

NTPC Limited

**PATRATU SUPER THERMAL POWER
STATION EXPANSION PHASE-I (3X800MW)**

**TECHNICAL SPECIFICATION
FOR
SUMP PUMPS**

Specification No.: PE-TS-434-172-N001 (Rev-00)



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA-201301**

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		SECTION:
		SUB-SECTION:
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SECTION - I

SPECIFIC TECHNICAL REQUIREMENTS

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TITLE:

**TECHNICAL SPECIFICATION
SUMP PUMPS**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-172-N001**

SECTION: **I**

SUB-SECTION: **IA**

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SUB-SECTION – IA

SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)



TITLE: TECHNICAL SPECIFICATION SUMP PUMPS 3x800MW PATRATU STPS EXP. PH.-I SPECIFIC TECHNICAL REQUIREMENTS	SPEC. NO.: PE-TS-434-172-N001	
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1.0 SCOPE:

This enquiry covers the design, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-contractors works, proper packing for delivery, complete with all accessories as per the requirements specified in this specification, Site testing and any other services, etc. if called for in the succeeding sections of the specification for following project:

3x800MW NTPC PATRATU STPS EXPANSION PHASE-I

Evaluation of sump pumps as indicated in technical specification shall be as per NIT.

Note:

- The bidder shall include complete supplies for the project in his scope, part supplies offered for project shall disqualify the offer.
- Sump pumps details viz. quantity, Capacity, Head, Materials of construction, Mandatory spares and other particulars are detailed in Data Sheet-A at Section-ID of the specification.

2.0 SCOPE OF SUPPLY:

2.1.1 Scope of supply includes Pumps, motors with standard/special accessories which shall necessarily be the part of the pump bidder scope.

2.1.2 The pumps shall be complete with following standard/ special accessories- as applicable.

2.2.1 Standard accessories to be supplied with each pump.

- Electric motor drive with cable glands.
- Self-contained lubrication system.
- Erection & commissioning spares, as required.
- Supply of first fill of lubricants including second fill/ replenishment as necessary after commissioning and handing over of equipment.

2.2.2 Special accessories included in Bidder's scope of supply:

The following accessories besides those stipulated in Data Sheet-A shall be in bidder's scope.

a) **DELETED.**

b) For Portable trolley mounted Submersible type sump pumps:

For these pumps 63 amps. Welding socket shall be made available by BHEL for power supply. The following shall be included in pump bidder scope:

- Wheel trolley for carrying pump and drive unit along with control panel.

The trolley shall be provided with "Hose Reeling Drum" & "Cable Reeling Drum".

The pump motors set shall be suitably mounted on trolley with solid rubber type wheels, the trolley shall be of robust construction. The portable pump with its drives shall be secured to the trolley such that there is no unbalance when the trolley is moved from one location to another or when the pump is working. The number of wheel trolleys shall be one (1) per pump.



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- One Control Panel for each pump complete with all accessories and necessary controls. For Submersible Type pumps all Control & Instrumentation is to be provided as per manufacturer's standard proven practice. If integral control system is provided for each pump, then Microprocessor / PLC / GIU based control system as per manufacturer's practice shall be provided. If Control system is provided externally for each pump, then it shall be implemented from DDCMIS. For both the cases, over all Control will be through DDCMIS. DDCMIS shall be in BHEL scope.

The control panel shall be mounted on the wheel trolley. The control panel shall be suitable for outdoor duty and to be provided with protection canopy.

- Power cable connected to control panel at one end and with plug compatible to 63 amp. Socket at the other end (Details shall be furnished during contract stage.) for connecting purchaser's power supply to control panel. Lengths are indicated in data sheet-A, Section-1D of technical specification.

Also power cable of suitable length between drive unit and control panel shall be in bidder's scope.

- Hose pipe with hose nipple, flanges, nuts and bolts & matching counter-flange with nuts, bolts and gaskets for connecting with pump discharge at one end & discharge pipe works of purchaser at other end. Arrangement of connecting hose with pump discharge and connecting with discharge pipe works of purchaser shall be as per clause no. 2.2.4 below.
- Delivery bends.
- Skirt base with suction strainer as applicable.
- Suitable lugs and other attachments on the pump motor assembly frame for hoisting and lowering of the pump motor set from and to the sump.
- Level switches as per control interlock requirement as detailed in Clause No. 7.2 herein.
- Lifting chains.

2.2.3 Rust inhibitor paint at Manufacturer's works.

2.2.4 Arrangement of connecting hose with pump discharge & discharge pipe of purchaser (if required).

One end of the discharge flange of the pump shall be connected to the delivery bend of suitable size.

Suitable sized expander/ reducer if required shall be connected with necessary flanges at both ends (bidder scope).

In case expander / reducer is not required, delivery bend shall be connected with hose nipple. Hose pipe shall be connected to hose nipple with necessary clamping arrangement.

In case expander / reducer is required, flange connected with hose nipple shall be connected to reducer / expander. Hose pipe shall be connected to hose nipple with necessary clamping arrangement.

The other end of hose to be connected to pipe work of purchaser shall be provided with suitable flanged piece with counter flanges, nuts and bolts.

2.2.5 One set of special tools & tackles for maintenance of equipment for each project shall be in bidder's scope.



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2.2.6 Bidder shall provide various drawings, data, calculations, test reports/ certificates operation & maintenance manuals including As Built drawings, etc. as specified and as necessary for the project.

3.0 Works excluded from Bidder's scope. The following/ services shall be provided by purchaser.

- a) Civil foundation
- b) Power supply

4.0 The pumps will be subjected to mechanical running at works and at site by the vendor. If the site performance is found not meeting the requirements including vibration and noise as specified, then the equipment shall be rectified or replaced by the vendor, at no extra cost to the purchaser.

5.0 High reliability of the pumps is an essential requirement. It is therefore essential that the bidder chooses a standard proven model from the range of pumps manufactured. A comprehensive list of similar installations shall be submitted along with the bid.

6.0 OTHER REQUIREMENTS:

6.1 The submersible Sump 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 contradiction within Section-I, either the stringent one or the requirement as per PURCHASER's interpretation shall govern.

6.2 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 their own quality plan in the event of order based upon guidance given therein, for approval of BHEL/Customer as applicable to respective project.

7.0 Operational philosophy:

7.1 DELETED.

7.2 Controls for Portable Submersible pumps:

Each submersible pump shall be provided with integral level switch mounted on pump frame for tripping the pump at low water level. The additional instruments/ interlocks required for pump - motor safety shall be also provided.

For Submersible Type pumps all Control & Instrumentation is to be provided as per manufacturer's standard proven practice. If integral control system is provided for each pump, then Microprocessor / PLC / GIU based control system as per manufacturer's practice shall be provided. If Control system is provided externally for each pump, then it shall be implemented from DDCMIS. For both the cases, over all Control will be through DDCMIS. DDCMIS shall be in BHEL scope

The start/ stop P.B. for pumps shall be provided in the panel being supplied by the bidder. Any additional feature Specified in Data Sheet-A shall be provided.



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- 8.0** No external water supply shall be available for the cooling/sealing of sump pumps. The portable type sump pumps shall be oil filled type.
- 9.0** 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.
- 10.0** The makes of various Bought-Out-Items of bidder shall be subject to Purchaser's approval.
- 11.0** 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 in full conformity with the specification, notwithstanding anything else stated elsewhere in bidder's offer, data sheets etc. The bidder's deviations or implied/ indirect deviations in data sheets, etc. shall not be binding on the purchaser.
- 12.0** The bidder shall guarantee the performance of pump- motor units along with accessories for rated, performance duties, including the acoustical/ vibrational aspects for the stipulated limits specified elsewhere in the specification.

NOTE: The discharge rate of sump pump is very much uncontrolled. As such pump should be capable to operate even under a condition of as low as 25% of specified total head.

13.0 DRAWINGS/ DOCUMENTS DISTRIBUTION SCHEDULE:

- a. Delivery of Equipment shall be as per NIT.
- b. The drawings to be submitted by bidder in event of award of contract:
- Technical Data Sheets of pump and motor
 - GA drawings of pumps,
 - Control philosophy & GA drawing of control panel.
 - Quality Plan.
 - O & M Manual.
- c. Drawings submission schedule after the award of contract shall be as below:



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SUMP PUMPS/SUB MERSIBLE PUMPS	Primary Documents		R-0 within 20 days (for all except C&I Doc., for C&I Doc. 30 Days) from LOI/PO & subsequent revisions within 10 days of comments received from BHEL.
	PE-V8-434-172-N001	TDS AND PERFORMANCE CURVES OF SUMP PUMPS	
	PE-V8-434-172-N002	GENERAL ARRANGEMENT AND CROSS SECTIONAL - SUMP PUMPS	
	PE-V8-434-172-N003	TDS AND CURVES FOR MOTORS (IF APPLICABLE) OF SUMP PUMPS	
	PE-V8-434-172-N004	C&I Doc. -WRITE UP, WIRING DIAGRAM & GA OF CONTROL PANEL FOR SUMP PUMPS	
	PE-V8-434-172-N005	QP- SUMP PUMPS	
	Secondary Documents		Within 30 days from MDCC
	PE-V8-434-172-N006	O&M MANUAL - SUMP PUMP	

14.0 Sub-Vendor List shall be furnished during detailed engineering. In case, Bidder offer makes other than the given list, the same shall be subject to approval of Customer/BHEL.

15.0 It is mandatory for the bidders 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 in full conformity with the specification "non-withstanding" anything else stated elsewhere in bidder's offer, data sheets etc. The implied/ indirect deviations in data sheets etc. Shall not be binding on the purchaser.***

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

- Compliance certificate duly signed and stamped.
- GA drawings of pumps with motors (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).

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.

17.0 Sump pumps/submersible pumps packing procedure before dispatch

The purpose of this procedure is to outline the requirements and procedures for protecting the equipment's during shipment and preserving during the storage.



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17.1 Preparation for Packing:

- After testing, operation, all fluids e.g. water etc., shall be completely drained from all parts, and the equipment blown dry.
- All material shall be cleaned internally and externally to remove, scale, rust fillings and any other foreign material.
- The pumps shall be placed on a strong wooden base & bolted to the wooden base using the foundation holes for further transportation up to site.

17.2 Protection of parts:

- Pumps shall be packed in properly in high grade bubble plastic wrap for transportation, and long storage at site.
- Sump pumps items shall be packed in proper sizes of wooden cases. High grade woods like Rubber woods, jungle wood, hard wood, mango wood, pine wood, etc. is used for packing.
- Loose material, & Electrical & Electronics items shall be packed in corrugated box and plastic bags with proper tagging and marking of handle with care in proper sizes of wooden cases
- All finished (or) machined (External C.S. Surfaces shall be protected against corrosion with corrosion resisting coating, which is easily removable (Compound shall be such that it will remain on the surface at temperature normally encountered during shipping & storage).
- All machined surfaces shall be protected from mechanical damage. All external unfinished carbon steel surfaces shall be sand blasted & shall be coated with rust preventive primer.
- Flanged opening if any shall be covered with blank flanges sealed with blank gasket of natural rubber or equivalent. Butt welded opening shall be closed with temporary closing covers. Internal threads shall be protected with metal plug sealed with Teflon tape (if applicable). External thread shall be protected with PVC sleeve.
- Wooden cases shall be covered with HDPE cloth from inside wooden box and the top. All the opening in sump pumps shall be closed properly by suitably covering to prevent foreign material entering in opened space.
- All the equipment shall be protected for entire period of dispatch, storage and erection against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and storage. All MS parts which are not painted shall be provided with coating of grease.
- Clay Desiccant or such other moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.

17.3 Preservation

The equipment's shall be stored under closed/open space in packed condition until installation. The packages containing loose plates and gaskets are to be protected from extreme climatic conditions.

17.4 Additional Dispatch Requirements



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

- i) List of items packed in each box with description & quantity.
- ii) Photograph of each sump pump, control panel, hose pipe and each box in open & closed condition.
- iii) 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

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Annexure-3 to Chapter "AWS System"			
	SUBMERSIBLE PUMPS			
1.00.00	SCOPE			
1.01.00	This specification covers general requirements in respect of design, material, manufacture, construction, testing & inspection at Vendor's/sub-vendor's delivery to side, of submersible pumps.			
2.00.00	CODES AND STANDARD			
	The design manufacture and performance of submersible pumps shall comply with all currently applicable statues, regulation, and safely codes in the locality where the Equipment will be installed. The Equipment shall also conform to the latest applicable Indian standards listed below/equivalent standards.			
2.01.00	List of Applicable Indian Standards			
	IS: 5120- Technical requirement of Rotodynamic Special Purpose pumps.			
	In case of any contradiction with aforesaid standards and the technical specification requirements, the stipulation of the technical specification shall prevail.			
3.00.00	General			
3.01.00	The submersible pumps shall be of proven design. The Pumps shall be purchased from a pump manufacturer who has manufactured and supplied at least One (1) no. of submersible pump set for continuous duty for similar application, of type and capacity as offered or higher and which has been in successful operation for at least one (1) year prior to the date of Techno-Commercial bid opening. The pump set shall be suitable for pumping raw water with high turbidity and soft solids/fibrous solids which are generally observed in contaminated rivers / canal water. Components of Identical pumps shall be interchangeable.			
3.02.00	Pumps shall have continuously rising head characteristics. The pump sets shall be suitable for parallel operation as well as solo operation in the system. The performance characteristics of the pumps running in parallel shall be identical. The manufacturer shall have to submit the parallel operation curve superimposed with system resistance curve to know the exact point of pump operation with various combinations.			
4.00.00	FEATURES OF CONSTRUCTION			
	a) The pump set shall be single stage, submersible type, monoblock, volute type driven by squirrel cage induction motor. The motor shall be an integral part of the pump set. It shall be a totally sealed unit suitable for completely as well as partially submerged condition. The pump shall operate continuously even if the water level in the sump is low (motor portion not in submerged condition). The pump shall be suitable for reverse rotation and shall not have any adverse effect on the operation of mechanical seal or any other component.			
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 46 of 55

CLAUSE NO.	TECHNICAL REQUIREMENTS	एन टी पी सी NTPC		
	b) Pumps shall be able to pass through solids upto 40 mm. c) The impeller shall be multi vane. The impeller shall not get blocked with solids. The impeller shall be keyed on shaft, retained with an expansion ring. The impellers shall be dynamically balanced to the grade 6.3 as per ISO 1940. d) Coupling device when provided shall ensure leak proof joint between the pump and discharge elbow. This shall also enable pump to be removed from the sumps without the necessity of dismantling any nuts, bolts etc. e) Pumps shall be portable/ fixed type and capable of using in any sump as and when required. Pump shall be provided with required duck foot bend, guide pipe, chain connection etc. for easy installation, removal and maintenance. Adequate length of chain required for lowering the pump into the sump and discharge pipe or duck foot shall be provided. f) Bearing: The shaft shall rotate on grease lubricated bearings. The upper bearing, provided for radial forces, shall be a single roller bearing. The lower bearing shall consist of at least one roller bearing for radial forces and one angular contact ball bearing for axial thrust. The bearings shall be pre-lubricated and packed for life. External lubrication for any of the bearings will not be accepted. The lower bearing housing shall include an independent thermal sensor to monitor the bearing temperature. If a high temperature occurs, the sensor shall activate an alarm and shut the pump down. Any other proven arrangement which is manufacturer’s standard is also acceptable. g) Sealing: Each pump shall be provided with a mechanical seal assemblies. The seal faces shall be of corrosion resistant tungsten carbide. The seal shall not require any maintenance or adjustment and shall be bi-directional. Should the seals fail and allow fluid to enter the stator housing, the fluid shall not come in contact with the lower bearing or stator. h) Shaft: The pump shaft and motor shaft shall be one piece construction. The pump shaft is an extension of motor shaft and no coupling for pump shaft and motor shaft is allowed. The shaft should not come in direct contact with pumped liquid. Use of stainless steel sleeves will not be considered as substitute for stainless steel shaft. i) Installation Accessories For transportable type of installation, a suitable stand / base frame type of arrangement shall be provided in such a way that in no case the pump will tilt. Each pump set shall be provided with the suitable length of stainless steel lifting chain.			
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 47 of 55

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Following accessories to be included in scope of supply for pumps supported on discharge bend: i. Pump pedestal and discharge connection(“duck foot’ type discharge bend) ii. Guide rails, guide rail support brackets and lifting chain as appropriate iii. Fasteners and anchor bolts j) The major pump components shall be of material mentioned at CI 9.00.00 of this sub-section and shall be with smooth surfaces, free of blow holes or other casting irregularities.			
5.00.00	MOTOR RATING Continuous motor rating (at 50 deg. C ambient) for pumps shall be at least ten percent (10%) above the maximum load demand of the driven equipment in the complete operating range (including run out condition) to take care of the system frequency variations.			
6.00.00	Painting Details of Pump All metal surfaces coming in contact with the pumping media, other than stainless steel shall be protected by factory applied water based primer and finally covered by a two component high-solid top coating.			
7.00.00	Control and Monitoring For Submersible Type pumps all Control & Instrumentation is to be provided as per manufacturer's standard proven practice. If integral control system is provided for each pump, then Microprocessor / PLC / GIU based control system as per manufacturer's practice shall be provided. If Control system is provided externally for each pump, then it shall be implemented from DDCMIS. For both the cases, over all Control will be through DDCMIS. For details of DDCMIS refer C&I sections.			
8.00.00	PERFORMANCE GUARANTEE TESTS			
8.01.00	Shop Test			
8.01.01	After the manufacture, all the pumps shall be subjected for performance test at the manufacturer's works to determine the power consumption and the head capacity characteristic in the presence of Employer's representative, as per requirements of Hydraulic Institute Standards, (HIS 11.6)			
8.01.02	Hydrostatic test to be conducted to demonstrate that the hydraulic end, when assembled to the motor, will not leak or fail structurally when subjected to hydrostatic pressure as per HIS 11.6. NPSHR test also to be conducted to demonstrate the NPSHR requirement of pump.			
8.01.03	Contractor shall submit along with his offer details of the proposed test facilities available for testing the pumps. The details must include the capacity, head, maximum motor rating, voltage level, sanctioned load and permissible starting current.			
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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8.01.04	It may be noted that during shop tests no negative tolerance shall be permitted on head (H), capacity (Q) and the pump efficiency (n). Instruments accuracy used shall be plus or minus 1.5% or better for measurement of flow and plus or minus 0.5% or better for measurement of pressure and power.			
8.01.05	Apart from the above, any testing if specified in subsection titled “Functional Guarantees and Liquidated damages” [subsection IV of Part A] of this Technical Specification shall also be conducted.			
8.02.00	Site Test a) Manufacturer shall demonstrate at site the trouble free mechanical running of individual pumps. b) The following parameters shall be measured during the demonstration test. i) Current, Voltage and Motor Input Power. ii) Frequency iii) Bearing temperature & Motor winding temperature. c) All interlocks and protections relating to the pumps, motors and motorised valves shall be tested. c) <u>Parallel operation:</u> There should be equal load sharing between pumps running in parallel with no abnormal vibrations, sound or hunting of head and flow. Load sharing between any pumps running in parallel should be within 10%.			
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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SPECIFIC TECHNICAL REQUIREMENTS

