NO.		QUALITY ASSURANCE													एनटीपीसी NTPC	
Tests/Check		Material Test	DPT/MPI	Ultrasonic test	RT	Balancing	Hydraulic test	Pneumatic Test	Assembly/ fit up	Dimensions	Functional/operational Test	Performance Test	Other Test	All Test as per relevant Std/ Approved Data Sheets	Remarks	
Items / Components																
A.	CW / ACW / MAKE UP WATER PUMPS								Y ¹	Y		Y ²		Y		
1	Shaft	Y ^a	Y ^b	Y ^c		Y				Y						
2	Impeller	Y ^a	Y ^b		Y ³	Y				Y						
3	Suction Bell / Bowl Castings/ Inserts	Y ^a	Y ^b				Y			Y			Y ⁶			
4	Discharge Head / Column Pipes / Distance Piece/Base Plate	Y ^a	Y ^b		Y ⁴		Y		Y	Y						
5	Companion Flanges	Y ^a	Y ^b		Y ⁵				Y	Y						
6	Thrust Bearing (Tilting Pad type)	Y ^a	Y	Y					Y	Y				Y		

LEGENDS:

Y	Applicable tests are identified by ‘Y’.
Y ^a	One per Heat/ Heat Treatment Batch/ Lot.
Y ^b	On machined surfaces only for Castings / Forgings and on Welds of Fabricated Components.
Y ^c	For Shaft diameter. ≥ 50 mm and for plate thickness ≥ 25 mm
Y ¹	Trial assembly of all Vertical Turbine Pump components with Column Pipes, Discharge Head, and Motor Stool shall be carried at shop.
Y ²	Performance testing of Pumps shall be carried out at shop, as per HIS standard to determine Head & Flow Characteristics.
Y ³	In case of CW pump impellers, Radiographic Examination shall be conducted as per ASTM E186/446 with Severity Level 2 for Gas porosity, Level 3 for Sand, Slag and Shrinkage. Cracks, Inserts and Mottling are not acceptable. Radiographic Examination should cover Vanes, Vane Junctions, Full Radial depth of Hub & other accessible areas of the rest of the Impeller.
Y ⁴	Spot Radiography for Butt weld of Fabricated Components for thickness below 37.5 mm shall be carried out. If thickness is 37.5 mm, 100% RT shall be carried out. (RT may be replaced by Ultrasonic Test due to constraint if any.) Stress relieving shall be carried out as per norms of ASME Section VIII.
Y ⁵	Segmental Flanges exceeding 37.5 mm thickness shall be stress relieved after welding. All butt weld joints in segmental flange shall be examined by Radiographic Test. (RT may be replaced by Ultrasonic Test due to constraint if any.) Maximum number of segments shall be 4 only.
Y ⁶	No repair welding is permitted on Cast Iron / Alloy Cast Iron Castings.

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.:CS-9585-001-2	SUB-SECTION-E-27 MAKE-UP WATER SYSTEM	Page 1 of 1
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TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

SPECIFIC TECHNICAL REQUIREMENTS

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SECTION: **I**

SUB-SECTION: **IB**

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SUB-SECTION – IB

SPECIFIC TECHNICAL REQUIREMENTS (ELECTRICAL)



TITLE :
ELECTRICAL EQUIPMENT SPECIFICATION
FOR
MISC. PUMPS HORIZONTAL
3 X 800 MW PATRATU STPP

SPECIFICATION NO.

VOLUME NO. :

SECTION : 1B

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TECHNICAL SPECIFICATION

FOR

MISC. PUMPS HORIZONTAL
(ELECTRICAL PORTION)



TITLE :
ELECTRICAL EQUIPMENT SPECIFICATION
FOR
MISC. PUMPS HORIZONTAL
3 X 800 MW PATRATU STPP

SPECIFICATION NO.
VOLUME NO. :
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1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

- a) Services and equipment as per “Electrical Scope between BHEL and Vendor”.
- b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The same shall be provided by the bidder without any extra charge.
- c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
- d) Electrical load requirement for **MISC. PUMPS**.
- e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer/BHEL approval without any commercial and delivery implications to BHEL
- g) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.
- h) Motor shall meet minimum requirement of motor specification.
- i) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.
- j) Cable BOQ worked out based on routing of cable listing provided by the vendor for “ both end equipment in vendor’s scope”shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:

Refer “Electrical Scope between BHEL and Vendor”.

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

- 3.1** The electrical specification without any deviation from the technical/quality assurance requirements stipulated shall be deemed to be complied by the bidder in case bidder furnishes the overall compliance of package technical specification in the form of



TITLE :
ELECTRICAL EQUIPMENT SPECIFICATION
FOR
MISC. PUMPS HORIZONTAL
3 X 800 MW PATRATU STPP

SPECIFICATION NO.
VOLUME NO. :
SECTION : 1B
REV NO. **00** : DATE : 25.04.2019
SHEET : 3 OF 3

compliance certificate/No deviation certificate.

- 3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

4.0 List of enclosures :

- a) Electrical scope between BHEL & vendor (Annexure –I)
- b) Specification of Motor (B-07).
- c) Datasheets(A&C) & quality plan for motors.
- d) Electrical Load data format (Annexure –II)
- e) BHEL cable listing format (Annexure –III)

ANNEXURE-I
STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

REV-0, DATE: 15.07.2016

PACKAGE : MISC. PUMPS (HORZ.)
SCOPE OF VENDOR: SUPPLY
PROJECT : 3X800 MW PATRATU STPP

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	BHEL Vendor BHEL	BHEL BHEL BHEL	
5	Any special type of cable like compensating, co-axial, prefab, MICC, fibre Optic cables etc.	Vendor	BHEL	
6	Cabling material (Cable trays, accessories ,cable tray supporting system, conduits etc.)	BHEL	BHEL	
7	Cable glands ,lugs, and bimetallic strip for equipment supplied by Vendor	Vendor	BHEL	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and control cables.
8	Equipment grounding & Lightning protection	BHEL	BHEL	
9	Below grade grounding	BHEL	BHEL	
10	Motors alongwith fixing accessories	Vendor	-	Makes shall be subject to customer/ BHEL approval at contract stage.

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract without any commercial implication.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.



TITLE

LV MOTORS**DATA SHEET-A****3 X 800 MW PATRATU STPP**

SPECIFICATION NO.

VOLUME

SECTION

1B

REV NO. 00 DATE 13.03.2019

SHEET 1 OF 1

- 1.0 Design ambient temperature : 50 °C
- 2.0 Maximum acceptable kW rating of LV motor : 200 KW
- 3.0 Installation (Indoors/ Outdoors) : As required
- 4.0 Details of supply system
- a) Rated voltage (with variation) : 415V $\pm$ 10%
 - b) Rated frequency (with variation) : 50 Hz + 3 % to - 5%
 - c) Combined voltage & freq. variation : 10% (sum of absolute values)
 - d) System fault level at rated voltage : 50 kA for 1 sec
 - e) Short time rating for terminal boxes : 50 KA for 0.25 sec
 - f) LV System grounding : Solidly
- 5.0 Class of insulation : Class 'F', with temp rise limited to class B.
- 6.0 Minimum voltage for starting : (a) 85% of rated voltage
(As percentage of rated voltage)
- 7.0 Power cables data : Shall be given during detailed engg.
- 8.0 Space heater supply : 240 V, 1 PHASE , 50 Hz
- 9.0 Rating up to which Single phase motor : Acceptable below 0.20 kW
- 10.0 Locked rotor current
- a) Limit as percentage of FLC : As per IS 12615*
- 11.0 Flame-proof motor
- a) Enclosure suitable (As per IS: 2148) : As per requirement
 - b) Classification of Hazardous area : As per requirement
(As per IS: 5572 part-I)
- 12.0 Paint shade : Shall be given during detailed engg
- 13.0 Degree Of protection for motor/ terminal box : IP 54/ IP 55

* Continuous duty LT motors up to 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium efficiency (IE3) as per IEC: 60034-30/ IS:12615

SUB-SECTION – B-07

MOTORS

CLAUSE NO.	TECHNICAL REQUIREMENTS
	MOTORS
1.00.00	GENERAL REQUIREMENTS
1.01.00	For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.
1.02.00	All equipment shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.
1.03.00	Contractor shall provide fully compatible electrical system, equipment, accessories and services.
1.04.00	All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.
1.05.00	Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.
1.06.00	The responsibility of coordination with electrical agencies and obtaining all necessary clearances for contractors equipment and systems shall be under the contractor scope.
1.07.00	Degree of Protection Degree of protection for various enclosures as per IEC60034-05 shall be as follows:- i) Indoor motors - IP 54 ii) Outdoor motors - IP 55 iii) Cable box-indoor area - IP 54 iv) Cable box-Outdoor area - IP 55
2.00.00	CODES AND STANDARDS 1) Three phase induction motors : IS/IEC:60034 2) Single phase AC motors : IS/IEC:60034 3) Crane duty motors : IS:3177, IS/IEC:60034 4) DC motors/generators : IS/IEC:60034 5) Energy Efficient motors : IS 12615, IEC: 60034-30
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2
SUB-SECTION-B-07 MOTORS	PAGE 1 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS			
3.00.00	TYPE			
3.01.00	AC Motors:			
	a) Squirrel cage induction motor suitable for direct-on-line starting.			
	b) Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30.			
	c) Crane duty motors shall be squirrel cage Induction motor as per the requirement.			
	d) Motor operating through variable frequency drives shall be suitable for inverter duty. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable.			
3.02.00	DC Motors	Shunt wound		
4.00.00	RATING			
	(a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor.			
	(b) Whenever the basis for motor or driven equipment ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.			
	(c) For BFP motors, starting MVA shall be restricted to meet requirements indicated in B-0.			
	(d) The starting current for the DC motors shall be restricted to 3 times of the full load current.			
5.00.00	TEMPERATURE RISE			
	Air cooled motors			
	70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation.			
	Water cooled			
	80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 2 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class 90 (Y) wet wound Boiler circulation pump motor. 6.00.00 OPERATIONAL REQUIREMENTS 6.01.00 Starting Time 6.01.01 For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time. 6.01.02 For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time. 6.01.03 For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time. 6.01.04 Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met. 6.02.00 Torque Requirements 6.02.01 Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque. 6.02.02 Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors. 6.03.00 Starting voltage requirement (a) Up to 85% of rated voltage for ratings below 110 KW (b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW (c) Up to 85% of rated voltage for ratings from 201 KW to 1000 KW (d) Up to 80% of rated voltage for ratings from 1001 KW to 4000 KW (e) Up to 75 % of rated voltage for ratings above 4000KW Except AOP & JOP motors running on D.G emergency supply, starting voltage shall be 80%.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 3 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS
7.00.00	DESIGN AND CONSTRUCTIONAL FEATURES
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors, space heater terminals inside the main terminal box may be acceptable.
7.02.00	All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). The method of movement of primary and secondary coolant shall be self-circulated by fan or pump directly mounted on the rotor of the main motor as per IEC 60034-6. However VFD driven motors can be offered with forced cooling type with machine mounted fan or pump driven by separate electric motor. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS: 2148 as detailed below (a) Fuel oil area : Group – IIB (b) Hydrogen generation : Group - IIC or (Group-I, Div-II as per plant area NEC) or (Class-1, Group-B, Div-II as per NEMA / IEC60034)
7.03.00	Winding and Insulation (a) Type : Non-hygroscopic, oil resistant, flame resistant (b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature. (c) 11kV & 3.3 kV AC motors : Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Pressure Impregnated i.e. resin poor method. The lightning Impulse & intertern insulation surge withstand level shall be as per IEC-60034 part-15. However winding insulation for wet wound Boiler circulation pump motor shall be thermal class 90 (Y) or better. (d) 240VAC, 415V AC & 220V DC motors : Thermal Class (B) or better
7.04.00	Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2
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CLAUSE NO.	TECHNICAL REQUIREMENTS				
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.				
7.06.00	Noise level for all the motors shall be limited to 85dB (A) except for BFP motor for which the maximum limit shall be 90 dB(A). Vibration shall be limited within the limits prescribed in IS/IEC 60034-14. Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.				
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.				
7.08.00	Motor body shall have two earthing points on opposite sides.				
7.09.00	11 KV motors shall be offered with Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.				
7.10.00	3.3 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Suitable termination kit shall be provided for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non-magnetic material for single core cables) shall be provided.				
7.11.00	The spacing between gland plate & center of terminal stud shall be as per Table-I.				
7.12.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.				
7.13.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV /415V systems without any injurious effect on its life.				
7.14.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.				
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box suitable for the same.				
<table><tr><td>EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)</td><td>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2</td><td>SUB-SECTION-B-07 MOTORS</td><td>PAGE 5 OF 10</td></tr></table>		EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 5 OF 10
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 5 OF 10		

CLAUSE NO.	TECHNICAL REQUIREMENTS			
8.00.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP motor.			
	(a) Below 110KW	:	11.0	
	(b) From 110 KW & upto 200 KW	:	9.0	
	(c) Above 200 KW & upto 1000KW	:	10.0	
	(d) From 1001KW & upto 4000KW	:	9.0	
	(e) Above 4000KW	:	6 to 6.5	
9.00.00	CW motor shall be designed with minimum power factor of 0.8 at design duty point.			
10.00.00	TYPE TEST			
10.01.00	HT MOTORS			
10.01.01	The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.			
10.01.02	The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set–up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.			
10.01.03	In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the employer for waiver of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The employer reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.			
10.01.04	Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED "and carried out within last ten years from the date of bid opening. These reports should be for			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2		SUB-SECTION-B-07 MOTORS
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
10.01.05	the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the employer either at third party lab or in presence of client/ employer's representative and submit the reports for approval. LIST OF TYPE TESTS TO BE CONDUCTED The following type tests shall be conducted on each type and rating of HT motor (a) No load saturation and loss curves upto approximately 115% of rated voltage (b) Measurement of noise at no load. (c) Momentary excess torque test (subject to test bed constraint). (d) Full load test (subject to test bed constraint) (e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.			
10.01.06	LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED The following type test reports shall be submitted for each type and rating of HT motor (a) Degree of protection test for the enclosure followed by IR, HV and no load run test. (b) Terminal box-fault level withstand test for each type of terminal box of HT motors only. (c) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15 (d) Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 7 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS
10.02.00	LT Motors
10.02.01	LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for employer's approval the reports of all the type tests as listed in this specification and carried out within last <i>ten</i> years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.
10.02.02	However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the employer either at third party lab or in presence of client/ employer's representative and submit the reports for approval.
10.02.03	LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only - Measurement of resistance of windings of stator and wound rotor. - No load test at rated voltage to determine input current power and speed - Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors) - 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(Shall be limited as per clause no 7.06.00 of this section) - Test for degree of protection and - Over speed test.
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2
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CLAUSE NO.	TECHNICAL REQUIREMENTS																				
12.	Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1																				
10.03.00	All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.																				
10.04.00	The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and “No design Change”. Minor changes if any shall be highlighted on the endorsement sheet.																				
TABLE - I DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS <table><thead><tr><th>Motor MCR in KW</th><th>Minimum distance between centre of stud and gland plate in mm</th></tr><tr><th>UP to 3 KW</th><th>As per manufacturer's practice.</th></tr></thead><tbody><tr><td>Above 3 KW - upto 7 KW</td><td>85</td></tr><tr><td>Above 7 KW - upto 13 KW</td><td>115</td></tr><tr><td>Above 13 KW - upto 24 KW</td><td>167</td></tr><tr><td>Above 24 KW - upto 37 KW</td><td>196</td></tr><tr><td>Above 37 KW - upto 55 KW</td><td>249</td></tr><tr><td>Above 55 KW - upto 90 KW</td><td>277</td></tr><tr><td>Above 90 KW - upto 125 KW</td><td>331</td></tr><tr><td>Above 125 KW-upto 200 KW</td><td>203</td></tr></tbody></table> For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm. PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE: NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:		Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm	UP to 3 KW	As per manufacturer's practice.	Above 3 KW - upto 7 KW	85	Above 7 KW - upto 13 KW	115	Above 13 KW - upto 24 KW	167	Above 24 KW - upto 37 KW	196	Above 37 KW - upto 55 KW	249	Above 55 KW - upto 90 KW	277	Above 90 KW - upto 125 KW	331	Above 125 KW-upto 200 KW	203
Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm																				
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2																				
SUB-SECTION-B-07 MOTORS																					
PAGE 9 OF 10																					

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Motor MCR in KW	Clearance		
	UP to 110 KW	10mm		
	Above 110 KW and upto 150 KW	12.5mm		
	Above 150 KW	19mm		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 10 OF 10

SUB-SECTION–E-51

MOTORS

MOTOR

TESTS/CHECKS TEMS/COMPONENTS	Visual	Dimensional	Make/Type/Rating /General Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment
Plates for stator frame, end shield, spider etc.	Y	Y	Y	Y	Y				Y
Shaft	Y	Y	Y	Y	Y	Y			Y
Magnetic Material	Y	Y	Y	Y			Y		
Rotor Copper/Aluminium	Y	Y	Y	Y			Y		Y
Stator copper	Y	Y	Y	Y			Y		Y
SC Ring	Y	Y	Y	Y	Y		Y	Y	Y
Insulating Material	Y		Y	Y			Y		
Tubes, for Cooler	Y	Y	Y	Y	Y				Y
Sleeve Bearing	Y	Y	Y	Y	Y				Y
Stator/Rotor, Exciter Coils	Y	Y	Y				Y	Y	
Castings, stator frame, terminal box and bearing housing etc.	Y	Y	Y	Y	Y			Y	
Fabrication & machining of stator, rotor, terminal box	Y	Y			Y			Y	Y
Wound stator	Y	Y					Y	Y	
Wound Exciter	Y	Y					Y	Y	
Rotor complete	Y	Y					Y		
Exciter, Stator, Rotor, Terminal Box assembly	Y	Y					Y		
Accessories, RTD, BTD,CT, Space heater, antifricion bearing, gaskets etc.	Y	Y	Y						
Complete Motor	Y	Y	Y						
Note: 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, No QP for LT motor upto 50KW. 2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard 3. Makes of major bought out items for HT motors will be subject to NTPC approval. Y1 = for HT Motor / Machines only.									

MOTOR

TESTS/CHECKS ITEMS/ COMPONENTS	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-325/IS-4722 /IS- 9283/IS 2148/IEC60034/IEC 60079-I	vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion
Plates for stator frame, end shield, spider etc.										
Shaft										
Magnetic Material	Y		Y							
Rotor Copper/Aluminium										
Stator copper			Y							
SC Ring										
Insulating Material			Y							
Tubes for Cooler		Y								
Sleeve Bearing		Y								
Stator/Rotor, Exciter Coils										
Castings, stator frame, terminal box and bearing housing etc.										
Fabrication & machining of stator, rotor, terminal box										
Wound stator										
Wound Exciter										
Rotor complete				Y	Y					
Exciter, Stator, Rotor, Terminal Box assembly										
Accessories, RTD, BTD,CT, , Space heater, antifriction bearing, gaskets etc.										
Complete Motor						Y	Y	Y	Y1	Y
Note: 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, No QP for LT motor upto 50KW. 2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard 3. Makes of major bought out items for HT motors will be subject to NTPC approval. Y1 = for HT Motor / Machines only.										



TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-100-N001**

SECTION: **I**

SUB-SECTION: **IC**

REV. NO. **00** DATE **25/04/2019**

SHEET **1** OF **1**

SUB-SECTION – IC

SPECIFIC TECHNICAL REQUIREMENTS (C&I)

SCOPE OF C&I FOR MISC. PUMPS

1. For each HT drives vibration pad is to be provided by pump supplier for mounting of vibration block of size 40mmx40mmx40mm. A key slot (30mmx15mmx3 mm) is to be provided on the drive shaft for phase marker.
2. RTD with thermo-well shall be provided for bearing temperature measurement by bidder.
3. The make/model of various instruments/items/systems shall be as per NTPC approved vendor list. No commercial and delivery implication in this regard shall be acceptable. In case of any conflict and repetition of clauses in the specification, the more stringent requirements among them are to be complied with.
4. Termination of cable from RTD with thermo-well to TB(Mounted on pump, TB in bidder scope) shall be in bidder scope.
5. The specifications for instruments mentioned in the specification are minimum requirements. The detail specifications shall be finalized during detail engineering.
6. The bidders shall specifically mention any deviation they would like to take on the C&I specification. In absence of only deviation a No deviation certificate is to be furnished.
7. Bidder to perform tests of C&I items/instruments/systems as per Quality plans/type test attached in the specification. However, if any test not specified in the quality plan but specified in specification Tests for I&C equipment included elsewhere in specification will have to perform by Bidder without any cost implication.
8. Instrument installation and accessories required for the same shall be in Bidder's scope and shall be submitted after award of contract. However any instrument/ analyzer installation not covered in the same shall be subject to customer and BHEL approval during detailed engineering.
9. In addition to requirements specified here, all C&I systems/ sub-systems/ equipment/ devices shall also meet other requirements stipulated under other Sub-sections/ parts/ sections of specification.
10. Bidder shall supply any other instrument/Equipment required for proper functioning of the Pump system, as deemed necessary during contract without any price implication to BHEL.

CLAUSE NO.	TECHNICAL REQUIREMENTS		
3.00.00	Temperature Elements and accessories		
3.01.00	Thermocouple		
	Sr. No.	Features	Essential/Minimum Requirements
	1	Type of Thermocouple.	: 16 AWG wire of Chromel-Alumel (Type K) or 24 AWG wire Pt-Rhodium Pt (Type R) depending on operating temperature Range (ungrounded separate junction type).
	2	No. of element	: Duplex
	3	Housing/Head	: IP-65/Diecast Aluminium. Head of TE to be provided with sufficient space and arrangement to mount head mounted temperature transmitter (as applicable). Plug in connectors are to be provided for external signal cable connection. TE terminal head shall be spring loaded for positive contacts with the thermo well.
	4	Insulation and Sheathing of Thermocouple	: Swaged type mineral (magnesium oxide) insulation and SS316 sheath.
	5	Calibration and accuracy	: As per IEC-584/ ANSI-MC-96.1 (special limits of errors/ class1) for T/C.
	6	Accessories	: Thermo well and associated fittings
	7	Standard	: IEC-584/ ANSI MC 96.1 for Thermocouple and ASME PTC-19.3 for Thermo-well
3.02.00	Resistance Temperature Detector (RTD)		
	Sr. No.	Features	Essential/Minimum Requirements
	1	Type of RTD.	: Four wire, Pt-100 (100 Ohms resistance at zero degree Centigrade).
	2	No. of element	: Duplex
	3	Housing/Head	: IP-65/Diecast Aluminium. Head of TE to be provided with sufficient space and arrangement to mount head mounted temperature transmitter (as applicable). Plug in connectors are to be
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-III-C-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 7 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS एनडीपीपी NTPC			
3.03.00	provided for external signal cable connection. TE terminal head shall be spring loaded for positive contacts with the thermo well 4 Insulation and sheathing of RTD : Mineral (magnesium oxide) insulation and SS316 sheath, 5 Calibration and accuracy : As per IEC-751/ DIN-43760 Class-A for RTD 6 Accessories : Thermo well and associated fittings 7 Standard : IEC-751/ DIN-43760 for RTD and ASME PTC-19.3 for Thermo-well. NOTES : 1) The specifications for RTDs of winding/ bearings of motor/pump, can be as per their manufacturer standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice. However the type of RTD shall be Pt100. 2) The specifications of temp elements for air conditioning & ventilation system / process can be as per system manufacturer's standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice.			
	Metal Temperature Thermocouples Measuring Medium Metal Temperature Material of Thermocouple. Chromel Alumel Type K Type of Thermocouple Duplex with ungrounded separate hot junctions Insulation Mineral Insulation (Magnesium Oxide). Thermocouple wire gauge 16 AWG Protective sheath SS 321 Protective sheath dia 8 mm OD Calibration & accuracy As per IEC-584/ ANSI-MC-96.1 (special limits of error) for T/C Mounting accessories 1/2" BSP SS sliding end connector, weld pad, clamps of heat resistant steel SS310. Adjustable gland fitting for connection at the junction box end as per manufacturer's standard. Cold end sealing SS pot seal with colour coded PTFE Insulated flexible tails. Sealing compound- Epoxy resin. Length of PTFE insulated flying leads shall be minimum 750 mm.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 8 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Minimum bending radius 30 mm Length of T/C On as required basis considering location of measurement point and the JB/TTJB location. Notes : 1) The specification for thermocouples of bearings metal temp measurements can be as per their manufacturer standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice. However type of thermocouples shall be K-type. 2) For boiler metal temperature applications, considering the location of installations and response time, manufacturer's standard and proven specification for metal temperature measurement can also be accepted subject to employer's approval. The manufacturer shall submit adequate supporting documents for establishing their standard and proven practice.			
3.04.00	Thermo well (for all process temp. elements) (a) Shall be one piece solid bored type of 316 SS of step-less tapered design. (As per ASME PTC 19.3, 1974) (b) For Mill classifier outlet long life solid sintered tungsten carbide material of high abrasion resistance shall be provided. (c) For Air & Flue gas 316 SS protecting tube with welded cap. (However contractor shall provide better material for Flue gas service if required based on the specified boiler design parameters). (d) For furnace zone, impervious ceramic protecting tube of suitable material along with Incoloy supporting tubes and adjustable flanges.			
3.05.00	Not Used			
3.06.0	TEMPERATURE TRANSMITTER (TT) Following types of 2-wire (loop powered) temperature transmitter (directly powered from 4-20mA input cards of DDCMIS/PLC) shall be provided. The temperature transmitter shall be fully compatible with thermocouples and RTDs being provided by the contractor. Temperature compensation of the thermocouples shall be performed in the temperature transmitter itself. a. Single Input Head mounted Temperature Transmitter These shall be suitable for mounting in the head of temperature element itself. Temperature transmitter and associated temperature element shall be factory fitted. b. Single Input DIN-rail mounted Temperature Transmitter These shall be suitable for mounting on DIN-rails in JB's. The specifications of the JB's shall be same as indicated in Subsection INST CABLE with additional DIN-rails and IP 65 Protection class. This temperature transmitter shall be the ones which are			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE -I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		PAGE 9 OF 46
		SUB-SECTION-III-C-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)		

CLAUSE NO.	TECHNICAL REQUIREMENTS						एनटीपीसी NTPC
3.00.00	TYPE TEST REQUIREMENT FOR C&I SYSTEMS						
	Sl. No	Item	Test Requirement	Standard	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate	
	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	
	1	Elect. Metering instruments	As per standard (col 4)	IS-1248	No	Yes	
	2	Transducers	As per standard (col 4)	IEC-60688,IS12784	No	Yes	
	3	Thermocouple	Degree of protection test	IS-13947	No	No	
	4	RTD	As per standard (col 4)	IEC-60751	No	No	
	5	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes	
	6	E/P converter	As per standard (col 4)	Mfr. standard	No	No	
	7	Dust emission monitor	Degree of protection test	IS-13947	No	Yes	
	8	Instrumentation Cables Twisted & Shielded*					
		-Conductor	Resistance test	VDE-0815	No	Yes	
			Diameter test	IS-10810	No	Yes	
			Tin Coating test (Persulphate test)	IS-8130	No	Yes	
		-Insulation	Loss of mass	VDE 0472	No	Yes	
		Ageing in air ovens**	VDE 0472	No	Yes		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)			TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS		PAGE 3 OF 9



STANDARD CHECK LIST FOR C&I INSTRUMENTS

CHECK LIST FOR TEMPERATURE ELEMENT - RTD

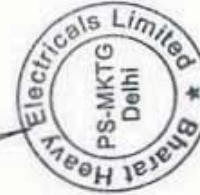
Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	TYPE						
	MODEL No./TAG No.						
	PROCESS CONNECTION						
2	STABILITY	-do-	-do-	P	W	V	
3	INSULATION RESISTANCE	-do-	-do-	P	W	V	
4	ENCLOSURE CLASS	-do-	-do-	P	W	V	
5	RESPONSE TIME	-do-	-do-	P	W	V	
7	ACCURACY	-do-	-do-	P	W	V	
8	HYDROSTATIC TEST	-do-	-do-	P	W	V	
9	ELECTRICAL CHARACTERISTIC OF SENSOR (CONTINUITY OF T/C WIRES & INSULATION RESISTANCE OF RTD LEADS w.r.t. BODY	-do-	-do-	P	W	V	
10	TEMP CURVES / CHARTS			P	V	V	
11	AMBIENT TEMP. EFFECT CHECK	-do-	-do-	P	W	V	
12	HV TEST	-do-	-do-	P	W	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same alongwith test certificates to be verified by BHEL.
- IBR certificate to be provided, if applicable



PROJECT : Patratu STPS Phase-I (3 x600MW)										LIST OF ITEMS REQUIRING QP			
PACKAGE : EPC PACKAGE										APPROVAL & ACCEPTABLE			
CONTRACTOR : BHEL Ltd										VENDOR AS APPROVED BY			
CONTRACT NO : CS-955-001-3													
No.	Major Equipment	QP Inspect on Category	QP No. 1585-001-CVI-Q	QP Submis sion SCH	QP Appro val SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub-SCH	SS Sub OR	Remark		
		Y				YOKOGAWA	Bangalore	A			EJA-E series 110.430.530		
		III				ABB	Bangalore	A			Model - 2600 T		
		III				ABB	GERMANY / Italy	A			Model - 2600 T		
		III				Siemens	France / India	A					
		III				Honeywell	Pune	A			SMAR Make		
		III				Lexson Automation	Daman	A			SMAR Make		
		III				Balco	Mumbai	A					
		*				ENDRESS & HOUSER	Aurangabad/ Germany	DR					
		*				CHINO	Chazlabyad	DR					
26	Thermocouples, RTD & Thermowells	III				HERAUS SENSOR	GERMANY	A		Sub QR			
		III				WISE Control	Korea	A					
		II				Tempos	Udaipur	A					
		II				Prodyectric	Goa	A					
		II				Delta Instrumentation & Electronics Ltd	Mumbai	A					
		III				Misco	USA	A					
		III				OKAZAKI corporation	JAPAN	A					
		III				Yamat	JAPAN	A					
		III				Yamat	Singapore	A					
		III				ABB/SENSYCON	Germany	A					
		III				EMERSON (Rosemount)	Germany	A					
		II				EMERSON (Rosemount)	Pavane	A			For RTD Reference Est and Performance feedback is to be submitted.		
		II				Thermal Instruments(GIC)	Savarivadi	A			Imported from Emerson, Germany (make)		
		II				Techno Instruments	Maharashtra	A					
		II				GQA Instrument Industries	GOA	A					
		*				GQA Instrument Industries	GOA	DR					
		*				WKA	Pune	DR					
		*				Techinval Industries	Ajmer	DR					
		*				E & H	Aurangabad	DR					
		*				Nestech	Vapi	DR					
		*				Industrial Instruments	Kolkata	DR					
		*				Exotherm	Thane	DR					
		*				Baumer Technologies	Vapi	DR					
		*				Plant Engineering	Noida	DR					
		*				Siemens India	Gurgaon	DR					
		II				Jindal Electronics	Roorkee	A					
		II				E & H	Aurangabad/ Germany	A			For Generator Turbine & Motor		
28	Ultrasonic type level Transmitter	III				EMERSON	Germany	A		Sub QR			
		III				BEIEMERS MILTRONICS	Pavane	A					
		III				Nivelco	CANADA	A					
		*				Vega	Hungary	DR					

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P. H. H.

PEM REGISTERED VENDOR

Package Name	Vendor Name	Vendor Address	Remarks
TEMP. ELEMENT	DETRIVE INSTRUMENTATION & ELECTRONICS LTD.	320, TV INDUSTIAL ESTATE, OFF.DR.A.BESANT ROAD, BEHIND GLAXO, WORLI, MUMBAI-MAHARASHTRA-INDIA Phone- 24934125,24938403 Pincode : 400025 Email : trivtech@vsnl.com	
TEMP. ELEMENT	GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	D2/5, Mapusa Industrial Estate, Mapusa, Goa,- MAHARASHTRA-INDIA Phone- 09326054551, Pincode : 403507, Email : sumukh@goainstruments.com,	
TEMP. ELEMENT	GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai,-Maharashtra,-India, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@general-gauges.com,	
TEMP. ELEMENT	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai,-Maharashtra,-INDIA Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	
TEMP. ELEMENT	Tempsens Instrument (I) Pvt Ltd	MR. V.P.RATHI/MR. HEMANT RATHI B-188A ROAD NO.5 , M.I.A UDAIPUR-RAJASTHAN-INDIA Phone- 09352420069 Pincode : 313003 Email : info@tempsens.com	
TEMP. ELEMENT	Thermal Instrument India Pvt. Ltd.	Mr. Raghavendra M. Kulkarni 194/195, Gopi Tank Road Behind Citylight Cinema,Mahim Mumbai-Maharashtra-India Phone- 09322664709 Pincode : 400016 Email : ramk@qiconindia.com	
TEMP. ELEMENT	TOSHNIWAL INDUSTRIES PVT. LTD.,	Industrial Estate, Makhupura, Ajmer,-Rajasthan,-India, Phone- 9352009000, Pincode : 305002, Email : info@tipl.com,	
TEMP. ELEMENT	Nesstech Instruments Private Limited	26/2, G Type, Global Industrial Park Near Nahuli Railway Crossing, Valvada Vapi-Gujarat-India Phone- 9920576002 Pincode : 396105 Email : sales@nesstech.co.in	
TEMP. ELEMENT	PYRO ELECTRIC INSTRUMENTS GOA PVT.LTD.	M. D. BICHU/R. M. BICHU G.B, HILL CROWN APARTMENTS, COLLEGE ROAD, MAPUSA-GOA-INDIA Phone- 9326114601 Pincode : 403507 Email : priyanka.marketing@pyro-electric.in	
TEMP. ELEMENT	Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI-Maharashtra-INDIA Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	, NAME HAS BEEN CHANGED FROM M/S WAAREE INSTRUMENTS LTD. TO M/S BAUMER TECHNOLOGIES INDIA PVT. LTD. W.E.F. 13.06.2012 .

NOTE:

1. The above sub-vendor list is tentative & reference only. However Sub-Vendor List is subject to BHEL/ end user approval without any commercial/ delivery implication.
2. New Sub-Vendor if proposed by Vendor during contract stage shall subject to BHEL/ end user approval without any commercial/delivery implication.



TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-100-N001**

SECTION: **I**

SUB-SECTION: **ID**

REV. NO. **00** DATE **25/04/2019**

SHEET **1** OF **1**

SUB-SECTION – ID

DATASHEET-A

MISC. PUMPS HORIZONTAL TYPE-1

DATASHEET-A

SPEC. NO. PE-TS-434-100-N001

SECTION-ID

REV-00

3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

DATE: 20/4/19

Sl. No.	DESCRIPTION	DM WATER MAKE UP PUMPS HORIZONTAL PUMPS (TYPE-I)	BOILER FILL PUMPS HORIZONTAL PUMPS (TYPE-I)	RAW WATER ASH PUMPS HORIZONTAL PUMPS (TYPE-I)	HVAC M/U WATER PUMP HORIZONTAL PUMPS (TYPE-I)
1.0	SERVICE				
1.1	Total no. of pumps for Project	4	2	2	2
1.2	No. of working & standby pumps	(3W+1S) for station	(1W+1S) for station	(1W+1S) for station	(1W+1S) for station
1.3	Liquid Handled (ref. water analysis enclosed herein)	DM Water	DM Water	Raw water	Clarified Water
1.4	Location (Indoor / Outdoor)	Outdoor	Outdoor	Outdoor	Outdoor
1.5	Duty	Continuous	Intermittent	Continuous	Continuous
1.6	No. of pumps working in parallel	3	-	-	-
1.7	Specific gravity	1	1	1	1
1.8	System design pressure (kg/sqcm), g	12	25	12	12
2.0	DESIGN PARAMETERS				
2.1	Design capacity each, M ³ /hr	75	250	150	150
2.2	Total dynamic head (MWC)	70	175	35	70
2.3	Suction Pressure(MWC)	Flooded suction	Flooded suction	Flooded suction	Flooded suction
2.4	Design Temperature (°C)	50	50	60	60
2.5	Maximum permissible speed of pump (RPM)	1500	1500	1500	1500
2.6	Max. limit on shut off head Corresponding to pump TDH (MWC) at 51.5 Hz	Not to exceed 110 MWC	Not to exceed 225 MWC	Not to exceed 108 MWC	Not to exceed 110MWC
2.7	Operating range	-----40-120% of design duty point flow-----			
2.8	Motor rating	Continuous motor rating (at 50 deg. C ambient) shall be 10% above the max power requirement at any condition of the entire characteristic curve of the pump (viz. 0-120%).			
2.9	Permissible tolerance in rated capacity & TDH	no negative tolerance			
2.10	Permissible tolerance in efficiency at rated capacity(%)	no negative tolerance			
2.11	Performance/Design Standard	HIS			
3.0	CONSTRUCTION FEATURES				
3.1	Pump type	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump
3.2	Impeller type	Closed	Closed	Closed	Closed
3.3	Casing type	Radial/ Axial split type	Radial/ Axial split type	Radial/ Axial split type	Radial/ Axial split type
3.4	Coupling type	Spacer Type	Spacer Type	Spacer Type	Spacer Type
3.5	Sealing arrangement	Gland packing initially & Mechanical seal finally after commisioning	Gland packing initially & Mechanical seal finally after commisioning	Self Water / Gland	Self Water / Gland
3.6	Type of Lubrication	Grease/self Liquid	Grease/self Liquid	Grease/self Liquid	Grease/self Liquid
3.7	Pump characteristics	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable
3.8	Drain Plugs, vent with valve, lifting lugs, priming connection, coupling guard, Positioning dowels, Companion flanges with nuts, bolts & gaskets	YES			
4.0	MATERIALS OF CONSTRUCTION				
4.1	Casing	ASTM A 351 CF 8M	ASTM A 351 CF 8M	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260
4.2	Impeller	ASTM A 351 CF 8M	ASTM A 351 CF 8M	ASTM A 351 CF8M / SS316	ASTM A 351 CF8M / SS316
4.3	Shaft	SS 316	SS 316	SS316 / SS410	SS316 / SS410
4.4	Shaft Sleeves	SS-410	SS-410	SS-410	SS-410
4.5	Impeller Wearing rings	SS 316	SS 316	SS 316	SS 316
4.6	All Fasteners	Stainless steel	Stainless steel	Stainless steel	Stainless steel
4.7	Gland/Seal Cover	SS 316	SS 316	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260
4.8	Lantern Ring	SS 316	SS 316	SS 316	SS 316
4.9	Mech. seal	Manufacturer standard	Manufacturer standard	NA	NA
4.10	Gland Packing	Asbestos Free (Teflon Impregnated)	Asbestos Free (Teflon Impregnated)	Asbestos Free (Teflon Impregnated)	Asbestos Free (Teflon Impregnated)

