

2 X 500 MW NEW NEYVELI TPP (NLC LTD)

VOLUME -IIB

TECHNICAL SPECIFICATION  
FOR  
SUMP PUMPS

Specification No.: PE-TS-402-172-N001 (REV. 0)



BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR  
PROJECT ENGINEERING MANAGEMENT  
NOIDA- 201 301



<b>TITLE :</b>	<b>SPECIFICATION NO.</b> PE-TS-402-172-N001
<b>TECHNICAL SPECIFICATION</b>	<b>VOLUME :</b> II B
<b>FOR</b>	<b>SECTION :</b> C
<b>SUMP PUMPS</b>	<b>REV. NO.</b> 0 <b>DATE :</b> 02.01.2015
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1.0 The tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.

1.1 Volume -I CONDITIONS OF CONTRACT

This consists of four parts as below:

Volume - I A : This part contains instructions to bidders for making bids to BHEL.

Volume - I B : This part contains general commercial conditions of the tender and include provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

Volume - I C : This part contains special conditions of contract.

Volume - I D : This part contains commercial conditions for erection and commissioning site work, as applicable.

1.2 Volume - TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume II which comprises of:

Volume - II A : General Technical Conditions

Volume - II B : Technical specification including drawings, if any

1.2.1 Volume - II B :

This volume is sub-divided into following sections:

Section - A : This section outlines the scope of enquiry.

Section - B : This section provides "Project Information"

Section - C : This section indicates technical requirements specific to the contract, not covered in Section-D.

Section - D : This section comprises of technical specifications of equipments complete with data sheet A, B & C.  
Data sheet-A specifies data and other requirements pertaining to the equipment.  
Data sheet - B specifies data to be filled by the bidder (Data Sheet B is contained in Volume - III)

1.2.2 Volume - III TECHNICAL SCHEDULES

This volume contains technical schedules and Data Sheets - B, which are to be duly filled by the bidder and the same shall be furnished with the technical bid.



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- 2.0 The requirements mentioned in Section C/Data Sheets-A of Section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section -D.



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## SECTION - A

### SCOPE OF ENQUIRY



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#### 1.00.00 SCOPE

This enquiry covers the design, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-contractors works, proper packing, delivery of the item namely Sump Pumps complete with all accessories as per the requirements specified in this specification for 2X500 MW NEW NEYVELI TPP (NLC LTD) project as per Annexure-I.

#### 2.00.00 GENERAL TECHNICAL INSTRUCTIONS

2.01.00 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship, and shall be capable of performing the required duties in a manner acceptable to Engineer/Owner, who will interpret the meaning of drawing and specifications and shall be entitled to reject any component or material, which in his judgement is not in full accordance herewith.

2.02.00 The omission of specific reference to any component/accessory necessary for the proper performance of Sump Pumps and drives shall not relieve the bidder of the responsibility of providing such facilities to complete the supply of Sump Pumps and drives at quoted prices.

2.03.00 BHEL's/Customer's representative shall be given access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.

2.04.00 The equipments covered under this specification shall not be despatched unless the same have been finally inspected, accepted and shipping release issued by BHEL/customer.

2.05.00 In case of any deviation from this technical specification (Vol.IIB) and General Technical Conditions (Vol.IIA), the same shall be indicated in the schedule of deviations enclosed in Vol.III. In the absence of duly filled schedules it will be assumed that the bid strictly conforms to the specification.

2.06.00 Unpriced copy of the price bid shall be furnished alongwith the technical bid.



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ANNEXURE-I

1. 2 X 500 MW NEW NEYVELI TPP (NLC LTD)

Sl. No.	Description	Type of Pumps	Total Qty.
1.	Fixed Duty type Submersible pumps for CW Pits	Submersible type	4 Nos.for station
2.	Fixed Duty type Submersible pumps for A- Row & B-Row pits	Submersible type	8 Nos.for station
3.	Portable type submersible pumps for various sumps	Submersible type	2 Nos. for station



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### Annexure-II

**CONTROL PANEL MAKE (NTPC APPROVED PANEL LIST):** INDUSTRIAL CONTROL APPLIANCE, POSITRONICS, PYROTECH, CONTROL & SWITCH GEAR, ELEMECH, PROCON INDUSTRIES.

**NOTE:** IF BIDDER OFFERS PANEL MAKE OTHER THAN BTPC LIST ABOVE, THEN THAT SHALL BE SUBJECT TO NTPC APPROVAL.

**POWER CABLE:** HVPL, TORRENT, INCAB, POLYCAB WIRES, ICL, UCL, CORDS CABLES, FINOLEX CABLES, NICCO, DELTON CABLES, KEI, ELKAY TELELINKS, RADIANT, PARAMOUNT, RAVIN CABLES.

**CONTROL CABLES:** ICL, PARAMOUNT CABLES, RADIANT CABLES, POLYCAB WIRES, UCL, NICCO, FGI, TORRENT, CORDS CABLES, ELKAY TELELINKS, DELTON CABLES, HVPL.



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**SECTION – B**  
**PROJECT INFORMATION**



## SECTION - 2

### 2 GENERAL PROJECT INFORMATION

#### 2.1 Introduction

The project site at Neyveli has distinct location advantages, being at pit-head distance from the source of lignite supply from Mines, making it convenient for transportation of lignite by belt conveyor. Water source is readily available from the nearby mines lake. Besides, other infrastructure such as access road, railway connection etc, already exist.

#### 2.2 Power Plant Site

The power plant site is located at Neyveli, opposite to the now defunct Fertilizer and Briquetting & Carbonization Plant, near TPS-1 Expansion and TPS-II.

#### 2.3 Project & Site Information

- |         |                                 |   |  |
|---------|---------------------------------|---|--|
| (i).    | Owner/Purchaser                 | : | Neyveli Lignite Corporation Limited (NLC Ltd), Neyveli, Cuddalore District, Tamil Nadu State, India  |
| (ii).   | Consultant                      | : | Lahmeyer International (India) Pvt. Ltd (LII), Gurgaon, NCR, India.  |
| (iii).  | Project Title                   | : | 2x500 MW Neyveli New Thermal Power Station (NNTPS)   |
| (iv).   | Location                        | : | 200 kms south of Chennai and 50 kms south-west of Cuddalore  |
| (v).    | Latitude                        | : | 11° 34' 00" N to 11° 35' 00" N   |
| (vi).   | Longitude                       | : | 79° 26' 00" E to 79° 27' 00" E   |
| (vii).  | Elevation above MSL             | : | + 67 m   |
| (viii). | Nearest Railway Station         | : | Neyveli,   |
| (ix).   | Nearest Sea Port                | : | Chennai, at a distance of 200 km   |
| (x).    | Nearest Airport                 | : | Chennai, at a distance of 200 km   |
| (xi).   | Road Access/Approach to Site    | : | Connected by Chennai-Thanjavur NH 45C road and state highway connecting Cuddalore – Virudhachalam via Neyveli. Both NH and state high way roads are well connected to NLC township roads. The approach road is approximately 15 kms from Chennai–Thanjavur NH – 45C road |
| (xii).  | <b>Site Meteorological Data</b> |   |  |
|         | • Max ambient temperature       | : | 42.8° C  |

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- Min Ambient Temperature : 26.9° C
  - Wet bulb temp : 29° C
  - Max. Relative Humidity : 92 % in the month of September
  - Min. Relative Humidity : 23 % in the month of May
  - Rainfall : About 1265.7 mm annually (average)
  - Wind direction : South West to North East direction
  - Wind Speed : 97.2 km/hr (maximum recorded)  
4.3 km/hr (average wind speed)
  - Seismicity : As per IS: 1893 (part 4) (Zone-II)  
Importance factor: 1.75.
- (xiii). Languages spoken in the region : English, Tamil

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### SECTION - C

#### SPECIFIC TECHNICAL REQUIREMENTS

SECTION C1: SPECIFIC REQUIREMENTS FOR SUMP PUMPS

SECTION C2: SPECIFIC REQUIREMENTS FOR ELECTRICAL EQUIPMENTS

SECTION C3: SPECIFIC REQUIREMENTS FOR C&I EQUIPMENTS



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## SECTION - C1

### SPECIFIC TECHNICAL REQUIREMENTS FOR SUMP PUMPS



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## 1.0 INTENT OF SPECIFICATION:

This specification is intended to cover the design, manufacture, inspection/ testing at manufacturer's works, properly packed for transportation/ delivery to site of following sump pumps and drives complete with accessories as specified and as required for

2X500 MW NEW NEYVELI TPP (NLC LTD)

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

The bidder shall include complete supplies for the project in his scope, part supplies offered for project shall disqualify the offer.