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SUB-SECTION – IB

SPECIFIC TECHNICAL REQUIREMENTS (ELECTRICAL)



TITLE :
ELECTRICAL EQUIPMENT SPECIFICATION
FOR
SUMP PUMPS
3 X 800 MW PATRATU STPP

SPECIFICATION NO.
PE-TS-434-165-N001, Rev-00
VOLUME NO. :
SECTION : IB
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TECHNICAL SPECIFICATION

FOR

SUMP PUMPS
(ELECTRICAL PORTION)



TITLE :
ELECTRICAL EQUIPMENT SPECIFICATION
FOR
SUMP PUMPS
3 X 800 MW PATRATU STPP

SPECIFICATION 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 **SUMP 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
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SPECIFICATION NO.
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VOLUME NO. :
SECTION : IB
REV NO. 00 : DATE : 12.03.2019
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 : SUMP PUMPS
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

IB

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: - Squirrel cage induction motor suitable for direct-on-line starting. - 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. - Crane duty motors shall be squirrel cage Induction motor as per the requirement. - 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
	- Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor. - 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. - For BFP motors, starting MVA shall be restricted to meet requirements indicated in B-0. - 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
SUB-SECTION-B-07 MOTORS	PAGE 4 OF 10

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 1. Measurement of resistance of windings of stator and wound rotor. 2. No load test at rated voltage to determine input current power and speed 3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors) 4. Full load test to determine efficiency power factor and slip. 5. Temperature rise test. 6. Momentary excess torque test. 7. High voltage test. 8. Test for vibration severity of motor. 9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section) 10. Test for degree of protection and 11. 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
SUB-SECTION-B-07 MOTORS	PAGE 8 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS				
10.03.00 10.04.00	12. Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1				
	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.				
	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				
	Motor MCR in KW		Minimum distance between centre of stud and gland plate in mm		
	UP to 3 KW		As per manufacturer's practice.		
	Above 3 KW - upto 7 KW		85		
	Above 7 KW - upto 13 KW		115		
	Above 13 KW - upto 24 KW		167		
Above 24 KW - upto 37 KW		196			
Above 37 KW - upto 55 KW		249			
Above 55 KW - upto 90 KW		277			
Above 90 KW - upto 125 KW		331			
Above 125 KW-upto 200 KW		203			
For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.					
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:					
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 UP to 110 KW Above 110 KW and upto 150 KW Above 150 KW	Clearance 10mm 12.5mm 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	

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, antifriction 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
SUMP PUMPS**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-172-N001**

SECTION: **I**

SUB-SECTION: **IC**

REV. NO. **00** DATE **08.03.19**

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

SUB-SECTION – IC

SPECIFIC TECHNICAL REQUIREMENTS (C &I)

SUB-SECTION – IIIC-12

CONTROL DESK & PANELS

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
1.00.00	CONTROL DESK & PANELS			
1.01.00	GENERAL			
1.01.01	All control desk, panels, LVS panel etc. shall be furnished fully wired with necessary provision for convenience outlets, internal lighting, grounding, ventilation, space heating, anti-vibration pads, internal piping & accessories as required for completeness of the system.			
1.01.02	All panels, desks, cabinets shall be free standing type & have bottom / top entry for cables to be finalised application wise during detailed engineering stage. The bottom of desk & cabinets shall be sealed with bottom plate, compression cable glands (double for field and single for inside rooms) and fire proof sealing material to prevent ingress of dust and propagation of fire. Sufficient number of power receptacles with disconnect switches shall be installed within all panels/desk.			
1.01.03	Exterior steel surface shall be sand blasted, ground smooth, filled, primed, sanded and smooth enamel painted to give a good finish subject to minimum paint thickness of 65-75 microns for sheet thickness of 3 mm and 50 microns for sheet thickness of 2mm. The exact color shall be finalised during detailed engineering.			
1.01.04	The design shall conform to the EN ISO 11064 (Ergonomical design of control room), Part-1,2 and 3.			
2.00.00	CONTROL DESK & PANEL			
2.01.00	GENERAL			
2.01.01	The exact dimensions, material, construction details, grounding, general arrangement etc. of Control Desk etc. shall be as per the actual requirement and shall be finalised during detailed engineering and subjected to Employer's Approval. For bidding purpose, the length of the desk/ panel and CD mounted devices are given in Appendix-I to Part-A, Section-VI.			
2.01.02	For control desk mounted instruments/ devices etc., which are to be powered from UPS, all required conversion of interface equipments / accessories to make such devices compatible with UPS supply shall be provided. All necessary hardware like Input switches/ fuse unit for each feeder as well as switch fuse unit for each instrument/ device on the power supply line shall be provided. From UPS, redundant feeders shall be provided with suitably rated MCB and provision of fast auto changeover of UPS feeders.			
2.02.00	Control Desk (CD) Control desk shall be Modular, non-welded construction free standing table top type with front & back cover constructed of 1.6 mm thick CRCA steel plates. The tabletop of the control desk shall be arc-shaped for mounting TFT monitors & mice for SG, TG, BOP (irrespective of scope of supply) and synchroscope. TFT monitors and synchroscope shall be provided with adjustable mounting arrangement. The work surface of control desk shall be 30mm thick with the top 12mm of Acrylic Solid Surface (ASS) and the remaining 18mm of laminated medium density fiber board. Work surface shall be made of two different colors at same level and seamlessly joined in each section. The structure frame shall consist of extruded aluminum top and bottom horizontal beams and vertical support tensioned together to form an integrated, finished curvilinear shaped frame. Vertical & Horizontal supports, minimum 2.5mm and 2mm thick respectively, have to be provided for the structure frame. Extreme side legs shall be illuminated type and should complete the overall form and aesthetics of the desk. It shall have concealed cable & wire way			
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-12 CONTROL DESK & PANELS	PAGE 1 OF 4

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
	management system. PA system hand sets, telephone sets, very few PB stations and lamps shall be mounted on the control desk on mosaic grid structure as per attached list. Sliding keyboard trays shall be provided on the CD. The exact profile of the desk, dimension and the radius of curvature shall be finalised during detailed engineering stage.		
2.02.01	All operator monitors & mice for SG, TG, BOP shall be mounted on this CD.		
2.02.02	The cabling / wiring between OWS & CPU's, power supply cables etc. shall be aesthetically routed and concealed from view.		
2.03.00	Hardwired devices on Control Desk (CD) (draw out section)		
2.03.01	CD shall be provided with a draw out section where hardwired devices shall be mounted on a mosaic grid mosaic portion for mounting backup.. The mosaic grid tiles shall be of 24 mm x 48 mm (or 25 mm x 50 mm) size, made of heat and flame retardant, self extinguishing and non-hygroscopic material with flat matt finish without glare and non reflecting type.		
2.04.00	Control Desk Devices "Release" & Lamp Test push buttons shall be provided for a set of push buttons/Auto/Manual stations. Depending on the type of control/function and required number of push buttons and indicating LEDs & their color, push button stations shall be selected. The size of the push button stations & A/M stations shall be 24 x 48 mm or 25x 50 mm and shall have service inscription details at the front. Emergency push buttons(with cover) shall be mounted on top of CD, as per quantity indicated in Part-A of specification.		
2.05.00	Unit-Incharge Desk Profile and construction of the Unit Incharge Desk shall be same as that of CD. Provision for Operator Work Station and PA system/ telephone handset etc. shall be provided similar to the Control Desk..		
2.05.01	Internal Panel/Desk Items		
2.06.00	Equipment and devices mounted within the panels/desk shall be mounted on suitable racks/brackets and shall be arranged for convenient access for adjustment and maintenance work.		
2.07.00	Furniture		
2.08.00	Bidder shall provide following industrial grade furniture items as a minimum from reputed manufacturers/suppliers meeting International Standards. The furniture shall be modular and latest with ease of operational features. The furniture shall be modern, aesthetically designed, modular, flexible, space saving and future safe. Each module shall have transparent cover and adjustable partition. It shall have locking provision for security. The components shall be suitable for integration/fabrication without any welding technology. 1. Work Station furniture		
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-12 CONTROL DESK & PANELS
			PAGE 2 OF 4

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
	Modular work station furniture, suitable for mounting servers & historians, programmer stations, PC based systems, printers (inkjet or A4 laser) etc. is to be provided.. 2. Server Rack Server rack shall be provided to mount programmer stations, PC based systems (of rack type and tower type), Matrix KVM switcher, Mini UPS etc. in Programmer room. Suitable arrangement for Ventillation and cooling shall be built in- 3. PC rack PC rack shall be provided to mount CPUs of work stations/PCs of OWS/LVS etc in Control Room. 4. Chairs Industry standard revolving chairs with wheels and with provision for adjustment of height (hydraulically/gas lift) shall be provided for the operators, unit-in-charge & other personnel in control room area. These shall be designed for sitting for long duration such that these are comfortable for the back. 5. Tables a Industry standard computer tables shall be provided & shall be as approved by Employer during detailed Engineering. b Conference Room standard tables shall be provided with acrylic coat for good finish. Details shall be finalised & approved by Employer during detailed engg. 6. Almirahs Steel Almirahs shall be provided for keeping documents in the documentation room. 7. Keypad Keypads shall be provided for the storing of keys of relevant areas in the respective control rooms 8. Lockers Suitable lockers shall be provided in the room adjacent to the control room for storing of personal articles of control room personnel & also for documents.		
3.00.00	LVS PANEL		
3.01.00	An arc shaped Large Video Screen (LVS) panel shall be supplied for mounting large video screens in number of tiers in various Control rooms as specified at Part-A of specification. An indicative typical sketch of Control Room Concept showing LVS & OWS is given in drawing no. 0000-999-POI-A-061Rev.B.		
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-12 CONTROL DESK & PANELS
			PAGE 3 OF 4

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
3.02.00	The profile, dimensions and the general arrangement shall be finalised & approved by Employer during detailed engineering. Recommendations, if any, for the control room lighting in order to ensure continuous proper viewing of the LVS screen by the operator & shift incharge (without any fatigue) shall be clearly brought out by the Contractor in his offer, along with all relevant details/basis.		
3.03.00	Any other requirement for proper LVS mounting & functioning & viewing shall also be specifically brought out by the Contractor in his offer, along with all relevant details. NOTE:- Signal exchange with DDCMIS for overall control shall be envisaged in panel/pump by Bidder and required hardware for same shall be in Bidder's scope. DDCMIS is in BHEL scope.		
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-12 CONTROL DESK & PANELS PAGE 4 OF 4

SPECIFICATIONS FOR PR. GAUGE, D.P. GAUGE, TEMP. GAUGE AND LEVEL GAUGE.

SI. No	FEATURES	ESSENTIAL/MINIMUM REQUIREMENTS		
		Pr. Gauge/ Gauge/ DP Gauge/ Draught gauges	Temperature Gauge	Level Gauge
1	Sensing Element and material	Bourdon for high pressure, Diaphragm/Bellow for low pr. Of 316 SS	Mercury in steel for below 450°C and inert gas actuated for above 450°C of SS bulb and capillary.	Tempered * toughened Borosilicate gauge glass steel armoured reflex or transparent type.
2	Body material	Die-cast aluminium	Die-cast aluminium	Forged carbon steel/304 SS
3	Dial size	150mm	150 mm	Tubular covering entire range
4	End connection	1/2 inch NPT (M)	3/4" NPT (M)	Process connection as per ASME PTC and drain/vent 15 NB
5	Accuracy	±1% of span	± 1% of span	± 2%
6	Scale	Linear, 270° arc graduated in metric units	Linear, 270° arc graduated in °C	Linear vertical
7	Range selection	Cover 125% of max. of scale	Cover 125% of max. of scale	Cover 125% of max. of scale
8	Over range test	Test pr. for the assembly shall be 1.5 to the max. Design pr. at 38°C.		
9	Housing	Weather and dust proof as per IP-55	Weather and dust proof as per IP-55	CS/304 SS leak proof
10	Zero/span adjustment	Provided	Provided	--
11	Identification	Engraved with service legend or laminated phenolic name plate		

12	Accessories	Blow out disc, SS Thermowell siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	Gasket for all KEL-F shield for transparent type vent and drain valves of Steel/SS as per CS/Alloy process Requirement.
13	Material of Bourdon/ movement	316 SS / 304 SS	316 SS / 304 SS

Notes:-

*Bicolour type level gauges will be provided for applications involving steam and water except for condensate and feed water services.

Length of gauge glass shall not be more than 1400 mm. If the vessel is higher, multiple gauge glasses with 50 mm overlapping shall be provided.

Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.

CLAUSE NO.	TECHNICAL REQUIREMENTS 			
15.00.00				
	PROCESS ACTUATED SWITCHES			
	FEATURES	ESSENTIAL / MINIMUM REQUIREMENTS		
		Pressure/ Draft Switches/ DP Switches	Temperature switches	Level switches
	Sensing Element	Piston actuated for high pressure and diaphragm or bellows for low pr./ vacuum	Vapor pressure sensing, liquid filled bellow type with SS bulb and capillary (5 m minimum, to suit application)	Capacitance types, float type, conductivity type, RF type, Ultrasonic type as per suitability to the application. .
	Material	316 SS	Bulb 316 SS/ capillary 304 SS	316 SS
	End connection	½ inch NPT (F)	½ inch NPT (F)	Manufacturer standard
	Over range/ proof pressure	150% of maximum operating pr.	-	150% of maximum operating pr.
	Repeatability	+/- 0.5% of full range		
	No. of contacts	2 No.+2NC. SPDT snap action dry contact		
	Rating of contacts	60 V DC, 6 VA (or more if required by DDCMIS)		
	Elect. Connection	Plug in socket.		
	Set point adjustment	Provided over full range.		
	Dead band adjustment	Adjustable/ fixed as per requirement of application.		
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-IIIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 38 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS				
	Enclosure	Weather and dust proof as per IP-55, metallic housing.			
	Accessories	Siphon, snubber, chemical seal, pulsation dampeners as required by process	Thermo well of 316 SS and packing glands	All mounting accessories	
	Mounting	Suitable for enclosure/ rack mounting or direct mounting	Suitable for rack mounting or direct mounting	-	
	Power Supply (wherever required)	As per Contractor's Standard practice.			
	Notes :-				
	1) Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application. 2) Pressure/ Diff pressure switches for very low press/ DP measurements can have sensor material other than SS316 in case of any technical limitation and the offered product is standard product of the manufacture for very low pressure applications. 3) Repeatability can be upto +/-1% of full range in case of switches with diaphragm seals or very low pressure/DP range. 4) The specifications of switches 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.				
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 39 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	normal, reverse indication and required channel alarm contact shall be provided. The contact rating shall be 60VDC, 6VA (or more if required by Control system). The exact details of the RRI shall be strictly as approved by Employer during detailed engineering. The power supply of RRI is to be arranged by the Bidder			
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 40 OF 46

	NTPC PVUNL PATRATU TPP (3X800 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SUBMERSIBLE PUMPS	
QUALITY ASSURANCE		

SUB-SECTION–E-61

MEASURING INSTRUMENTS (PRIMARY & SECONDARY)

CLAUSE NO.	QUALITY ASSURANCE										एनटीपीसी NTPC																																																																																																																																																																																																						
MEASURING INSTRUMENTS (PRIMARY AND SECONDARY) <table><tr><th rowspan="2">TESTS ITEMS</th><th rowspan="2"></th><th rowspan="2">Dimensions (R)</th><th rowspan="2">Make, Model, Type, Rating (R)</th><th rowspan="2">Process / Electrical connection (R)</th><th rowspan="2">Calibration (R)</th><th rowspan="2">Test as per standard(R)</th><th rowspan="2">Insulation Resistance (R)</th><th rowspan="2">IBR Certification (if applicable)(R)</th><th rowspan="2">Hydro Test(R)</th><th rowspan="2">Material Test certificate ®</th></tr><tr></tr><tr><td>1. PR Gauge (IS-3624)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td></tr><tr><td>2. Temp. Gauge (BS-5235)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td></tr><tr><td>3. Pr./D.P.Switch(BS-6134)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>4. Electronic Transmitter(IEC-770)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>5. Temp. Switch</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>6. Recorder(IS-9319/ANSI C-39.4)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>7. Vertical indicators</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td>Y</td><td></td><td></td><td></td></tr><tr><td>8. Digital Indicators</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td>Y</td><td></td><td></td><td></td></tr><tr><td>9. Integrators</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10. Electrical Metering Instrument (IS-1248)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>11. Transducer (IEC-688)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>12. Thermocouples (IEC – 754 / ANSI-MC-96.1)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>13. RTD(IEC-751)</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>14. Thermowell</td><td>Y</td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td>Y</td><td>Y</td><td>Y</td></tr><tr><td colspan="11">R-Routine Test A- Acceptance Test Y – Test applicable</td></tr><tr><td colspan="11">: Note: 1) Detailed procedure of Environmental Stress Screening shall be as per Quality Assurance Programme in General Technical Conditions. Requirement of test and procedure (if required) finalized during QP finalization</td></tr><tr><td colspan="11">2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.</td></tr></table>												TESTS ITEMS		Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (if applicable)(R)	Hydro Test(R)	Material Test certificate ®	1. PR Gauge (IS-3624)	Y	Y	Y	Y	Y	Y					2. Temp. Gauge (BS-5235)	Y	Y	Y	Y	Y	Y					3. Pr./D.P.Switch(BS-6134)	Y	Y	Y	Y	Y	Y	Y				4. Electronic Transmitter(IEC-770)	Y	Y	Y	Y	Y	Y	Y				5. Temp. Switch	Y	Y	Y	Y	Y	Y	Y				6. Recorder(IS-9319/ANSI C-39.4)	Y	Y	Y	Y	Y	Y	Y				7. Vertical indicators	Y	Y	Y	Y	Y		Y				8. Digital Indicators	Y	Y	Y	Y	Y		Y				9. Integrators	Y	Y	Y	Y	Y						10. Electrical Metering Instrument (IS-1248)	Y	Y	Y	Y	Y	Y	Y				11. Transducer (IEC-688)	Y	Y	Y	Y	Y	Y	Y				12. Thermocouples (IEC – 754 / ANSI-MC-96.1)	Y	Y	Y	Y	Y	Y	Y				13. RTD(IEC-751)	Y	Y	Y	Y	Y	Y	Y				14. Thermowell	Y		Y					Y	Y	Y	R-Routine Test A- Acceptance Test Y – Test applicable											: Note: 1) Detailed procedure of Environmental Stress Screening shall be as per Quality Assurance Programme in General Technical Conditions. Requirement of test and procedure (if required) finalized during QP finalization											2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.										
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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-E-61 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)			Page 1 of 1																																																																																																																																																																																																							