MISC. PUMPS HORIZONTAL TYPE-1

DATASHEET-A

SPEC. NO. PE-TS-434-100-N001

SECTION-ID

REV-00

3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

DATE: 20/4/19

Sl. No.	DESCRIPTION	DM WATER MAKE UP PUMPS	BOILER FILL PUMPS	RAW WATER ASH PUMPS	HVAC M/U WATER PUMP
4.11	Base Plate	MS fabricated IS-2062 (min. thk.-10 mm) Epoxy Coated			
4.12	Stuffing Box	ASTM A 351 CF 8M	ASTM A 351 CF 8M	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260
4.13	Casing Wearing rings (If applicable)	SS 316	SS 316	SS 316	SS 316
4.14	Coupling	Spacer Type	Spacer Type	Spacer Type	Spacer Type
4.15	Connecting Pipe material (for deciding counterflange material)	SA 312 TP 304 (stainless steel)	SA 312 TP 304 (stainless steel)	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410
5.0	MANDATORY SPARES FOR PUMP-MOTOR SET				
5.1	Motor	1 no.	NA	1 no.	1 no.
	Mandatory Spare Note: 1. 1 Set consists of quantity required for complete replacement for one pump. 2. In case spares indicated in the list are not applicable to the particular design offered by the bidder, same shall be indicated in the price schedule. However if spare is found to be applicable during detailed engineering, same shall be provided by the bidder without any price implication to BHEL.				
6.0	BID EVALUATION RATE				
6.1	Bid evaluation rate	Rs.2.0 Lacs/KW	NA	Rs.2.0 Lacs/KW	Rs.2.0 Lacs/KW
6.2	Maximum permissible efficiency for Bid evaluation				
6.2.1	Pump Efficiency	70	-	75	79
6.2.2	Motor Efficiency	93	-	93	94
Notes :					
1	Material of construction for other components not specified above shall be similarly selected in line with the above for the duty intended and subject to approval.				
2	For items stated as not applicable by bidder, shall have to be supplied without any cost implication to BHEL in the event they are found to be applicable during detail engineering stage.				
3	For all HT motor driven pumps (wherever applicable), bidder shall provide flat surface with dimensions 60 MM x60 MM on bearing Housing for mounting vibration measuring block and a key slots of dimensions 30MM (L) X 15 MM (W) X 3 MM (D) on each pump shaft or some other suitable location which shall be confirmed during detail engineering by BHEL for Phase Marker.				
4	Wherever SS material is coming in contact with non SS material, suitable isolation (rubber etc.) shall be provided to avoid galvanic corrosion.				

MISC. PUMPS HORIZONTAL TYPE-2

DATASHEET-A

SPEC. NO. PE-TS-434-100-N001

SECTION-ID

REV-00

3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

DATE: 20/4/19

Sl. No.	DESCRIPTION	ECW (TG AUX.) PUMPS	ECW (SG AUX'S) PUMPS	ECW COMMON STATION AUX'S PUMPS	ACW PUMPS	AHS COOLING PUMPS	ACW COMMON STATION AUX. PUMPS
		HORIZONTAL PUMPS (TYPE-II)	HORIZONTAL PUMPS (TYPE-II)	HORIZONTAL PUMPS (TYPE-II)	HORIZONTAL PUMPS (TYPE-II)	HORIZONTAL PUMPS (TYPE-II)	HORIZONTAL PUMPS (TYPE-II)
1.0	SERVICE						
1.1	Total no. of pumps for Project	9	6	2	9	2	2
1.2	No. of working & standby pumps	(2W+1S) per unit	(1W+1S) per unit	(1W+1S) for Station	(2W+1S) per unit	(1W+1S) for station	(1W+1S) for station
1.3	Liquid Handled (ref. water analysis enclosed herein)	pH corrected DM Water	pH corrected DM Water	pH corrected DM Water	Clarified water	Clarified water	Clarified water
1.4	Location (Indoor / Outdoor)	Indoor	Indoor	Outdoor	Outdoor	Outdoor	Outdoor
1.5	Duty	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
1.6	No. of pumps working in parallel	2	-	-	2	-	-
1.7	Specific gravity	1	1	1	1	1	1
1.8	System design pressure (kg/sqcm), g	10	12	10	10	10	10
2.0	DESIGN PARAMETERS						
2.1	Design capacity each, M ³ /hr	1350	650	2950	1900	705	2950
2.2	Total dynamic head (MWC)	35	56	40	50	75	31
2.3	Suction Pressure(MWC)	25.5	25.5	25.5	Flooded suction	Flooded suction	Flooded suction
2.4	Design Temperature (°C)	60	60	60	60	60	60
2.5	Maximum permissible speed of pump (RPM)	1500	1500	1500	1500	1500	1500
2.6	Max. limit on shut off head Corresponding to pump TDH (MWC) at 51.5 Hz	Not to exceed 65 MWC	Not to exceed 86 MWC	Not to exceed 65 MWC	Not to exceed 90 MWC	Not to exceed 92 MWC	Not to exceed 90 MWC
2.7	Operating range	-----40-120% of design duty point flow-----					
2.8	Motor rating	Continuous motor rating (at 50 deg. C ambient) shall be 10% above the max power requirement at any condition of the entire characteristic curve of the pump (viz. 0-120%).					
2.9	Permissible tolerance in rated capacity & TDH	no negative tolerance					
2.10	Permissible tolerance in efficiency at rated capacity(%)	no negative tolerance					
2.11	Performance/Design Standard	HIS					
3.0	CONSTRUCTION FEATURES						
3.1	Pump type	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump
3.2	Impeller type	Closed	Closed	Closed	Closed	Closed	Closed
3.3	Casing type	Horizontal Axial split type	Horizontal Axial split type	Horizontal Axial split type	Horizontal Axial split type	Horizontal Axial split type	Horizontal Axial split type
3.4	Coupling type	Flexible type	Flexible type	Flexible type	Flexible type	Flexible type	Flexible type
3.5	Sealing arrangement	Gland packing initially & Mechanical seal finally after commisioning	Gland packing initially & Mechanical seal finally after commisioning	Gland packing initially & Mechanical seal finally after commisioning	Gland packing initially & Mechanical seal finally after commisioning	Gland packing initially & Mechanical seal finally after commisioning	Gland packing initially & Mechanical seal finally after commisioning
3.6	Type of Lubrication	Self Liquid	Self Liquid	Self Liquid	Self Liquid	Self Liquid	Self Liquid
3.7	Pump characteristics	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable
3.8	Drain Plugs, vent with valve, lifting lugs, priming connection, coupling guard, Positioning dowels, Companion flanges with nuts, bolts & gaskets	Required					
4.0	MATERIALS OF CONSTRUCTION						
4.1	Casing	ASTM – A351 – CF8M	ASTM – A351 – CF8M	ASTM – A351 – CF8M	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260
4.2	Impeller	ASTM – A351 – CF8M	ASTM – A351 – CF8M	ASTM – A351 – CF8M	Bronze to IS 318 Gr I/II./SS316	Bronze to IS 318 Gr I/II./SS316	Bronze to IS 318 Gr I/II./SS316
4.3	Shaft	SS 316	SS 316	SS 316	SS 316	SS 316	SS 316
4.4	Shaft Sleeves	SS 410	SS 410	SS 410	SS 410	SS 410	SS 410
4.5	Impeller Wearing rings	SS 316	SS 316	SS 316	High Leaded Bronze to IS 318 Gr. V/ SS 316 in case of SS impeller.	High Leaded Bronze to IS 318 Gr. V/ SS 316 in case of SS impeller.	High Leaded Bronze to IS 318 Gr. V/ SS 316 in case of SS impeller.
4.6	All Fasteners	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
4.7	Gland/Seal Cover	SS 316	SS 316	SS 316	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260

MISC. PUMPS HORIZONTAL TYPE-2

DATASHEET-A

SPEC. NO. PE-TS-434-100-N001

SECTION-ID

REV-00

3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

DATE: 20/4/19

Sl. No.	DESCRIPTION	ECW (TG AUX.) PUMPS	ECW (SG AUX'S) PUMPS	ECW COMMON STATION AUX'S PUMPS	ACW PUMPS	AHS COOLING PUMPS	ACW COMMON STATION AUX. PUMPS
4.9	Lantern Ring	SS 316	SS 316	SS 316	Bronze	Bronze	Bronze
4.10	Mech. seal	Manufacturer standard	Manufacturer standard	Manufacturer standard	Manufacturer standard	Manufacturer standard	Manufacturer standard
4.10	Gland Packing	Braided Impregnated Teflon (Asbestos Free)	Braided Impregnated Teflon (Asbestos Free)	Braided Impregnated Teflon (Asbestos Free)	Braided Impregnated Teflon (Asbestos Free)	Braided Impregnated Teflon (Asbestos Free)	Braided Impregnated Teflon (Asbestos Free)
4.11	Base Plate	MS fabricated IS-2062 (min. thk.-10 mm) Epoxy Coated					
4.12	Stuffing Box	ASTM A 351 CF 8M	ASTM A 351 CF 8M	ASTM A 351 CF 8M	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260
4.13	Casing Wearing rings (If applicable)	SS 316	SS 316	SS 316	High Leaded Bronze to IS 318 Gr. V/ SS 316 in case of SS impeller.	High Leaded Bronze to IS 318 Gr. V/ SS 316 in case of SS impeller.	High Leaded Bronze to IS 318 Gr. V/ SS 316 in case of SS impeller.
4.14	Coupling	Spacer Type	Spacer Type	Spacer Type	Spacer Type	Spacer Type	Spacer Type
4.15	Connecting Pipe material (for deciding counterflange material)	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410
5.0	MANDATORY SPARES FOR PUMP-MOTOR SET						
5.1	Impeller	-	1 No.	-	-	-	-
5.2	Shafts	-	1 No.	-	-	-	-
5.3	Shaft Sleeve (DE & NDE)	2 Sets for each type of pump	2 Nos.	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump
5.4	Casing wearing rings	2 Sets for each type of pump	2 sets	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump
5.5	Impeller wearing rings	2 Sets for each type of pump	2 sets	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump
5.6	Bearings for the pumps	2 Sets for each type of pump	2 Sets of each type	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump
5.7	Motor and motor bearings	-	NA	-	-	-	-
5.8	Thrust Bearings	2 Sets for each type of pump	2 Sets of each type & size	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump
5.9	Sleeve nuts and O-rings	2 Sets for each type of pump	1 Sets of each type & size	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump	2 Sets for each type of pump
5.10	Gland & Gland Packing (if applicable)	-	2 Sets of each type & size	-	-	-	-
5.11	Fastners	1 Set for each type of pump	1 Set of each type and size	1 Set for each type of pump	1 Set for each type of pump	1 Set for each type of pump	1 Set for each type of pump
5.12	Complete Coupling(Pump & Motor)	1 Set for each type of pump	1 Set of each type and size	1 Set for each type of pump	1 Set for each type of pump	1 Set for each type of pump	1 Set for each type of pump
5.13	Mechanical seal (both DE and NDE)	2 Sets each of DE & NDE for each type of pump	1 Set of each type and size	2 Sets each of DE & NDE for each type of pump	NA	NA	NA
5.14	Complete Assembly of Pump With Coupling	1 No.	-	1 No.	1 No.	1 No.	1 No.
5.15	Gland Packing (DE & NDE) if applicable	4 Sets for each type of pump	-	4 Sets for each type of pump	4 Sets for each type of pump	4 Sets for each type of pump	4 Sets for each type of pump
5.16	Rotary & stationary faces for mech. seal (DE & NDE)	4 Sets each of DE & NDE for each type of pump	-	4 Sets each of DE & NDE for each type of pump	NA	NA	NA
5.17	Set of soft parts for mech. seal (O -rings , gaskets)	8 Sets for each type of pump	-	8 Sets for each type of pump	NA	NA	NA
5.18	Stuffing Box	-	-	-	-	-	-
5.19	Coupling between pump & motor, bushes, pins with all fasteners & coupling guards	-	-	-	-	-	-
5.20	Gland, Packing & Gland Assembly for each type	-	-	-	-	-	-
5.21	Motor	-	-	-	-	-	-
	Mandatory Spare Note: 1. 1 Set consists of quantity required for complete replacement for one pump. 2. In case spares indicated in the list are not applicable to the particular design offered by the bidder, same shall be indicated in the price schedule. However if spare is found to be applicable during detailed engineering, same shall be provided by the bidder without any price implication to BHEL.						
6.0	BID EVALUATION RATE						
6.1	Bid evaluation rate	Rs.2.0 Lacs/KW	Rs.2.0 Lacs/KW	Rs.2.0 Lacs/KW	Rs.2.0 Lacs/KW	Rs.2.0 Lacs/KW	Rs.2.0 Lacs/KW
6.2	Maximum permissible efficiency for Bid evaluation						
6.2.1	Pump Efficiency	85	83	86	84	82	87

MISC. PUMPS HORIZONTAL TYPE-2

DATASHEET-A
SECTION-ID
3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

SPEC. NO. PE-TS-434-100-N001
REV-00
DATE: 20/4/19

Sl. No.	DESCRIPTION	ECW (TG AUX.) PUMPS	ECW (SG AUX'S) PUMPS	ECW COMMON STATION AUX'S PUMPS	ACW PUMPS	AHS COOLING PUMPS	ACW COMMON STATION AUX. PUMPS
6.2.2	Motor Efficiency	95	95	95	95	95	95
Notes :							
1	Material of construction for other components not specified above shall be similarly selected in line with the above for the duty intended and subject to approval.						
2	For items stated as not applicable by bidder, shall have to be supplied without any cost implication to BHEL in the event they are found to be applicable during detail engineering stage.						
3	For all HT motor driven pumps (wherever applicable), bidder shall provide flat surface with dimensions 60 MM x60 MM on bearing Housing for mounting vibration measuring block and a key slots of dimensions 30MM (L) X 15 MM (W) X 3 MM (D) on each pump shaft or some other suitable location which shall be confirmed during detail engineering by BHEL for Phase Marker.						
4	Wherever SS material is coming in contact with non SS material, suitable isolation (rubber etc.) shall be provided to avoid galvanic corrosion.						

MISC. PUMPS HORIZONTAL TYPE-2

DATASHEET-A
SECTION-ID

SPEC. NO. PE-TS-434-100-N001

REV-00

3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

DATE: 20/4/19

Sl. No.	DESCRIPTION	CONDENSATE TRANSFER PUMPS	RAW WATER PT PUMPS	APH WASH PUMPS	SERVICE WATER PUMP	FGD MAKE-UP WATER PUMPS	ACW MAKE-UP WATER PUMPS
		HORIZONTAL PUMPS (TYPE-II)	HORIZONTAL PUMPS (TYPE-II)	HORIZONTAL PUMPS (TYPE-II)	HORIZONTAL PUMPS (TYPE-II)	HORIZONTAL PUMPS (TYPE-II)	HORIZONTAL PUMPS (TYPE-II)
1.0	SERVICE						
1.1	Total no. of pumps for Project	3	3	2	2	2	2
1.2	No. of working & standby pumps	(3W) for station	(2W+1S) for station	(1W+1S) for station	(1W+1S) for station	(1W+1S) for station	(1W+1S) for station
1.3	Liquid Handled (ref. water analysis enclosed herein)	DM Water	Raw water	Clarified Water	Clarified Water	Clarified Water	Clarified Water
1.4	Location (Indoor / Outdoor)	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor
1.5	Duty	Intermittent	Continuous	Intermittent	Continuous	Continuous	Continuous
1.6	No. of pumps working in parallel	3	2	-	-	-	-
1.7	Specific gravity	1	1	1	1	1	1
1.8	System design pressure (kg/sqcm), g	10	12	12	12	12	12
2.0	DESIGN PARAMETERS						
2.1	Design capacity each, M ³ /hr	355	1475	1050	1400	675	325
2.2	Total dynamic head (MWC)	50	25	93	75	35	20
2.3	Suction Pressure(MWC)	10	Flooded suction	Flooded suction	Flooded suction	Flooded suction	Flooded suction
2.4	Design Temperature (°C)	50	60	60	60	60	60
2.5	Maximum permissible speed of pump (RPM)	1500	1500	1500	1500	1500	1500
2.6	Max. limit on shut off head Corresponding to pump TDH (MWC) at 51.5 Hz	Not to exceed 90 MWC	Not to exceed 100 MWC	Not to exceed 114 MWC	Not to exceed 108 MWC	Not to exceed 100 MWC	Not to exceed 100 MWC
2.7	Operating range	-----40-120% of design duty point flow-----					
2.8	Motor rating	Continuous motor rating (at 50 deg. C ambient) shall be 10% above the max power requirement at any condition of the entire characteristic curve of the pump (viz. 0-120%).					
2.9	Permissible tolerance in rated capacity & TDH	no negative tolerance					
2.10	Permissible tolerance in efficiency at rated capacity(%)	no negative tolerance					
2.11	Performance/Design Standard	HIS					
3.0	CONSTRUCTION FEATURES						
3.1	Pump type	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump	Horizontal centrifugal type Between Bearing Pump
3.2	Impeller type	Closed	Closed	Closed	Closed	Closed	Closed
3.3	Casing type	Radial/ Axial split type	Radial/ Axial split type	Radial/ Axial split type	Radial/ Axial split type	Radial/ Axial split type	Radial/ Axial split type
3.4	Coupling type	Spacer Type	Spacer Type	Spacer Type	Spacer Type	Spacer Type	Spacer Type
3.5	Sealing arrangement	Gland packing initially & Mechanical seal finally after commisioning	Self Water / Gland	Self Water / Gland	Self Water / Gland	Self Water / Gland	Self Water / Gland
3.6	Type of Lubrication	Grease/self Liquid	Grease/self Liquid	Grease/self Liquid	Grease/self Liquid	Grease/self Liquid	Grease/self Liquid
3.7	Pump characteristics	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable
3.8	Drain Plugs, vent with valve, lifting lugs, priming connection, coupling guard, Positioning dowels, Companion flanges with nuts, bolts & gaskets						
4.0	MATERIALS OF CONSTRUCTION						
4.1	Casing	ASTM A 351 CF 8M	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260
4.2	Impeller	ASTM A 351 CF 8M	ASTM A 351 CF8M / SS316	ASTM A 351 CF8M / SS316	ASTM A 351 CF8M / SS316	ASTM A 351 CF8M / SS316	ASTM A 351 CF8M / SS316
4.3	Shaft	SS 316	SS316 / SS410	SS316 / SS410	SS316 / SS410	SS316 / SS410	SS316 / SS410
4.4	Shaft Sleeves	SS-410	SS-410	SS-410	SS-410	SS-410	SS-410
4.5	Impeller Wearing rings	SS 316	SS 316	SS 316	SS 316	SS 316	SS 316
4.6	All Fasteners	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
4.7	Gland/Seal Cover	SS 316	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260
4.9	Lantern Ring	SS 316	SS 316	SS 316	SS 316	SS 316	SS 316
4.10	Mech. seal	Manufacturer standard	NA	NA	NA	NA	NA