## 2.0 SCOPE OF SUPPLY:

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

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

### 2.2.1 Standard accessories to be supplied with each pump.

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

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

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

#### a). For Fixed Submersible pumps

For each of these pumps a supply feeder upto starter cum control panel shall be made available by BHEL. The following to be included in pump bidder scope.

- One No. wall mounted local control panel for each set of two(2) Nos. of pumps per unit. The common LCP shall also house starter panel of 2 Nos. submersible sump pumps. For details of panels and control interlocks- refer Clause No. 7.1 in succeeding paras of this Section.

Control system for project shall be relay based.

- Submersible type power & control cable for each pump of lengths as per data sheet A with suitable connection arrangement to wall mounted starter cum control panel. Separate Cables shall be provided by Bidder for power and control purpose and these cables shall not be bunched together. Minimum size of power



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cables shall not be less than 2.5 mm square. Cable shall be flexible copper conductor PVC insulated, armored and overall hard grade PVC sheathed. In case where power and control cables are combined, the paired screened cable shall be provided.

- 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.
- Accessories as per data sheet.
- Level switches as per control interlock requirement as detailed in Clause No. 7.1 herein. Each level switch shall be provided with accessories like Probe , Perforated enclosing MS pipe for probe a/w mounting flange , matching flange with fixing nuts and bolts
- Pressure gauge at discharge of each pump with 3-way isolating root valve as per datasheet.
- Lifting chains.

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 to be included in pump bidder scope.

- Wheel trolley for carrying pump and drive unit along with starter cum 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.
- One starter cum control panel for each pump complete with necessary auto selector switches, start/stop buttons, switch/contacter fuse, red & green indication lamp, over load relays, L/L reset push buttons, A/O/M switch, control transformer. The starter cum control panel shall be mounted on the wheel trolley. The starter cum control panel shall be suitable for outdoor duty and to be provided with protection canopy.  
  
Control system shall be relay based.
- Power cable connected to starter panel at one end and with plug compatible to



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63 amp. Socket at the other end (Details shall be furnished during contract stage.) for connecting purchaser's power supply to starter panel. Lengths are indicated in data sheet.

Also power cable of suitable length between drive unit and starter 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. 2.2.13 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.

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 equipments for each project shall be in bidder's scope.

**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

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4.0 The pumps will be subjected to mechanical running at works and site by the purchaser. 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 alongwith the bid.

6.0 **OTHER REQUIREMENTS:**

6.1 In case of contradictions between Section-C, Section-D and Data Sheet-A, the prevailing document shall be in this order:

- a) Data Sheet -A
- b) Section - C
- c) Section - D

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 Controls for **Fixed Submersible pumps:**

Submersible Sump Pumps shall be controlled through a wall mounted starter cum control panel (in bidder's scope) for each set of Two (2) pumps.

The local control panel shall be Relay based. The starter cum control panel shall be suitable for outdoor duty and to be provided with protection canopy

The following controls/interlocks shall be provided in the local control panel.

Normally one pump will be running and the other an auto standby, however, in the event of very high level both pumps shall run.

- (a) Start/stop facility.
- (b) If any of the working sump pumps trips due to electric fault etc. the standby sump pump will come into operation automatically.
- (c) Selector switch for main/standby selection.
- (d) One number level switch (high level) provided in the sump shall start one number sump pump in the event of high water level in the sump.
- (e) One number level switch (high level) provided in the sump shall start second sump pump in the event of very high water level in the sump.
- (f) One number level switch (low level) provided in the sump shall trip the running pumps in the event of very low water level in the sump.
- (g) Sump pumps status indication (ON/Off/Trip).



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- (h) Indication for failure of any sump pump.
- (i) Indication for Low voltage, low level, high level and overload.
- (j) Ammeter shall be provided in LCP if motor rating is 30 KW or above.
- (k) Power and Control circuits shall be with MCCB.
- (l) Alarm shall be annunciated in the event of low water level in the sump.

**Important note:** In order to make equal running of pumps, provision for duty standby selection of pumps shall be provided by bidder.

#### 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.

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

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 (Refer annexure-II for BOIs).

11.0 It is mandatory for the bidder to submit alongwith 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 any thing 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-motorunit along with accessories for rated, performance duties, including the acoustical/ vibrational aspects for the stipulated limits specified elsewhere in the specification.

13.0 **DRAWINGS/ DOCUMENTS DISTRIBUTION SCHEDULE :**  
After award of LOI, the successful bidder shall submit drawings/documents as per NIT.

14.0 The various Sections-C's & D's along with Data Sheets attached in this specification



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together with the specification for Sump Pumps shall be complied with by the bidders.

15.0 Bidder to submit all drawing/ documents in soft as well as hard copy as per NIT.

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

- a) Compliance certificate duly signed and stamped (enclosed at Vol. III of specn.).
- b) GA drawings of pumps and motors with following: (shall be only for reference purpose, same shall not be reviewed/commented by purchaser at this stage and shall be subject to approval only during contract).
- c) Technical deviation schedule (if reqd.) (Enclosed at Vol. III of specn.).

**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.**



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## SECTION – C2

### SPECIFIC REQUIREMENTS FOR ELECTRICAL EQUIPMENTS



TECHNICAL SPECIFICATION FOR  
SUMP PUMPS  
(ELECTRICAL PORTION)

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SPECIFIC TECHNICAL REQUIREMENTS: ELECTRICAL

**1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER/ PURCHASER**

- 1.1 Scope for supply, and erection & commissioning of various equipment forming part of electrical system for this package shall be as per Annexure-I to Section – C [Scope of Work (Electrical)].
- 1.2 Make of various equipment/ items in the scope of bidder shall be to approval of owner during detailed engineering stage without any commercial implications.
- 1.3 Bidder shall furnish all AC as well as DC loads required for the system at different voltage levels (eg. 415V AC, 240 V AC, 220 V DC etc.) of all types, such as motor feeders, supply feeders in PEM format along with the offer.
- 1.4 All electrical equipment shall be suitable for the power supplies, fault levels and climatic conditions indicated in project information enclosed with the specification.
- 1.5 All drawings, data sheets, Quality Plan, calculations, test reports, test certificates, etc. shall be submitted during detailed engineering stage as per formats enclosed. The same shall be subject to approval without any commercial implications.
- 1.6 Technical requirements shall be as per specifications listed in Clause 4.1, 4.2 & 4.3 below.

**3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID**

- 3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated. In line with this, the bidder as technical offer shall furnish two signed and stamped copies of the following:
  - a) A copy of this sheet "Electrical Equipment Specification for Sump Pumps and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
  - b) List of Erection and Commissioning spares.
  - c) List of Erection & Maintenance tools & tackles.
  - d) Electrical load requirement in the load data format.
- 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**

- 4.1 Electrical scope between BHEL & vendor (Annexure-I).
- 4.2 Technical specification no. PE-SS-999-506-E101, Data Sheets (A & C) for 415V Electric Motors.
- 4.3 Quality Plan for motors.
- 4.4 Load data format (Annexure-II).

**ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR****PROJECT: 2 x 500 MW NEW NEYVELI (NLC LTD)****PACKAGE: SUMP PUMP**

<b><u>S.NO</u></b>	<b><u>DETAILS</u></b>	<b><u>SCOPE SUPPLY</u></b>	<b><u>SCOPE E&amp;C</u></b>	<b><u>REMARKS</u></b>
1	LT MCC	BHEL <sup>s</sup>	BHEL <sup>s</sup>	For portable type sump pumps, BHEL shall provide 415V supplyfeeder. Starter shall be provided in starter cum control panel located on skid supplied by the bidder. For fixed type sump pumps,415V supply feeder shall be supplied by BHEL. Starter to be provided in Local control panel by vendor. Bidder to furnish the load list.
2	a) Local push button station (for motors)	BHEL <sup>s</sup>	BHEL <sup>s</sup>	Located near the motor
	b) Local Starter cum control panel (for fixed type sump pump)	Vendor	BHEL <sup>s</sup>	
3	Power cables, ordinary control cables and screened control cables between equipments supplied by vendor.	Vendor	BHEL <sup>s</sup>	
4.	Power cables, ordinary control cables and screened control cables between equipments supplied by vendor &BHEL <sup>s</sup> .	BHEL <sup>s</sup>	BHEL <sup>s</sup>	
5	Any special type of cable like compensating. Co-axial, prefab, MICC and fibre optical	Vendor	Vendor	
6	Cabling material (cable trays, accessories and cable tray-supporting system, conduits, M Boxes/J Boxes) for cabling between equipments supplied by vendor and BHEL.	BHEL <sup>s</sup>	BHEL <sup>s</sup>	
7	Conduits and conduit accessories for cabling between equipments by vendor	Vendor	BHEL	Cabling shall be through conduits. However, vendor can use the trunk routes available for laying of cables.
8	Equipment earthing.	BHEL	BHEL	
9	Motors with Base frame and fixing hardware for motors.	Vendor	BHEL	Makes shall be subject to customer/BHEL approval at contract stage.
10	a) Input cable schedules b) Cable interconnection details. c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for control cables for vendor-supplied equipment (soft copies in the BHEL cable schedule format) shall be furnished during detail engineering by vendor.
11	Equipment layout drawings.	Vendor	-	Layout details between vendor supplied equipment and installation drawings by vendor
12	Cable glands and lugs for equipment supplied by vendor	Vendor	BHEL	1. Double compression Ni-Cr plated brass /tinned brass glands. 2. Solder less crimping type heavy-duty tinned copper/heavy duty aluminium lugs for power cables. 3. Heavy duty tinned copper lugs for control cables.
13	Any other item for completeness of system.	Vendor	BHEL	Supply of any other item for completeness of electrical work ( although not mentioned specifically but required for trouble free operation of system) shall be deemed to be included in the scope of vendor without any extra charge.

Note-

1. All QPs shall be subject to approval of BHEL/ Customer after award of contract.
2. Make of all electrical equipments/ items supplied shall be of reputed make & shall be subject to approval of BHEL/ Customer after award of contract.
3. \$: Shall be in customer scope where equipment are supplied by customer.

**SPECIFIC ELECTRICAL REQUIREMENT FOR SUMP PUMPS**

SL.NO.	PARAMETERS	UNIT	NLC
	<b>MOTOR</b>		
1	DESIGN AMBIENT TEMP	DEG. C	50
2	VOLTAGE SUPPLY AND VARIATION	VOLT	415V, $\pm$ 10%
3	FREQUENCY WITH VARIATION	Hz	50 (+) 5% to (-) 3%
4	COMBINED VOLTAGE & FREQUENCY VARIATION		10%
5	MAX ACCEPTABLE RATING OF MOTOR AT 415 V	KW	160 KW & below
6	SYSTEM FAULT LEVEL AND ITS DURATION	KA	50kA, 1sec
7	SUTABILITY OF TERMINAL BOX FOR FAULT LEVEL AND DURATION		50 KA, 0.25 sec
8	CLASS OF INSULATION & TEMP RISE LIMITED TO		Class-F or better and temp rise limited to Class-B
9	MIN. STARTING VOLTAGE		85%
10	MOTOR RATING FOR SINGLE PHASE SUPPLY		0.22 kW & Below
11	MAXIMUM LOCKED ROTOR CURRENT	% OF FLC	As per IS 325/IS 9283
12	ACCEPTABLE NOISE LEVEL	DB	Noise level for all motors shall be limited to 85dB(A) at 1.5 m (in line with IS 12065)
13	TYPE OF STARTER PROVIDED IN MCC		DOL
14	DOP OF ENCLOSURE		IP-68
15	SPACE HEATER REQUIREMENT	<30kW	30KW & ABOVE
16	PAINT SHADE		DURING DETAIL ENGINEERING.



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## SECTION – C3

### SPECIFIC REQUIREMENTS FOR C&I EQUIPMENTS

### C&I SPECIFICATION FOR SUMP PUMP

	SPECIFIC TECHNICAL REQUIREMENTS (C&I) SUMP PUMP	
<p>CONTROL AND INSTRUMENTATION SPECIFICATION FOR SUMP PUMP</p>		



## 9. FIELD INSTRUMENTS & FINAL CONTROL ELEMENTS

### 9.1 General Requirements

1. Measuring instruments/equipment and subsystems offered by the Contractor shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Further, all instruments shall be of proven reliability, accuracy, repeatability requiring a minimum of maintenance. They shall comply with the acceptable international standards and shall be subject to owner's approval. All instrumentation equipment and accessories under this specification shall be furnished as per technical specifications, ranges, make/ numbers as approved by the owner during detailed engineering.
2. Every panel mounted instrument requiring power supply shall be provided with a pair of easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.
3. All local gauges as well as transmitters, sensors, and switches for parameters like pressure, temperature, level, flow etc. as required for the safe and efficient operation and maintenance as well as for operator and management information (including all computation) of equipment under the scope of specification shall be provided.
4. The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. The contacts of equipment mounted instruments, sensors, switches etc. for external connection including spare contacts shall be wired out in flexible/rigid conduits, independently to suitably located common junction boxes. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapings where the pressure exceeds 40 kg/sq cm.
5. For protection purposes, transmitters can be considered in place of switches.



## 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.



## 12. SYSTEM CABINETS, PANELS & JUNCTION BOX

### 12.1 General Requirements

1. All control panels, system cabinets, local panels and local instrument enclosures, racks shall be furnished fully wired with necessary provision for convenience outlets, internal lighting, grounding, ventilation, space heating, anti-vibration pads and accessories as per IS:5039-1969 as required for completeness of the system.
2. All panels & cabinets shall be free standing type and have bottom entry for cables unless otherwise specified. The bottom of panels, cabinets, enclosures shall be sealed with bottom plate, compression cable glands and fire proof sealing material to prevent ingress of dust and propagation of fire. The Cabinets shall be designed for front & back access to components, terminals and wiring
3. The cabinets shall be provided with bottom glanding plate which shall be removable from inside and shall be provided with sufficient no. of knockouts. The details of knockouts shall be provided during detail engineering. All knockouts shall be provided with pluggable grommets.
4. The cabinets shall be of max. 2200mm height including base channel. The base channel shall be of 100 ISMC. All cabinets shall be of same height. Construction shall be modular. Contractor shall give the overall dimensions of each system and non-system cabinets in the format as per Schedule- 13 of this volume.
5. System & non-system cabinets shall have "look alike" appearance.
6. All electronic system cabinets shall be designed for 50 deg C operating under maximum ambient temperature without air conditioning system in service. Further cabinets, panels shall be so designed that temperature rise due to heat load does not exceed 10 deg. C above ambient temperature under all operating conditions. Necessary louvers, fans, limited packing density, adequate spacing between instruments, devices etc. shall be provided to maintain temperature rise within permissible limits.
7. Panels, cabinets enclosures wiring shall be arranged to enable the removal of modules/instruments and devices without unduly disturbing them.
8. All panels, cabinets, enclosures interiors shall be illuminated with rapid start fluorescent strip fixtures with door actuated switches. Door switch terminals shall be shrouded. All illuminated lights shall be provided with isolation switch in addition to door switch for maintenance & switching Off when not required. Illumination light shall be provided on both front & back sides if both sides are provided with equipments/instruments/terminal blocks requiring maintenance.