SUB-SECTION–E-61A

MEASURING INSTRUMENTS (PRIMARY & SECONDARY)

CLAUSE NO.	QUALITY ASSURANCE										एनटीपीसी NTPC
	MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)										
	TESTS ITEMS	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (if applicable)(R)	Hydro Test(R)	Material Test certificate ®	
		1. PR Gauge (IS-3624)	Y	Y	Y	Y	Y				
		2. Temp. Gauge (BS-5235)	Y	Y	Y	Y	Y				
		3. Pr./D.P.Switch(BS-6134)	Y	Y	Y	Y	Y	Y			
		4. Electronic Transmitter(IEC-770)	Y	Y	Y	Y	Y	Y			
		5. Temp. Switch	Y	Y	Y	Y	Y	Y			
		6. Recorder(IS-9319/ANSI C-39.4)	Y	Y	Y	Y	Y	Y			
		7. Vertical indicators	Y	Y	Y	Y		Y			
		8. Digital Indicators	Y	Y	Y	Y		Y			
		9. Integrators	Y	Y	Y	Y					
		10. Electrical Metering Instrument (IS-1248)	Y	Y	Y	Y	Y	Y			
		11. Transducer (IEC-688)	Y	Y	Y	Y	Y	Y			
		12. Thermocouples (ANSI-MC-96.1)	Y	Y	Y	Y	Y	Y			
		13. RTD(IEC-751)	Y	Y	Y	Y	Y	Y			
		14. Thermowell	Y		Y				Y	Y	Y
		R-Routine Test A- Acceptance Test Y – Test applicable									
		:									

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-61A MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	Page 1 of 2
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CLAUSE NO.	QUALITY ASSURANCE												एनटीपीसी NTPC
TESTS ITEMS		Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Requirement as per standard (R)	WPS approval (A)	Non-destructive testing (R)	Calculation for accuracy (R)	Insulation Resistance (R)	IBR Certification as applicable (R)	Hydro test (R)	Material test certificate (A)
15. Cold junction compensation box		Y	Y	Y	Y					Y			
16. Orifice plate(BS-1042)		Y	Y	Y	Y*	Y	Y**	Y**			Y	Y**	Y
17. Flow nozzle(BS-1042)		Y	Y	Y	Y*	Y	Y	Y			Y	Y	Y
18. Impact head type element		Y	Y	Y					Y				Y
19. Level transmitter/float type switch		Y	Y	Y	Y					Y	Y	Y	Y
20. Flue Gas analyser		Y	Y	Y	Y								
21. Dust emission monitors		Y	Y	Y	Y								
*Calibration to be carried out on one flow element of each type and size if calibration carried out as type test same shall not be repeated.													
** If applicable													
R-Routine Test		A- Acceptance Test				Y – Test applicable							
Note: 1) Detailed procedure of Environmental Stress screening test shall be as per Quality Assurance. Programme in General Technical Conditions 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.													
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-61A MEASURING INSTRUMENTS (PRIMARY & SECONDARY)				Page 2 of 2	

SUB-SECTION–E-65

PROCESS CONNECTION & PIPING

PROCESS CONNECTION AND PIPING

TESTS	Visual ®	GA, BOM, Layout of component & construction feature®	Dimension ®	Paint Shade/thickness ®	Flattening,flaring,hydrotest,hardness check as per ASTM standard (A)	Component Ratings ®	Wiring ®	Make, Model, Type, Rating®	IR & HV ®	Review of TC for instrument/devices (R)	Accessibility of TBs/Devices ®	Illumination,grounding ®	Tubing ®	Leak/Hydro test(A)	Chemical/physical properties of material (A)	Proof pressure test,Dismantling & reassembly test,Hydraulic impulse and vibration test (R)	Tests as per standards & specification
ITEMS																	
Local Instrument enclosure	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y			
Local instruments racks	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y			
Junction Box	Y	Y	Y	Y*		Y		Y	Y								
Gauge Board	Y	Y	Y	Y		Y		Y		Y			Y	Y			
Impulse pipes and tubes	Y		Y		Y			Y							Y		
Socket weld fittings ANSI B-16.11	Y		Y					Y							Y		Y
Compression fittings	Y		Y					Y						Y	Y	Y	
Instrument valves & Valve manifolds	Y		Y					Y						Y	Y		
Copper tubings ASTM B75	Y							Y									Y
*-applicable for painted junction boxes. Note: R-Routine Test A- Acceptance Test Y – Test applicable Note: This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.																	

CLAUSE NO.		QUALITY ASSURANCE													एनटीपीसी NTPC
CONTROL PANEL															
Attributes/ Characteristics Item , Components Sub System Assembly		Electrical Properties	Mechanical Properties	Chemical Properties	Dimensions / Finish	Type/ Rating/Functional check	HV/IR	Routine test as per relevant std.	Constructional Features	Relevant standard ,Seven tank process	Paint finish/ shade/thickness adhesion	Mountings / BOM/ Make, Completeness	Interlock Functional & Operation Testing / Simulation check	Degree of Protection Test	Specification requirement
Sheet Steel			Y	Y	Y										
Aluminum / Copper Bus-bar		Y	Y	Y	Y										
Support Insulator (BS-2782/IEC-660)		Y	Y	Y	Y										
Control / Selector Switch						Y	Y	Y							
Contractor/ MCB						Y	Y	Y							
O/L Protection relays						Y		Y							
C.T /V.T/ Indicating Meter						Y	Y	Y							
Fuse/ Fuse carrier						Y	Y	Y							
Terminals/lugs/pvc wires		Y			Y	Y	Y	Y							
Timers						Y	Y	Y							
LVS, Mosaics															Y
Push Button/ Lamp/ (Relevant standard)						Y	Y	Y							
Control Transformer						Y	Y	Y							
Mimic, Annunciator						Y		Y							
Gasket			Y	Y	Y	Y		Y							
Fabrication									Y						
Pretreatment & Painting										Y	Y				
Control panel											Y	Y	Y	Y	Y
NOTE: 1. This is an indicative list of Test/ Checks. The manufacturer to furnish a detailed Quality Plan indicating the practice and procedure along with supporting documents. 2. All major Bought Out Items will be subject to Employer approval.															
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-36 CONTROL PANEL				Page 1 of 1					

	NTPC PVUNL PATRATU TPP (3X800 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SUBMERSIBLE PUMPS	
SUB VENDOR LIST		

PROJECT : Patratu STPS Phase-I (3 X600MW)											
PACKAGE : EPC PACKAGE											
CONTRACTOR : BHEL Ltd											
CONTRACT NO : CS-3555-001-2											
LIST OF ITEMS REQUIRING QP											
APPROVAL & ACCEPTABLE											
VENDOR AS APPROVED BY											
REVISION NO : 00											
DATE : 26.04.2017											
No.	Major Equipment	QP Inspired on Category	QP No. 9585- 001-QV1 Q	QP Submits on SCH	QP Approval val SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub-SCH	SS Approval Sub QR	Remark
						Khrona	France / USA / Pura	DR			
						Yokogawa	Bangalore	DR			
						P&F	Germany	DR			
						Magnetrol	Belgium	DR			
						ABB	Germany / India	DR			
						Probes Marshall	Pune	DR			
						Instrumentation Limited	Palghat	A			
						Microprecision	Palghat	A			
						Siemens	Pune	A			
						Flow Star	Farsabad	A			
						SEKO	Austria	A			
						MINCO India Pvt. Ltd.	GOA	A			
						MINCO India Flow Elements Pvt. Ltd.	GOA	A			
						WISE Control	Korea	A			
						T M Technomatic	Italy	A			
						IEPL	Hyderabad	DR			
						Engg. Specialities	Kolkata	DR			
						BALIGA	CHENNAI	DR			
						Pyroelectric	Mumbai	DR			
						Hydro Pneumatics	Mapusa	DR			
						Tansa Equipment Pvt. Ltd.	Thane	DR			
						Dynamic Fluid Vales Pvt. Ltd.	Belgaum	DR			
						BUENBERG	UK	A			
						ASHCROFT	USA/Germany/ India	A			
						Wika	GERMANY	A			
						WISE Control	Korea	A			
						Nagano KEIKI	Japan	A			
						H Guna South India	Bangalore	A			
						A. N. Instruments	Kolkata	A			
						Gauge Bourdon	Panvel	A			
						Goh Thermoclastic	GOA	A			
						Wika	Pune	A			
						Baumer	Vapi	A			
						Precision mass products Pvt. Ltd.	Gandhinagar	A			
						H Guna	Rajahmundry	A			
						US Gauge	USA	DR			
						Winiers	USA	DR			
						Forbes Marshall	Hyderabad	A			
						Manometer	Mumbai	DR			
						Walchandnagar Industries Ltd.	Chennai	A			
						Nasstech	Vapi	A			
						Gauges Bourdon	UK	DR			
						Fisher Mass	Germany	DR			



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PROJECT : Patratu STPS Phase-I (3 X400MW)												
PACKAGE : EPC PACKAGE												
CONTRACTOR : BHEL Ltd												
CONTRACT NO : CS-9585-001-2												
No.	Major Equipment	Q.P. Inspected on Category	Q.P. No. 1585-001-QVI	Q.P. Submis- sion SCH	Q.P. Appro val SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub QR	Remark
29	Level gauge (Transparent & Reflex, Tubular type)	I				Protech Control	Kolkata	DR				
30	Press. DP, Vacuum Switch	I				New Scientific	Kolkata	DR				
		I				PTCI	Kolkata	DR				
		I				Main Contractor approved Sources		A				
		III				SOR	USA	A				
		III				DRESSOR (ASHCROFT)	USA/Germany	A				
		III				ITT BARTON	USA	A				
		III				HENION	GERMANY	A				
		III				BARKSDALE	GERMANY	A				
		I				Nippon KEIKI	Japan	DR				
		II				Switzer Process Instrument	Chennai	A				Up to 40kg/cm2 & not for Compound Switch and except 900 series
		II				Trafag	Gurgaon	A				Up to 40kg/cm2 & not for Compound Switch
		II				Switzer Process Instrument	Ghaziabad	A				Up to 40kg/cm2 & not for Compound Switch
		III				Gellia control	UK	A				
		I				Gauges Bourdon (GIG)	Farvel	A				
		I				ASHCROFT	Gandhinagar	A				
		I				Wika	Pune	DR				
		III				Gorgelon	France	A				
		III				United Electric	USA	A				
		I				SMC	Japan	DR				
		I				Neodyna	USA	DR				
		I				IMI NORGEN	Noida	DR				
		I				WISE Control	Korea	DR				
		I				Baumel	Vapi	DR				
		I				Vasu Tech	New Delhi	DR				
		III				Boil & Krich	Germany	DR				
31	Temperature Switch	III				SOR	USA	A				
		III				DRESSOR (ASHCROFT)	USA/Germany	A				
		III				ITT BARTON	USA	A				
		III				DELIA CONTROLS	UK	A				
		I				Switzer Process Instrument	Chennai	A				
		I				Switzer Process Instrument	Ghaziabad	A				
		II				Trafag	Gurgaon	A				
		I				ASHCROFT	Gandhinagar	A				
		I				Wika	Pune	DR				
		III				Gorgelon	France	A				
		III				United Electric	USA	A				
		I				SMC	Japan	DR				
32	Flow switch	III				UNIVERSAL FLOW METER	USA	DR				
		III				Switzer	Chennai	A				



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NTPC		PROJECT : Patratu STPS Phase-I (3 X800MW) PACKAGE : EPC PACKAGE CONTRACTOR : BHEL Ltd CONTRACT NO : CS-9555-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY						REVISION NO : 00 DATE : 26.04.2017	
No.	Major Equipment	QP Inspected on Category	QP No. 9555-001-QV	QP Submis- sion SCH	QP Appro val SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub-SCH	SS Approval SCH	Sub QR	Remark	
49	HIGH Temp. cable (PTFE/PEP)	I				MINCO India Flow Elements Pvt. Ltd.	GOA	A					
		*				SAMEL	Korea	DR					
		*				MINCO	GOA	DR					
		*				Engg. Specialities	Kolkata	DR					
		*				Pyroelectric	Mumbai	DR					
		*				Hydropneumatics	Mapusa / GOA	DR					
		*				ASIAN INDUSTRIAL VALVES	Chennai	DR					
		*				Dynaford valves Pvt. Ltd.	Belgium	DR					
		*				Habia cables	Sweden	A					
		II				Lapp cables	Germany	A					
		II				Kerpen cables	Germany	A					
		II				TEW & C	USA	A					
		II				Thermo-Electra Bv	Netherland	A					
		II				Habia cables	China	A					
		II				Thermocables	Hyderabad	A					
		II				Tempents	Udaipur	A					
		*				Dellon Cables	Pandrabadi	DR					
		*				RJ Cables	Roorkee	DR					
50	Fiber optic cable	II				HFCL	Goa	A					
		II				R&M	Switzerland	A					
		II				Akash Fibre	Bhimad	A					
		II				Finclax	Pune/Goa	A					
		II				Bida Ericson	Rewa	A					
		II				Molex	UK	A					
		II				Coming	USA	A					
		II				Schneider	GOA	A				Previously known as D Link / Smartlink, Goa	
		*				RPG Cables	India	DR					
		*				Unilux Cables	India	DR					
		*				Terracom	India	DR					
51	Pneumatic Actuator (Powder Cylinder e.g. FOR SADC)	II				Dong Woo Valve Control Co. LTD	Korea	A					
		II				Shin Hwa Engineering Co. LTD	Korea	A					
		I				Instrumentation Limited	Pilghat	A					
		I				Kellon	Cochin(Malapp)	A					
		I				SMC Pneumatics	Noida	A					
		I				Rolex	Mumbai	A					
		*				Emerson Process Management	Chennai	DR					
		*				MIL Controls	Alwaye	DR					
		*				Festo	Bangalore	DR					
		*				IMI Norgren	Noida	DR					
52	Level switch capacitance type	III				ENDRESS & HOUSER	Aurangabad	A					
		III				MAGNETROL	BELGIUM	A					
		III				SREM	PUNE	A					
		III				PUNE TECHTROL	PUNE	A					



Signature
Deptt.

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Asadov,

C & M
 Deptt.
 Hindustan
 Ltd.

PROJECT : Patra STPS Phase-I (3 X 800MW)												
PACKAGE : EPC PACKAGE												
CONTRACTOR : BHEL Ltd												
CONTRACT NO : GS-0185-001-2												
LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE												
VENDOR AS APPROVED BY												
REVISION NO : 00												
DATE : 28.04.2017												
No.	Major Equipment	QP Inspect on Category	QP No. 001-QV	QP Subm Q	QP Appro val SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub QR	Remark
		III				COSA XENTAUR	USA	A				Through Spectrum automation
		*				VAISHALA	Sweden / Japan	DR				
		*				DWYER	USA	DR				
		*				Endee	Mumbai	DR				
		*				Nivo Controls	Indore	DR				
		*				Bartec GMBH	Germany	DR				
		*				Risal	Bangalore	A				
77	Blank Panels / Cabinets	III				Hoffman	BANGALORE	A				
		III				Pyrotech	Udaipur	A				
		III				BHEL	Bangalore	A				
		III				Schneider	Bangalore	DR				
78	CCTV Components (IP)	*				Sony	Japan	DR				
		*				Siemens	Pondicherry	DR				
		*				Dv Tel	USA	DR				
		*				Henry Wei	Gurgaon	DR				
		II				Bosch	Bangalore	A				With Bosch Software
		II				Axis	Sweden	A				With Bosch Software
		*				Palco	USA	DR				
		II				Axis	Sweden	A				With Milestone Software
79	Control Desk, Server / PC Rack	I				Pyrotech works Space	Udaipur	A				
	Auxiliary control room.											
		I				Cosmes	India	A				
		I				Adash Control	Bangalore	A				
		*				Chemim Controls	Pondicherry	DR				
		*				Harmony Systems	New Delhi	DR				
80	Digital Indicators	III				Maribus	Gandhi Nagar	A				For Non mosaic mounting
		III				ABB	Germany	A				
		III				Fabcor	UK	A				
		III				Yokogawa	Japan	A				
		III				Gossen / Metrowall / Camille Bauer	Germany	A				
		III				Siemens	Germany	A				
		III				Chino	Japan	A				
		III				Weigel Messgerate	Germany	A				
		III				Pyrotech	Udaipur	A				
		*				Chino Corporation	Mumbai	DR				
		*				Yokogawa	Bangalore	DR				
		*				Leitrolck	Pune	DR				
		*				Telexchem	Chennai	DR				
81	Quasi Emission Monitor	III				Land Instrument International	UK	A				For Non mosaic mounting
		III				Durg	Germany	A				For Non mosaic mounting and submit only two proposals
		III				Sick Mithak	Ireland	A				
		III				Emerson Process Management	UK	A				Land Combustion Division
		III				Codell	UK	A				