MISC. PUMPS HORIZONTAL TYPE-2

DATASHEET-A

SPEC. NO. PE-TS-434-100-N001

SECTION-ID

REV-00

3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

DATE: 20/4/19

Sl. No.	DESCRIPTION	CONDENSATE TRANSFER PUMPS	RAW WATER PT PUMPS	APH WASH PUMPS	SERVICE WATER PUMP	FGD MAKE-UP WATER PUMPS	ACW MAKE-UP WATER PUMPS
4.10	Gland Packing	Asbestos Free (Teflon Impregnated)	Asbestos Free (Teflon Impregnated)	Asbestos Free (Teflon Impregnated)	Asbestos Free (Teflon Impregnated)	Asbestos Free (Teflon Impregnated)	Asbestos Free (Teflon Impregnated)
4.11	Base Plate						
4.12	Stuffing Box	ASTM A 351 CF 8M	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260	2.5% Ni Cl to IS: 210 Gr FG-260
4.13	Casing Wearing rings (If applicable)	SS 316	SS 316	SS 316	SS 316	SS 316	SS 316
4.14	Coupling	Spacer Type	Spacer Type	Spacer Type	Spacer Type	Spacer Type	Spacer Type
4.15	Connecting Pipe material (for deciding counterflange material)	SA 312 TP 304 (stainless steel)	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410	Carbon Steel as per IS:2062, Plates rolled & welded as per IS 3589 Gr. 410
5.0	MANDATORY SPARES FOR PUMP-MOTOR SET						
5.1	Impeller	-	-	1 Set for each type	1 Set for each type	-	1 Set for each type
5.2	Shafts	-	-	1 Set for each type	1 Set for each type	-	1 Set for each type
5.3	Shaft Sleeve (DE & NDE)	-	-	1 Set for each type	1 Set for each type	-	1 Set for each type
5.4	Casing wearing rings	-	-	1 Set for each type	1 Set for each type	-	1 Set for each type
5.5	Impeller wearing rings	-	-	1 Set for each type	1 Set for each type	-	1 Set for each type
5.6	Bearings for the pumps	-	-	1 Set for each type	1 Set for each type	-	1 Set for each type
5.7	Motor and motor bearings	-	-	-	-	-	-
5.8	Thrust Bearings	-	-	-	-	-	-
5.9	Sleeve nuts and O-rings	-	-	-	-	-	-
5.10	Gland & Gland Packing (if applicable)	-	-	-	-	-	-
5.11	Fastners	-	-	-	-	-	-
5.12	Complete Coupling(Pump & Motor)	-	-	-	-	-	-
5.13	Mechanical seal (both DE and NDE)	-	-	-	-	-	-
5.14	Complete Assembly of Pump With Coupling	-	-	-	-	-	-
5.15	Gland Packing (DE & NDE) if applicable	-	-	-	-	-	-
5.16	Rotary & stationary faces for mech. seal (DE & NDE)	-	-	-	-	-	-
5.17	Set of soft parts for mech. seal (O -rings , gaskets)	-	-	-	-	-	-
5.18	Stuffing Box	-	-	1 Set for each type	1 Set for each type	-	1 Set for each type
5.19	Coupling between pump & motor, bushes, pins with all fasteners & coupling guards	-	-	1 Set	1 Set	-	1 Set
5.20	Gland, Packing & Gland Assembly for each type	-	-	1 Set	1 Set	-	1 Set
5.21	Motor	1 no.	1 no.	NA	NA	-	-
	Mandatory Spare Note: 1. 1 Set consists of quantity required for complete replacement for one pump. 2. In case spares indicated in the list are not applicable to the particular design offered by the bidder, same shall be indicated in the price schedule. However if spare is found to be applicable during detailed engineering, same shall be provided by the bidder without any price implication to BHEL.						
6.0	BID EVALUATION RATE						
6.1	Bid evaluation rate	NA	Rs.2.0 Lacs/KW	NA	Rs.2.0 Lacs/KW	Rs.2.0 Lacs/KW	Rs.2.0 Lacs/KW
6.2	Maximum permissible efficiency for Bid evaluation						
6.2.1	Pump Efficiency	-	86	-	85	84	85
6.2.2	Motor Efficiency	-	95.3	-	95	95	92.9
Notes :							
1	Material of construction for other components not specified above shall be similarly selected in line with the above for the duty intended and subject to approval.						

MISC. PUMPS HORIZONTAL TYPE-2

DATASHEET-A

SPEC. NO. PE-TS-434-100-N001

SECTION-ID

REV-00

3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

DATE: 20/4/19

Sl. No.	DESCRIPTION	CONDENSATE TRANSFER PUMPS	RAW WATER PT PUMPS	APH WASH PUMPS	SERVICE WATER PUMP	FGD MAKE-UP WATER PUMPS	ACW MAKE-UP WATER PUMPS
2	For items stated as not applicable by bidder, shall have to be supplied without any cost implication to BHEL in the event they are found to be applicable during detail engineering stage.						
3	For all HT motor driven pumps (wherever applicable), bidder shall provide flat surface with dimensions 60 MM x60 MM on bearing Housing for mounting vibration measuring block and a key slots of dimensions 30MM (L) X 15 MM (W) X 3 MM (D) on each pump shaft or some other suitable location which shall be confirmed during detail engineering by BHEL for Phase Marker.						
4	Wherever SS material is coming in contact with non SS material, suitable isolation (rubber etc.) shall be provided to avoid galvanic corrosion.						

ANNEXURE-III

RAW WATER ANALYSIS

S.No	Constituent	As	mg/l
1	Calcium	CaCO ₃	105
2	Magnesium	CaCO ₃	81
3	Sodium	CaCO ₃	70
4	Potassium	CaCO ₃	7
	Total cations	CaCO ₃	263
5	M- Alkalinity	CaCO ₃	180
6	P- Alkalinity	CaCO ₃	0
7	Chloride	CaCO ₃	60
8	Sulphate	CaCO ₃	23
	Total Anions	CaCO ₃	263
9	Total Silica, Reactive	SiO ₂	17
	Silica, Reactive		15
	Silica, Colloidal		2
10	Iron (Total)	Fe	0.5
11	pH	-	7.0-7.8
12	Turbidity	NTU	100
13	Total dissolved solids		350-400
14	Temperature	Deg C	20-35
15.	TOC		1.93
16.	BOD		8
17.	COD		14

CT Make-up details.**1. TSS: <10 NTU****2. TDS & other parameters: As per Raw Water Analysis.****COC for Aux. Cooling Water System is 5.0**

CLAUSE NO.	PROJECT INFORMATION			एनडीपीसी NTPC																		
	ANNEXURE-III THE MINIMUM QUALITY OF DM WATER TO BE CONSIDERED FOR MAKE-UP WATER <table><tr><th>Sl.No.</th><th>Characteristics</th><th>Value</th></tr><tr><td>1.</td><td>Silica (Max.)</td><td>0.02 ppm as Sio2</td></tr><tr><td>2.</td><td>Iron as Fe</td><td>Nil</td></tr><tr><td>3.</td><td>Total hardness</td><td>Nil</td></tr><tr><td>4.</td><td>pH value</td><td>6.8 -7.2</td></tr><tr><td>5.</td><td>Conductivity</td><td>Not more than 0.1micro mho/cm excluding the effects of free CO2</td></tr></table> Passivated DM water shall have PH value of 8.5 to 9.5.				Sl.No.	Characteristics	Value	1.	Silica (Max.)	0.02 ppm as Sio2	2.	Iron as Fe	Nil	3.	Total hardness	Nil	4.	pH value	6.8 -7.2	5.	Conductivity	Not more than 0.1micro mho/cm excluding the effects of free CO2
Sl.No.	Characteristics	Value																				
1.	Silica (Max.)	0.02 ppm as Sio2																				
2.	Iron as Fe	Nil																				
3.	Total hardness	Nil																				
4.	pH value	6.8 -7.2																				
5.	Conductivity	Not more than 0.1micro mho/cm excluding the effects of free CO2																				
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9585-001-02	SUB-SECTION-IB PROJECT INFORMATION	PAGE 10 OF 15																		



TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-100-N001**

SECTION: **II**

SUB-SECTION: **IIA**

REV. NO. **00** DATE 25/04/2019

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SUB-SECTION - IIA

STANDARD TECHNICAL SPECIFICATION (MECHANICAL)

- **STANDARD TECHNICAL SPECIFICATION FOR MISC. PUMPS (HORIZONTAL) INCLUDING DATASHEET-C**
- ~~**STANDARD TECHNICAL SPECIFICATION FOR MISC. PUMPS (VERTICAL) INCLUDING DATASHEET-C**~~
- **STANDARD QUALITY PLANS**

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1.00.00	GENERAL INFORMATION	
1.01.0	The general guidelines as illustrated in the subsequent clauses of this section shall be applicable for horizontal centrifugal pumps to be procured under the scope of this package.	
1.02.0	It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship, and shall be capable of performing the required duties in a manner acceptable to Engineer/Owner who will interpret the meaning of drawings and specifications and shall be entitled to reject any component or material, which in his judgement is not in full accordance herewith.	
1.03.0	The omission of specific reference to any component/accessory necessary for the proper performance of Miscellaneous Pumps and drives shall not relieve the bidder of the responsibility of providing such facilities to complete the supply of equipment at quoted prices.	
1.04.0	BHEL's / Customer's representative shall be given full access to the shop in which the equipment are being manufactured or tested and all test records shall be made available to him.	
1.05.0	The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and shipping release issued by BHEL/Customer.	
2.00.00	CODES AND STANDARDS	
2.01.00	In addition to the requirements spelt out elsewhere in the specification, the equipment to be provided under this section shall specifically conform to the following codes, standards, specifications and regulations, as applicable, including all the latest amendments subsequent to the year of publication as mentioned below.	
2.01.01	IS-1520/1980:	Horizontal Centrifugal pumps for clear, cold and fresh water.
2.01.02	IS-5120/1977:	Technical requirements for Rotodynamic special Purpose pumps.
2.01.03	IS-5639/1970:	Pumps for handling chemicals & corrosive liquids.
2.01.04	IS-5659/1970:	Pumps for process water.
2.01.05	IS-6536/1972:	Pumps for handling volatile liquids.
2.01.06	IS-9137/1978:	Code for acceptance tests for centrifugal, mixed flow and axial flow pumps- Class 'C'.

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2.01.07	ISO 3555/1977: BS 5316/1977 Part 2	Acceptance test for centrifugal, mixed flow and axial flow pumps - Class 'B' tests.		
2.01.08	ISO 2548/1973: BS 5316/1976 Part 1	- Do - Class 'C' tests.		
2.01.09	API-610/1989:	Centrifugal pumps for general refinery services.		
2.01.10	HIS	Hydraulic Institute Standards, USA		
2.01.11	PTC 8.2/1965:	Power Test Codes - Centrifugal pumps.		
2.01.12	ASTM-1-165-55	Standard Methods for Liquid Penetration Inspection.		
2.02.00	In case of any contradiction with the above standards and annexure, the stipulations in the annexure shall prevail and shall be binding on the bidder.			
3.00.00	SCOPE OF SUPPLY & SERVICES:			
3.01.00	The miscellaneous pumps and drives scope shall be as specified in Data Sheet A /Section IA.			
3.02.00	The Capacity, Head, Materials of construction and other particulars of pumps are detailed in Data Sheet A of the specification.			
3.03.00	Accessories: All the pumps under this specification shall be complete with following standard/special accessories.			
3.03.01	Standard accessories: a) LT Electric drives/motors (as applicable) with cable gland and lugs at motor end. (The bare HT drive motors and LT motors not in bidder's scope of supply, wherever required supplied as free issue by BHEL refer Cl. 5.08.00). b) Pump motor coupling along with coupling guard. c) Common base plate for pumps and motor. d) Self contained lubrication system along with all internal piping, valves, fittings, specialties etc. as required.			

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e) Counter flanges for suction/ discharge nozzles along with fixing nuts, bolts and gaskets. f) Anchor bolts, nuts, seating steel works, shims etc. as necessary for mounting the pump-motor unit on civil foundations. g) Suitable vent (with valves)/ lifting/ handling attachments for the pump/ motor/ accessories. h) Suitable drain connections with isolating valves as applicable. i) Supply of first fill of lubricants with topping requirements for one year of operation after commissioning and handing over of equipment. j) Set of “Special” Tools & Tackles for Pumps and motors, if any. k) Erection and commissioning spares, “on as required” basis. l) Bidder shall provide various drawings, data, calculations, test reports/ certificates, operation and maintenance manuals, As-built drawings, etc. as specified and as necessary. m) Mandatory spares as specified in respective Data Sheet-A of this section. 3.04.00 Services included in Bidder’s Scope: 3.04.01 The pumps shall be guaranteed to meet the performance requirements specified vide Data Sheet -A and also for trouble free operation after commissioning. Schedule of performance guarantees (Section-IIIA) duly filled and signed shall be furnished with the bid. 3.04.02 Pumps with Mechanical seal shall be supplied with gland packing arrangement initially to site and gland packing arrangement shall be replaced by vendor with mechanical seal arrangement at site after commissioning of the pumps with gland packing. However Mechanical seal shall be dispatched along with main supply for this purpose. Shaft sleeve and any other item required for satisfactory operation of Mechanical seal after replacement at site shall be provided by the pump supplier without any cost implication to BHEL. 3.04.03 The pumps erected by the purchaser shall be checked by the bidder for correctness of their installation, alignment, etc. at site prior to their commissioning. 3.04.04 After commissioning of pumps at site, site performance test for Noise, vibration and parallel running of pumps of all pumps for each unit/project shall be conducted by pump vendor at project site to ensure that the pumps meet the specified requirements. Pump vendor shall bring necessary instruments for conductance of site performance test.			



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If the site performance is found not meeting the requirements in any respect as specified, then the equipment shall be rectified or replaced by the vendor, without any commercial implication to BHEL

Note: Applicability of conducting PG test at site by vendor as per above clause shall be applicable if indicated in Section-1A.

If conductance of PG test of pumps at site for Noise, vibration and parallel running of pumps of all pumps for each unit/project is not in bidders scope and same is conducted by BHEL/ customer. In such cases also, if the site performance is found not meeting the requirements in any respect as specified, then the equipment shall be rectified or replaced by the vendor, without any commercial implication to BHEL.

3.04.05 Performance Guarantees for pumps shall stand valid till the satisfactory completion of performance testing by BHEL and its acceptance by purchaser / customer.

3.05.00 Works excluded from Bidder's Scope:

- a) All HT motors and those LT Motors which are specifically excluded.
- b) Civil foundation
- c) Suction/ discharge pipe works
- d) MCC/ Switchgear/Power supply
- e) Power and Control Cables, unless specifically specified in Electrical/ Systems portion of the specification.
- f) Erection of equipments.

4.00.00 BID EVALUATION CRITERIA & LIQUIDATED DAMAGES FOR SHORTFALL:

4.01.00 The bids received shall be evaluated for power consumption at inlet to the motors, in respect of pumps specified in Data Sheet-A (working pump only viz. not the standby), for the purpose of price comparisons as briefed below:

The bid evaluation shall be done at the rate as specified in Data Sheet A per one (1) KW Power consumption, per working pump as follows.

$$\text{KW} = \frac{Q \times H \times S}{P \times M \times 367.2}$$

Where Q = Rated capacity M³/hr
H = Rated TDH, MWC
P = Pump Efficiency
M = Motor Efficiency.
S = Specific Gravity of fluid handled

4.02.00 The efficiencies for pumps and motors for arriving at benchmark power for Bid Evaluation shall be as indicated in Data Sheet A for various pumps.



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No advantage shall be given to the bidder for Aux. Power quoted lower than the Bench mark values calculated with KW calculation formula at Cl. 4.01.00 *above, considering the bid evaluation efficiencies for pump and motor as indicated in Data Sheet-A.* However the bids shall be evaluated as above if the Aux. Power quoted are higher than Bench mark values.

NOTE:

1. Efficiencies for HT motors and LT motors not in bidder's scope, for bid evaluation purpose shall be taken based on the maximum value as furnished in Data Sheet A.
2. During contract stage the Guaranteed power consumption of Pumps with BHEL supplied drives (HT/LT) for successful bidder shall be reworked by BHEL as below:

Revised guarantee power consumption shall be as per KW calculation formula at Cl. 4.01.00 *above, where P = pump efficiency guaranteed by bidder and M = motor efficiency as per approved datasheet of the supplied HT/LT motor.*

4.03.00 Liquidated damages for shortfall in Guaranteed KW

The above guaranteed power consumption shall be demonstrated by the successful bidder during performance testing at works/ site.

For pumps with BHEL supplied drives, the power consumption shall be compared with the reworked guarantee power consumption, defined as per note no. 2 of Cl. 4.02.00 *above* for the purpose of shortfall.

The liquated damages @ twice the bid evaluation rate as above per KW per working pump shall be levied in the event of failure of bidder to demonstrate the guaranteed power consumption.

5.00.00 TECHNICAL REQUIREMENTS:

5.01.00 The pumps shall meet the technical requirements of Section-I as well as Section-II. In the event of any contradiction of Section-II with Section-I, the Section-I will prevail.

5.02.00 The pumps shall be Electric motor driven.

5.03.00 The Pumps shall conform to HIS. It is bare minimum requirement, however, any other equivalent or stringent standard is also acceptable, if, all the requirements of HIS are also met.