9. Sufficient number of power receptacles with disconnect switches shall be installed within panels, enclosure and racks.
10. The local instrument enclosures/racks shall be provided locally for mounting of electronic transmitters and switches, etc.
11. All panels, cabinets shall be properly grounded. The grounding scheme shall be as approved by the owner.
12. Exterior steel surface shall be sand blasted, ground smooth, filed, 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. Minimum 2 coats of primer and two sprays of final finish colour shall be applied to all surfaces.
13. The colour of the panel's interior shall be brilliant white in the panel interior. External colour of the panels will be as RAL 7032 for LIE/ LIR and RAL 7035 for control room system cabinets.
14. All panels, enclosures, system cabinets, marshalling cabinets shall be provided with a minimum of 20% spare terminations and system cabinets shall be provided with spare space for 20% additional modules fully wired with connectors etc. in excess of the total requirement of the system design when the cabinets are delivered. The spare space capacity shall be distributed evenly throughout the cabinets.

## 12.2 System Cabinets

**Table 12.1  
Specifications for System Cabinets**

S.N	Features	Minimum Requirements
1	Application	For housing Signal conditioning cards, input/output cards, processor cards, power supply units etc.
2	Location	Indoor
3	Type	Free standing Vertical type
4	Protection class	IP-42
5	Material & Thickness	CRCA steel/3mm
6	Doors	Double door with neoprene gasket, Lockable,
7	Cable entry	Bottom with fire proof compound thickness 50 mm for sealing
8	Anti vibration pad	Required, 15mm
9	Painting	Interior- Brilliant White Exterior- RAL 7035
10	Cabinet Dimension	To be decided during detail engineering
11	Grounding	M6 earthing stud shall be provided
12	Ventilation	Fans & louvers with brass mesh



S.N	Features	Minimum Requirements
		required
13	Lighting	rapid start fluorescent strip fixtures with door actuated switches required
14	Lifting arrangement	Removable lifting eyebolts shall be provided

- The racks in system cabinets shall have provision along with plug in sockets/back plane to house accommodate the spare slots/modules as specified elsewhere.
- The system cabinets, racks in system cabinets, slots in the racks & the terminals shall have identification numbers. A stainless steel metal tag (plate) shall be fixed to the inside of the door & the layout of the racks, slots & details of the card type/service shall be inscribed on this metal tag.
- Each cabinet shall be provided with one each 3 pin receptacles for 230 V, 1P, 50 Hz and receptacles for 24V DC.
- One of the doors shall be provided with folder to keep the relevant engineering document of the cabinet.
- All cabinets shall have common key for locks.
- Door shall have concealed type of hinges with 120 degree swing.
- Door latches shall be of the three-point type to ensure tight closing.
- Separate Power & shield earthing bus shall be provided at the front & rear side of the cabinets. The earthing bus shall be isolated from panel body by suitable insulation material.

### 12.3 Marshalling Cabinets

**Table 12.2  
Specifications for Marshalling Cabinets**

S.N	Features	Minimum Requirements
1	Application	For termination of all cables originating from field.
2	Location	Indoor
3	Type	Free standing Vertical type
4	Protection class	IP-44
5	Material & Thickness	CRCA steel/ min. 2mm for panel sides & 3mm for gland plates
6	Doors	Double door with neoprene gasket, Lockable,
7	Cable entry	Bottom with fire proof compound thickness 50 mm for sealing
8	Terminal Blocks	Rail mounted cage-clamp fused type



S.N	Features	Minimum Requirements
		with LED indication suitable for conductor size up to 2.5 mm <sup>2</sup> & fused type with LED indication for power supply (24 VDC, 230 V AC, 110 V AC etc.) for instruments & equipments.
9	Anti vibration pad	Required, 15mm
10	Painting	Interior- Brilliant White Exterior- RAL 7035
11	Cabinet Dimension	To be decided during detail engineering
12	Grounding	M6 earthing stud shall be provided
13	Ventilation	Fans & louvers with brass mesh required
14	Lighting	rapid start fluorescent strip fixtures with door actuated switches required
15	Lifting arrangement	Removable lifting eyebolts shall be provided

1. Separate Marshalling cabinets for the system shall be supplied for terminating all cables originating from the field and for distributing the signals to different functional panels and cubicles.
2. The terminal blocks shall be cage clamp type. Fused terminal blocks hinged at one end to facilitate easy isolation shall be provided wherever necessary. All cabinets shall be provided with spare terminals for the spare inputs/outputs as specified else where in the specification. The type of terminals for terminations from cabinets/panels shall match with the pre fabricated cables and pins supplied.
3. The terminals for field cables shall be arranged in a logical order of equipment/system wise and shall be worked out by Contractor, subject to approval by Owner / Consultant.
4. The marshalling cabinets, the terminal blocks, the terminals and the electronic hardware if any, shall have identification numbers.
5. Each cabinet shall be provided with one each 3 pin receptacles for 230 V, 1P, 50 Hz and receptacles for 24V DC.
6. One of the doors shall be provided with folder to keep the relevant engineering document of the cabinet.
7. All cabinets shall have common key for locks.
8. Door shall have concealed type of hinges with 120 degree swing.
9. Door latches shall be of the three-point type to ensure tight closing.
10. Separate Power & shield earthing bus shall be provided at the front & rear side of the cabinets. The earthing bus shall be isolated from panel body by suitable insulation material

#### **12.4 Local Instrument Enclosure & Racks**



1. Transmitters and switches, devices, etc. mounted in the field shall be suitably grouped together and mounted in local instruments enclosures in case of open areas of the plant and in local instrument racks in case of covered areas. These local instrument enclosures and racks shall be furnished as per the actual requirements finalised during detailed engineering stage. The exact grouping of instruments in a particular instrument enclosure/instrument rack shall be as finalised during detailed engineering stage subject to the owner's approval.
2. The local instrument enclosures shall be constructed of 2 mm sheet plate and shall be of modular construction with one or more modules and two end assemblies bolted together to form an enclosure. Vibration dampeners shall be installed for supporting each enclosure. The internal layout shall be such that the impulse piping/ blow down lines are accessible from back doors of the enclosure and the transmitters etc. are accessible from front side for easy maintenance. Gaskets shall be used between all mating sections to achieve protection class of IP-65.
3. The local instrument racks shall be free standing type constructed of suitable 3 mm thick channel frame of steel and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel, and extended beyond the ends of the rack. Bulk heads, especially designed to provide isolation from process line vibration shall be provided. Exact fabrication details shall be as finalized during detailed engineering stage. The junction box for racks also shall conform to IP 65 protection class.
4. Provision for continuous purging arrangement is to be made for all air and flue gas applications.
5. Each transmitter enclosure housing instruments i.e. for air and flue gas applications, requiring purge air for continuous air purging shall be provided with common purge air header, redundant air filter regulators of sufficient capacity, required pressure gauges, valves, fittings, SS tubing and individual purge meters for each purge line etc. as required.
6. As soon as the panel's fabrication is over, Owner shall inspect the panels and further work on the panels, namely assembly, wiring and assembly of components shall be carried out only after the inspection.
7. The junction box of Local Instrument Enclosure & Racks shall be provided with hinged type door, latch for locking & gland plates for cable entry. All terminals in junction box shall be of rail mounted cage clamp type suitable for conductor size up to 2.5 Sq. mm.