18-07-16

PROJECT : Patratu STPS Phase-I (3 X800MW)												
PACKAGE : EPC PACKAGE												
CONTRACTOR :BHEL Ltd												
CONTRACT NO : GS-1555-051-2												
LIST OF ITEMS REQUIRING QP												
APPROVAL & ACCEPTABLE												
VENDOR AS APPROVED BY												
REVISION NO : 05												
DATE : 26.04.2017												
No.	Major Equipment	QP Inspecti on Category	QP No. 9585-001-QVI Q	QP Submis sion SCH	QP Appro val SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub QR	Remark
82	Electrical Indicating Instruments (Mosaic Compatible)	II				Forbes Marshall	Pune	A				Main kit from M/s Codel, UK
		III				Siemens	Germany	A				
		III				Gossen / Metrowatt / Camille Bauer	Germany	A				
		III				Gatz	Germany	A				
83	Flue Gas Analyser (CO)	III				Wolpert Messgeräte Codel	Germany UK	A			Sub QR	Analysier from M/s Emerson, Germany / USA.
		III				Emerson Process Management	Pawane	A				Lead Combination Div
		III				Land Instrument International	UK	A				
		III				Sick Mahlak	Germany	A				
		III				Siemens	Germany	A				
84	Flue Gas Analyser (CO2)	*				Codel	UK	DR			Sub QR	
		*				Sick Mahlak	Germany	DR				
		*				Kilnake Procal Ltd.	Germany	DR				
85	Flue Gas Analyser (SO2 and NOx)	III				Sick Mahlak	Germany	A			Sub QR	Analysier from M/s Emerson, Germany / USA.
		III				Emerson Process Management	Pawane	A				
		III				Siemens	Germany	A				
		III				Fuji Electric	Japan	A				
		*				Yokogawa	Japan	DR				
		*				Codel	UK	DR				
		*				ABB	Glooucestershire	DR				
86	Flue Gas Analyser (O2 Analyser (HT))	II				SECO	Chennai	A			Sub QR	Main Contractor Can propose additional vendor for this item
87	Flue Gas Analyser (O2 Analyser (LT))	III				Marathon Monitor	USA	A			Sub QR	Make EMERSON, USA
		III				Emerson (Rosemount)	Pawane	A				Make Emolec, Germany, Model
		III				Forbes Marshall	Pune	A				Make 5000 series
		III				ICE	Mumbai	A				Make Analtek, USA
		III				Yokogawa	Bangalore	A				Make Yokogawa, Japan
		III				ABB	Bangalore	A				Make ABB, UK
		*				AMETEK (P and AI division)	Singapore	DR				
		*				Endtec	Germany	DR				
		*				Fuji Electric	Japan	DR				
		*				Teledyne	USA	DR				
		*				Chemtrol	Goa	A			Sub QR	
88	Flue Gas Analyser Panel	I				Emerson Process Management	Navi Mumbai	A				
		I				Pyrotech	Udaipur	A				
		I				Analytical Instrument Company	Kota	A				Analysier from M/s Fuji, Japan
		I				Yokogawa	Bangalore	DR				
		I				Adago	Mumbai	A				
		*				Marvel Engrg Company	Chennai	DR				



18.02.16

NTPC		PROJECT : Patna STPS Phase-I (3 X800MW)					LIST OF ITEMS REQUIRING QP					
		PACKAGE : EPC PACKAGE					APPROVAL & ACCEPTABLE					
		CONTRACTOR : BHEL Ltd					VENDOR AS APPROVED BY					
		CONTRACT NO : CS-8585-001-2										
No.	Major Equipment	QP Inspecti on Categor y	QP No. 8585-001-QMIS val Q	QP Submis SCH	QP Appro val SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub-SCH	SS Approval SCH	Sub QR	Remark
		I				Cords Cable	Bhimadi / Kaurandi	A				

LEGENDS :

1.0 SYSTEM SUPPLIER / SUB SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)

A - For those items proposed vendor is acceptable in NTPC, subject to meeting the NTPC Specification requirement. To be indicated with letter 'A' in the list alongwith the condition of approval, if any.
 DR - For those items "Detailed Required" for NTPC review. To be identified with letter "DR" in the list.

NOTED : For those items vendors are approved by Main Supplier and accepted by NTPC without specific vendor approval from NTPC. To be identified with "NOTED"

2.0 QP INSPECTION CATEGORY :

CAT - I : For those items the Quality Plans are approved by NTPC and final acceptance will be on physical inspection witness by NTPC

CAT - II : For those items the Quality Plans are approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis of review of documents.

CAT-III:

UNITSWORKS : Place of manufacturing. Place of main supplier of multi units/works.

* - Inspection category will be decided during vendor evaluation.

NOTE - 1 : EMPTY CABINETS, COMPUTERS, SIGNAL ISOLATOR/MULTIPLIER, MCB, TB, POWER SUPPLY ETC. SHALL ALSO BE ACCEPTABLE FROM INDEGENOUS SOURCES AGREED BY NTPC IN QP. IF THE TOTAL INTEGRATED PANEL AND FAT IS CONDUCTED INDEGENOUSLY ITEM TO BE TREATED AS CAT - I.

NOTE - 2 : Mandatory Sapre will be treated as CAT-III

NOTE - 3 : For the items not appearing in the proeward list, bidder and NTPC will mutually discussed in future.

NOTE - 4 : Intergration testing of DDCMIS shall be done with monitor connected to the LVS workstation. This would be tied up in the QAP/ATST. Dispatch of LVS can be allowed like a CAT-III item but only after successful testing of functionality as indicated in QP and completion of ATST of first unit.

NOTE - 5 : C&I Items Integral for skid, Fan, Motor, Pump etc Instrument shall be supplied as per OEM standard/ approved sources.

NOTE - 6 : for instrumentation cable quantity less than 1 km of each type inspection category is III and for less than 2.5 km of each type inspection category is CAT-II
 Engg. Div/O&A&I

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PEM APPROVED SUB VENDOR LIST

SI No	Package Name	Supplier Name	Supplier Communication Address	Supplier Works Address
1	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	BOSE PANDA INSTRUMENTS PVT.LTD.	Mr. Partha Bose 44, Saheed Hemanta Kumar Bose, Sarani, Kolkata Phone- +91 33 2548 7220 Pincode : 700074 Email : parthabosebpi@gmail.com; bosepanda@vsnl.net	Works-1->Mr. Partha Bose 44, Saheed Hemanta Kumar Bose,Sarani, -Kolkata-WEST BENGAL India Phone- +91 33 2548 7220 FAX : +91 33 2548 0429, Pincode : 700074 Email : parthabosebpi@gmail.com bosepanda@vsnl.net
2		A.N. INSTRUMENTS PVT. LTD.	MARKETING DIVISION, 5th FLOOR, 59-B, CHOWRINGHEE ROAD, KOLKATA Phone- 24757784,22472509 Pincode : 700020 Email : anidel@bol.net.in	Works-1->Mr. Gautam Mukherjee Kusumba,Sonarpur Station Road,P.O. -Narendrapur, -Kolkata-WEST BENGAL INDIA Phone- 9836878855 FAX : 033-24342748 Pincode : 700103 Email : gkm_ani@hotmail.com
3		H.GURU INDUSTRIES	Mr. G. D. Hazra/Mr. P. K. Mitra 10 B, HO-CHI-MINH SARANI, KOLKATA Phone- 033 2282 2463 / 1637 Pincode : 700071 Email : mguru@vsnl.net	Works-1->NA NA -- Phone- FAX : Pincode : Email :
4		PRECISION MASS PRODUCTS PVT. LTD.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com	Works-1->Mr. Hitesh Parmar/Mr. Hitesh Parmar Plot No.2306, Phase II, GIDC Chhatral, -Kalol-GUJARAT INDIA Phone- 9327359227 FAX : 02764-233440 Pincode : 382729 Email : hitesh.parmar@ashcroftindia.com
5		Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 A GIDC A Phase 1, -VAPI-GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com
6		H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	32,INDUSTRIAL SUBURB YESWANTHAPUR BANGALORE Phone- 080-23370300, Pincode : 560022 Email : info@hgurusouth.com	Works-1->Shikha Hazra/ Shyamal Hazra 32, Industrial Suburb,Yeshwanthpur -BANGALORE-KARNATAKA INDIA Phone- 080-23370300 FAX : 080-23379890 Pincode : 560022 Email : shikhahazra@hgurusouth.com
7		FORBES MARSHALL (HYD) LTD.	MR SAILESH PATALAY/MR. M K SRINIVASAN PLOT NO.A- 19/2, & T-4/2, IDA, NACHARAM, HYDERABAD Phone- 9849913704 Pincode : 500 076 Email : mksrinivasan@forbesmarshall.com	Works-1->MR G.SRINIVASAN/MR ANUJ MALPANI PLOT NO:A- 19/2 & T-4/2,I.DA. NACHARAM , -HYDERABAD-TELANGANA INDIA Phone- 09866550762 FAX : 040 27152193 Pincode : 560076 Email : gshrinivasan@forbesmarshall.com
8		GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@general-gauges.com,	Works-1->Gauge Bourdon India Pvt. Ltd., Plot No-4, 5, 6,Jawahar Co-operative Industrial Estate, -Kalamboli Taluka Panvel-MAHARASHTRA India Phone- 022-27421095, FAX : 022- 27421901, Pincode : 410209, Email : info@general-gauges.com
9		Nesstech Instruments Private Limited	26/2, G Type, Global Industrial Park Near Nahuli Railway Crossing, Valvada Vapi Phone- 9920576002 Pincode : 396105 Email : sales@nesstech.co.in	Works-1-> Others 26/2, G Type, Global Ind. Park Near Nahuli Railway Crossing, -Vapi-GUJARAT INDIA Phone- 9920576002 FAX : Pincode : 396105 Email : sales@nesstech.co.in, bkanadia@nesstech.co.in
10		SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec- 3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Center, Others By-Pass Junction,Near Kalsekar College kausa, mumbra,Thane -Mumbai-MAHARASHTRA INDIA Phone- 022-25491409,9892230623 FAX : Pincode : 400612 Email : sdbpl@vsnl.com
11	JUNCTION BOX	K.S.INSTRUMENTS PVT.LTD.	S Raghavan No. 72, 3rd Main, 1st Stage Industrial Suburb, Yeshwanthpur Bangalore Phone- 9880385770 Pincode : 560022 Email : sales1@ksinstruments.net	
12		SUCHITRA INDUSTRIES	NO-2,OPP-27 AECS LAYOUT 2ND STG REJAMAHALVILAS EXTN 2ND STG BANGALORE Phone- Pincode : Email : suchitra.industriesblr@gmail.com	Works-1->B. Srinivas Suchitra Industries, Opp No 53, Muneshwara Black Devinagar, Lottagal hal -BANGALORE- KARNATAKA INDIA Phone- 080-23511247 FAX : Pincode : 560094 Email : suchitra_industries@yahoo.com
13		Shrenik & Company,	Mr. Mitesh Shah/Mr. Pulin Shah 39 A/3 ,Panchratna Industrial Estate, Sarkhej-Bavla Road Ahmedabad Phone- 9825024921 Pincode : 382213 Email : sales@nustron.com. pulin@sumip.com	Works-1->Mr.Pulin Shah/ Mr. Kaloesh Parmar 39 A/3 Panchratna Industrial Est,Sarkhej-Bavla Road, Changothar - Ahmedabad-GUJARAT INDIA Phone- 98250 80339 1 FAX : 079- 26932424 Pincode : 382213 Email : sales@sumin.com
14		FLEXPRO ELECTRICALS PVT. LTD.	Mr. Dineshbhai Zaveri C-1/ 27&37, GIDC, Kabilpore, Navsari Phone- 02637-265140,265003 Pincode : 396424 Email : flexpro@flexproltd.com	Works-1->Mr. Dineshbhai Zaveri CEO C-1/ 27&37, GIDC, Kabilpore, -Navsari-GUJARAT INDIA Phone- 02637- 265140,265003 FAX : 02637-265308 Pincode : 396424 Email : flexpro@flexproltd.com
15		AJMERA INDUSTRIAL & ENGINEERING WORKS	JIGNESH MAHENDRA AJMERA DENA BANK BLDG.,SHREE NAGESH INDL. ESTATE,STATION ROAD, MUMBAI Phone- 022 67973578 Pincode : 400 088 Email : ajmera@ajmera.net. jmaajmera@yahoo.com	Works-1->JIGNESH MAHENDRA AJMERA DENA BANK BLDG., SHREE NAGESHINDL. ESTATE,STATION ROAD, -MUMBAI- MAHARASHTRA INDIA Phone- 022 67973578 FAX : Pincode : 400 088 Email : ajmera@ajmera.net
16	LEVEL SWITCH- CAPACITANCE TYPE	SIGMA INSTRUMENTS CO.	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in
17		SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec- 3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Center, Others By-Pass Junction,Near Kalsekar College kausa, mumbra,Thane -Mumbai-MAHARASHTRA INDIA Phone- 022-25491409,9892230623 FAX : Pincode : 400612 Email : sdbpl@vsnl.com
18		V. AUTOMAT & INTRUMENTS (P) LTD.	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDL.AREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com	Works-1->Mr. BHAGWAN SINGH/ Mr. NANDAN SINGH F-61, OKHLA INDL.AREA,PHASE-I -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : nroduction@vautomat.com
19		LEVCON INSTRUMENTS PVT. LTD.	Mr Shayak Gupta/Badal Jana Rajkamal', 7th floor, 13, Camac Street KOLKATA Phone- 0 33 2283 2766 Pincode : 700017 Email : b. jana@levcongroup.com	
20		Flow Star Engineering Pvt. Ltd.,	MR. KHALID AKHTAR/MR. TAPAN KUMAR JANA Plot No-7 F/2, Northern India Industrial 20/3, Mathura Road FARIDABAD Phone- 9818176380 Pincode : 121005 Email : khalid@flowstar.co.in	Works-1->MR. KHALID AKHTAR/MR. TAPAN KUMAR JANA Plot No-7 F/2, Northern India Complex,20/3, Mathura Road - FARIDABAD-HARYANA INDIA Phone- 0129-4069661, FAX : 0129- 4069663 Pincode : 121005 Email : tkjana@flowstar.co.in
21		Pune Techtrol Pvt. Ltd.	N.P.Khatan/Sudhakar Badiger S-18, MIDC Bhosari, Pune Phone- 9850560042 Pincode : 411 026 Email : ho@punetechtrol.com	
22		Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 A GIDC A Phase 1, -VAPI-GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com
23		Sapcon Instrument Pvt Ltd.	131, PALSHIKAR COLONY Contact Person- Mr. Ashwin (9826080207) INDORE Phone- +91-731-4085751, Pincode : 452004 Email : sales@sapconinstruments.com	Works-1->Mr. Ashwin R Palshikar/Mr. Navin Bodse 131 PALSHIKAR COLONY, -INDORE-MADHYA PRADESH INDIA Phone- 9754261005 FAX : 0731-2475475 Pincode : 452004 Email : sales@sancon.in

24	LEVEL SWITCH- CONDUCTIVITY TYPE	LEVCON INSTRUMENTS PVT. LTD.	Mr Shayak Gupta/Badal Jana Rajkamal', 7th floor, 13, Camac Street KOLKATA Phone- 0 33 2283 2766 Pincode : 700017 Email : b_iana@levcongroup.com	Works-1-> 38G, PICNIC GARDEN ROAD, -KOLKATA-WEST BENGAL INDIA Phone- FAX : Pincode : Email :
25		BLISS ANAND PVT. LTD.	Mr. Vikas Anand/ Mr.RGRajan 92B & 93 B , IMT MANESAR Gurgaon Phone- 0124-4366000 TO 9 Pincode : 122001 Email : sales@blissanand.com	Works-1->Mr. Bharat Kumar/ Mr. Sasi Kumar Plot No. 92B & 93B,Sec-V, IMTManesar -GURGAON-HARYANA INDIA Phone- 0124-4366000 TO 9 FAX : 0124-2290884 Pincode : 122002 Email : bharat@blissanand.com
26		V. AUTOMAT & INSTRUMENTS (P) LTD.	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDLAREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com	Works-1->Mr. BHAGWAN SINGH/ Mr. NANDAN SINGH F-61, OKHLA INDLAREA,PHASE-I -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : production@vautomat.com
27		HI-TECH SYSTEMS & SERVICES LTD.	Mr. Vikash Agrawal/Mr. Tarun Debnath 119, PARK STREET , KOLKATA Phone- 033-22290045 Pincode : 700016 Email : sandeep@hitech.in	Works-1->Mr. Jitendra Kumar/Mr. Debasis Dey 82/1, Sarsuna Main Road, -KOLKATA-WEST BENGAL INDIA Phone- 9883994030 FAX : Pincode : 700061 Email : jitendra@hitech.in
28		RAMAN INSTRUMENTS PVT.LTD.	Mr. N R Shenoy/Mr G B Vijh 8, First Floor.Plot : 160A Bait-Ush-Sharaf, 29th Road,Bandra(W) MUMBAI Phone- 09892331381 Pincode : 400050 Email : ramanbni@vsnl.com	Works-1->NA -- Phone- FAX : Pincode : Email :
29		SIGMA INSTRUMENTS CO.	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in
30	LEVEL SWITCH- FLOAT TYPE	SOR INC.	LARRY DEGARMO/Avdresh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com, avdresh@sherman-india.com.	Works-1->LARRY DEGARMO/ ROY STUMBOUGH 14685 W. 105TH STREET, LENEXA -KANSAS- USA Phone- 913-888-0767 FAX : 913-888-0767 Pincode : 66215 Email : rstumbough@sorinc.com
31		Pune Techtrol Pvt. Ltd.	N.P.Khatan/Sudhakar Badiger S-18, MIDC Bhosari, Pune Phone- 9850560042 Pincode : 411 026 Email : ho@punetechtrol.com	
32		D.K. INSTRUMENTS PVT.LTD.	N.SIKDAR/ SUMIT SIKDAR 76/2,SELIMPUR RD DHAKURIA Kolkata Phone- 033-2415-1310. Pincode : 700031 Email : dkinst@vsnl.net	
33		V. AUTOMAT & INSTRUMENTS (P) LTD.	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDLAREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com	Works-1->Mr. BHAGWAN SINGH/ Mr. NANDAN SINGH F-61, OKHLA INDLAREA,PHASE-I -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : production@vautomat.com
34		SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Center, Others By-Pass Junction,Near Kalsekar College kausa, mumbra,Thane -Mumbai-MAHARASHTRA INDIA Phone- 022-25491409,9892230623 FAX : Pincode : 400612 Email : sdbpl@vsnl.com
35		LEVCON INSTRUMENTS PVT. LTD.	Mr Shayak Gupta/Badal Jana Rajkamal', 7th floor, 13, Camac Street KOLKATA Phone- 0 33 2283 2766 Pincode : 700017 Email : b_iana@levcongroup.com	
36		GENERAL INSTRUMENTS CONSORTIUM	Mr. Amarendra Kulkarni 194/195, Gopi Tank Road, Off. Pandurang Naik Marg, Mahim Mumbai Phone- 9323195251 Pincode : 400016 Email : amarendra@general-gauges.com	
37		SBEM PVT. LTD.	MR.N.K. BEDARKAR/MR. VISHWANATH KARANDIK 39, ELECTRONIC CO.OP. ESTATE, PUNE SATARA ROAD PUNE, Phone- 912041030100 Pincode : 411009 Email : newdelhi@sbem.co.in	Works-1->MR. MOHAN PADWAL 691/A/2,BIBWEWADI INDL ESTATE -PUNE-MAHARASHTRA INDIA Phone- 918600042374 FAX : 912024215670 Pincode : 411037 Email : wm@sbem.co.in
38		Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 A GIDC A Phase 1, -VAPI-GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com
39		SIGMA INSTRUMENTS CO.	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in
40		SOR INC.	LARRY DEGARMO/Avdresh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com, avdresh@sherman-india.com.	Works-1->LARRY DEGARMO/ ROY STUMBOUGH 14685 W. 105TH STREET, LENEXA -KANSAS- USA Phone- 913-888-0767 FAX : 913-888-0767 Pincode : 66215 Email : rstumbough@sorinc.com