5.04.00 The horizontal pumps shall be Horizontal split casing type with speeds not exceeding 1500 RPM or as indicated in Data Sheet-A.

5.05.00 No negative tolerance shall be permitted in rated capacity & TDH.

5.06.00 No negative tolerance shall be permitted in efficiency at rated capacity.

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5.07.00	The shut off head of pumps shall be more than pump rated TDH and percentage variation may vary depending on the specific speed of the pump as under: i. 10-15% for pumps of specific speed up to 1000 US units, ii. 15-20% for pumps of specific speed in the range of 1000 to 2000 US units, iii. 20-40% for pumps of specific speed in the range of 2000 to 4000 US units, iv. Above 50% for pumps of specific speed in the range of 4000 to 7000 US units.		
5.08.00	All HT motors and those LT motors which are not in bidder's scope of supply: bare motors only, shall be supplied as free issue by BHEL through BHEL, based on ratings and TS (Torque - Speed) curve selected and furnished by the bidders along with their un-priced bid. The responsibility for satisfactory operation for combined performance of pumps & motors shall rest with the bidder only as if, the drive motors also have been supplied by the bidder. Couplings, base plate, foundation bolts, any other fittings, etc. as required shall be supplied by the bidders only. BHEL shall supply one number of each type of drive motors (where drive motor is not in bidder's scope of supply) for shop testing of pumps with job motors. All other motors shall be dispatched by BHEL directly to project sites.		
5.09.00	For all HT motor driven pumps, BHEL has envisaged vibration-monitoring system in their own scope. The bidder shall make provisions for mounting following on the pump/ pump shaft: • Purchaser's probes in both DE/NDE bearings of pumps • Key slots on pump shaft and flat surface on bearing housing for mounting vibration measuring block with dimensions as specified in Data Sheet A. • Other components as finalized during detailing. • For mounting of above on the HT motors & specifically excluded LT motors, same shall be taken care by BHEL.		
5.10.00	The pumps shall be capable of developing the required total head at rated capacity for continuous operation. The pumps shall operate satisfactorily at any point on the Q-H characteristic curve over a range of 0% to 130% capacity and shall be suitable for continuous operation between 30% to 130% capacity.		
5.11.00	Selection of the pumps shall be such that the design point shall be met even with negative manufacturing tolerance.		
5.12.00	The total head capacity curve shall be continuously rising towards the shut off, the pumps shall preferably be non-overloading type and stable.		
5.13.00	The pumps shall be capable of running over the entire range of NPSH conditions required without any noise, vibration or cavitations. The prevailing suction pressures for various pumps are indicated in Data Sheet-A for suitable mechanical design of pumps.		

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5.14.00	The pumps shall be of stiff shaft design. The minimum internal clearances should be sufficiently more than the maximum static deflection of the shaft. Shaft size selected must take into consideration the critical speed as specified in API-610.		
5.15.00	Pumps and motors shall run smooth without undue noise and vibration. The vibration shall be within vibration norms for testing as per American National Standard for 'Rotodynamics Pump' for Vibration Measurement and allowable values, Doc. ANSI/ HIS 9.6.4-2009. The applicable vibration limits for each pump, shall be indicated in the Technical Data sheet to be furnished by the successful bidder after award of LOI/ PO. The noise level shall be limited to 85 dB at distance of 1.0M.		
5.16.00	Pumps of a particular category shall be identical and shall be suitable for parallel operation with equal load division. Components of identical pumps shall be interchangeable.		
5.17.00	After installation, the guaranteed values of noise, vibration and parallel operation of pumps shall be tested and verified. If the site performance is found not meeting the requirements in any respect as specified, then the equipment shall be rectified or replaced by the vendor, at his own cost.		
5.18.00	High reliability of the pumps is an essential requirement and therefore it gets weightage over its efficiency. It is therefore essential that the bidder choose a standard proven model from the range of pumps manufactured.		
5.19.00	The offered pumps shall be of proven design meeting the experience-qualifying requirement of their operation at two sites for a minimum period of one year or as specified in technical PQR. Any deviation to this criterion shall be suitably highlighted in the deviations schedule.		
5.20.00	The bearings shall be self-water lubricated, no external water supply shall be available. The cooling/ lubrication water for bearings, etc. shall be tapped from the pump discharge and supplied thru' bidder's integral pipe work. If water handled by pump is dirty/ not suitable for lubrication/ cooling, the bidder shall provide requisite strainer/ filters, tanks, motorized valves, etc. after the tap off for the required service, the arrangement provided shall be subject to Purchaser's approval.		
6.00.00	MANDATORY SPARES:		
6.01.00	Bidder to provide the Mandatory spares listed vide Data Sheet-A. Unit price of mandatory spares shall be furnished in price Schedule.		
6.02.00	Bidder shall include the cost of Mandatory Spares, unless specified otherwise in Sec-IA of the specification or NIT.		

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HORIZONTAL PUMPS****SPECIFICATION NO.** PES-179-06**VOLUME:****SECTION:** IIA**REV. NO.** 04**DATE:** 01/07/2016**SHEET** 8 of 16**7.00.00 OTHER REQUIREMENTS:**

7.01.00 The quality of water handled by various pumps shall be as per Data Sheet-A.

7.02.00 The materials of construction for various components specified are the minimum requirements and materials of construction for other components not specified shall be similarly selected by the bidder for the intended duty.

7.03.00 The makes of various bought out items of bidder (i.e. motor, bearings, mechanical seal etc.) shall be subject to purchaser's approval in the event of order.

7.04.00 Painting for Pumps

- a) The surface of SS, Gun metal, brass, bronze and non-metallic component shall not be applied with any painting.
- b) The Steel surface to be applied with painting shall be thoroughly cleaned before applying painting by brushing, shop blasting etc. as per the agreed procedure.
- c) For all the steel surfaces inside the (indoor installation) building, a coat of red oxide primes of min. thickness DFT of 50 microns followed up with under coat of Synthetic Enamel paint of min. thickness DFT of 50 microns shall be applied. The top coat shall consist of two coats each of min. thickness DFT of 50 microns of synthetic enamel paint and thus total DFT shall be min. 200 microns.
- d) For all the steel surfaces exposed to (outdoor installation) atmosphere, a coat of chlorinated rubber based zinc phosphate primer of min. thickness DFT of 50 microns followed up with under coat of chlorinated rubber paint of min. thickness DFT of 50 microns shall be applied. Then, intermediate coat consisting of one coat of chlorinated rubber based paint pigmented with Titanium di-oxide with min. thickness DFT of 50 microns and top coat shall consist of two coats each of min. thickness DFT of 50 microns of chlorinated rubber paint shall be provided. Total DFT of paint system shall be min. 200 microns.

7.05.00 It is mandatory for the bidder to submit along with the bid, the deviations if any – whether major or minor in the schedule of deviations only. In the absence of deviations listed in the “Schedule of deviations, the offer shall be deemed to be full conformity with the specification, “not-withstanding” anything else stated elsewhere in bidder’s offer. The implied/indirect deviations shall not be binding on the purchaser.

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8.00.00	PERFORMANCE REQUIREMENTS		
8.01.00	Performance requirements for the pumps shall be as guided in Data sheet - A enclosed with Section-I.		
8.02.00	Pump(s) shall preferably be designed to have the best efficiency at flow within $\pm 10\%$ of the specified duty point flow. The pumps shall be suitable for continuous operation at any point within the "Range of Operation" as stipulated in the Data Sheet - A attached with Section-I.		
8.03.00	Pump(s) shall preferably have a continuously rising head-capacity characteristics from the specified duty point towards shut-off point, the maximum being at shut-off to enable parallel operation. Under all circumstances, the 'range of operation' of the pumps shall exclude any unstable operating zone of the head-capacity curve.		
8.04.00	Wherever specified in the Data Sheet - A, pumps of each category shall be suitable for parallel operation. The head vs. capacity, the BHP vs. capacity characteristics etc. shall be identical to ensure equal load sharing and trouble-free operation of any pump when the other pump(s) working in parallel with it trip.		
8.05.00	The pump set along with drive motor shall run smooth without undue noise and vibration. Acceptable vibration limits shall be guided by the HIS of USA. Refer clause 5.15.00 above for permissible limits.		
9.00.00	DESIGN AND CONSTRUCTION		
9.01.00	Pump Casing		
9.01.01	Pump casing shall be provided with adequate number of vents and priming connections with valves unless the pump is made self-venting and priming. Casing drain, as required, shall be provided complete with drain valves. It shall be provided with a connection for suction and discharge pressure gauge as standard feature.		
9.01.02	Pump design must ensure that the nozzles are capable of withstanding external reactions not less than those specified in API-610.		
9.01.03	In case where an expansion joint is located at pump discharge, the pump assembly will be subjected to an additional thrust which will be transmitted to the foundation. This additional thrust shall be taken into the consideration of pump design.		
9.02.00	Impeller		
9.02.01	The Impeller assembly shall be dynamically balanced and designed with critical speed substantially above the operating speed.		

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9.03.00	Wearing Rings		
9.03.01	Replaceable type wearing rings shall be furnished to prevent damage to impeller and casing.		
9.04.00	Shaft		
9.04.01	Shaft size shall be selected considering that the critical speed shall be away from the operating speed as recommended in applicable Code/Standard. The critical speed shall be at least 30% higher than the rated speed.		
9.05.00	Shaft Sleeves		
9.05.01	Renewable type fine finished shaft sleeves shall be provided at the stuffing boxes/mechanical seals. Length of the shaft sleeves must extend beyond the other faces of gland packing or seal end plate so as to distinguish between the leakage past Shaft and shaft sleeve and that past the seals/glands.		
9.05.02	Shaft sleeves shall be properly fastened to the shaft to prevent any leakage or loosening. Shaft sleeve assembly should ensure concentric rotation.		
9.06.00	Bearings		
9.06.01	Bearings shall be easily accessible without disturbing the pump assembly. A drain shall be provided at the bottom of each bearing housing.		
9.06.02	Heavy-duty sleeve/ball/roller type bearings shall be provided to take care of the radial loads.		
9.06.03	In case of sleeve type radial, axial thrust shall be absorbed in suitable hydraulic devices and/or thrust bearings.		
9.06.04	Bearings and hydraulic devices (if provided for balancing axial thrust) shall be of adequate design for taking the entire pump load arising from all probable conditions of continuous operation. Life of the bearings shall be guided by the design standard of the pump. Antifriction bearings of standard type, if provided, shall be selected for a minimum life 20,000 hrs. of continuous operation at maximum axial and radial loads at rated speed. Thrust bearing shall be capable of running continuously at maximum load.		
9.06.05	The bearing shall be oil/grease lubricated. Suitable lubricating arrangement for the bearings shall be furnished with the pump complete with all accessories like pump, filters, piping, fittings, valves, interlocking and supervising instruments etc. as necessary. The design shall be such that the bearing lubricant does not contaminate the liquid being pumped.		
9.06.06	Bearing housing for HT motor driven pumps shall have provision for mounting temperature measuring device.		

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9.06.07	Bearings of reputed makes are to be provided, same shall be indicated in Technical Data sheet to be furnished by the successful bidder after award of LOI/ PO, subject to acceptance of BHEL/ end customer, without any price implication to BHEL.		
9.07.00	Stuffing Boxes		
9.07.01	Stuffing box design shall permit replacement of packing without removing any part other than the gland.		
9.07.02	Stuffing boxes shall be sealed/cooled by the fluid being pumped/external clear water, as specified in the Annexure. All necessary pumps, piping, fittings, valves, instruments etc. as required for safe and trouble-free operation of the pumps and as specified in the Annexure shall be included in the scope of supply.		
9.08.00	Mechanical Seals		
9.08.01	Mechanical seals (cartridge type) shall be provided if specified in the Data Sheet-A of this section. The pump supplier shall co-ordinate with the seal maker in establishing the direct circulation rate for maintaining a stable film at the seal in the chamber. The seal piping system shall form an integral part of the pump assembly.		
9.08.02	When handling liquids near boiling point, suitable arrangement for external cooling shall be provided so as to prevent flashing at the seal faces.		
9.08.03	For the seals under vacuum service, the seal design must ensure sealing against atmospheric pressure, even when the pumps are not operating.		
9.08.04	Pumps with Mechanical seal shall be supplied with gland packing arrangement initially to site and gland packing arrangement shall be replaced by vendor with mechanical seal arrangement at site after commissioning of the pumps with gland packing. However Mechanical seal shall be dispatched along with main supply for this purpose. The special tools (if any) required for above shall be arranged by bidder.		
9.08.05	Mechanical seals of reputed makes are to be provided, same shall be indicated in Technical Data sheet to be furnished by the successful bidder after award of LOI/ PO, subject to acceptance of BHEL/ end customer, without any price implication to BHEL.		
9.09.00	Drive Unit		
9.09.01	The pumps shall be driven by electric motor directly coupled as specified in the Data Sheet-A of this section. A heavy duty coupling along with coupling guard shall be provided between the pump and drive unit.		
9.09.02	Unless otherwise specified in Data Sheet-A of this section, drive unit power rating shall be the maximum of the following requirements.		



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- a) 16% margin over the pump shaft input power at the rated duty point.
- b) 10% margin over the maximum pump shaft input power required within the 'Range of Operation'.
- c) Pump shaft input power required considering the overloading of the pump assuming single pump operation in the event of tripping of one or more of the pumps operating in parallel.

9.10.00 Coupling for pump & Motor Shaft

9.10.01 The pump and motor shafts shall be connected with adequately sized flexible coupling of proven design with spacer to facilitate dismantling of the pump without disturbing the motor. Necessary coupling guard shall be provided.

9.10.02 No. of coupling holes for joining coupling hubs shall be even in number and preferably in multiples of four.

10.00.00 INSPECTION AND TESTING

10.01.00 The Quality Plans enclosed in the specification are for bidder's guidance only. The bidder shall comply with these and other minimum requirements specified in the specification and shall furnish his own quality plan in the event of order based on the guidance given as above, for approval by BHEL/Customer.

10.02.00 The Bidder shall carry out the following specific tests inspections to ensure that the equipment furnished lies in strict conformance with the specification and also in accordance with applicable codes/standards and good engineering practice.

a) Identification and Testing

- i) All materials used for pump construction shall be of tested quality. Material shall be tested as per the relevant standard and test certificates shall be made available to the Owner.
- ii) 100% PMI (Process Material Identification) inspection for material grade of pump casing, shaft and impeller shall be done by vendor & certification shall be submitted for review of BHEL. Further BHEL reserves the right to conduct random & independent PMI inspection on pump casing, shaft and impeller to ascertain the grade of material during inspection at vendor works.
- iii) Tests for each pump included under this section shall include but not be limited to the following:

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- The entire surface of the impeller / casing / diffuser castings shall be subjected to Dye Penetration Test as per ASTM Specification no.:1-165-65.
- Shaft coupling & other active components shall be subjected to Dye Penetration and Ultrasonic Tests.
- Wearing rings, shaft sleeves shall be subjected to Dye Penetration Test.
- Fabricated components of pumps shall be subjected to Dye Penetration test on weld.
- Verification of material, witnessing of pouring, casting and inspection of finished fabricated/castings.
- Inspection of finished castings for impeller and verification of materials.
- Inspection of pump shaft and verification of material.
- Witnessing of NDT/review of NDT reports.
- Static balancing test for impeller and dynamic balancing of complete rotating parts as per ISO- 1940 to grade 6.3 or better.
- Complete Inspection of assembled pump.

b) Hydraulic Testing

The pump casing shall be hydrostatically tested at maximum of the following:

- i. 2 times the TDH (Total Dynamic Head) at rated capacity (or)
- ii. 1.5 times the shut-off pressure (or)
- iii. System Design pressure indicated in Data Sheet-A of Section-I.

The HT pressure shall be maintained for a period of not less than 30 minutes. During testing there should not be any pressure drop & leakage.

c) Performance Test at Shop

- i) Each pump shall have to be tested to determine the performance curves of the pumps. These tests are to be conducted in presence of Owner's representative as per the requirements of the Standards of Hydraulic Institute of USA (ASME-Power Test Code PTC 8.2/BS-599) or any other equivalent standard.
- ii) Performance tests are to be conducted to cover the entire range of operation of the pumps at rated speed. These shall be carried out to span 130% of rated capacity up to pump shut-off condition. A minimum of five combinations of



TITLE:

**STANDARD TECHNICAL SPECIFICATION
HORIZONTAL PUMPS**

SPECIFICATION NO. PES-179-06

VOLUME:

SECTION: IIA

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SHEET 14 of 16

head and capacity are to be achieved during testing to establish the performance curves, including the design capacity point, shut-off point and the two extremities of the range of operation as specified in the annexure. After completion of performance test, all pumps shall be stripped down for inspection of internals.

- iii) Tests shall be conducted with actual drive motors being furnished.
- iv) NPSH tests are to be conducted for each type at 3% head drop conditions, if specified in the pump approved QP.
- v) All rotating components of the pumps shall be subjected to static and dynamic balancing tests. The assembled rotor will be subjected to dynamic balancing tests.
- vi) Mechanical run test shall be carried out on all pumps to determine the vibration levels, noise levels etc. This test shall be conducted at site also. However, test value at site shall be used for the acceptance of the equipment.

10.03.00 Inspection of Mandatory/ Recommended spares shall be in line with approved QP for main supply.

11.00.00 DRAWINGS/ DOCUMENTS DISTRIBUTION SCHEDULE

11.01.00 After award of LOI, the successful bidder shall submit drawings/documents as per Data Sheet-C.

11.02.00 The no. of drawings/documents to be submitted shall be as per Data Sheet-C.

12.00.00 The various Sections-I's & II's along with Data Sheets attached in this specification together with the specification for Miscellaneous Pumps shall be complied with by the bidders.

13.00.00 Bidder to submit all drawing/ documents in soft as well as hard copy in the event of order as per schedule indicated in section-IA.

Within one (1) week of receipt of BHEL comments a technical representative from Bidder's works shall come for meeting with BHEL along with revised documents to resolve all issues and incorporate all comments in the soft copy here only for further submission to customer.

Further on receipt of customer's comments on the documents a technical representative from Bidder's works shall come for meeting with Customer to resolve all issues and incorporate all comments in the soft copy here only and further resubmission of same to Customer. The representative shall be available here till Category-I approval of all the drawings and documents.

**TITLE:****STANDARD TECHNICAL SPECIFICATION
HORIZONTAL PUMPS****SPECIFICATION NO.** PES-179-06**VOLUME:****SECTION:** IIA**REV. NO.** 04**DATE:** 01/07/2016**SHEET** 15 of 16

14.00.00 Guarantee for all pumps shall at least remain valid for 18 months from the Unit commissioning date or as specified in NIT.