## 12.5 Local Junction Box

Table 12.3



### Specifications for Junction Box

S.N	Features	Minimum Requirements
1	No. of Ways	32 (2X16) with 20% spares terminals
2	Material & Thickness	3 mm thick Stainless steel
3	Protection class	IP-65 for outdoor/ IP 55 for Indoor
4	Cable entry	Bottom
5	Mounting	Suitable for Wall/column/structures mounting
6	Terminal Blocks	Rail mounted cage-clamp type suitable for conductor size up to 2.5 mm <sup>2</sup>
7	Grounding	M6 earthing stud shall be provided
8	Gland plate	Removable type
9	Door	Single Lockable door with gasket, able to open sideways, turn able hinge based, latch type lock without handle with common key.
10	Accessories	Tag plate, clamps, fixtures, bolts (SS), nuts (SS), Gasket (Neoprene), cable glands (SS), Lugs (Brass), Fire proof compound for sealing.

- All JB's for outdoor application shall be provided with individual canopies to prevent ingress of water.
- All JB' shall have provision to add 10% additional TB's.
- The marking on terminal strips shall correspond to the terminal numbering on wiring diagrams.
- Separate Terminal blocks shall be used for Analog & Digital Signals & also for signals with different voltage levels.
- The terminal blocks shall be arranged with at least 100 mm clearance between two sets of terminal blocks and between terminal blocks and junction box walls.
- Separate shield bus shall be provided with screw connection for terminating cable shields.
- All spare cable entries shall be provided with plugs.
- All wires in JB shall be neatly dressed & ferruled.
- Double deck type terminal block shall not be used.

**Table 12.4  
Specifications for Cable Glands**



S.N	Features	Minimum Requirements
1	Type	Double compression
2	Entry Thread	½" NPT
3	Material	Brass
4	Finish	Cadmium Plated
5	Protection	IP-54 or better
6	Accessories	Neoprene gasket, Locknut, Reducer etc.



2. Thermo wells shall, in general, be of SS 316 and shall be drilled from bar stock except for air and flue gas services. However, selection of thermo well material shall be as per following guideline.
3. Welded type thermo wells with 38 mm O.D. for welding & ½" NPT internal threads shall be used for pressure above 100 kg / sq cm or temperature above 400 deg C. Socket weld type thermo well with 34 mm O.D. for welding & ½" NPT internal thread, shall be used for pressure between 40-100 kg/cm<sup>2</sup> and temperature up to 400°C. Screwed type thermo wells with ½" NPT internal threads & M33X2 (M) outer threads shall be used for pressure below 40 kg/cm<sup>2</sup> and temperature below 400°C. For pipes having probability of prolonged vibration, seal welding may be done all around after tightening the thermo well within the base.
4. Thermo well manufacturing drawing covering material specification, dimensional details, details of special treatment, finish etc. as well as test procedure shall be subject to Owner's / Consultant's approval. Material certificate shall have to be furnished for each thermo well.
5. Wherever any approval is necessary from any recognized body / authority during manufacturing of high pressure wells, the same shall have to be arranged by the Contractor.
6. The thermo well immersion depth (U) shall be sufficient to eliminate conduction error. A general rule which may be followed is to use an immersion length equalling a minimum of 10 times the diameter of the protective tube or well. In general, immersion length of thermo wells for different line sizes shall be as follows:

**Table 9.5**

**Thermowell Immersion Length**

S.N	Line Size	Immersion Length
1	From 4" to 6"	65 mm
2	From 8" & onwards	140 mm
3	Vessels	400 mm

**9.7 Pressure Gauge/ Differential Pressure Gauge/Draft Gauge**

**Table 9.6**

**Specification for Pressure Gauge/ DP Gauge/ Draft Gauge**

S.N	Feature	Minimum Requirement
1	Type	Bourdon / Bellows / Diaphragm
2	Sensing Element Material	AISI 316 SS
3	Movement Material	AISI 304 SS



S.N	Feature	Minimum Requirement
4	Case Material / Protection Class	SS / IP 65
5	Dial Size	150 mm For Special application 250 mm shall be used
6	Scale	Black lettering on white background in 270 °C arc
7	Range Selection	Normally operate at 75% of its maximum pressure range. Instruments measuring varying pressures shall operate in a band of 60% of its maximum pressure range.
8	Over range Protection	150% of maximum range by internal stop. External stop below zero.
9	Adjustment	External Micrometer screw for zero adjustment. Internal micrometer screw for range adjustment.
10	Stop at Max. Reading	Shall be provided
11	Element Connection	Argon welding
12	Process Connection	½" NPT(M) bottom connection for local mounting, back connection for panel mounting
13	Accuracy	+/- 1.0 % of full scale or better
14	Operating Ambient Temperature	50 °C (Max. continuous)
15	Safety Feature	Neoprene Safety Diaphragm (Blowout disc) at the back
16	Window	Shatter-proof glass
17	Chemical Seal Unit	SS 316 Flange and Diaphragm, PTFE coated / block, Silicon Oil filling fluid
18	Accessories	Snubbers for pulsating fluid applications / 3-way gauge cock / 2-valve manifold / Pigtail / Siphon for steam service / Gauge Saver, if maximum or Design Pressure is very high than the Operating Pressure / Counter Flanges / Bolts, Nuts, Gaskets / SS Tag Plate

1. Directly connected pressure measuring instruments shall be diaphragm, bourdon or bellow type elements depending upon the services conditions. In general, diaphragm elements shall be used in the range of 0 to 1000 mm water column pressure, bellow type element for ranges of 0 to 1 Kg/cm<sup>2</sup> and bourdon type element for ranges greater than 1 Kg/cm<sup>2</sup>.
2. Primary element material shall be corrosion resistant to process fluid or diaphragm seals shall be provided for protection.
3. For draft measurement Teflon coated beryllium copper diaphragm shall be used.



4. Snubbers shall be floating pin type, externally mounted and externally adjustable. It shall be used for all pulsating services.
5. Diaphragm seals, filled type or mechanical type shall be furnished where plugging of the element may occur or where suitable material is not available in highly corrosive services. When chemical seals are required, they shall be the clean out type with flushing connection.
6. Over-range protection shall be provided to at least 150 % of range. For vacuum service, the element shall have under-range protection to full vacuum
7. Ranges of the gauges shall be so selected that the gauge normally operates in the middle third of the scale and conform to IS 3624 standard dials, wherever necessary.
8. The sensing elements for all gauges shall be properly aged and factory tested to remove all residual stresses and shall be SS 316 with forged socket and tip of the same material. Elements above 70 Kg/sq. cm range shall be bored instead of drawn.
9. For low pressure application where long elements are used, well supported protecting tube shall be installed to prevent mechanical damage and erosion of the elements.