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
SUMP PUMPS**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-172-N001**

SECTION: **I**

SUB-SECTION: **ID**

REV. NO. **00** DATE **08.03.19**

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

SUB-SECTION – ID

DATASHEET-A

	3X800MW PATRATU STPS EXP. PH-I		Specification No: PE-TS-434-172-N001
	TECHNICAL SPECIFICATION FOR SUMP		Section-ID
	DATA SHEET - A		Date-07.03.19
CL. NO.	DESCRIPTION	UNIT	Portable Submersible Sump Pumps for general purpose
1.0.0	GENERAL		
1.1.0	Service /Location of Sump pumps		For dewatering of various pits/sumps
1.2.0	Equipment name		Drainage Pumps (Miscellaneous)
1.3.0	Pump type		Submersible & Portable type
1.4.0	Duty		Intermittent
1.5.0	Location (Pumps & drives to be designed for)		Outdoor
1.6.0	Maximum Ambient Temperature	°C	60
1.7.0	Drive		Motor Driven
1.8.0	Motor Rating		Continuous motor rating (at 50 deg. C ambient) for pumps shall be at least ten percent (10%) above the maximum load demand of the driven equipment in the complete operating range (including run out condition) to take care of the system frequency variations.
2.0.0	PUMP PARAMETERS		
2.1.0	Design capacity	M3/hr	40
2.2.0	Total head at rated capacity	MWC	20 (Suitable for working in Range 5 to 25)
2.3.0	Total no.of pumps installed	Nos.	12
2.4.0	No. of pumps working / Standby	Nos.	-
2.5.0	Parallel operation required		-
2.6.0	Pump RPM		1500 (Max.)
2.7.0	Static head of pumping system	MWC	--
2.8.0	Depth of pit		--
2.9.0	Range of operation	%	30 to 150 % of the rated flow
2.10.0	Pump design standard		IS 5120/IS 8034
2.11.0	Max. particle size to be handled	mm	40
3.0.0	LIQUID DATA		
3.1.0	Liquid handled		Drains with particle size upto 40 mm
3.2.0	Specific gravity		1.1
3.3.0	Temperature (max.)	°C	60
4.0.0	DESIGN AND CONSTRUCTION		
	FEATURES		
4.1.0	Impeller type		Open, Non-clog type
4.2.0	Flange drilling standard		ANSI B 16.5
5.0.0	MATERIAL OF CONSTRUCTION		
5.1.0	Casing / Suction bell		2.5 % Nickel Cast Iron, IS: 210 Grade FG 260; S-0.1% max. P-0.15% max.
5.2.0	Impeller		SS-316
5.3.0	Shaft		SS-410
5.4.0	Wear ring (where applicable)		Austenitic cast iron
5.5.0	Shaft sleeve (where applicable)		SS-316/SS410
5.6.0	Coulmn Pipe (where applicable)		-
5.7.0	Pump and motor coupling		-
5.8.0	Fasteners		SS 316
5.9.0	Gland		2.5 % Nickel Cast Iron, IS: 210 Grade FG 260; S-0.1% max. P-0.15% max.
5.10.0	Gland Packing		Braided Graphite- free Teflon
5.11.0	Mechanical seal		As applicable
5.12.0	Pump Lubrication		SELF/Oil/Grease

	3X800MW PATRATU STPS EXP. PH-I		Specification No: PE-TS-434-172-N001
	TECHNICAL SPECIFICATION FOR SUMP		Section-ID
	DATA SHEET - A		Date-07.03.19
CL. NO.	DESCRIPTION	UNIT	Portable Submersible Sump Pumps for general purpose
5.13.0	Pump line shaft lubrication		N/A
5.14.0	Strainer (Body / Mesh)		Body (2.5 % Nickel Cast Iron, IS: 210 Grade FG 260; S-0.1% max. P-0.15% max.) / Mesh (SS 316)
Note :	Bidder's may offer alternative materials, if they are superior to that specified above for the indicated service of the pump.		
6.0.0	INSPECTION AND TESTING		As per approved Quality Plan by BHEL/Customer
7.0.0	SUPPLY OF ACCESSORIES AND SERVICE.		
7.1.0	Counter Flanges with Nuts, Bolts, Gaskets etc.		Yes
7.2.0	Elastomer cables (Water proof) for connecting pump with its panel, length (M)	M	50M
7.3.0	Control panel as per specification with integral starter		Yes Trolley mounted for each sump pump with IP 65 protection
7.4.0	Suction and Discharge pressure gauge with root valve / pump		-
7.5.0	Discharge hose/ Pipe		
	- Hose/ Pipe length per pump		30 M (Heavy duty rubberised canvas)
	- Hose/Pipe dia		Maxm 65 NB or suit pump discharge
7.6.0	Orifice Plate and its arrangement at Pump Discharge		1 no. (suitable for Presure drop of 10 MWC).
7.7.0	Cables (*) for connecting the Control panel with the power supply source - Length (M) / pump. (*)including plug matching with purchaser's 63 Amp welding socket		50 m
7.8.0	Lifting Hooks		Yes
7.9.0	Chains		Yes (min. 15M per pump)
7.10.0	Suction Strainers		Yes
7.11.0	Pump Stool		Yes
7.12.0	Wheel trolley required per pump		Yes
7.13.0	Level switches for		Float type level probe integral with pump
	- Very Low level		Yes
	- High level		NA
	- Very high level		NA
8.0.0	Levels for installation		
8.1.0	Pump/Motor Support Elevation		N/A
8.2.0	Pump Invert Level		N/A
9.0.0	Special Requirements		N/A
10.0.0	Mandatory Spares		Not Applicable



TITLE:

**TECHNICAL SPECIFICATION
SUMP PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-172-N001**

SECTION: **II**

SUB-SECTION: IIA

REV. NO. **00** DATE 08.03.19

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

SUB-SECTION - IIA

STANDARD TECHNICAL SPECIFICATION (MECHANICAL)

	TITLE :	SPECIFICATION NO.: PE-TS-999-172-N001	
	TECHNICAL SPECIFICATION FOR	SECTION: IIA	
	SUMP PUMPS	REV. NO. 0	DATE : 14.06.16
	STANDARD TECHNICAL REQUIREMENT	SHEET	OF

1.00.00 GENERAL

1.01.00 This specification covers the design, performance requirement, constructional features, material requirements, manufacture, inspection and testing at the manufacturer's and/or his sub-contractor's works and painting requirements for delivery of Sump Pump/submersible pumps complete with all accessories as specified hereinafter.

1.02.00 The design, performance, major constructional features, materials of construction etc., of the Sump Pumps/submersible pumps shall be guided by Data Sheet-A. The requirements of this specification shall also be taken care of.

2.00.00 Codes and Standards

2.01.00 The design, performance requirement, material requirements, manufacture, inspection and testing of the Sump Pumps shall generally comply with the requirements of all applicable Indian/British/American/DIN standards, in particular the following :

- IS 8034 : Technical requirements for submersible pump sets
- IS 5600 : Technical requirements for rotodynamic pumps for handling sewage and drainage.
- IS 1710 : Vertical turbine pumps for clear, cold and fresh water.
- IS 5120 : Technical requirements - Rotodynamic special purpose pumps
- IS 5600 : Sewage and drainage pumps
- IS 5639 : Pumps for handling chemical and corrosive mixed flow and axial flow pumps
- IS 9137 : Code for acceptance for centrifugal, mixed flow and axial flow pumps
- BS 5316 : Acceptance tests for centrifugal, mixed flow and axial flow pumps
- Hydraulic Institute Standards of USA
- API 610 : Centrifugal pumps general refinery services

2.02.00 In case of any contradiction between the above standards and this specification, the

	TITLE :	SPECIFICATION NO.: PE-TS-999-172-N001	
	TECHNICAL SPECIFICATION FOR	SECTION: IIA	
	SUMP PUMPS	REV. NO. 0	DATE : 14.06.16
	STANDARD TECHNICAL REQUIREMENT	SHEET	OF

stipulations in this specification shall prevail and shall be binding on the bidder.

3.00.00 General Description

3.01.00 Sump pumps/submersible pumps specified hereinafter shall be used to dewater various sump pits in the power house and other plant area where gravity draining is not envisaged to ensure general housekeeping.

Type of Sump Pumps required under this specification are described in Section-ID/Data Sheet-A, the following requirements shall be taken care, as applicable.

3.01.01 Fixed Type Sump Pumps

Fixed type Sump pumps shall be electric motor driven permanently installed and shall be vertical wet pit bottom suction volute type and will handle drainage water, containing solid particles with sludges, polluted liquid etc. from the area where they are installed. These pumps will run continuously by the use of high and low level switches in the sump. Particle size expected in the water may be of the order of 30mm.

3.01.02 Fixed Duty Type Submersible Pumps

Fixed duty type submersible pumps shall be electric motor driven permanently installed and the motor shall be integral part of the pumps and the pump & motor shall be single unit i.e. monoblock type which be submerged in the water. Submersible pump will handle drainage water, containing solid particles with sludges, polluted liquid etc. from the area where they are installed. These pumps will run continuously by the use of high and low level switches in the sump. Particle size expected in the water may be of the order of 30mm.

3.01.03 Trolley Mounted portable sump pumps

These pumps shall be horizontal centrifugal, either electric motor driven or Diesel engine driven as specified in Data Sheet-A and shall be portable type. Each pump set alongwith drive, control panel etc., shall be mounted on a trolley for ease of transportation. These pumps shall be suitable for handling drainage water containing hard solid particles, sludge, polluted liquid with expected particle size of 30mm.

3.01.04 Trolley Mounted Vertical Submersible portable type pump

These pumps shall be vertical submersible portable type pump motor sets with suitable arrangement for carrying to any place and for lowering to and raising from various water reservoirs and pits. The pump motor set shall be monoblock type and shall be mounted on trolley and shall be suitable for handling water containing mud/sludge, solid particles, cotton waste, silica, ash particles, coal particles, polluted liquid etc. The particle size expected in water may be 30mm.

4.00.00 GENERAL PERFORMANCE REQUIREMENT

	TITLE :	SPECIFICATION NO.: PE-TS-999-172-N001	
	TECHNICAL SPECIFICATION FOR	SECTION: IIA	
	SUMP PUMPS	REV. NO. 0	DATE : 14.06.16
	STANDARD TECHNICAL REQUIREMENT		SHEET OF

- 4.01.00 The pumps shall be designed to have best efficiency at the specified duty point. The pump set shall be suitable for continuous operation at any point within the "Range of Operation".
- 4.02.00 Pumps shall have a continuously rising head capacity characteristics from the specified duty point towards shut off point, the maximum head being at shut off.
- 4.03.00 Permanently installed vertical sump pumps/submersible pumps, wherever specified, shall be suitable for parallel operation. The head vs capacity, the bhp capacity characteristics etc. shall match to ensure equal load sharing and trouble free operation throughout the range. Drive motor shall not be overloaded when pump discharge is more than rated.
- 4.04.00 The static head requirement of portable type sump pumps may have a considerably wide range of variation depending upon the depth of pit being dewatered. While the pump shall have adequate capacity at the maximum head, its drive shall be sufficiently rated to cater for any overloading during the pump operation at its minimum possible head, i.e. maximum discharge.
- 4.05.00 Pump with its drive unit shall run smooth without undue noise and vibration. Acceptable peak to peak vibration limits shall generally be guided by Hydraulic Institute Standards (latest edition)/as per applicable IS standard.
- 5.00.00 GENERAL**
- 5.01.00 Pumps as described in Section-IA/ID (DataSheet-A) shall be complete with their drives, couplings and other accessories as also those needed to make the pump sets complete in all respect, for proper operation and maintenance.
- 6.00.00 DESIGN AND CONSTRUCTION**
- 6.01.00 The design, construction testing and other details of the sump pumps and related accessories shall be in line with the stipulations and data in this section and as per data sheet-A.
- 6.02.00 Each sump pump shall be equipped and coupled with a drive motor with rating so selected as to have atleast 25% margin over the maximum power required by the pump, throughout its range of operation.
- The discharge rate of sump pump is very much uncontrolled. As such pump should be capable to operate even under a condition of as low as 25% of specified total head.
- 6.03.00 All integral piping shall be as per IS-1239 of heavy grade (as suited for the maximum operating pressure) and shall be either galvanised or painted with approved rust inhibiting paint.
- 6.04.00 All valves shall be steel body type as per applicable IS/BA/ANSI standard, with pressure class compatible with the maximum working pressure.

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- 6.05.00 All hoses shall be of steel wire reinforced type. Pump suction hose shall be suitable for working under vacuum. Pump discharge hose shall be suitable to withstand the maximum pressure that it may be subject to in all working conditions, including hydrostatic testing of the sump pump discharge line.
- 6.06.00 Pump suction strainer (applicable only for Portable Horizontal Sump Pumps) shall have openings large enough just to permit the entry of solids having maximum size as stipulated in the specification.
- 6.07.00 Pressure gauges shall be of Bourdon type, with sealing diaphragm to prevent ingress of the work fluid. Selected range of pressure gauge shall be such that the entire range of working pressure covers about 1/3rd to 2/3rd to its range. Accuracy of measurement shall be within $\pm 1\%$ of scale range. The suction pressure gauge shall be compound type. Pressure gauge dial size shall be 100mm or more.
- 6.08.00 Pumps**
- 6.08.01 Fixed type Sump Pumps shall be wet pit type, vertical shaft, centrifugal, vertical submerged suction, non-clog volute type complete with enclosed shaft, discharge pipe, head assembly thrust bearing and drive assembly, cover plates etc.
- 6.08.02 Fixed duty type Submersible pumps shall be monoblock type in which electric motor shall be integral part of the pump and this monoblock of pump & motor set shall be submerged in the water. The pump shall be single stage and non-clog design.
- 6.08.03 Trolley mounted portable sump pumps shall be of horizontal shaft, single stage, end suction, radially split casing, centrifugal, non-clog design complete with common base plate, drive assembly etc. These pumps shall be trolley mounted portable type.
- 6.08.04 Vertical Submersible Portable type pumps shall be submersible pump motor type, single stage and non-clog design and shall be portable type.
- 6.08.04 Casing**
- a) Casing shall be so designed to allow free passage of specified maximum size of solid.
- b) Casing shall be designed to withstand the maximum shut off pressure developed by the pump.
- c) The casings shall be cast, free from blow holes, sand holes, other detrimental defects. The casing shall be complete with suction and discharge connections.
- d) For submersible type sump pumps adequate seal arrangement shall be made to keep leakage of liquid from casing to column assembly to minimum and adequate drain shall be provided in column assembly to permit escape of the leakage flow. The casing shall also include the bearing housing of the bottom pump shaft

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bearing.

- e) Trolley mounted portable sump pumps shall be provided with vent connections and drain connections with valves. These pumps shall be manually primed.

6.08.05 Impeller

- a) The impeller shall be non-clog type, cast in one piece and specially designed to pass large solids or unscreened liquids. The clearance between stationary and moving parts should be such as to allow sustained performance without excessive maintenance.
- b) Impellers of Fixed type sump pumps shall have provision for adjustment from an accessible location.

6.08.06 Pump shaft

- a) Shaft size selected shall be such that critical speed is at least 20% away from the operating speed and the runway speed.
- b) The shaft shall be ground and polished to final dimension and of ample size to withstand all stresses resulting from rotor weight, hydraulic loads and across the line starting. Shaft shall be provided with renewable sleeves particularly under stuffing boxes and other locations as recommended by pump manufacturers.
- c) The coupling between shafts shall be so designed that they become tight during pump operation.

6.08.07 Column Pipe for fixed type sump pumps (As applicable for vertical sump pumps)

The discharge pipe shaft assembly shall be flanged or screwed as per manufacturer's standard and standard length of each piece of column pipe shall be in conformity to the shaft piece lengths from consideration of easy handling.

6.08.08 Bearings

- a) Adequate nos. of properly designed bearings shall be furnished. Bearings for fixed type Sump Pumps shall be Oil lubricated and Bearings for trolley mounted Horizontal pumps shall be antifriction type and lubricated by oil/grease. All necessary grease gun, grease cup and tubing shall be included.
- b) Thrust bearing of adequate design shall be furnished for taking the entire pump thrust arising from all probable conditions of continuous operation through out its "range of operation" and also the shut off condition life of thrust bearing shall be 20,000 working hour minimum for the load corresponding to the duty point. The bearings shall be lubricated by grease or oil from a location conveniently accessible. Design shall be such that the lubricant can not contaminate the

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handling liquid.

6.08.09 Wearing Ring/Liner Plate

Renewable wearing rings/liner plates shall be provided either on impeller or on the casing or on both impeller and casing.

6.08.10 Stuffing Box

Stuffing box of Fixed type sump pumps shall be of mechanical packing type. Trolley mounted portable sump pumps shall have mechanical seal of reliable design.

6.08.11 Coupling

Pump and motor shall be connected with a suitable flexible coupling. Coupling shall be provided with coupling guard.

6.08.12 Fixed type sump pumps shall be provided with a suitable mounting plate. The mounting plate shall be adequately sized to accommodate the level switches, discharge pipe, oil cups etc. Trolley mounted portable sump pumps and drives shall be mounted on one base plate. Base plate shall be of rigid construction properly ribbed as needed. Suitable drain with valve, vent with valve and drain funnel shall be furnished by the Bidder.

The necessary supporting plate, mounting frame, base plate, etc., as required shall be supplied under this specification alongwith anchor bolts, foundation bolts, pipe, sleeves etc. Lifting lug, eye bolts etc., as required for the proper handling of each pump set shall be furnished.

6.08.13 Suction Bell

Fixed type sump pumps and vertical submersible portable type pumps shall be complete with adequately dimensioned suction bell to guide and streamline intake fluid.

7.00.00 INSPECTION AND TESTING

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

- a) Material identification and testing shall include but shall not be limited to the following components:
 - i) Impeller & wearing rings.