15.00.00 The following documents only shall be furnished by the bidder with his offer:

- a) Compliance certificate duly signed and stamped (enclosed at Section-IIIB).
- b) GA drawings of pumps and motors with following: (shall be only for reference purpose, same shall not be reviewed/commented by purchaser at this stage and shall be subject to approval only during contract).
 - Civil static & dynamic loads.
 - Foundation details.
- c) Guarantee Schedule duly signed and stamped (enclosed at Section-IIIA).
- d) Technical deviation schedule (if reqd.) (enclosed at Section-IIIC).
- e) Data for drive Motor (HT/LT- which is not in bidder's scope of supply - as applicable):
Load torque speed curves of the pumps, selected motor rating, rpm, GD^2 of driven equipment.
- f) Unpriced copy of the price bid shall be furnished along with the technical bid.

Apart from above no other Drgs./Docs./Data sheets etc. are required to be submitted at bid stage and even if furnished shall not be taken cognizance of.

In case of any deviation from this technical specification, the same shall be indicated in the schedule of deviations as per Section-IIIC or NIT. In the absence of duly filled schedules it will be assumed that the bid strictly conforms to the specification.



TITLE:

**STANDARD TECHNICAL SPECIFICATION
HORIZONTAL PUMPS**

SPECIFICATION NO. PES-179-06

VOLUME:

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DATA SHEET – C

Drawings / documents distribution schedule to be followed by successful Bidder:

1.0 Drawings/documents submission schedule, shall be as per Section-IA.

The successful bidder shall submit at least following drawings/ documents:

1.1 Fully dimensioned outline general arrangement drawings of the pump and motor assembly. This drawing should include foundation base plate/sole plate details as applicable, civil foundation, anchor bolt details, loading data (Static and Dynamic), points of connections of external piping, cables and mounting of devices furnished by the supplier and details for Gap between Coupling Shafts, Float & details for axial/radial tolerance allowed etc. which are required for erecting agency during erection of pump.

1.2 Cross sectional drawing of the equipment showing the details of assembly of components and their material of construction with standard applicable codes.

1.3 Technical datasheet as per Datasheet-B (Section-IIID) including characteristic curves of pumps showing the following:

- a) Flow Vs Head
- b) Flow Vs Power
- c) Flow Vs Efficiency
- d) Flow Vs NPSHR/ minimum submergence

1.4 QAP for pump and QAP for motors (if applicable).

1.5 GA, Datasheet, Curves etc. for drive motor (as applicable).

1.6 Operation and maintenance manual.

1.7 Lubrication arrangement drawings for external lubrication (if applicable).

1.8 PG test procedure as per clause 3.04.04 (if applicable).

1.9 Motor type test document (if applicable).

2.0 Within the stipulated time period as per vendor's drawings/ documents schedule as per NIT, the O&M Manual comprising of minimum following shall be submitted:

- a) Drawings of components & details as deemed necessary.
- b) Instruction manual for erection, operation & maintenance.
- c) Storage instruction.

3.0 Before dispatch of the equipment the bidder shall furnish the following.

- a) Material test certificates.
- b) Shop test reports & certificates.
- c) Fulfilment of packing instructions as indicated in Section-IA of this specification.

4.0 Distribution of drawings / documents for all projects:

The no. of copies of drawing/ documents to be submitted by the successful bidder, after the award of the contract shall be as per Section-IA or as specified in NIT.



BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
STANDARD QUALITY PLAN

Rev-01

QUALITY PLAN FOR MISCELLANEOUS PUMPS

CUSTOMER

PROJECT TITLE

BIDDER/VENDOR

QUALITY PLAN NUMBER

PE-QP-999-100-N004 (For Hor. Pumps)
 PE-QP-999-100-N004 (For Ver. Pumps)

SHEET 1 OF 6

SYSTEM

ITEM - CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL)

S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1	MATERIALS CONTROL											
1.1	CASINGS (INCLUDING BOWLS,DIFFUSERS, STAGE BODIES, DISCH HEAD (IF CAST)), ETC. - (AS APPLICABLE) AND IMPELLER	MECHANICAL AND CHEMICAL PROPS	CR	MECHANICAL AND CHEM. ANALYSIS	ONE/HEAT/BATCH	APPROVED CS DRAWING/DATA SHEET	RELEVANT MATERIAL SPECN.	LAB REPORT/ MTC	3/2.		2,1	
1.2	STUFFING BOX, SUCTION BELL, WEARING RINGS,NECK RINGS, SHAFT SLEEVES	DO-	MA	MECHANICAL AND CHEM. ANALYSIS	ONE/HEAT/BATCH	APPROVED CS DRAWING/DATA	RELEVANT MATERIAL SPECN.	LAB REPORT/ MTC	3/2.		2,1	
		HARDNESS DIFFERENCE BETWEEN CASING / IMPELLER AND WEARING RING	MA	LAB. TEST	100%	APPROVED CS DRAWING/ DATA SHEET	50 BHN MIN.	LAB. REPORT	3/2.		2,1	
1.3	BARS/FORGINGS FOR SHAFTS, LINE SHAFTS	1.PHYSICAL & CHEMICAL PROPS	CR	1.MECHANICAL & CHEMICAL ANALYSIS.	1/CAST OR 1/BARS	APPROVED CS DRAWING/DATA SHEET	RELEVANT MATERIAL SPECN.	MILL T.C. OR LAB.REPORT	3/2.		2,1	CORRELATION REQUIRED, IDENTIFICATION AS PER TC
		2.DIMENSIONS	CR	2.MEASURMENT	100%	MFR. DRAWING	MFR. DRAWING	INSP.REPORT	3/2.		2,1	
		3.INTERNAL DEFECTS FOR 40MM & ABOVE DIA SHAFTS.	CR	3.ULTRA SONIC TEST	100%	ASTMA388 BACK WALL ECHO 100%	DEFECT ECHO MAX 20% OF B.W.E. LOSS OF BACK WALL ECHO 20% MAX	NDT CERTIFICATE	3/2.		2,1	
1.4	STRESS RELIEVING/ HEAT TREATMENT OF CASTING OF ALL ABOVE (IF APPLICABLE) / SOLUTION ANNEALING OF SS CASTING	1. VARIFICATION OF HT CHART	MA	VERIFICATION OF SR/HT CHART	ALL BATCHES	RELEVANT MATERIAL SPECN.	DO-	CORRELATED SR/HT.CHARTS	3/2.		2,1	
		2. IGC TEST FOR SS CASTING	MA	LAB. TEST	ONE SAMPLE/ HT BATCH	ASTM A 262	ASTM A 262 Gr A	LAB. REPORT	3/2.		2,1	
1.5	SHAFT ENCLOSING TUBES, COLUMN PIPES & DISCHARGE ELBOW	1. MECHANICAL & CHEMICAL PROPS. 2. DIMENSIONS. 3. SURFACE FINISH	MA	1. MECH & CHEM TEST 2. MEASUREMENT 3. VISUAL EXAM	1/BATCH 100% 100%	APPROVED GA DRG./DATA SHEET	RELEVANT MATERIAL SPECN./MAFG./ APPROVED DOCS	MFR T.C OR LAB. REPORT	3/2.		2,1	
BHEL				PARTICULARS			BIDDER / VENDOR					
				NAME								
				SIGNATURE								
				DATE						BIDDER/VENDOR SEAL		

NAME
SIGN.
DATE

Prepared By
AJAY JAIN
Ajay
23-07-2012

Reviewed By
ASHWANI KHANNA
Ashwani
23-07-2012

Approved By
I. J. SINGH
I. J. Singh
23-07-2012



BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
STANDARD QUALITY PLAN

Rev-01

QUALITY PLAN FOR MISCELLANEOUS PUMPS				CUSTOMER		PROJECT TITLE						
				BIDDER/VENDOR		QUALITY PLAN NUMBER						
SHEET 2 OF 6				SYSTEM		ITEM - CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL)						
S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/METHOD OF CHECKED	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.6	PLATE FLANGE, C/FLANGE	1. MECHANICAL & CHEMICAL PROS. 2. DIMENSIONS. 3. SURFACE FINISH	MA	1. MECH & CHEM TEST 2. MEASUREMENT 3. VISUAL EXAM	1/CAST 100% 100%	APPROVED GA DRG./DATA SHEET	RELEVANT MATERIAL SPECN./ MFR. DRG./ APPROVED DOC	MILL TC/ LAB REPORT	3/2.		2,1	CORRELATION REQ. FOR MAT OTHER THAN IS 2062
1.7	SUCTION STRAINER (IF APPLICABLE)	MECHANICAL & CHEMICAL PROS.	MI	MECH. & CHEMICAL TEST	1/HEAT	APPROVED GA DRG./DATA SHEET	RELEVANT MATERIAL SPECN./ MFR. DRG./ APPROVED DOC	MILL TC/ LAB REPORT	3/2.		2,1	
1.8	MECHANICAL SEAL (IF APPLICABLE)	TYPE, SIZE, MFRS, NO., MAKE	MA	VISUAL EXAM	100%	APPROVED DATASHEET / GA MECH. SEAL	APPROVED DATASHEET		3/2.		2,1	COMPLIANCE TC FOR APPROVED MAKE
1.9	PUMP BEARINGS	TYPE, SIZE, MFRS, NO., MAKE	MA	VISUAL EXAM	100%	APPROVED DATASHEET	APPROVED DATASHEET		3/2.		2,1	COMPLIANCE TC FOR APPROVED MAKE
2.0 IN PROCESS CONTROL												
2.1	ALL COMPONENTS UNDER 1.00 ABOVE	VISUAL DEFECTS, DIMENSIONS	MA	VISUAL EXAM, MEASUREMENT	100%	MFG. DRAWING	MFG. DRAWING	COMPLIANCE TC	3/2.		2,1	
2.2	IMPELLER	CLEANING AND DEBURRING	MA	VISUAL	100%	MFG. DRAWING	MFG. DRAWING		3/2.		2,1	
	IMPELLER	DYNAMIC BALANCING	CR	DYNAMIC BALANCING	100%	ISO 1940	ISO1940 Gr 6.3	BALANCING CERTIFICATE	3/2.	2,1		WITNESSING ONLY FOR SIZE GREATER THAN 10KW
2.3	IMPELLER-ALL ACCESSIBLE SURFACES, DIFFUSERS	DP TEST	MA	DP TEST ON M/CED AREA	100%	APPENDIX 8 OF ASME SEC. VIII DIV. 1		NDT CERTIFICATE	3/2.	2,1		WITNESS BY BHEL & VERIFICATION BY CUSTOMER
2.4	WEARING RING, SHAFT SLEEVES, CASING	DP TEST	MA	DP TEST ON M/CED AREA	100%	APPENDIX 8 OF ASME SEC. VIII DIV. 1		NDT CERTIFICATE	3/2.		2,1	
2.5	SHAFT	DP TEST	MA	DP TEST ON M/CED AREA	100%	ASTM E 165	NO RELEVANT INDICATION ALLOWED	NDT CERTIFICATE	3/2.	2,1		WITNESS BY BHEL & VERIFICATION BY CUSTOMER
2.6	CASINGS/ BOWLS, STAGE BODIES, DISCHARGE HEAD (IF CAST), SUCTION HOUSING, COLUMN PIPE DISCHARGE PIPE ETC	LEAK TIGHTNESS	CR	VISUAL	100%	TECHNICAL DATA SHEET AND NOTE 2	NO LEAKAGE FOR TEST DURATION OF 30 MIN.	HT CERTIFICATE	3/2.	2,1		HAMMERING OF CASTINGS WITH WOODEN/ RUBBER MALLET BEFORE HYDRO TEST
BHEL				PARTICULARS		BIDDER / VENDOR						
				NAME								
				SIGNATURE								
				DATE					BIDDER/VENDOR SEAL			

NAME
SIGN.
DATE

Prepared By
AJAY JAIN
Ajay
23-07-2012

Reviewed By
ASHWANI KHANNA
Ashwani
23-07-2012

Approved By
I. J. SINGH
I. J. Singh
23-07-2012



BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
STANDARD QUALITY PLAN

Rev-01

QUALITY PLAN FOR MISCELLANEOUS PUMPS				CUSTOMER		PROJECT TITLE						
				BIDDER/VENDOR		QUALITY PLAN NUMBER						
SHEET 3 OF 6				SYSTEM		ITEM - CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL)						
S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.7	FABRICATED COMPONENTS											WELDING PROCEDURE APPROVAL BY BHEL ALT. 3RD PARTY (LLYODS, BVQI OR EQ.) IS ACCEPTABLE.
2.7.1	WELDING PROCEDURE SPECIFICATION	CORRECTNESS	MA	EXAM.	100%	ASME SEC.IX	ASME SEC.IX	QW 482 OF ASME SEC.IX	3/2.		2,1	
2.7.2	WELDING PROCEDURE QUALIFICATION	WELD SOUNDNESS	MA	VISUAL,PHYS. TESTS RT (AS APPLICABLE)	100%	ASME SEC.IX	ASME SEC.IX	QW 483 OF ASME SEC.IX	3/2.		2,1	
2.7.3	WELDER PERFORMANCE QUALIFICATION	WELD SOUNDNESS	MA	VISUAL,PHYS. TESTS RT (AS APPLICABLE)	100%	ASME SEC.IX	ASME SEC.IX	QW 484 OF ASME SEC.IX	3/2.		2,1	
2.7.4	WELD FIT-UPS	DIMENSION & ALIGNMENT	MA	MEAS.VISUAL EXAM	100%	WPS, MFG . DRAWING	WPS, MFG . DRAWING	IR/LOGBOOK	3/2.			
2.7.5	ROOT RUNS	SURFACE DEFECTS	MA	PENETRANT TEST	100%	ASTM E 165	NO SURFACE DEFECT	DO.	3/2.		2, 1	
2.7.6	WELDMENTS	SURFACE DEFECTS	MA	PENETRANT TEST	100%	ASTM E 165	ASME-VIII,DIV I	INSPN REPORT	3/2.		2,1	
BHEL				PARTICULARS		BIDDER / VENDOR						
				NAME								
				SIGNATURE								
				DATE								
BIDDER/VENDOR SEAL												

NAME	Prepared By AJAY JAIN <i>Ajay</i>	Reviewed By ASHWANI KHANNA <i>Ashwani</i>	Approved By I. J. SINGH <i>I. J. Singh</i>
SIGN.			
DATE	23-07-2012	23-07-2012	23-07-2012



BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
STANDARD QUALITY PLAN

Rev-01

QUALITY PLAN FOR MISCELLANEOUS PUMPS				CUSTOMER		PROJECT TITLE						
				BIDDER/VENDOR		QUALITY PLAN NUMBER						
SHEET 4 OF 6				SYSTEM		ITEM - CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL)						
S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.7.7	BUTT WELDS	INTERNAL DEFECT	MA	UT/RT	100%			IR	3/2.		2.1	
2.7.8	DICHARGE HEAD, COLUMN PIPE, DISCHARGE PIPE, ETC.	1. LEAK TIGHTNESS 2. DIMENSION	CR	1. HYDROTEST 2. MEASUREMENT	100%	TECHNICAL SPEC/ DATA SHEET, MFR DRAWING	1. NO LEAKAGE 2. MFR. DRAWING	IR	3/2.	2.1		
3.0	SUB-ASSEMBLY CONTROL											
3.1	ROTOR ASSEMBLY	ECCENTRICITY	MA	MEASUREMENT	100%	MFR.DRAWING	MFR.DRAWING	IR/LOG BOOK	3/2.		1	
3.2	ROTOR ASSEMBLY RESIDUAL UNBALANCE	STATIC & DYNAMIC	CR	STATIC & DYNAMIC BALANCING	100%	ISO 1940	ISO1940 Gr 6.3	BALANCING CERTIFICATE	3/2.	2.1		WTNESSING ONLY FOR SIZE GREATER THAN 10KW
3.3	COMPLETE PUMP ASSEMBLY	COMPLETENESS, CORRECTNESS, CLEANLINESS, CLEARANCES, FREENESS, ALIGNMENT	MA	VISUAL EXAM MEASUREMENT	100%	APPROVED DRG & MFG STANDARDS	APPROVED DRG & MFG STANDARDS	I.R. & CHECK LISTS	3/2.		2.1	
BHEL				PARTICULARS		BIDDER / VENDOR						
				NAME								
				SIGNATURE								
				DATE					BIDDER/VENDOR SEAL			

NAME	Prepared By AJAY JAIN	Reviewed By ASHWANI KHANNA	Approved By I. J. SINGH
SIGN.			
DATE	23-07-2012	23-07-2012	23-07-2012



BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
STANDARD QUALITY PLAN

Rev-01

QUALITY PLAN FOR MISCELLANEOUS PUMPS				CUSTOMER		PROJECT TITLE						
				BIDDER/VENDOR		QUALITY PLAN NUMBER						
SHEET 5 OF 6				SYSTEM		ITEM - CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL)						
S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
4	FINAL INSPECTION, TESTS & PACKING DESPATCH CONTROL											
4.1	PUMP WITH JOB/SHOP MOTOR ASSEMBLED ON INDIVIDUAL BASE FRAME	1. Q V/S HEAD, 2. Q V/S POWER, 3. Q V/S PUMP EFF. 4. VIBRATION 5. NOISE 6. BEARING TEMP. 7. LEAKAGES	CR	PERFORMANCE TEST	100%	APPD. PERFORMANCE TEST PROCEDURE/ APPD. DATA SHEET/APPD. CURVES FOR VIBRATIONS - AS PER ANSI/HIS 9.6.4-2009 (VALUES AS PER APPROVED DATA SHEET) FOR BEARING TEMP - BEARING HOUSING SHOULD NOT BE UNTOUCHABLY HOT. FOR LEAKAGE - MINOR LEAKAGE (DROP BY DROP) IN CASE OF GLAND PACKING ARRANGEMENT.	I.R., PERF. TEST RECORD, PLOTTED CURVES	3/2.	2,1.			* MINIMUM 7 POINTS FROM SHUT-OFF TO MAX. OPERATING FLOW COVERING ENTIRE OPERATION RANGE OF PUMP SHALL BE TAKEN.
		NPSH/ MIN. SUBMERGENCE REQUIRED	CR	NPSH TEST	1/MODEL	DO.	IR. NPSH/MIN. SUBMERGENCE TEST RECORD, PLOTTED CURVES	3/2.	2,1.			IF SPECIFIED or INSISTED BY CUSTOMER.
4.2	STRIP DOWN AFTER PERFORMANCE TEST	1. UNDUE WEAR TEAR AND RUBBING	MA	VISUAL EXAM AFTER STRIPPING	1/MODEL	NO UNDUE WEAR TEAR & RUBBING ON IMPELLER & WEAR RING	INSP. REPORT	3/2.	1			WITNESS REQUIRED ONLY WHEN ABNORMAL SOUND OBSERVED DURING PERFORMING TEST.
4.3	COMPLETE PUMP WITH UNIT MOTOR BASE FRAME, COUNTER FLANGES ETC. INCLUDING ALL ACCESSORIES AS PER SECTION C OF SPECN.	COMPLETENESS, CLEANLINESS, OVERALL DIMENSIONS ORIENTATION, WORKMANSHIP AND FINISH	MA	VISUAL EXAM MEASUREMENT	100%	APPD. G.A DRAWING	APPD. G.A DRAWING	INSP. REPORT	3/2.	1		
BHEL				PARTICULARS		BIDDER / VENDOR						
				NAME								
				SIGNATURE								
				DATE				BIDDER/VENDOR SEAL				