## 9.8 Temperature Gauge

**Table 9.7  
Specification for Temperature Gauge**

S.N	Feature	Minimum Requirement
1	Type	Mercury filled
2	Sensing Element material	Bourdon AISI 316 SS
3	Movement Materials	AISI 304 SS
4	Case Material/Protection class	SS / IP65
5	Capillary Armouring	SS Flexible
6	Capillary	SS 316 ( 5 mtr. Length for Local & 15 metre for panel Mounting)
7	Bulb/Stem Diameter	12 mm
8	Dial Size	150 mm
9	Window	Shatterproof glass
10	Scale	Black lettering on white background in 270 °C arc
11	Adjustment	Micrometer screw for zero adjustment. Internal micrometer screw for range adjustment.
12	Pointer	Externally Adjustable
13	Range Selection	Normal Process Temperature –



S.N	Feature	Minimum Requirement
5	Repeatability	± 0.5 % of full range or better
6	Accuracy	± 0.5 % of full scale or better
7	Working temperature	As per process requirement
8	Probe length	As per requirement
9	Probe Mounting	1 ½ " Flanged
10	No. of contact	2 NO. + 2 NC, SPDT, snap action type dry contact
11	Rating of contacts	5A, 240 V AC / 2A, 24 V DC / 0.25 A, 220V DC
12	Enclosure	IP 65
13	Housing	Cast aluminum epoxy coated weather proof
14	Cable connection	½ " NPT with Cable gland
15	Ambient Temperature	60°C (max.)
16	Electrical Connection	Plug-in type
17	Accessories	Counter flange, Cable gland, Prefab cable etc.
18	Set point	Adjustable
19	Accessories	All mounting accessories

### 9.13 Float/Displacer Type Level Switch

**Table 9.12**

**Specification for Float/Displacer Type Level Switch**

S.N	Feature	Minimum Requirement
1	Type	Float/Displacer type
2	Float/Stem/Displacer Material	SS 316
3	Repeatability	± 0.5 % of full range or better
4	Accuracy	± 0.5 % of full scale or better
5	Working temperature	As per process requirement
7	Process connection	As per requirement
8	Over-range proof	150% of max. design pressure
9	No. of contact	2 NO. + 2 NC, SPDT, snap action type dry contact
10	Rating of contacts	5A, 240 V AC / 2A, 24 V DC / 0.25 A, 220V DC
11	Enclosure	IP 65
12	Hydro Test	Chamber – 100% at 1.5 times rated pressure or as per ANSI flange rating Float – 1.1 times of operating pressure
13	Electrical Connection	Plug-in socket
14	Accessories	All mounting accessories



1. Level Switch shall work on gland less magnetically coupled float or displacer operated mechanism having separate float chamber.
2. Float, stem and displacer shall be 316 stainless steel.
3. Level switch body, cage and process connections shall be designed to withstand the maximum pressure and temperature of the operating fluid.
4. A setting adjustment on the level set point of + / - 25 mm shall be provided. The adjustment shall be made externally to the switch.
5. The accuracy & repeatability of the switch shall be within +/- 0.5 % of full-scale range. On – Off differential shall be adjustable.
6. Process connections of the cage shall be 25 NB male plain nipples connected through socket / welded isolation valves of adequate rating.
7. Level switch connections shall also include 15 NB test and drain connections to permit servicing, testing, calibration of the instrument.
8. The switching elements shall be snap-acting, shock-proof and vibration-proof. All switches shall have two electrically isolated SPDT contacts with provision of external adjustment of set points and dead bands. The contact ratings shall be 5 amps at 240 V AC 50 Hz or 0.25 amps at 220 V DC.
9. Switch enclosures shall be cast aluminium, weather-proof, NEMA -4X type with cable entry through compression type cable glands / ¾ "NPT conduit connections. Switches located in hazardous areas shall have dust-ignition-proof enclosure as per NEC article 500 provisions.

#### 9.14 Ultrasonic Level Transmitter

**Table 9.13  
Specification for Ultrasonic Transmitter**

S.N	Feature	Minimum Requirement
1	Application	Level measurement in silos, sump water level etc.
2	Medium	Coarse, hard solid materials like ash etc. Materials may be slowly falling through the detection range.
3	Type	Non contact Microprocessor based 2 wire type, HART protocol compatible Ultrasonic Transmitter
4	Principle	Time of flight
4	Sensor Material	Corrosion resistant material to suit individual application requirement.



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## **SECTION - D STANDARD TECHNICAL SPECIFICATION**

SECTION D1: STANDARD TECHNICAL SPECIFICATION FOR SUMP PUMP

SECTION D2: STANDARD TECHNICAL SPECIFICATION FOR ELECTRIC MOTOR

SECTION D3: STANDARD TECHNICAL SPECIFICATION FOR CONTROL PANEL, PR. GAUGE, LEVEL SWITCHES




TITLE :	SPECIFICATION NO. PE-TS-402-172-N001	
TECHNICAL SPECIFICATION	VOLUME : II B	
FOR	SECTION : C	
SUMP PUMPS	REV. NO. 0	DATE :02.01.2015
	SHEET	OF

**SECTION - D1**

**STANDARD TECHNICAL SPECIFICATION  
FOR SUMP PUMPS**

**DATA SHEET- A**

**DATA SHEET- C**

	<b>TITLE :</b>	<b>SPECIFICATION NO.</b>	<b>PE-TS-MOU-100-N001</b>
	<b>TECHNICAL SPECIFICATION</b>	<b>VOLUME :</b>	<b>II B</b>
	<b>FOR SUMP PUMPS</b>	<b>SECTION :</b>	
	<b>(FOR MEMORANDUM OF UNDERSTANDING PURPOSE)</b>	<b>REV. NO.</b>	<b>0</b> <b>DATE :</b> 10.06.12
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**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 complete with all accessories as specified hereinafter.

1.02.00 The design, performance, major constructional features, materials of construction etc., of the Sump 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 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 stipulations in this specification shall prevail and shall be binding on the bidder.

**3.00.00 General Description**

3.01.00 Sump 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.

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Type of Sump Pumps required under this specification are described in Section-C/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 sludge, 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 25mm.

### **3.01.02 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 which shall be furnished along with project enquiry and shall be portable type. Each pump set along with drives, control panel etc., and shall be mounted on a trolley for ease of transportation. These pumps shall be suitable for handling drainage water containing hard solid particles, sludge, and polluted liquid with expected particle size of 25mm.

### **3.01.02 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 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 25mm.

### **4.00.00 GENERAL PERFORMANCE REQUIREMENT**


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 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.

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Acceptable peak to peak vibration limits shall generally be guided by Hydraulic Institute Standards (latest edition).

**5.00.00 GENERAL**

5.01.00 Pumps as described in Section-C/Datasheet-A (furnished along with the project enquiry) shall be complete with their drives, couplings (if required) 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 at least 15% 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.


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.

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6.08.02 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 (if required), drive assembly etc. These pumps shall be trolley mounted portable type.

6.08.03 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 Fixed 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 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 runaway 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 (if required) between shafts shall be so designed that they become tight during pump operation.

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**6.08.07 Column Pipe for fixed type 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 handling liquid.

**6.08.09 Wearing Ring/Liner Plate (As required)**

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 (If required)**

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


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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 (if required).
  - ii) Shafts & shaft sleeves (if required).
  - iii) Couplings (if required).
  - iv) Bearings
  - v) Column pipes (if required).
  - 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 (if required) be subject to D.P. & Ultrasonic test.
  - iii) Wearing rings (if required) 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 along with 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.