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- ii) Shafts & shaft sleeves.
 - iii) Couplings
 - iv) Bearings
 - v) Coloumn pipes
 - vi) Discharge head
- b) Tests shall also include but shall not be limited to the following :
- i) The entire surface of the impeller castings shall be subjected to D.P. test as per ASTM-E-165.
 - ii) Shaft shall be subject to D.P. & Ultrasonic test.
 - iii) Wearing rings shall be subject to D.P. test.
 - iv) Witnessing of NDT/review of NDT reports.
 - v) Static balance test for impeller & dynamic balance of complete rotating parts as per ISO-1940.
 - vi) Complete inspection of assembled pump
- c) Hydrostatic test shall be done for the following components (as minimum) at 150% of the shut-off pressure. Pressure shall be maintained for a period of not less than one (1) hour.
- i) Bowls/suction bells
 - ii) Column pipe
 - iii) Discharge head
 - iv) Any other applicable pressure parts.

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d) Performance tests at shop

- i) Each pump shall have to be tested to determine performance curves of the pumps. These tests are to be conducted in the 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 but the tolerances on Head, Discharge & Power shall be specified in HIS, USA.
- ii) Performance tests are to be conducted to cover the entire range of operation of the pumps. These shall be carried out to span 130% of rated capacity upto pump shut-off condition. A minimum of five combinations of head & 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 annexures. 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) The Bidder shall submit in his proposal the facilities available at his works to conduct performance testing.
- v) NPSH tests are to be conducted on one pump of each type at 3% head drop conditions, if specified in the pump Annexures.
- vi) 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.
- vii) 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.

7.01.00 The pump integral accessories like thrust bearing, pump motor coupling etc., shall be subject to tests as per manufacturer's standard.

7.02.00 Test on motors, control panels, starter panels, cables shall be conducted as per the requirement of this specification.

7.03.00 After erection at site, pumps shall be operated to prove satisfactory and trouble free performance.

7.04.00 A typical quality plan is enclosed for bidder's guidance, the bidder shall furnish detailed Quality Plan based on same for Purchaser's approval, in the event of order.

8.00.00 Drawings, data, curves and information

8.01.00 Following drawings, data and information for the equipments are required to be submitted by the bidder alongwith his formal proposal.

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8.01.01 General Arrangement drawings of the pumps showing various dimensions, suction and discharge locations. 8.01.02 Typical cross-section drawings of the pumps, seal rings, etc., and materials of construction for all items. 8.01.03 Characteristic curves of pumps showing effective head, pump input power, efficiency, submergence and NPSH, against capacity ranging from shut off condition to 150% of rated capacity. 8.01.04 Speed vs. torque curve of the pump corresponding to recommended mode of pump starting, super-imposed on speed vs. torque of the motor, corresponding to 80% and 100% rated voltage. 8.01.05 Diagram showing the type of lubrication system etc. 8.01.06 Completely filled up schedules enclosed under Vol.III of this specification. 8.01.07 GA drawing of Control Panel. 8.01.08 A write up describing clearly the procedure for installing the pump and also for overhauling the fixed type pumps. A procedure for lowering and raising the vertical submersible portable type pumps shall also be given. 8.02.00 Drawings, data, curves and information to be submitted by the successful tenderer after placement of order. 8.02.01 The drawings/data asked against clause nos.8.01.00 to 8.01.07 above shall also be furnished in a finalised form by the successful tenderer for the approval of the purchaser/his consultant. In addition following documents shall also be submitted for Purchaser's/consultant's approval. 8.02.02 Pump foundation details with static and dynamic loads. 8.02.03 Pump and drive sealing, bearing lubrication and cooling arrangement drawing. 8.02.04 Drive data 8.02.05 Reports on shop tests and test certificates. 8.02.06 All other drawings/documents and data as specified and deemed necessary.			

 BHARAT HEAVY ELECTRICALS LIMITED		MANUFACTURERS NAME & ADD		MANUFACTURING QUALITY PLAN									
				ITEM :	Sump pumps/Submersible Pump		QP NO: PE-QP-999-100-N005		PROJECT :				
						REV-02		END CUSTOMER:					
						DATE: 14.06.16		CONTRACT No.:					
						PAGE 1 OF 2		MAIN SUPPLIER: BHEL, Noida					
SR. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									M	B	C		
1	2	3	4	5	6	7	8	9	D*	10			
1.0 Raw Material and Bought out Control													
1.1a	Pump Casing	Physical Properties - Tensile Strength & Hardness / Chemical Composition	CR	Physical / Chemical Analysis	1 / Heat / Batch	Appd. C S Drg.	Approved drawing/Data sheet	Lab Report	√	P	V	V	
1.1b	Impeller	Physical Properties - Tensile Strength, Yield Strength & Elongation Chemical Composition	CR	Physical / Chemical Analysis	1 / Heat / Batch	Appd. C S Drg.	Approved drawing/Data sheet	Lab Report	√	P	V	V	
1.2	Heat treatment of Stainless Steel Castings	Heat Cycle	MA	Verification of HT chart	All Batches	Appd. C S Drg.	Approved drawing/Data sheet	Corelated HT charts	√	P	V	V	
1.3	Bars / forgings for pump and motor shafts	Physical/Chemical Properties	CR	Physical / Chemical Analysis	1 / Bar	Appd. C S Drg.	Approved drawing/Data sheet	Mill TC or lab report	√	P	V	V	
		Dimensions	MA	Measurment	100%	Manufacturers Drawing	Manufacturers Drawing	IR		P	V	V	
		Internal defects for 40 mm and above diameter	CR	UT	100%	ASTM A-388	Refer Note 1	IR	√	P	V	V	
1.4	Cable Type: PVC insulated, multicore, copper conductor	Routine TC and acceptance TC as per IS 694/Is1554, Length and size	MA	Measurement	100%	Approved Datasheet / IS 694/IS1554	Approved Datasheet / IS 694/IS1555	IR & TC	√	P	V	V	Compliance cert. To be submitted by Vendor
1.5	Bearings	Make, Bearing No., Surface finish	MA	Visual Examination	100%	Manufacturers Std	Manufacturers Std	IR		P	V		
2.0 Inprocess Control													
2.1	All Components	Visual Defects	MA	Visual	100%	Manufacturers Drawing	No harmful defects	Log book / IR		P	V	V	
		Dimensions	MA	Measurement	100%	Manufacturers Drawing	Manufacturers Drawing	Log book / IR		P	V	V	
2.2	Pump discharge casing	Leak tightness	CR	Hydro test (Duration 30 minutes min.)	100%	Refer Remark.	No leakage	IR	√	P	W	V	Test Pr.2 x duty pts. Pr. OR 1.5 x shut off whichever is higher
	Motor Housing	Leak tightness	CR	Air test (Duration 30 Minutes min)	100%	Air test at 0.5 kg/cm2 (guage pressure)	No leakage	IR	√	P	V	V	
2.3	Casing & Impeller (machined surfaces)	Surface Defects	CR	DPT	100%	ASTME:165	No Surface defect	IR	√	P	V	V	On machined surface only
2.4	Impeller	Static & Dynamic residual unbalance	CR	Static, Dynamic balancing	100%	ISO : 1940	ISO 1940 Gr. 6.3	IR	√	P	V	V	
2.5	Pump Motor Shaft	Internal Defects	CR	DPT	100%	ASTME:388	ASTME:388, Refer note 1	IR	√	P	V	V	On machined surface only
		Surface Defects	CR	DPT	100%	ASTME:165	No Surface defect	IR	√	P	V	V	On machined surface only
3.0 Sub-Assembly, Assembly Control													
3.1	Pump, Motor, Rotor	Eccentricity	MA	Measurement	100%	Manufacturers Drawing	Manufacturers Drawing	Log book / IR		P	V	V	
3.2	Pump and Motor assembly	Completeness, correctness	MA	Visual Examination	100%	Manufacturers Drawing	Manufacturers Drawing	IR		P	V	V	
				LEGEND: RECORDS IDENTIFIED WITH "TICK" () SHALL BE			BHEL DOC No.:PE : V8 - XXX - 100-N005						
				ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION			NAME AND SIGN OF APPROVING AUTHORITY AND SEAL						
		BHEL		** M: MANUFACTURER/SUB CONTRACTOR									
MANUFACTURER/		CONTRACTOR		B: BHEL, C:CUSTOMER (END USER)									
SUBCONTRACTOR				P : PERFORM W: WITNESS V : VERIFICATION AS APPROPRIATE									
SIGNATURE													
							ENGG DIV / QA & I						

 BHARAT HEAVY ELECTRICALS LIMITED		MANUFACTURERS NAME & ADD		MANUFACTURING QUALITY PLAN									
				ITEM :		Sump Pump/Submersible Pump		QP NO: PE-QP-999-100-N005		PROJECT :			
				REV-02				END CUSTOMER:					
				DATE: 14.06.16				CONTRACT No.:					
						PAGE 2 OF 2				MAIN SUPPLIER: BHEL, Noida			
SR. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	D*	AGENCY			REMARKS
										M	B	C	
1	2	3	4	5	6	7	8	9		10			
4.0	Final Inspection, Test, Packing, Despatch Control												
4.1	Pump set (Pump+ Motor)	Q Vs Head, Q Vs Power Q Vs Efficiency	CR	Performance test	100%	Tech. Spec., Appd. Data Sheet, Appd. Curves, HIS, Test procedure	Tech. Spec., Appd. Data Sheet, Appd. Curves, HIS	Performance test record, Plotted Curves	Ö	P	W	V	
4.2	Routine Test on motor	HV, IR, Locked Rotor, No Load, Make type, Rating	CR	Electrical tests	100%	IS 325	Approved Data Sheet	IR	Ö	P	V	V	Widing resistance ** Degree of protection shall be IP 68, HV at 2.5 KV AC for 1 Minute.
4.3	Strip down after Performance test	Undue wer, tear and breakages	CR	Visual examination of Casing & Impeller after stripping	100%	Undue wer, tear and breakages	No undue wear, tear and breakages	IR	Ö	P	W	V	Witnessing one no. of each type
4.4	Complete Pump	Completeness, Correctness, Workmanship and finish, overall dimensions	MA	Visual examination	100%	Approved G.A. drawing	Approved G.A. drawing	IR	Ö	P	V	V	Compliance report for accessories will be submitted.
4.5	Completion of all stages	Completion	MA	Verification of IR's TC's	100%	Approved QP	Approved QP	IR	Ö	P	V	V	
4.6	Painting	Surface Preparation		Visual examination	100%	Approved data sheet/Manufacturer standard		IR		P	V	V	Compliance report by Manufacturer
		Adhesion, Uniformity and thickness		Visual Measurement	100%	As per painting schedule/Manufacturer standard		IR		P	W	V	Compliance report by Manufacturer
4.7	Wooden Packing	Soundness, Aesthetic		Visual	100%	As per packing procedure		IR		P			Compliance report by Manufacturer
Note :													
1. For accessories and bought out items, Manufacturer will submit Compliance for review.													
2. For UT test on shaft, defect echo < 20 % full screen height when back wall echo set @ 100 % screen height. Reduction in back wall echo to be <20%. Defect height > 20 % of FSH is not acceptable, also loss in backwall echo>20 % not acceptable.													
3. IP 68 protection certificate for test conducted on similar motor shall be submitted for review													
4. Compliance for provision of thermic switch for over heating protection of winding, reverse rotation protection device shall be submitted by Manufacturer													
5. For control panel separate QAP is applicable.													
6. Before sending the documents for approval, supplier to ensure that "Reference documents" & "acceptance Norms" does contain data required for the Characteristic to be checked" as indicated in QP.													
				LEGEND: RECORDS IDENTIFIED WITH "NCK" () SHALL BE			BHEL DOC No.:PE : V8 - XXX - 100-N005						
				ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION			NAME AND SIGN OF APPROVING AUTHORITY AND SEAL						
		BHEL		** M: MANUFACTURER/SUB CONTRACTOR									
MANUFACTURER/		CONTRACTOR		B: BHEL, C:CUSTOMER (END USER)									
SUBCONTRACTOR		P : PERFORM W: WITNESS V : VERIFICATION AS APPROPRIATE											
SIGNATURE													
							ENGG DIV / QA & I						



TITLE:

**TECHNICAL SPECIFICATION
SUMP PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-172-N001**

SECTION: **II**

SUB-SECTION: **IIB**

REV. NO. **00** DATE **08.03.19**

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									



TITLE:

**TECHNICAL SPECIFICATION
SUMP PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-172-N001**

SECTION: **II**

SUB-SECTION: **IIC**

REV. NO. **00** DATE 08.03.19

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

SUB-SECTION - IIC

STANDARD TECHNICAL SPECIFICATION (C &I)



SPECIFICATION FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS -999- 145 -054A

VOLUME II B

SECTION D

REV. NO. 03

DATE : 16-09-2013

SHEET 1 OF 6

1.0 SCOPE

This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site, **supervision, erection, and commissioning at site** of Local Panels required for control and monitoring of the Auxiliary Plant & Equipment.

2.0 CODES AND STANDARDS

2.1 All the equipments specified herein shall comply with the requirements of the latest issue of the relevant National and International standards.

2.2 As a minimum requirement, the following standards shall be complied with:

- a) IS-6005 : 1998 : Code of practice for phosphating of iron and steel.
- b) IS-5 : 2007 : Colors for ready mixed paints and enamels.
- c) IS-1248:2003 : Direct Acting Indicating Analog Elec Measuring Instruments.
- d) IS/IEC 60947:Part 1:2004 : Low Voltage switchgear & control gear: Part-I (General Rules)
- e) IS-8828:1996 : Circuit breaker for household and similar installations.
- f) IS-13947 (Part-I):1993 : Low Voltage switchgear & control gear : Part-I (General Rules)
- g) ISA-18.1:1979 : Annunciator Sequences and Specification
- h) NFPA-496:2003 : Purged & Pressurised Enclosure for Electrical Equipment in Hazardous Locations.

3.0 TECHNICAL REQUIREMENTS

3.1 Panel Construction

3.1.1 The local panels shall house the secondary instruments, annunciation system, Single loop controller, Control switches / push buttons, indicating lamps/**LED cluster**, relays, timers and other devices required for operation and monitoring of the equipment locally.

3.1.2 The panels shall be of free standing type either welded construction on angle iron (minimum section of 50 x 50 x 4 mm) structure or folded construction by sheet metal formation depending upon the equipments to be mounted on it. The panels shall be robustly built and **stiffeners** as necessary shall be provided.

3.1.3 The panel shall be suitably reinforced to ensure adequate support for all instruments mounted thereon. All welds on exposed panel surfaces shall be ground smooth.

3.1.4 The salient features of construction shall be:

Sheet material: Cold rolled sheet steel

Frame thickness: Not less than 3.0mm

Enclosure thickness: Not less than 2.5 mm for load bearing sections (Mounted with instruments)
1.6 mm for doors and Not less than 2.0 mm for others

Panel Height: Not less than 2365 mm (Refer data sheet-A (No. PES-145A-DS1-0))

Gland plate thickness: 3.0mm

Base channel: ISMC 100 with anti-vibration mounting & foundation bolts.

3.1.5 The panel shall be provided with rear doors with integral lockable handle. The door when locked shall be held at minimum three places. The door width shall not be more than 550mm. The doors shall be provided with suitable **stiffeners** to prevent buckling. The handle shall be on the right side of the door. The door shall be removable type with concealed hinges to facilitate maintenance work. Suitable pocket inside the door shall be provided for keeping the drawings / documents. **Double door shall be provided with suitable glass windows, as per the requirement.**

3.1.6 Suitable neoprene gasket shall be provided on all doors and removable covers. Suitable ventilation **system along with louvers** shall be provided at bottom and top of the doors covered with removable wire mesh.



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- 3.1.7 The class of protection shall be in accordance with IP-42 unless otherwise specified in the data sheet – A (No. PES-145-54A-DS1-0).
- 3.1.8 All steel surfaces shall be cleaned by sand / pellet blasting, treated for pickling, degreasing and phosphating etc. by seven tank method. The panel shall have a high quality finish and appearance. The panel shall be painted with two coats of primer followed by two coats of epoxy / synthetic enamel based final paint of color shade and finish as given in data sheet-A (No. PES-145A-DS1-0). Minimum thickness of the paint shall be 85 microns for external paint and 70 microns for internal paint.
- 3.1.9 The cable glands of the required size and type as given in data sheet-A (No. PES-145A-DS1-0) shall be supplied alongwith the Panel.
- 3.1.10 All operable and indicating devices shall be mounted on the front of the panel while aux. Relays / timers MCBs etc. required for realization of control logics shall be mounted on a mounting plate inside the panel. Auxiliary relays and timers etc. shall be grouped according to the control function. No operable or indicating devices shall be mounted below 750 mm and above 1800 mm (w.r.t. finished ground level). The devices shall be located in such a way so as to ensure easy access for operation / maintenance.
- 3.1.11 Single / dual control power supply feeders of voltage class as specified in data sheet-A (No. PES-145A-DS1-0) shall be provided by the purchaser. In case redundant power supply feeders are provided then auto changeover unit shall be mounted on the panel are in the panel supplier's scope. Where DC control power supply is specified an additional 240V, 50 Hz AC supply feeder for powering of space heater and lighting shall be provided by the purchaser. Suitable arrangement shall be provided inside the panel to receive and terminate the power supply feeder(s). For this purpose MCBs of suitable current rating shall be provided by the vendor. A supervisory relay along with a pilot lamp to indicate control supply 'ON' shall be provided on the panel. Any other power supply required for the operation of the devices mounted in the panel shall be arranged by the vendor.
- 3.1.12 The internal wiring shall be carried out with 1100 volt grade PVC insulated copper multi strand wire / flexible of 1.5mm² size. AC & DC wires shall be kept separate from each other. Separate coloured wires to be used for AC and DC circuits. All wires shall be properly numbered and identified with ferrules as per the Control scheme / wiring diagram. Wires shall be routed and run through PVC troughs.
- 3.1.13 Terminal blocks shall be clip on type, 1100 volts grade. Separate terminal blocks shall be used for AC & DC circuits. The terminals shall be suitable for terminating 0.5 mm² to 2.5mm² external cables. **The TB points in terminal block shall be cage clamp type / screw type.** The terminal for ammeters shall be provided with removable links for shorting CTs. Each terminal strip shall be provided with identification strip. The terminal shall not be mounted below 250 mm **height from finished floor. The panel shall have ten (20) percent spare terminal.**
- 3.1.14 The interior of each panel shall be suitably illuminated through fluorescent **lamps / tube lights with shrouded cover of minimum 15W** operable on 240V 50 Hz AC power supply through panel door switch. A 15 Amp. 3-pin Power receptacle shall be provided.
- 3.1.15 Suitable space heaters operable on 240 Volts 50 Hz AC power system shall be provided at the panel bottom. These shall be designed to maintain the panel temperature five (5) deg. C above the ambient temperature during maintenance shutdown. Suitable isolating and control devices comprising of MCB, thermostat etc. shall be provided for the space heater.
- 3.1.16 The panel shall be provided with a copper earth bus of 25 x 6 mm size running throughout the width of the panel. It shall be terminated internally with 10 mm bolts at extreme ends for connection to; main station earth. The panel mounted equipments / devices shall be connected to earth bus through green coloured PVC insulated stranded copper conductor of 2.5 mm² size.
- 3.1.17 Local Panel shall be provided with main name plate of 150 mm x 40 mm size having inscription of 20 mm height. The individual devices on the panels shall be as provided with separate name plate with inscription of 3 mm height. The instrument / devices shall be provided with stick on label plates inside the panel. The material of the main and individual labels shall be three (3) ply 3 mm thick Traffolyte



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Sheet / 2 mm Anodised Aluminium Plate. The inscription shall be with white letters on black background on traffolyte sheet. The labels shall be fixed by self tapping non-rusting screws.