NAME SIGN. DATE	Prepared By AJAY JAIN 23-07-2012	Reviewed By ASHWANI KHANNA 23-07-2012	Approved By I. J. SINGH 23-07-2012
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BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
STANDARD QUALITY PLAN

Rev-01

QUALITY PLAN FOR MISCELLANEOUS PUMPS

CUSTOMER

PROJECT TITLE

BIDDER/VENDOR

QUALITY PLAN NUMBER

SHEET 6 OF 6

SYSTEM

ITEM - CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL)

S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
4.4	COMPLETION OF ALL STAGES	1.COMPLETION	MA	VERIFICATION OF IR/T.C.ETC.	100%	MFG. DRG./TECHNICAL DOCS.	APPD. MFG. DRG./TECHNICAL DOCS	IR.	3/2.	2,1		WITNESSING ONLY BY BHEL, CUSTOMER VERIFICATION ONLY BUT CHP
4.5	PAINTING	1.SURFACE FINISH, DFT, MARKINGS ETC.	MA	VISUAL EXAM MEASUREMENT AESTHETIC	100%	APPD.DRG.	APPD.DOCS	IR.	3/2.		2	
4.6	PACKING, MARKING	SOUNDNESS OF PACKING	MI	VISUAL AESTHETIC	100%	MFG. STANDARD	MFG. STANDARD		3/2.		2	

MTC -Mill Test Certificate, MA-Major, MI-Minor, TC-Test Certificate, CR-Critical, IGC- Inter Granular Corrosion

- 1.AS CAST HEAT MARKS SHALL BE PROVIDED ON CI CASTING LIKE TOP & BOTTOM CASING.
2. HYDRO TEST PRESSURE SHALL BE AT LEAST 2(TWO) TIMES THE DUTY POINT (OR) 1.5 TIMES OF SHUT OFF HEAD (OR) SYSTEM DESIGN PRESSURE, WHICHEVER IS HIGHER.
3. THIS QAP IS ALSO APPLICABLE FOR SPARES.
4. NO WELD REPAIRS PERMISSIBLE ON CI CASTING.
5. MATERIAL SHALL BE AS PER APPROVED CROSS SECTION DRG./ DATA SHEET.
6. STRIP TEST- INCASE OF ABNORMAL NOISE OBSERVED DURING PERF. TEST, THOSE PUMP WILL BE STRIPPED DOWN FOR VISUAL INSPECTION OF IMPELLER & WEAR SHALL BE OFFERED FOR VISUAL INSPECTION FOR WEAR /RUBBING MARKS.
7. PUMPS WITH MECHANICAL SEAL ARRANGEMENT TO BE TESTED AND SUPPLIED WITH GLAND PACKING ARRANGEMENT. HOWEVER MANUFACTURER TO ENSURE DIMENTIONAL MATCHING OF MECHANICAL SEAL WITH PUMP GA DRAWING.

LEGEND : 1- BHEL OR BHEL NOMINATED THIRD PARTY /END CUSTOMER OF BHEL,
2- VENDOR,
3-SUB-VENDOR

P- PERFORM, W- WITNESS, V-VERIFICATION

BHEL	PARTICULARS	BIDDER / VENDOR	
	NAME		
	SIGNATURE		
	DATE		BIDDER/VENDOR SEAL

NAME	Prepared By	Reviewed By	Approved By
SIGN.	AJAY JAIN	ASHWANI KHANNA	I. J. SINGH
DATE	23-07-2012	23-07-2012	23-07-2012



TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-100-N001**

SECTION: **II**

SUB-SECTION: **IIB**

REV. NO. **00** DATE **25/04/2019**

SHEET **1** OF **1**

SUB-SECTION - IIB

STANDARD TECHNICAL SPECIFICATION (ELECTRICAL)

		QUALITY PLAN	CUSTOMER :			PROJECT			SPECIFICATION :			
			BIDDER/ : VENDOR			TITLE QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			NUMBER :			
									SPECIFICATION TITLE			
SHEET 1 OF 2		SYSTEM			ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION		VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-	
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	2	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUFR'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	2	1		
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-	NOTE -1 & NOTE-3
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									

		QUALITY PLAN		CUSTOMER :		PROJECT TITLE			SPECIFICATION : NUMBER :			
				BIDDER/ : VENDOR		QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION : TITLE :			
		SHEET 2 OF 2		SYSTEM		ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION		VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-	
NOTES: 1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON 2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER. 3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY. <u>Legends for Inspection agency</u> 1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER) P. PERFORM W. WITNESS V. VERIFY												
BHEL			PARTICULARS		BIDDER/VENDOR				BIDDER'S/VENDORS COMPANY SEAL			
			NAME									
			SIGNATURE									
			DATE									

		QUALITY PLAN		CUSTOMER :			PROJECT TITLE		SPECIFICATION : NUMBER :			
				BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03		SPECIFICATION : TITLE			
		SHEET 1 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)		SECTION		VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	
1.0	RAW MATERIAL & BOUGHT OUT CONTROL											
1.1	SHEET STEEL, PLATES, SECTION, EYEBOLTS	1.SURFACE CONDITION	MA	VISUAL	100%	-	FREE FROM BLINKS, CRACKS, WAVINESS ETC	LOG BOOK	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	-DO-	3	-	-	
		3.PROOF LOAD TEST (EYE BOLT)	MA	MECH. TEST	-DO-	-DO-	-DO-	INSPEC. REPORT	3	-	2	
1.2	HARDWARES	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, UN-EVENNESS ETC.	-DO-	3	-	-	
		2.PROPERTY CLASS	MA	VISUAL	SAMPLES	MANFR'S DRG./SPEC BOOK	RELEVANT IS/SPEC.	SUPPLIERS TC & LOG	3	-	2	
1.3	CASTING	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK	3	-	2	
		2.CHEM. & PHY. PROP.	MA	CHEM & MECH TEST	1/HEAT NO.	MANFR'S DRG./SPEC	RELEVANT IS/	SUPPLIER'S TC	3	-	2	
		3.DIMENSIONS	MA	MEASUREMENT	100%	MANUFR'S DRG.	MANUFR'S DRG.	LOG BOOK	3	-	2	
1.4	PAINT & VARNISH	1.MAKE, SHADE, SHELF LIFE & TYPE	MA	VISUAL	100% CONTINUOUS	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	LOG BOOK	3	-	2	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN SHEET 2 OF 9		CUSTOMER :		PROJECT TITLE			SPECIFICATION :			
				BIDDER/ :		QUALITY PLAN			SPECIFICATION :			
				VENDOR		NUMBER PED-506-00-Q-007, REV-03			TITLE			
		SYSTEM		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION		VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED
		2. CHEM. & PHYSICAL PROPERTIES	MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	MFG. DRG. SPEC.	RELEVANT IS	SUPPLIER'S TC	3	-	2	
		3. DIMENSIONS	MA	MEASUREMENT	100%	-DO-	MANUFR'S DRG.	LOG BOOK	3	-	2	
		4.INTERNAL FLAWS	CR	UT	-DO-	ASTM-A388	MANUFR'S SPEC. BHEL SPEC.	-DO-	3	2	1	
1.6	SPACE HEATERS, CONNECTORS, TERMINAL BLOCKS, CABLES, CABLE LUGS, CARBON BRUSH TEMP. DETECTORS, RTD, BTD'S	1. MAKE & RATING	MA	VISUAL	-DO-	MANUFR'S DRG. SPEC.	MANUFR'S DRG. SPEC.	-DO-	3	-	2	
		2. PHYSICAL COND.	MA	-DO-	-DO-	-	NO PHYS. DAMAGE, NO ELECTRICAL DISCONTINUITY	-DO-	3	-	2	
		3.DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	MANUFR'S DRG./ SPEC.	MANUFR'S DRG. / SPEC.	-DO-	3	-	2	
		4.PERFORMANCE/ CALIBRATION	MA	TEST	100%	-DO-	-DO-	INSP. REPORT	3	-	2	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE									
									BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN SHEET 3 OF 9		CUSTOMER :		PROJECT			SPECIFICATION :				
				BIDDER/ VENDOR :		TITLE			NUMBER :				
				SYSTEM		QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE				
				ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND. ETC. 2. OTHER CHARACTERISTICS	MA MA	VISUAL TEST	100% SAMPLE	- MANUF'S SPEC.	NO VISUAL DEFECTS MANUF'S SPEC.	INSPT. REPORT LOG BOOK AND OR SUPPLIER'S TC	3 3	- -	2 2		
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND. 2.DIMENSIONS INCLUDING BURS HEIGHT 3. ACCEPTANCE TESTS	MA MA MA	VISUAL MEASUREMENT ELECT. & MECH TESTS	100% SAMPLE -DO-	- MANUFR'S DRG. . MANUF'S SPEC./ RELEVANT IS	NO VISUAL DEFECTS (FREE FROM BURS) MANUFR'S DRG. RELEVANT IS	LOG BOOK -DO- SUPPLIER'S TC	3 3 3	- - -	- 2 2		FOR MV MOTOR INSULATION/VARNISH THICKNESS SHALL BE MORE THAN THE BURS HEIGHT
1.9	CONDUCTORS	1. SURFACE FINISH 2.ELECT. PROP. & MECH. PROP	MA MA	VISUAL ELECT. & MECH.TEST	100% SAMPLES	- RELEVANT IS/ BS OR OTHER STANDARDS	FREE FROM VISUAL DEFECTS RELEVANT IS/ BS OR OTHER STANDARDS	LOG BOOK SUPPLIERS TC & VENDOR'S INSPN. REPORTS	3* 3	- -	2* 2		* MOTOR MANUFACTURER TO CONDUCT VISUAL CHECK FOR SURFACE FINISH ON RANDOM BASIS (10% SAMPLE) AT HIS WORKS AND MAINTAIN RECORD FOR VERIFICATION BY BHEL/CUSTOMER.
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE										
									BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN SHEET 4 OF 9		CUSTOMER :		PROJECT			SPECIFICATION :			
				BIDDER/ :		TITLE			NUMBER :			
				VENDOR		QUALITY PLAN			SPECIFICATION :			
				SYSTEM		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			TITLE			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION			VOLUME III
									P	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.10	BEARINGS	3.DIMENSIONS	MA	MEASUREMENT	-DO-	-DO-	-DO-	Log Book	3	-	2	
		1.MAKE & TYPE	MA	VISUAL	100%	MANFR'S DRG./ APPROVED DATASHEET	MANFR'S DRG./ APPROVED DATASHEET	-DO-	3	-	2	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	BHEL DATA SHEET	BHEL DATA SHEET BEARING MANUF'S CATALOGUES	-DO-	3	-	2	
		3.SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	2	
1.11	SLIP RING (WHEREVER APPLICABLE)	1.SURFACE COND.	MA	VISUAL	100%	-	-DO-	-DO-	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	
		3.TEMP.WITH-STAND CAPACITY	MA	ELECT.TEST	-DO-	MANUF'S SPEC./ BHEL SPEC.	MANUF'S SPEC./ BHEL SPEC.	-DO-	3	-	2	
		4.HV/IR	MA	-DO-	100%	-DO-	-DO-	-DO-	3	-	2	
1.12	OIL SEALS & GASKETS	1.MATERIAL OF GASKET	MA	VISUAL	100%	MANUF'S DRG/SPECS	MANUF'S DRG./ SPECS.	-DO-	3	-	-	
		2.SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE									
									BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :		
				BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE		
		SHEET 5 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION		VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
2.0	IN PROCESS											
2.1	STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR)	1.WORKMANSHIP & CLEANNES	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	3/2	2	-	
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-	
2.2	MACHINING	1.FINISH	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	2	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-	
		3.SHAFT SURFACE FLOWS	MA	PT	-DO-	RELEVENT SPEC./ ASTM-E165	MANUFR'S SPEC./ BHEL SPEC./	-DO-	2	-	1	
2.3	PAINTING	1.SURFACE PREPARATION	MA	VISUAL	100%	MANFR'S SPEC./BHEL SPEC./ RELEVANT STAND	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
		2.PAINT THICKNESS (BOTH PRIMER & FINISH COAT)	MA	MEASUREMENT BY ELCOMETER	SAMPLE	-DO-	-DO-	-DO-	2	-	-	
		3.SHADE	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	2	-	-	
		4.ADHESION	MA	CROSS CUTTING & TAPE TEST	-DO-	-DO-	-DO-	Log Book	2	-	-	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN		CUSTOMER :			PROJECT			SPECIFICATION :		
				BIDDER/ :			TITLE			NUMBER :		
				VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE		
SHEET 6 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.4	SHEET STACKING	1.COMPLETENESS	MA	MEASUREMENT	SAMPLE	MANUFR'S SPEC.	MANUFR'S SPEC.	Log Book	2	-	-	(FOR MOTORS OF 2MW AND ABOVE) * ON 10% RANDOM SAMPLE
		2.COMPRESSION & TIGHTENING	MA	MEASUREMENT	100%	-DO-	-DO-	Log Book	2	-	-	
		3.CORE LOSS & HOTSPOT	MA	ELECT.TEST	-DO-	-DO-	-DO-	Log Book	2	1*	1	
2.5	WINDING	1.COMPLETENESS	CR	VISUAL	100%	MANUFR'S SPEC./BHEL SPEC.	MANUFR'S SPEC./BHEL SPEC.	Log Book	2	-	-	FOR MV MOTOR
		2.CLEANLINESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-	
		3.IR-HV-IR	CR	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	2	-	1	
		4.RESISTANCE	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	
		5.INTERTURN INSULATION	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-	
		6.SURGE WITH STAND AND TAN. DELTA TEST	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	
2.6	IMPREGNATION	1.VISCOSCITY	MA	PHY. TEST	AT STARTING	-DO-	-DO-	Log Book	2	-	-	THREE DIPS TO BE GIVEN
		2.TEMP. PRESSURE VACCUM	MA	PROCESS CHECK	CONTINUOUS	-DO-	-DO-	Log Book	2	-	-	
		3.NO. OF DIPS	MA	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE									
									BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN SHEET 7 OF 9		CUSTOMER :		PROJECT TITLE			SPECIFICATION : NUMBER :			
				BIDDER/ VENDOR :		QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
				SYSTEM		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	
2.7	COMPLETE STATOR ASSEMBLY	4.DURATION	MA	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	VERIFICATION FOR MV MOTOR ONLY
		1.COMPACTNESS & CLEANLINESS	MA	VISUAL	100%	-DO-	-DO-	Log Book	2	-	-	
2.8	BRAZING/COMPRESSION JOINT	1.COMPLETENESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-	
		2.SOUNDNESS	CR	MALLET TEST & UT	-DO-	-DO-	-DO-	Log Book	2		1	
		3.HV	MA	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	2		1	
2.9	COMPLETE ROTOR ASSEMBLY	1.RESIDUAL UNBALANCE	CR	DYN. BALANCE	-DO-	MFG SPEC./ ISO 1940	MFG. DWG.	Log Book	2		1	
		2.SOUNDNESS OF DIE CASTING	CR	ELECT. (GROWLER TEST)	-DO-	MFG. SPEC.	MFG. SPEC.	Log Book	2		1	
2.10	ASSEMBLY	1.ALIGNMENT	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	2	-	-	
		2.WORKMANSHIP	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	2	-	-	
		3.AXIAL PLAY	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	2	-	1	
		4.DIMENSIONS	MA	-DO-	-DO-	MFG.DRG./ MFG SPEC.	MFG. DRG/ RELEVANT IS	Log Book	2	-	-	
		5.CORRECTNESS, COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	2	-	-	
		6. RTD, BTD & SPACE HEATER MOUNTING.	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	2		1	
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE									
BIDDER'S/VENDORS COMPANY SEAL												

		QUALITY PLAN SHEET 8 OF 9		CUSTOMER :		PROJECT			SPECIFICATION :			
				BIDDER/ :		TITLE			NUMBER :			
				VENDOR		QUALITY PLAN			SPECIFICATION :			
		SYSTEM		NUMBER PED-506-00-Q-007, REV-03			TITLE					
		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)		SECTION			VOLUME III					
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
3.0	TESTS	1.TYPE TESTS INCLUDING SPECIAL TESTS AS PER BHEL SPEC.	MA	ELECT.TEST	1/TYPE/SIZE	IS-325/ BHEL SPEC./ DATA SHEET	IS-325/ BHEL SPEC./ DATA SHEET	TEST REPORT	2	1*	1	* NOTE - 1
		2.ROUTINE TESTS INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^s	1	^s NOTE - 2
		3.VIBRATION & NOISE LEVEL	MA	-DO-	100%	IS-12075 & IS-12065	IS-12075 & IS-12065	-DO-	2	1 ^s	1	^s NOTE - 2
		4.OVERALL DIMENSIONS AND ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPC. REPORT	2	1	-	
		5.DEGREE OF PROTECTION	MA	ELECT. & MECH. TEST	1/TYPE/ SIZE	RELEVANT IS	BHEL SPEC. AND DATA SHEET	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		6. MEASUREMENT OF RESISTANCE OF RTD & BTD	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^s	1	^s NOTE - 2
		7. MEASUREMENT OF RESISTANCE, IR OF SPACE HEATER	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^s	1	^s NOTE - 2
		8. NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPC. REPORT	2	1 ^s	1	^s NOTE - 2
		9.EXPLOSION FLAME PROOF NESS (IF SPECIFIED)	MA	EXPLOSION FLAME PROOF TEST	1/TYPE	IS-3682 IS-8239 IS-8240	IS-3682 IS-8239 IS-8240	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		10. PAINT SHADE, THICKNESS & FINISH	MA	VISUAL & MEASUREMENT BY ELKOMETER	SAMPLE	BHEL SPEC. & DATA SHEET	BHEL SPEC. & DATA SHEET	TC	2	1 ^s	1	SAMPLING PLAN TO BE DECIDED BY INSPECTION AGENCY ^s NOTE - 2
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN SHEET 9 OF 9		CUSTOMER :		PROJECT TITLE			SPECIFICATION : NUMBER :			
				BIDDER/ VENDOR		QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
				SYSTEM		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION		VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
NOTES: 1 DEPENDING UPON THE SIZE AND CRITICALLY, WITNESSING BY BHEL SHALL BE DECIDED. 2 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON. 3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THESE TEST MAY NOT BE REPEATED. 4 WHEREVER CUSTOMER IS INVOLVED IN INSPECTION, AGENCY (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER. <u>Legends for Inspection agency</u> 1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER) P. PERFORM W. WITNESS V. VERIFY												
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE									
									BIDDER'S/VENDORS COMPANY SEAL			



TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-100-N001**

SECTION: **III**

SUB-SECTION:

REV. NO. **00** DATE 25/04/2019

SHEET **1** OF **1**

SECTION III

DOCUMENTS TO BE SUBMITTED BY BIDDER



TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-100-N001**

SECTION: **IIIA**

SUB-SECTION:

REV. NO. **00** DATE 25/04/2019

SHEET **1** OF **1**

SECTION IIIA

**GUARANTEE SCHEDULE
(TO BE SUBMITTED ALONG WITH THE BID BY ALL BIDDERS)**

**SCHEDULE OF PERFORMANCE GUARANTEES****3X800MW NTPC PATRATU STPS EXPANSION PHASE-1**

SPECN. NO.:

PE-TS-434-100-N001, Rev-00

VOLUME:

--

SECTION:

IIIA

Sheet 1 of 2

REV. NO.