X500 MW NEW NEYVELI TPP (NLC LTD)				Specification No: PE-TS-402-172-N001	
MECHANICAL SPECIFICATION FOR SUMP PUMPS				Vol-II B Section-D	
DATA SHEET - A (SUMP PUMPS)				Date- 02.01.2015	
CL. NO.	DESCRIPTION	UNIT	Group-A		Group-B
			Fixed Duty type Submersible Sump Pumps		Portable Submersible Sump Pumps
<b>1.0.0</b>	<b>GENERAL</b>				
1.1.0	Service /Location of Sump pumps		CW pits	A-Row & B-Row pits	Various general purpose pits
1.2.0	Equipment name		Sump Pump	Sump Pump	Sump Pump
1.3.0	Pump type		Fixed duty Submersible sump pumps	Fixed duty Submersible sump pumps	Portable Submersible sump pumps
1.4.0	Duty		Intermittent	Intermittent	Intermittent
1.5.0	Location		Indoor	Indoor	Outdoor
1.6.0	Maximum Ambient Temperature	°C	60	60	60
1.7.0	Motor Rating		Motor rating shall be so selected as to have at least 25 % margin over the maximum power required by the pump, throughout its entire range of operation.		
<b>2.0.0</b>	<b>PUMP PARAMETERS</b>				
2.1.0	Design capacity	M3/hr	40	20	40
2.2.0	Total head at rated capacity	MWC	12	50	12
2.3.0	Total no. of pumps installed	Nos.	4	8	2
2.4.0	No. of pumps working / Standby	Nos.	(1 W+1 S) Per Unit	(2 W+ 2 S) Per Unit	(1 W) Per Unit
2.5.0	Parallel operation required		Yes	Yes	No
2.6.0	Pump RPM		1500 (Max.)	3000 (Max.)	1500 (Max.)
2.9.0	Range of operation	%	30 to 150 % of the rated flow	30 to 150 % of the rated flow	30 to 150 % of the rated flow
2.10.0	Pump design standard		IS 5120/IS 8034	IS 5120/IS 8034	IS 5120/IS 8034
2.11.0	Max. particle size to be handled		40 mm	40 mm	40 mm
<b>3.0.0</b>	<b>LIQUID DATA</b>				
3.1.0	Liquid handled		water with suspended particles & traces of oil	water with suspended particles & traces of oil	water with suspended particles & traces of oil
3.2.0	Specific gravity		1.1	1.1	1.1
3.3.0	Temperature (max.)	°C	60	60	60
<b>4.0.0</b>	<b>DESIGN AND CONSTRUCTION FEATURES</b>				
4.1.0	Impeller type		Open, Non-clog type	Open, Non-clog type	Open, Non-clog type
4.2.0	Flange drilling standard		ANSI B 16.5	ANSI B 16.5	ANSI B 16.5
<b>5.0.0</b>	<b>MATERIAL OF CONSTRUCTION</b>				
5.1.0	Casing / Suction bell		2.5%Ni Cl,IS:210 Gr FG 260	2.5%Ni Cl,IS:210 Gr FG 260	2.5%Ni Cl,IS:210 Gr FG 260
5.2.0	Impeller		SS-316	SS-316	SS-316
5.3.0	Impeller shaft		SS-410	SS-410	SS-410
5.4.0	Wear ring (where applicable)		Austenitic cast iron	Austenitic cast iron	Austenitic cast iron
5.5.0	Shaft sleeve (where applicable)		SS-316/SS410	SS-316/SS410	SS-316/SS410
5.6.0	Coulmn Pipe (where applicable)		-	-	-
5.7.0	Pump and motor coupling		-	-	-
5.8.0	Fasteners		SS 316	SS 316	SS 316
5.9.0	Gland		C.I, IS-210, FG-260/ Equivalent	C.I, IS-210, FG-260/ Equivalent	C.I, IS-210, FG-260/ Equivalent
	Gland Packing		Braided Graphite- free Teflon	Braided Graphite- free Teflon	Braided Graphite- free Teflon
5.10.0	Mechanical seal		As applicable	As applicable	As applicable
5.11.0	Pump Lubrication		SELF/Oil/Grease	SELF/Oil/Grease	SELF/Oil/Grease
5.12.0	Pump line shaft lubrication		N/A	N/A	N/A
5.13.0	Strainer (Body / Mesh)		SS 316	SS 316	SS 316
<b>Note :</b> Bidder's may offer alternative materials, if they are superior to that specified above for the indicated service of the pump.					
<b>6.0.0</b>	<b>INSPECTION AND TESTING</b>		As per approved quality plan by BHEL/ Customer		
<b>7.0.0</b>	<b>SUPPLY OF ACCESSORIES AND SERVICE.</b>				
7.1.0	Counter Flanges with Nuts,Bolts, Gaskets etc.		Yes	Yes	Yes
7.2.0	Elastomer cables for connecting pump with its panel length (M)		25M	25M	25M
7.3.0	Relay based control panel with integral starter		Yes Wall mounted,common for two pumps of one unit with IP 55 protection	Yes Wall mounted,common for two pumps of one unit with IP 55 protection	Yes Trolley mounted for each sump pump with IP 55 protection
7.4.0	Discharge pressure gauge with root valve for each pump		1 no. per pump	1 no. per pump	-
7.5.0	Discharge hose				
	- Hose length per pump		30 M (wire braided flexible hose)	30 M (wire braided flexible hose)	30 M (Heavy duty rubberised canvas)
	- Hose dia		To suit pump discharge	To suit pump discharge	To suit pump discharge
7.6.0	Cables (*) for connecting the starter panel with the power supply source - Length (M) / pump (*)including plug matching with purchaser's 63 Amp welding socket		-	-	-
7.7.0	Chains		Yes(15M)	Yes(15M)	Yes, (15M)
7.8.0	Suction Strainers		Yes	Yes	Yes
7.9.0	Pump Stool		Yes	Yes	Yes
7.10.0	Wheel trolley required per pump		No	No	Yes
7.11.0	Level switches for		Top mounted displacer or capacitive type level switch (subject to customer's approval)	Top mounted displacer or capacitive type level switch (subject to customer's approval)	Float type level probe integral with pump
	- Very Low level		Yes, One level switch for two pumps installed in a pit	Yes, One level switch for each pump installed in a pit	Yes
	- High level		Yes, One level switch for two pumps installed in a pit	Yes, One level switch for each pump installed in a pit	NA
	- Very high level		Yes, One level switch for two pumps installed in a pit	Yes, One level switch for each pump installed in a pit	NA
8.0.0	Levels for installation				
8.1	Pump/Motor Support Elevation		N/A	N/A	N/A
8.2	Pump Invert Level		N/A	N/A	N/A

 <b>500 MW NEW NEYVELI TPP (NLC LTD)</b>				Specification No: PE-TS-402-172-N001	
<b>TECHNICAL SPECIFICATION FOR SUMP PUMPS</b>				Vol-II B Section-D	
<b>DATA SHEET - A (SUMP PUMPS)</b>				Date- 02.01.2015	
CL. NO.	DESCRIPTION	UNIT	Group-A		Group-B
			Fixed Duty type Submersible Sump Pumps		Portable Submersible Sump Pumps
9.0.0	Special Requirements		N/A	N/A	N/A
10.0.0	Pit Size		1.5 M X 1.5 M X 1.0 M	4 M X 1.2 M X 1.0 M	-

MANUFACTURERS NAME & ADD			STANDARD QUALITY PLAN										PROJECT	
Submersible Pumps D.L. 31.05.2012 MODEL SUBMERSIBLE PUMPS			Q.P No: PE-QP-898-100-N005 REV No.: R01 DATE: 31.05.2012										END USER : CUSTOMER	
ITEM :			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	N			
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	Correlated HT charts	✓	P	V	V		
		IGC TEST	MA	CHEMICAL	1 SAMPLE/HT BATCH	ASTM A 262	PRACTICE - "E"	TC	✓	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	Measurement	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, multicoore, copper conductor and Size		MA	Measurement	100%	Approved Datasheet / IS 694/ IS 1554	Approved Datasheet / IS 694/ IS 1554	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	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	
		Leak tightness	CR	Air test (Duration 30 minutes min.)	100%	Air testing at 0.5 Kg / cm <sup>2</sup> ( gauge pressure )	No leakage	IR	✓	P	V	V		
2.3	Casing & Impeller (M/C 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	UT	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	
3.1	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		
MANUFACTURER/ SUBCONTRACTOR			ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION										BHEL DOC No.: PE-V8-XXX-172-N005	
SIGNATURE			BHEL CONTRACTOR										NAME AND SIGN OF APPROVING AUTHORITY AND SEAL	