3.1.18 Vendor shall furnish electric load and heat load list (in case panel is to be placed in ac environment) of each panel.

3.2 Hazardous Area Panel Requirement

3.2.1 The Local Panel located in hazardous area shall be pressurized as per NFPA-496 requirements to render it non-hazardous. Alarms shall be provided for local and remote annunciation when pressurisation falls below 2.5 mm of water column. Protection shall be of type Z of NFPA-496. It shall not be possible to switch ON the power of purged section unless it is purged as per the recommendation of NFPA-496. Vendor must provide a protective device on the panel to protect the panel from over pressurisation.

3.2.2 Vendor shall supply pressurisation kit consisting of valves, restriction orifices, dual filter regulation, pressure gauges, pressure switches, rotameter etc. Pressurisation kit shall be surface mounting on a metal board and located outside the local panel. Pressurisation kit shall further consist of solenoid valve flow switch, timer blow off safety device etc., so as to make purging fully automatic. However final start shall be manual. Panel protection against over pressure to be provided as per NFPA-496.

3.2.3 Pressurised local control panel pressurization kit assembly design shall provide minimum leakage flow through the Local Control Panel. Panel venting shall be as per NFPA-496.

3.2.4 All components in the local panel like indicating instruments, push buttons switches, lamps etc., which are required to be energized without panel pressurization or before completion of purge cycle shall be explosion proof as per NEMA-7 & suitable for area classification.

3.2.5 All push buttons etc. requiring frequent operation during machine running shall have good positive sealing. Weatherproof housing or cover to be provided wherever necessary. Vendor shall provide pressurisation bypass switch outside explosion proof enclosure of pressurized panel with lamp indication. This shall be used only during maintenance. All hinges, screws, other non-painted metallic parts shall be of stainless steel material.

3.2.6 Provision to switch off manually all types of power shall be provided in the panel. In addition, it shall also be possible to switch off power circuits / components which are powered from motor control centre or control room manually in case of pressurization failure. All such cables from MCC and main control room shall be terminated in explosion proof boxes (NEMA-7).

3.3 Control & Monitoring devices

3.3.1 Instruments like Indicators, recorders, single loop controllers etc. as applicable and specified elsewhere for the plant / equipment shall be supplied and mounted on the panel.

3.3.2 Alarm Annunciator System

It shall be solid state discrete facia type having a sequence of ISA-S18.1A or as specified, opaque facia windows of 70 mm x 50 mm size, having two (2) lamps per window, and hooter of 10W, and provision for repeat group alarm at remote. The annunciator shall be provided with ten (10) percent spare windows or minimum two (2) windows along with electronics.

3.3.3 Relays

The relays shall be electromagnetic type suitable for specified control supply. Its contact configuration and rating shall be suitable for the specified control function. However minimum contact rating shall be 5 Amp AC & 2 Amp DC as applicable. There shall be ten (10) percent spare contacts.

3.3.4 Timers

The timers shall be electronic type suitable for specified control supply. Its contact configuration and rating shall be suitable for the specified control function. However, minimum contact rating shall be 5 Amp AC & 2 Amp DC as applicable.



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3.3.5 Control / Selector Switches

Switches shall be Rotary Cam type with minimum of 5 Amps AC & 2 Amp DC continuous current rating. Selector switches shall be stay put type while control switches shall be spring-return-to-neutral type. Contact configuration and rating shall be as per the control function requirement. The switches shall be lockable type wherever specified. Each switch shall be provided with engraved plates indicating the switch position / functions.

3.3.6 Push Buttons / Indicating Lights

The push buttons shall be momentary action self-resetting type, however stop P.B. for unidirectional drives shall be provided with manual reset facility. Its contact configuration & rating shall be as required for the control function but minimum 2 NO + 2 NC of 5 Amp. AC rating. It shall have round coloured projecting tab and engraved escutcheon plate / inscription plate. Colour coding of push buttons shall be as under:

RED	Motor OFF / Valve CLOSE	YELLOW	Alarm acknowledge	Left Hand Side
GREEN	Motor ON / Valve OPEN	BLACK	Lamp test	Right Hand Side

Indicating lights shall be suitable for direct connections across specified power supplies. It shall be fitted with built in resistance to prevent circuit tripping on shorting of lamp filament. It shall be fitted with LED cluster type lamp replaceable from front.

GREEN	Motor OFF / Valve CLOSED condition	AMBER	Motor tripped	Left Hand Side
RED	Motor ON / Valve OPEN condition	WHITE	Normal / healthy	Right Hand Side

3.3.7 Ammeters

Ammeter shall be 96 x 96 mm size, 90 deg. deflection, 1.5% accuracy, 1 Amp. CT operated or with 4-20mA input and Flush mounting type as called for in the data sheet-A (No. PES-145-54A-DS1-0). Ammeters for motors shall have six (6) times folded scale at upper end to enable motor starting current indication

3.3.8 Miniature Circuit Breaker (MCB)

These shall be instantaneous magnetic trip type for short circuit in addition to current time inverse delayed thermal trip feature for over current protection. The housing of MCB shall be made of non-ignitable, high impact material. It shall have minimum short circuit rating of 9 KA for AC Voltages and 4 KA for DC Voltages.

3.3.9 Makes of various instruments / devices shall be as given below

1.	Alarm Annunciators	:	Procon / IIC
2.	Ammeters	:	AEP / IMP
3.	Control / Selector Switches	:	Alsthom / Kaycee / Siemens / L&T
4.	Push Buttons / Indicating Lamps	:	Siemens / L&T / Teknic / Alsthom
5.	Auxiliary Relays	:	Jyoti / Siemens / L&T / OEN
6.	Timers	:	L&T / Alsthom / Bhartiya Cutler Hammer
7.	MCBs	:	S&S Power Engg. / Indo Asian / MDS
8.	Terminal Blocks	:	Jyoti / Elmex

4.0 TESTING AND INSPECTION

4.1 The bidder shall adopt suitable quality assurance program to ensure that the equipments offered will meet the specification requirements in full.

4.2 BHEL's standard Quality Plan for LCP is enclosed with the specification. The bidder shall furnish his acceptance to BHEL's QP and submit the signed and stamped copy of QP along with the offer.



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4.3 The vendor shall conduct the following tests as a minimum requirement:

4.3.1 Routine Tests

1. High Voltage (H.V.)
2. Insulation Resistance (I.R.)
3. Functional

4.3.2 Type Tests

1. Enclosure Class Test



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5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables

The bidder shall supply all commissioning spares and consumables 'as required' during Start-up, as part of the main equipment supply.

5.2. Mandatory Spares

The bidder shall offer alongwith main offer, the Mandatory Spares as specified elsewhere in the specification. The Mandatory Spares offered shall be of the same make and type as the main equipment.

5.3. Recommended Spares

The bidder shall furnish a list of Recommended Spares indicating the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation alongwith unit rate against each item to enable BHEL/BHEL's Customer to place a separate order later, if required.

6.0 DRAWINGS AND DOCUMENTS

6.1 The bidder shall furnish the following documents in required number of copies along with the bid :

1. Data Sheet no. PES-145A-DS1-0
2. General Arrangement Drawing.
3. Catalogue and technical information for instruments and devices.
4. Quality Plan.

6.2 The vendor shall furnish the following documents in required number as agreed after the award of contract:

1. Data Shee No. PES-145A-DS2-0
2. GA Drawing indicating layout of instruments, construction details, foundation details, cable gland plate alongwith cable glands and all details mentioned in this specification.
3. Control Schematic Diagram along with grouping of different terminals for various functions.
4. Catalogue and technical information for instruments and devices with selected options clearly marked.
5. O&M Manuals.
6. "As Built" Drawing.
7. CDs.

7.0 MARKING AND PACKING

7.1 Panel with all instruments / devices mounted on it shall be suitably packed & protected for the entire period of despatch, storage and erection against impact, abrasion, corrosion, incidental damage due to vermin, sunlight, high temperature, rain moisture, humidity, dust, sea-water spray (where applicable) as well as rough handling and delays in Transit and storage in open.

8.0 APPLICABLE DATA SHEET FORMS

This document shall be read with one or more of the following data sheet forms :

- | | | |
|-----------------------------------|---|-------------------------------|
| - Data sheet A&B for Local Panels | : | Data sheet no. PES-145A-DS1-0 |
| - Data sheet C for Local Panels | : | Data sheet no. PES-145A-DS2-0 |



DATA SHEET FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS-999-145-054A

VOLUME

SECTION

REV. NO.

02

DATE: 16.09.2013

SHEET

1 OF

3

TAG No. Qty.....

Data Sheet No.: PES-145A-DS1-0

Data Sheet A & B

DATA SHEET-A FOR LOCAL PANEL
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY
BIDDER)

GENERAL

MANUFACTURER

CONSTRUCTION

☒ FOLDED ☐ WELDED

(As per requirement EDN)

ENCLOSURE SHEET THICKNESS

FRONT

☒ 2.0 mm

OTHER

☒ 2.0 mm

DOOR

☒ 1.6 mm

HEIGHT

☐ 2365 mm for stand alone panels. ☒ Other Height-2200mm

OTHER

☐ Load bearing sheet front shall have 3mm thickness

TECHNICAL

INPUT POWER SUPPLY *

(ANY OTHER POWER REQUIREMENT
TO BE DERIVED FROM THIS SUPPLY ONLY)☐ 240V 50 Hz AC ☐ 220V DC☐ 415V 3 PHASE 3W ☒ 415V 3 PHASE 4W

NO. OF FEEDERS

☒ ONE ☐ TWO

STARTER WITH MCC

(CHECK WITH MAUX/ELEC)

☒ REQUIRED ☐ NOT REQUIRED

IPR POSITION

☐ MCC ☒ RELAY PANEL

CONTACT RATING OF RELAY

☐ 5 Amp, 230 V AC ☐ 0.25 Amp, 220V DC

CONTROL SUPPLY

☐ 110V AC ☐ 220V AC☐ 220V DC ☐ Other.

(As per requirement)

ALARM ANNUNCIATOR WINDOW
(EXCLUDING SPARES)

REQUIRED

TEMP SCANNER

(IF REQUIRED -NO. OF CHANNELS TO BE
SPECIFIED UNDER SEC-C)☐ REQUIRED ☒ NOT REQUIRED

PAINT TYPE

☐ EPOXY ENAMEL☒ EPOXY POWDER COATEDMIMIC (TYPE OF MIMIC- MATERAIL, THICKNESS
TO BE SPECIFIED DURING DETAILED ENGG.)☐ REQUIRED ☐ NOT REQUIRED

PANEL COLOUR (EXTERNAL)

☐ LIGHT GREY (Shade 631 IS-5)☐ OPALINE GREEN (Shade 275) .☒ Front & Rear-RAL 9002, End panel side-RAL 5012.

FINISH (EXTERNAL)

☐ MATT☐ GLOSSY☒ SEMI GLOSSY

PANEL COLOUR (INTERNAL)

☒ WHITE ☐ CREAM☐ OFF WHITE

FINISH (INTERNAL)

☐ MATT ☐ GLOSSY ☒ SEMI GLOSSY

CLASS OF PROTECTION

☐ IP-42 (FOR INDOOR SERVICE)☒ IP-55 (FOR OUTDOOR SERVICE) - for FIXED PMP☒ IP-65 FOR PORTABLE PMPs



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SHEET 2 OF 3

TAG No. Qty.....

Data Sheet No.: **PES-145A-DS1-0**

Data Sheet A & B

DATA SHEET-A FOR LOCAL PANEL
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY
BIDDER)

CONTROL HARDWARE

☒ RELAY BASED

FOUNDATION ARRANGEMENT

☒ FOUNDATION BOLTS ☐ ANCHOR FASTENERS

WEIGHT OF PANEL (Kg.)

.....(Vendor to specify)

PANEL TYPE

☐ PRESSURISED ☒ UNPRESSURISED
As per Requirement

CABLE GLAND

☒ DOUBLE COMPRESSION

AMMETER (TYPE OF INPUT) *

☐ 1 Amp CT ☒ 4-20 mASCOPE OF SUPERVISION FOR
ERECTION & COMMISSIONING☐ APPLICABLE ☒ NA

* TO BE CO-ORDINATED WITH PEM ELECTRICAL

PREPARED BY

CHECKED BY

APPROVED BY

NAME

AANCHAL CHOUDHARY

SACHIN SRIVASTAVA

MA MANSOORI

DESIGNATION

SR.ENGR

DY.MNGR

D. GM

SIGNATURE

DATE

16.09.2013

16.09.2013

16.09.2013

COMPANY SEAL

NAME:

SIGNATURE:

DATE:



DATA SHEET FOR LOCAL PANELS

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TAG No. Qty.....

Data Sheet No.: PES-145A-DS1-0

Data Sheet C

DATA SHEET-C FOR LOCAL PANEL
(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

GENERAL	MANUFACTURER		
	CONSTRUCTION		☐ FOLDED ☐ WELDED (As per requirement EDN)
	ENCLOSURE SHEET THICKNESS	FRONT	
		OTHER	
		DOOR	
		HEIGHT	
OTHER			
TECHNICAL	INPUT POWER SUPPLY		
	NO. OF FEEDERS		
	CONTACT RATING OF RELAY		
	TEMP SCANNER		
	CONTROL SUPPLY		
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)		
	PAINT TYPE		
	PANEL COLOUR (EXTERNAL)		
	FINISH (EXTERNAL)		
	TYPE OF MIMIC MATERIAL OF MIMC THICKNESS OF MIMIC		
	PANEL COLOUR (INTERNAL)		
	FINISH (INTERNAL)		
	CLASS OF PROTECTION		
	CONTROL HARDWARE		
	FOUNDATION ARRANGEMENT		
	WEIGHT OF PANEL (Kg.)		



DATA SHEET FOR LOCAL PANELS

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TAG No. Qty.....

Data Sheet No.: **PES-145A-DS1-0**

Data Sheet C

DATA SHEET-C FOR LOCAL PANEL
(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

	PANEL TYPE			
	CABLE GLAND			
	AMMETER (TYPE OF INPUT)			
	SCOPE OF SUPERVISION			
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL NAME: SIGNATURE: DATE:
	AANCHAL CHOUDHARY	SACHIN SRIVASTYAVA	MA MANSOORI	
	16.09.2013	16.09.2013	16.09.2013	

STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL										STD QUALITY PLAN NO.: PE-QP-999-145-1056				
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										SHEET 1		OF 7		
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks		
									P	W	V			
1.0	INCOMING Sheet Steel (CRCA & HR)	1. Chemical Composition	MA	Chemical analysis	Sample	IS:1079 IS:513	IS:1079 IS:513	Test Certificate	3	---	2			
		2. Bend Test	CR	Mech. test	Sample	IS:1079 IS:513	IS:1079 IS:513	Log Book	2	---	---			
		3. Surface finish	MA	Visual	100%	Factory Standard / Sample	Factory Standard / Sample	Log Book	2	---	---			
		4. Waviness	MA	Visual	100%	Factory Standard	No Waviness	Log Book	2	---	---			
		5. Thickness	MA	Measurement	100%	BHEL Spec.	BHEL Spec.	Log Book	2	---	---			
		6. Mill marking	MA	Visual	100%	Factory Standard	Factory Standard	Log Book	2	---	1			
2.0	Flats / Angles / Channels	1. Dimensions	MA	Measurement	Sample	IS:2062	IS:2062	Log Book	2	---	---			
		2. Surface Defects	MA	Visual	100%	Factory Standard / Sample	Factory Standard / Sample	Log Book	2	---	---			
		3. Straightness	MA	Measurement	100%	Factory Std.	Factory Std.	Log Book	2	---	---			
		4. Mill marking	MA	Visual	100%	IS:2062	IS:2062	Log Book	2	---	1			
3.0	Cables / Wires	1. Visual / Surface defects	MA	Visual	100%	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	2	---	---			
		2. IR and HV	MA	Electrical	100%	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	2	---	---			
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics										\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.				
										1 - BHEL 2 - Vendor 3 - Sub-vendor				

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										SHEET 2		OF 7							
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks							
		3. Conductor a) Resistance b) Size c) Sheet colour	MA MA MA	Electrical Measurement Visual	100% 100% 100%	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	2	---	---	---							
		4. Type / Routine Test Certificates	MA	Verification	100%	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	3	---	2	---							
4.0	Electrical Components like Annunciator Transformers Lamps Switches PBs Contactors Relays Timers Space Heaters Thermostat Indicating meters etc.	1. Verification at make and Type 2. Verification of Test Certificates 3. Operation / Functional check 4. I.R. 5. H.V. 6. Calibration 7. Pick up / Drop off Voltage	CR CR CR MA MA MA MA	Visual Scrutiny of Type / Routine T.Cs. Electrical Electrical Electrical Electrical	Sample 100% Sample+ 100% 100% 100% 100% 100%	BHEL Spec. and BOM Relevant IS Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue	BHEL Spec. and BOM Relevant IS Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue	Log Book Log Book Log Book Log Book Log Book Log Book Log Book Log Book Log Book Log Book Log Book	2 2 2 2 2 2 2 2 2 2 2	--- --- --- --- --- --- --- --- --- 1 ---	--- --- --- --- --- --- --- --- --- --- ---	+ for relay & contactors only @ for all components except relays & contactors.							
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics														\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.				1 - BHEL 2 - Vendor 3 - Sub-vendor	

LEGEND: * CR - Critical characteristics
MA - Major characteristics
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V - Agency Verifying the Test.