00

DATE:

25-04-2019

Following parameters are guaranteed for following pumps

Sl. No.	Pump Description	Guaranteed Capacity	Guaranteed TDH	Guaranteed Pump Eff.	Guaranteed Motor Eff.	Guaranteed Power consumption at inlet to motor terminals	Pump model	Motor Rating	Pump GD ² Value for HT motor only	Pump RPM	T/S Curve attached for HT motor
		(M3/Hr)	(MWC)	%	%	(KW)		(KW)			
	Horizontal pumps (Type-I)										
1	#DM WATER MAKE UP PUMPS	75	70								
2	BOILER FILL PUMPS	250	175		95						YES
3	# RAW WATER ASH PUMPS	150	35								
4	# HVAC M/U WATER PUMP	150	70								

Note: 1 # Bid evaluation and LD is applicable for these pumps only as per clause 4.00.00 of Section-IIA & Data Sheet-A of Section-ID of Technical Specification for pumps.

We the undersigned hereby undertake to meet the performance guarantees as listed in the table above on the conditions as elsewhere specified. Any variation of the specified conditions during official tests will be taken in account by the customer

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE

NAME

DESIGNATION

SIGNATURE

DATE

COMPANY SEAL

**SCHEDULE OF PERFORMANCE GUARANTEES****3X800MW NTPC PATRATU STPS EXPANSION PHASE-1**

SPECN. NO.:

PE-TS-434-100-N001, Rev-00

VOLUME:

--

SECTION:

IIIA

Sheet 2 of 2

REV. NO.

00

DATE:

25-04-2019

Following parameters are guaranteed for following pumps

Sl. No.	Pump Description	Guaranteed Capacity	Guaranteed TDH	Guaranteed Pump Eff.	Guaranteed Motor Eff.	Guaranteed Power consumption at inlet to motor terminals	Pump model	Motor Rating	Pump GD ² Value for HT motor only	Pump RPM	T/S Curve attached for HT motor
		(M3/Hr)	(MWC)	%	%	(KW)		(KW)			
	Horizontal pumps (Type-II)										
1	#ECW (TG AUX.) PUMPS	1350	35		95						YES
2	#ECW (SG AUX'S) PUMPS	650	56		95						YES
3	#ECW COMMON STATION AUX'S PUMPS	2950	40		95						YES
4	#ACW PUMPS	1900	50		95						YES
5	#AHS COOLING PUMPS	705	75		95						YES
6	#ACW COMMON STATION AUX. PUMPS	2950	31		95						YES
7	CONDENSATE TRANSFER PUMPS	355	50								
8	#RAW WATER PT PUMPS	1475	25								
9	APH WASH PUMPS	1050	93		95						YES
10	#SERVICE WATER PUMP	1400	75		95						YES
11	#FGD MAKE-UP WATER PUMPS	675	35								
12	#ACW MAKE-UP WATER PUMPS	325	20								

Note: 1 # Bid evaluation and LD is applicable for these pumps only as per clause 4.00.00 of Section-IIA & Data Sheet-A of Section-ID of Technical Specification for pumps.

We the undersigned hereby undertake to meet the performance guarantees as listed in the table above on the conditions as elsewhere specified. Any variation of the specified conditions during official tests will be taken in account by the customer

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE

NAME

DESIGNATION

SIGNATURE

DATE

COMPANY SEAL



TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-100-N001**

SECTION: **IIIB**

SUB-SECTION:

REV. NO. **00** DATE 25/04/2019

SHEET **1** OF **1**

SECTION IIIB

**COMPLIANCE CERTIFICATE
(TO BE SUBMITTED ALONG WITH THE BID BY ALL BIDDERS)**

	TECHNICAL SPECIFICATIONS	SPECN. NO.:	PE-TS-434-100-N001, Rev.00		
	MISCELLANEOUS PUMPS	VOLUME:	--	SECTION:	IIIB
	COMPLIANCE CERTIFICATE	REV. NO.	0	DATE:	25-04-2019
The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnish same with the offer. a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions/ deviations with regard to same. b) QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CONSULTANT/ CUSTOMER approval in the event of order & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. c) All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/ CONSULTANT/ CUSTOMER approval. d) There are no other deviation with respect to specification other than those furnished in the 'Schedule of Deviations'. e) Bidder shall include the cost of Mandatory Spares, unless specified otherwise in Sec-IA of the specification or NIT. Any mandatory spares stated as not applicable, shall have to be supplied without any cost implication to BHEL in the event they are found to be applicable during detail engineering stage. f) The offered materials should be either equivalent or superior to those specified. Also for components where material is not specified it shall be suitable for intended duty. All materials shall be subject to approval in the event of order. g) Prices for recommended spares (if any) for 3 years operation shall be furnished separately & not included in the base price. h) The commissioning spares (if any) are supplied on 'As Required Basis' & prices for same included in the base price (If bidders reply to this is "No commissioning spares are required" and if some spares are actually required during commissioning same shall be supplied by bidder without any cost to BHEL). i) All sub vendors shall be as per BHEL/CONSULTANT/CUSTOMER approved list. j) Tests for noise, vibration, parallel running etc. for pumps shall be conducted at site by Pump Vendor/BHEL as per cl. no. 3.04.00 of Section-IIA and if the site performance is found not meeting the requirements in any respect as specified, than the equipment shall be rectified or replaced by the vendor, at his own cost. k) Any special tools & tackles, if required, shall be in bidder's scope. l) All models offered have been supplied by bidder in the past and are meeting the experience qualifying criteria of BHEL/CONSULTANT/CUSTOMER (viz. offered model is successfully operating in two separate stations for at least one year or as specified in technical PQR). Any deviation to this criteria shall be suitably highlighted in deviation schedule. m) All selected motor ratings have minimum margins as per Datasheet A, Section ID.					
We the undersigned hereby undertake to meet the compliance requirements as listed above on the conditions as elsewhere specified.					
PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE					
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL	



TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-100-N001**

SECTION: **IIIC**

SUB-SECTION:

REV. NO. **00** DATE 25/04/2019

SHEET **1** OF **1**

SECTION IIIC

**DEVIATION SCHEDULE
(TO BE SUBMITTED ALONG WITH THE BID BY ALL BIDDERS)**

	TITLE * SCHEDULE OF DEVIATIONS () From Conditions of Contract (Volume - I) () From General Technical Conditions (Volume - II A) () From Technical Specifications (Volume - II B)				SPECIFICATION NUMBER PE-TS-434-100-N001	
					VOLUME III PART - A	
					SHEET OF	
We the undersigned hereby certify that the above mentioned are the only deviations.						
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE						
NAME	DESIGNATION	SIGNATURE	DATE			
					COMPANY SEAL	



TITLE:

**TECHNICAL SPECIFICATION
MISCELLANEOUS PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-100-N001**

SECTION: **IIID**

SUB-SECTION:

REV. NO. **00** DATE 25/04/2019

SHEET **1** OF **1**

SECTION IIID

DATA SHEET – B FOR PUMPS

ELECTRICAL LOAD DATA FORMAT

CABLE SCHEDULE

MOTOR DATASHEET-C

**(TO BE SUBMITTED BY SUCCESSFUL BIDDER AFTER AWARD OF
CONTRACT)**

		PROJECT: MISCELLANEOUS PUMPS DATASHEET - B		VENDOR DOC. NO.		REV NO.	
				BHEL DOC. NO.		REV NO.	
SL.	DESCRIPTION	UOM	PUMP DATA	PUMP DATA	PUMP DATA	PUMP DATA	PUMP DATA
1.0	GENERAL						
1.1	Designation of the Pump						
1.2	Manufacturer						
1.3	Model No.						
1.4	No. of pumps	Nos.					
1.5	System Design Pressure	Kg/cm ²					
1.6	Specific Gravity of fluid to be handled	-					
2.0	PERFORMANCE PARAMETERS						
2.1	Performance standard						
2.2	Rated capacity. (No negative tolerance)	M ³ /hr					
2.3	Total Dynamic Head (TDH) at rated capacity (No negative tolerance)	MWC					
2.4	Shut off head	MWC					
2.5	Range of Operation of the Pump						
	a) Min.Flow	M ³ /hr					
	b) Max.Flow	M ³ /hr					
2.6	The pumps offered have continuously rising head capacity curves from the duty point towards shut off point.						
2.7	The pumps offered have stable rising H-Q curves within the "Range of Operation"						
2.8	Pump rated speed	RPM					
2.9	Vibration measurements (2.9.2 is applicable in addition to 2.9.1 for Pumps with speed less than 600 RPM)						
2.9.1	Max.value of vibration on any pump /motor bearing w.r.t. velocity (Vrms) as per ANSI/ HIS 9.6.4 for speed > 600 RPM						
	a) Guaranteed at manufacturer's works	mm/s					
	b) Guaranteed at site	mm/s					
2.9.2	Max.value of vibration on any pump /motor bearing w.r.t. peak to peak amplitude as per ANSI/ HIS 9.6.4 for speed <= 600 RPM						
	a) Guaranteed at manufacturer's works	microns					
	b) Guaranteed at site	microns					
2.10	Max. noise Level (Guaranteed at site)	dB					
2.11	Guaranteed Pump efficiency at rated head & rated capacity without -ve tolerance	%					
2.12	Power consumption						
	a) Guaranteed pump input power at duty point	KW					
	b) Guaranteed max. Pump input power within range of operation.	KW					
	c) Max. pump input power at shut off	KW					
	d) Guranteed power at motor input	KW					
2.13	NPSH required at rated capacity	MWC					
3.0	DESIGN & CONSTRUCTION FEATURES						
3.1	Type of pump casing						
3.2	Pump duty						
3.3	Type of Impeller						
3.4	Location						
3.5	Pump suitable for parallel operation						
3.6	Torque speed curve of the pump & drive motor furnished for pumps with drive motor rating of 100 KW and above.						
3.7	Pump number of stages						

		PROJECT: MISCELLANEOUS PUMPS DATASHEET - B		VENDOR DOC. NO.		REV NO.	
				BHEL DOC. NO.		REV NO.	
SL.	DESCRIPTION	UOM	PUMP DATA	PUMP DATA	PUMP DATA	PUMP DATA	PUMP DATA
3.8	Specific speed $N = \text{RPM} \times (\text{Flow in USGPM})^{1/2} / (\text{Head in Ft.})^{3/4}$						
3.9	Minimum suction head required in MLC for pump operation at maximum discharge point within the 'Range of Operation' specified (NPSHR at max. flow).						
3.10	Whether pump is suitable/designed so that pump internals can be attended without disturbing suction and discharge piping.						
3.11	Type of coupling between pump & motor						
3.12	Bearing (DE & NDE)						
	a) Type and manufacturer						
	b) Bearing no.						
	c) Type of lubrication						
	d) Design life (Hrs.)						
3.13	Shaft Sealing arrangement						
	a) Type and manufacturer						
	b) Sealing liquid						
	c) Requirement of external water if any						
	i) Quality						
	ii) Quantity/ Pump	M ³ /hr					
3.14	In case separate oil/grease/water pump or any such equipment required for bearing lubrication/stuffing box gland sealing, furnish full technical details of these equipment and their drive.						
4.0	MATERIAL OF CONSTRUCTION (Indicate applicable code/ standard)						
4.1	Casing						
4.2	Impeller						
4.3	Shaft						
4.4	Shaft sleeves						
4.5	Wear ring						
4.6	fasteners						
4.7	Gland						
4.8	Lantern ring						
4.9	Mechanical seals (faces)/						
	Gland packing						
4.10	Base plate						
5.0	CONNECTIONS AND OTHER DIMENSIONAL DETAILS						
5.1	Impeller diameter	mm					
6.0	DRIVE DATA						
6.1	Drive unit output at 50°C ambient condition	KW/ P					
7.0	INSPECTION & TESTING						
7.1	Material test						
7.2	Hydrostatic test pressure	Kg/cm ²					
7.3	Hydrostatic test duration	Min.					
7.4	Performance test on pump at shop						
7.5	Dyanamic balance test						
8.0	WEIGHT AND LOADING DATA						
8.1	Weight of the pump & drive assembly	Kg					
8.2	Weight of the heaviest piece to be handled	Kg					

		PROJECT: MISCELLANEOUS PUMPS DATASHEET - B		VENDOR DOC. NO.		REV NO.	
				BHEL DOC. NO.		REV NO.	
SL.	DESCRIPTION	UOM	PUMP DATA	PUMP DATA	PUMP DATA		
8.3	Size of base plate (length x width)	mm					
9.0	ADDITIONAL INFORMATION FOR VERTICAL PUMPS						
9.1	Type of pump						
9.2	No. of stages for Vertical Turbine Pump	Nos.					
9.3	Bowl Head	MLC					
9.4	Bowl Efficiency	%					
9.5	Setting Length	m					
9.6	Column pipe OD X Thickness	mm X mm					
9.7	No of column pieces	Nos.					
9.8	No of intermediate shafts	Nos.					
9.9	No of bearings	Nos.					
9.10	Type & make of Bearing						
9.11	Sealing/lubrication arrangement of bearings						
9.12	Capacity of overhead forced lubrication tank	m ³					
9.13	Nos of forced lubrication pumps	Nos.					
9.14	Capacity of forced lubrication pumps	m ³ /Hr					
9.15	TDH of forced lubrication pumps	MLC					

[illegible]

ANNEXURE III

[illegible]

CLAUSE NO.	Bidder's Name				
	DE-1B	LT MOTORS			
	A.	GENERAL			
	5.	Manufacturer & Country of origin. (Shall be as per approved QA make)			
	6.	Equipment driven by motor			
	7.	Motor type			
	8.	Quantity			
	B.	DESIGN AND PERFORMANCE DATA			
	18.	Frame size			
	19.	Type of duty			
	20.	Type of enclosure /Method of cooling/ Degree of			
	21.	Applicable standard to which motor generally			
	22.	Efficiency class as per IS 12615			
	23.	(a)Whether motor is flame proof	Yes/No		
		(b)If yes, the gas group to which it conforms as per IS:2148			
	24.	Type of mounting			
	25.	Direction of rotation as viewed from DE END			
	26.	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)			
	27.	Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)			
	28.	Maximum continuous load demand of driven			
	29.	Rated Voltage (volts)			
	30.	Permissible variation of :			
		a. Voltage (Volts)			
		b. Frequency (Hz)			
		c. Combined voltage and frequency			
	31.	Rated speed at rated voltage and			
	32.	At rated Voltage and frequency:			
		a. Full load current			
	EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2		DB07: MOTORS
					PAGE 13 OF 17

CLAUSE NO.	Bidder's Name		एनटीपीसी NTPC
		b. No load current	
	33.	Power Factor at	
		a. 100% load	
		b. NO load	
		c. Starting.	
	34.	Efficiency at rated voltage and frequency,	
		a. 100% load	
		b. 75% load	
		c. 50% load	
	35.	Starting current (amps) at	
		a. 100 % voltage	
		b. 85% voltage	
		c. 80% voltage	
	36.	Minimum permissible starting Voltage (Volts)	
	37.	Starting time with minimum permissible voltage	
		a. Without driven equipment coupled	
		b. With driven equipment coupled	
	38.	Safe stall time with 100% and 110% of rated	
		a. From hot condition	
		b. From cold condition	
	39.	Torques :	
		a. Starting torque at min. permissible voltage(kg-	
		b. Pull up torque at rated voltage.	
		c. Pull out torque	
	d. Min accelerating torque (kg.m) available		
	e. Rated torque (kg.m)		
40.	Stator winding resistance per phase (ohms at 20		
41.	GD ² value of motors		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW) TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2 DB07: MOTORS PAGE 14 OF 17			

CLAUSE NO.	Bidder's Name				
	42.	No of permissible successive starts when motor is in hot condition			
	43.	Locked Rotor KVA Input			
	44.	Locked Rotor KVA/KW			
	45.	Vibration limit :Velocity (mm/s)			
	46.	Noise level limit (dBA)			
	C.	CONSTRUCTIONAL FEATURES			
	1.	Stator winding insulation			
		a. Class & Type			
		b. Winding Insulation Process			
		c. Tropicalised (Yes/No)			
		d. Temperature rise over specified maximum ambient temperature of 50 deg C			
		e. Method of temperature measurement			
		f. Stator winding connection			
	2.	Main Terminal Box			
		a. Type			
		b. Location(viewed from NDE side)			
		c. Entry of cables(bottom/side)			
		d. Recommended cable size(To be matched with cable size envisaged by owner)			
		e. Fault level (MVA),Fault level duration(sec)			
		f. Cable glands & lugs details (shall be suitable for			
	3.	Type of DE/NDE Bearing			
	4.	Motor Paint shade			
	5.	Weight of			
		a. Motor stator (KG)			
		b. Motor Rotor (KG)			
		c. Total weight (KG)			
	D.	List of accessories.			
	EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2		DB07: MOTORS
					PAGE 15 OF 17

CLAUSE NO.	Bidder's Name		एनटीपीसी NTPC
	1.	Space Heaters (Applicable for 30 KW & above motor) (Nos./Power in watts/supply voltage)	
	2.	Terminal Box for Space Heater (Yes/No)	
	3.	Speed switch (Yes/No)	
	4.	Insulation of bearing (Yes/No)	
	5.	Noise reducer(Yes/No)	
	6.	Grounding pads	
		i) No and size on motor body	
		ii) Nos on terminal Box	
	7.	Vibration pads	
		i) Nos and size	
		ii) Location	
	8.	Any other fitments	
	E.	List of curves.	
	1.	Torque speed characteristic of the motor	
	2.	Thermal withstand characteristic	
	3.	Starting. current Vs. Time	
	4.	Starting. current Vs speed	
	5.	P.F. and Effi. Vs Load	
	F.	Additional Data to be filled for each rating of DC Motor	
	1.	Rated armature voltage (Volt)	
	2.	Rated field excitation (Amp)	
	3.	Permissible % variation in voltage	
	4.	Minimum Permissible Starting voltage (volt)	
	5.	At rated voltage	
		i)Full load Armature current.(Amp)	
		ii)Full load Field current (Amp)	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2	DB07: MOTORS PAGE 16 OF 17