1 - BHEL
2 - Vendor
3 - Sub-vendor

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										REV. NO.		01		DATE: 22-02-2008		
										SHEET		3		OF 7		
Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks				
									P	W	V					
5.0	Misc. Components like Gaskets, Terminal Blocks etc.	1. Verification of Type / Make 2. Surface defects 3. IR / HV on Terminal Blocks	MA MA MA	Visual Visual Electrical	Sample Sample Sample	BHEL Spec. & Mfrs. Catalogue BHEL Spec. & Mfrs. Catalogue BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue BHEL Spec. & Mfrs. Catalogue BHEL Spec. & Mfrs. Catalogue	Log Book Log Book Log Book	2 2 2	--- --- ---	--- --- ---					
6.0	IN PROCESS Blanking / Bending / Forming	1. Dimensions 2. Surface defects after bending	MI MA	Measurement Visual	100% 100%	Approved Mfr. drgs. Factory Standard	Approved Mfr. drgs. Factory Standard	Log Book Log Book	2 2	--- ---	--- ---					
7.0	Nibbling / Punching	1. Cutout Sizes 2. Deburring	MI MA	Measurement Visual	100% 100%	Approved Mfr. drgs. Approved Mfr. drgs.	Approved Mfr. drgs. Approved Mfr. drgs.	Log Book Log Book	2 2	--- ---	--- ---					
8.0	ASSEMBLY Frame Assembly & Sheet fixing	1. Dimensions 2. Alignment 3. Welding Quality 4. Surface defects	MA MA MA MA	Measurement Measurement Visual Visual	100% 100% 100% 100%	Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards	Log Book Log Book Log Book Log Book	2 2 2 2	--- --- --- ---	2 2 2 2					
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics										\$			P	1 - BHEL 2 - Vendor 3 - Sub-vendor		
													W	- Agency Performing the Test.		
													V	- Agency Witnessing the Test.		
														- Agency Verifying the Test.		

STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL										STD QUALITY PLAN NO.: PE-QP-999-145-I056				
 PEM :: C&I										VOLUME IIB		SECTION D		
										REV. NO. 01		DATE: 22-02-2008		
										SHEET 4		OF 7		
										Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check
9.0	Pre-treatment and Painting	1. Pretreatment Process 2. Process parameters like bath temp. concentration etc. 3. Dipping / Removal Time 4. Surface quality after every dip 5. Primer after phosphating 6. Putty Application & Rubbing after primer 7. Paint first coat 8. Putty Application and Rubbing after first coat of paint 9. Paint second coat	MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1			
			MA	Measurement	Periodic	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1			
			MA	Measurement	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1			
			MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1			
			MA	Visual, Thickness	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1			
			MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1			
			MA	Visual, Thickness	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1			
			MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1			
			MA	Visual, Thickness, Scratch test Colour adhesion	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1			
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics										\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test. 1 - BHEL 2 - Vendor 3 - Sub-vendor				

LEGEND: * CR - Critical characteristics
 MA - Major characteristics
 MI - Minor characteristics

\$ P - Agency Performing the Test.
 W - Agency Witnessing the Test.
 V - Agency Verifying the Test.

1 - BHEL
 2 - Vendor
 3 - Sub-vendor

STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL										STD QUALITY PLAN NO.: PE-QP-999-145-I056						
 PEM :: C&I										VOLUME IIB		SECTION D				
										REV. NO. 01		DATE: 22-02-2008				
										SHEET 5		OF 7				
										Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents
									P	W	V					
10.	Panel Wiring	1. Wiring Layout 2. Wiring Termination (Crimped Lugs) 3. Ferrule numbers 4. Colour of wiring 5. Size of Conductor	MA MA MA MA MA	Visual Visual Visual Visual Measurement	100% 100% 100% 100% 100%	Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs.	Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs.	Log Book Log Book Log Book Log Book Log Book	2 2 2 2 2	--- --- --- --- ---	--- --- --- 1 1					
11.	Component Mounting	1. Correct components 2. Fixing	MA MA	Visual Visual	100% 100%	Approved drgs., Specs. & BOM Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM Approved drgs., Specs. & BOM	Log Book Log Book	2 2	--- ---	--- ---					
12.	FINAL Final Inspection	1. Workmanship 2. Component layout (neatness, accessibility & safety) Mounting / Proper fixing of all components 3. Components identification Marking / Name plates	MA MA MA	Visual Visual Visual	100% 100% 100%	Factory Standard BHEL approved drg. / Spec. BHEL approved drg. / Spec.	Factory Standard BHEL approved drg. / Spec. BHEL approved drg. / Spec.	Inspection Report Inspection Report Inspection Report	2 2 2	1 1 1	1 1 1	At Random by BHEL, based on 100 % internal test reports by Mfr.				
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics										\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.				1 - BHEL 2 - Vendor 3 - Sub-vendor		

LEGEND: * CR - Critical characteristics
 MA - Major characteristics
 MI - Minor characteristics

\$ P - Agency Performing the Test.
 W - Agency Witnessing the Test.
 V - Agency Verifying the Test.

1 - BHEL
 2 - Vendor
 3 - Sub-vendor

STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL										STD QUALITY PLAN NO.: PE-QP-999-145-I056				
 PEM :: C&I										VOLUME IIB				
										SECTION D				
										REV. NO. 01		DATE: 22-02-2008		
										SHEET 7		OF 7		
Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks		
									P	W	V			
13.	TYPE TEST	Degree of Protection	CR	Mech. Protection	Sample	BHEL approved spec., drg relevant IS-13947 Part-1, IS-2148.	BHEL approved spec., drg relevant IS-13947 Part-1, IS-2148.	Type Test Certificate	3	---	1			
14	ROUTINE TEST	IR before & after HV Test	CR	Electrical	100%	BHEL approved spec., drg., BOM & relevant IS.	BHEL approved spec., drg., BOM & relevant IS.	Test Report	2	1	1			
15	FUNCTIONAL TEST	1. Control Logic Operation	CR	Electrical	100%	BHEL approved spec. / drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1			
		2. Instrument Calibration	CR	Electrical	10%	BHEL approved spec. / drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1			
		3. Temperature rise	CR	Electrical	100%	BHEL approved spec/drg. & relevant IS.	BHEL approved spec/drg & relevant IS.	Inspection Report	2	1	1			

LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics										\$	P	- Agency Performing the Test.	1	- BHEL
											W	- Agency Witnessing the Test.	2	- Vendor
											V	- Agency Verifying the Test.	3	- Sub-vendor



TITLE:

**TECHNICAL SPECIFICATION
SUMP PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-172-N001**

SECTION: **III**

SUB-SECTION:

REV. NO. **00** DATE 08.03.19

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

SECTION III

DOCUMENTS TO BE SUBMITTED BY BIDDER



TITLE:

**TECHNICAL SPECIFICATION
SUMP PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-172-N001**

SECTION: **III**

SUB-SECTION:

REV. NO. **00** DATE 08.03.19

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

SECTION IIIA

COMPLIANCE CERTIFICATE

(TO BE SUBMITTED ALONG WITH BID)

	TITLE : TECHNICAL SPECIFICATION SUMP PUMPS 3X800MW NTPC PATRATU EXPANSION PHASE-I		SPECIFICATION No. : PE-TS-434-172-N001, Rev-00	
COMPLIANCE CERTIFICATE			SECTION: IIIA	
			Date: 08.03.19	
			Sheet 1 of 1	

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.
- c) QP will be subject to BHEL/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.
- d) All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/ Customer approval.
- 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) There are no other deviation with respect to specification other than those furnished in the 'Schedule of Deviations'.
- g) 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.
- h) Prices for recommended spares (if any) for 3 years operation shall be furnished separately & not included in the base price.
- i) 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).
- j) All sub vendors shall be as per BHEL/ Customer approved list.
- 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/ Customer (viz. The submersible pumps shall be of proven design. The pump manufacturer should have manufactured and supplied at least One (1) no. of submersible pump set for continuous duty for similar application, of type and capacity as offered or higher and which has been in successful operation for at least one (1) year prior to the date of Techno-Commercial bid opening. The pump set shall be suitable for pumping raw water with high turbidity and soft solids/fibrous solids which are generally observed in contaminated rivers / canal water. Components of Identical pumps shall be interchangeable. Any deviation to these criteria shall be suitably highlighted in deviation schedule).
- m) All selected motor ratings have minimum margins as per Data sheet-A, section-1D of technical specification.
- n) Power & Control circuits shall be with MCCB.

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	
------	-------------	-----------	------	--



TITLE:

**TECHNICAL SPECIFICATION
SUMP PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-172-N001**

SECTION: **III**

SUB-SECTION:

REV. NO. **00** DATE 08.03.19

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

SECTION IIIB

GA DRAWING OF SUMP PUMPS

(TO BE SUBMITTED ALONG WITH BID--FOR REF. ONLY)



TITLE:

**TECHNICAL SPECIFICATION
SUMP PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-172-N001**

SECTION: **III**

SUB-SECTION:

REV. NO. **00** DATE 08.03.19

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

SECTION IIIC

**DEVIATION SCHEDULE
(AS PER NIT FORMAT)**

(TO BE SUBMITTED ALONG WITH BID)



TITLE:
**TECHNICAL SPECIFICATION
SUMP PUMPS**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-434-172-N001**
SECTION: **III**
SUB-SECTION:
REV. NO. **00** DATE 08.03.19
SHEET **1** OF **1**

SECTION IIID

ELECTRICAL LOAD DATA FORMAT

CABLE SCHEDULE

MOTOR DATA SHEET-C

AND BLALANCE DOCUMENT AS PER CL. 13.0 OF SECTION-IA

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

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONT ROL CODE	REMA RKS	LOAD No.	VERIFICATI ON FROM MOTOR DATASHEE T (Y/N)	KKS NO
	NAME PLATE	MAX. CONT. DEMAND (MCR)		SIZE CODE	Nos															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
ANNEXURE-II																				
NOTES:																				
1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER																				
2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V																				
: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)																				
	LOAD DATA (ELECTRICAL)	JOB NO.	434					ORIGINATING AGENCY				PEM (ELECTRICAL)								
		PROJECT TITLE	3X800MW PATRATU STPP					NAME				DATA FILLED UP ON								
		SYSTEM	SUMP PUMPS					SIGN.				DATA ENTERED ON								
		DEPTT. / SECTION	MSE					SHEET 1 OF 1		REV. 00		DE'S SIGN. & DATE								

ANNEXURE III

[illegible]

CLAUSE NO.	Bidder's Name				
	PART-II TECHNICAL INFORMATION AND DATA TO BE SUBMITTED AFTER AWARD OF CONTRACT				
	DE-1A	HT 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			
	17.	Frame size			
	18.	Type of duty			
	19.	Type of enclosure /Method of cooling/ Degree of			
	20.	Applicable standards to which motor generally			
	21.	(a)Whether motor is flame proof	Yes/No		
		(b)If yes, the gas group to which it conforms as per IS:2148			
	22.	Type of mounting			
	23.	Direction of rotation as viewed from DE END			
	24.	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)			
	25.	Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)			
	26.	Maximum continuous load demand at design duty point of driven equipment in KW			
	27.	Rated Voltage (volts)			
	28.	Permissible variation of :			
	d.	Voltage (Volts)			
	e.	Frequency (Hz)			
	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 6 OF 17

CLAUSE NO.	Bidder's Name				
	f.	Combined voltage and frequency			
	29.	Rated speed at rated voltage and frequency			
	30.	At rated Voltage and frequency:			
	c.	Full load current			
	d.	No load current			
	31.	Power Factor at			
	d.	100% load			
	e.	NO load			
	f.	Starting.			
	32.	Efficiency at rated voltage and frequency			
	d.	100% load			
	e.	75% load			
	f.	50% load			
	33.	Starting current (amps) at			
	a.	100 % voltage			
	b.	85% voltage			
	c.	80% voltage			
	34.	Minimum permissible starting Voltage (Volts)			
	35.	Starting time with minimum permissible voltage			
	a.	Without driven equipment coupled			
	b.	With driven equipment coupled			
	36.	Safe stall time with 100% and 110% of rated voltage			
	a.	From hot condition			
	b.	From cold condition			
	37.	Torques :			
	a.	Starting torque at min. permissible voltage(kg-mtr.)			
	b.	Pull up torque at rated voltage.			
	c.	Pull out torque			
	d.	Min accelerating torque (kg.m) available			
	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
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CLAUSE NO.	Bidder's Name			
	e.	Rated torque (kg.m)		
	38.	Stator winding resistance per phase (ohms at 20 Deg.C.)		
	39.	GD ² value of motors		
	40.	No of permissible successive starts when motor is in		
	41.	Locked Rotor KVA Input		
	42.	Locked Rotor KVA/KW		
	43.	Vibration limit		
	a.	Velocity (mm/s)		
	b.	Displacement (microns)		
	44.	Noise level limit (dBA)		
	C.	CONSTRUCTIONAL FEATURES		
	1.	Stator winding insulation		
		a. Class & Type		
		b. Winding Insulation Process shall be VPI	Yes/No	
		c. Tropicalised (Yes/No)		
		d. Temperature rise over specified max.		
		i. Cold water temperature of 38 DEG. C.		
		ii. Ambient Air 50 DEG. C.		
		e. Method of temperature measurement		
		f. Stator winding connection		
		g. Number of terminals brought out		
	2.	Type of terminal box for following:		
		a. Stator leads		
		b. Space heater		
		c. Temperature detectors(RTDs,BTDs)		
		d. Instrument switch etc.		
	3.	Bearing		
		a. Type DE/NDE		
		b. Manufacturer		
	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
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CLAUSE NO.	Bidder's Name		
		c. Self Lubricated or forced Lubricated	
		d. Recommended lubricant	
		e. Oil quantity	
		f. Max cold oil temp. to bearing	
		g. Guaranteed life in Hrs	
		h. Lubrication type	
	4.	Oil pressure gauge/ switch	
		a. Range	
		b. Contact Nos. & ratings	
		c. Accuracy	
	5.	Type of cooler (CACA/CACW)/ Number	
	6.	Cooling water requirements	
		a. Quantity required	
		b. Maximum permissible inlet water temp. in deg.C	
		c. Pressure of water at inlet to coolers	
		d. Outlet temperature of water at full load	
		e. Cold air temp. at outlet	
	7.	Paint shade	
	8.	Max. permissible temperature of rotor (deg.C)	
	9.	Temp. Rise of rotor during 1 st start (deg.C)	
	10.	Temp. rise of rotor during 2 nd start (deg.C)	
	11.	Surge withstand voltage (stator winding) as per IEC-	
		a. Lightning impulse withstand level (1.2/50 micro sec surge)(KVp)	
		b. Interturn insulation surge withstand level (KVp)	
	12.	Weight of	
		a. Motor stator (KG)	
	b. Motor Rotor (KG)		
	c. Total weight (KG)		
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 9 OF 17

CLAUSE NO.	Bidder's Name				
	D.	List of accessories.			
	1.	RTDs for winding(Type/Nos/Leads/Location/make/Res.at 0 Deg.C)			
	2.	RTDs for bearing(Type/Nos/Leads location/make/Res.at 0 Deg.C)			
	3.	RTDs for Hot Air (Type/No/Leads)			
	4.	RTDs for Cold Air (Type/No./Leads)			
	5.	Space Heaters			
		i) Nos.			
		ii) Total Power (Watts)			
		iii) Supply Voltage			
	6.	Stator Terminal Box			
		i) Type			
		ii) Fault Level (MVA)/Fault Level duration (secs)			
		iii) Location(viewed from NDE side)			
		iv) Entry of cables (bottom/side)			
		v) Recommended cable size(To be matched with cable size envisaged by owner)			
	7.	Cable glands & lugs details (shall be suitable for power cable)			
	8.	Neutral Terminal box Type			
	9.	Current Transformer			
		i) Nos.			
		ii) Ratio			
		iii) Accuracy Class			
		iv) Knee Point Voltage-Vk (Volts)			
		v)Exciting Current			
		vi) Max Secondary Resistance			
	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
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CLAUSE NO.	Bidder's Name			
	10.	Dial Type Thermometer		
		i) For Bearings (Nos.)		
		ii) For Air Temp (Nos.)		
		a. Hot Air		
		b. Cold Air		
		iii) Contact Rating		
		iv) Range		
		v) Supply Voltage		
	11.	Rotor Terminal Box		
	12.	TBs for RTDs. BTDs & Space Heater (Yes/No)		
	13.	Sole Plate (Yes/No)		
	14.	Foundation & Anchoring bolts (Yes/No)		
	15.	Base Frame (Yes/No)		
	16.	Speed switch (Yes/No)		
		i) No of contacts and contact ratings of speed		
	17.	Insulation of bearing (Yes/No)		
	18.	Forced oil lubrication (Yes/No)		
	19.	Oil level indicator (Yes/No)		
	20.	Noise reducer(Yes/No)		
	21.	Flow switch for CACW motor (Quantity)		
		i) No of contacts and contact ratings		
	22.	Water leakage detector		
		i) No of contacts and contact ratings		
	23.	Grounding pads		
		i) No and size on motor body		
		ii) Nos on terminal Box		
	24.	Vibration pads		
		i) Nos and size		
		ii) Location		
	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
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CLAUSE NO.	Bidder's Name				
	25.	Any other fitments			
	E.	List of curves.			
	1.	Torque speed characteristic of the motor			
	2.	Calibration characteristic of platinum type resistance temperature detector			
	3.	Calibration characteristic of platinum BTD			
	4.	Thermal withstand characteristic			
	5.	Starting. current Vs. Time			
	6.	Starting. current Vs speed			
	7.	Neg. sequence current vs Time..			
	8.	P.F. and Effi. Vs Load			
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 12 OF 17

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
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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		
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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.		
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CLAUSE NO.	Bidder's Name			
	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)		
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CLAUSE NO.	Bidder's Name			
		iii) No load Armature current (Amp)		
	6.	Full load Field current (Amp)		
	7.	No load Armature current (Amp)		
	8.	Minimum permissible field current (Amp) to avoid		
		i) Maximum permissible voltage		
		ii) Rated voltage		
		iii) Minimum Permissible Voltage		
	9.	Resistance (indicative Values) in ohm		
		i) Armature winding (Arm + IP + Series) at 25		
		ii) Field Winding at 25 deg. C		
	10..	Inductance (indicative values)		
		i) Armature winding		
		ii) Field winding		
	11	Value of trimmer resistance (ohm) to be connected in series with the shunt field to		
		i) 220 V DC		
		ii) 250 V DC		
		iii) 187 V DC		
	12	Value of the external resistance (ohm) required to be connected in series with armature during starting only		
	13	Technical data sheet for external resistance box		
	14	GA drawing of motor		
	15	Starting time calculation		
	16	Starter resistance design calculation		
	17	Electrical connection diagram of motor		
	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	
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