\*\* M: MANUFACTURER/SUB SUPPLIER  
 B: MAIN SUPPLIER OF PACKAGE, N: BHEL/INT/END CUSTOMER  
 P: PERFORM W: WITNESS V: VERIFICATION AS APPROPRIATE

STANDARD QUALITY PLAN													
ITEM :													
Submersible Pumps Dt: 31.05.2012 MODEL SUBMERSIBLE PUMPS													
Q.P No: PE-QP-999-100-N005 REV No.: R0 DATE: 31.05.2012													
PROJECT END USER : CUSTOMER													
MAIN SUPPLIER: BHEL, Noida													
SR. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD			REMARKS		
								M	B	N			
1													
<b>4.0 Final Inspection, Test, Packing, Despatch Control</b>													
4.1	Pump set (Pump+ Motor)	Q Vs Head, Q Vs Power Q Vs Efficiency Noise & Vibration	CR	Performance test	100%	ENCLOSED TEST PROCEDURE	Tech. Spec., Appd. Data Sheet, Appd. Curves, HIS	Performance test record, Plotted Curves	✓	P	W	V	Witnessing by BHEL pump per type
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	✓	P	W	V	Wdg resistance Degree of protection shall be IP 68 HV at 2.5 KV ac for 1 minutes
4.3	Strip down after Performance test	Undue wear, tear and breakages	CR	Visual examination of Casing & Impeller after stripping	1 / type	Undue wear, tear and breakages	No undue wear, tear and breakages	IR	✓	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	✓	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	✓	P	V	V	Reports by Manufacturer
4.6	Painting	Surface Preparation		Visual examination	100%	Approved Data Sheet	Approved Data Sheet	IR	✓	P	V	V	Reports by Manufacturer
4.7	Wooden Packing	Adhesion, Uniformity and thickness		Visual Measurement	100%	As per Painting Schedule	As per Painting Schedule	IR	✓	P	W	V	Reports by Manufacturer
		Soundness, Aesthetic		Visual	100%	Manufacturer's Standard	Manufacturer's Standard	IR	✓	P			Compliance report by Vendor
<p>Note : 1. For accessories and bought out items, Vendor will submit Compliance for review.</p> <p>2. For UT test on shaft, acceptance criteria : Defect echo &lt; 20 % full screen height when back wall echo set @ 100 % screen height. Reduction in back wall echo to be &lt;20%</p> <p>Defect height &gt; 20 % of FSH is not acceptable, also loss in back wall echo &gt; 20 % not acceptable</p> <p>3. IP 68 protection certificate for test conducted on similar motor shall be submitted for review</p> <p>4. Compliance for provision of thermic switch for over heating protection of winding, reverse rotation protection device shall be submitted by Vendor.</p> <p>5. For Control Panel Separate QAP is applicable.</p> <p>6. Before Sending the documents for approval, supplier to ensure that 'Reference Documents' &amp; 'Acceptance Norms' does contain data required for the 'Characteristic to be Checked' as indicated in QP.</p>													
<p>MANUFACTURER/ SUBCONTRACTOR : BHEL CONTRACTOR</p> <p>SIGNATURE</p>													
NAME AND SIGN OF APPROVING AUTHORITY AND SEAL													



TITLE :	SPECIFICATION NO. PE-TS-402-172-N001	
TECHNICAL SPECIFICATION	VOLUME : II B	
FOR	SECTION : C	
SUMP PUMPS	REV. NO. 0	DATE :02.01.2015
	SHEET	OF

## SECTION – D2

### STANDARD TECHNICAL SPECIFICATION FOR ELECTRIC MOTOR

### QUALITY PLAN FOR MOTORS



TITLE :  
**GENERAL TECHNICAL REQUIREMENTS**  
  
**FOR**  
  
**LV MOTORS**

SPECIFICATION NO. PE-SS-999-506-E101
VOLUME NO. : <b>II-B</b>
SECTION : <b>D</b>
REV NO. : <b>00</b> DATE : 29/08/2005
SHEET : 1 OF 1

## **GENERAL TECHNICAL REQUIREMENTS**

**FOR**

**LV MOTORS**

**SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00**



TITLE :  
**GENERAL TECHNICAL REQUIREMENTS**  
  
**FOR**  
  
**LV MOTORS**

SPECIFICATION NO.  
PE-SS-999-506-E101  
VOLUME NO. : **II-B**  
SECTION : **D**  
REV NO. : **00** DATE : 29/08/2005  
SHEET : 1 OF 4

## 1.0 INTENT OF SPECIFICATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer's work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

## 2.0 CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement for rotating electrical machines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechanical vibration of rotating electrical machines

In case of imported motors, motors as per IEC-34 shall also be acceptable.

## 3.0 DESIGN REQUIREMENTS

3.1 Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2 Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information  
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

### 3.3 Starting Requirements

3.3.1 Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.

3.3.2 Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.



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The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.

3.3.3 The following frequency of starts shall apply

- i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.
- ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)
- iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for minimum 20,000 starts during the life time of the motor

#### 3.4 **Running Requirements**

3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.

3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.

#### 3.5 **Stress During bus Transfer**

3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.

3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.

3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.

3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.


#### 4.0 **CONSTRUCTIONAL FEATURES**

4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy

4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.

Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled

4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.

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- 4.4. Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.
- 4.5. Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.
- 4.6. In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation.  
In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.
- 4.7 Terminals and Terminal Boxes**
- 4.7.1 Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.  
  
Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".
- 4.7.2 unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.
- 4.7.3 Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or U W & V respectively.
- 4.7.4 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.
- 4.7.5 Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.
- 4.7.6 Degree of protection for terminal boxes shall be IP 55 as per IS 4691.
- 4.7.7 Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.
- 4.7.8. Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.
- 4.7.9 Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.
- 4.8 Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.



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- 4.9.1 Motors provided for similar drives shall be interchangeable.
- 4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.
- 4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.
- 4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.
- 4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.
- 4.9.6 Name plate with all particulars as per IS: 325 shall be provided
- 4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.

**5.0 INSPECTION AND TESTING**

- 5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.
- 5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.
- 5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.
- 5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.

**6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT**

- a) OGA drawing showing the position of terminal boxes, earthing connections etc.
- b) Arrangement drawing of terminal boxes.
- c) Characteristic curves:  
*(To be given for motor above 55 kW unless otherwise specified in Data Sheet).*
  - i) Current vs. time at rated voltage and minimum starting voltage.
  - ii) Speed vs. time at rated voltage and minimum starting voltage.
  - iii) Torque vs. speed at rated voltage and minimum voltage.  
For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.
  - iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.

SHEET 1 OF 2		QUALITY PLAN		CUSTOMER :		PROJECT		SPECIFICATION :			
COMPONENT/OPERATION		CHARACTERISTICS CHECK		SYSTEM		TITLE		NUMBER :			
SL. NO.	2	3	4	5	6	7	8	9	10	11	
				TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION AGENCY	VOLUME III REMARKS	
			CAT.						P	W	V
1.0	PAINTING	1. SHADE	MA	VISUAL	SAMPLE	MANUF'R'S SPEC/BHEL SPEC/RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	3	-	-
2.0	ASSEMBLY	1. WORKMANSHIP 2. DIMENSIONS 3. CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOR CODE	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	3	-	-
			MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	3	-	-
			MA	VISUAL	100%	MFG. SPEC./ RELEVANT IS	MFG. SPEC. RELEVANT IS	-DO-	3	-	-
3.0	TESTS	1. ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC. 2. OVERALL DIMENSIONS & ORIENTATION	MA	-DO-	100%	IS-325/ BHEL SPEC/ DATA SHEET	SAME AS COL.7	TEST REPORT	3	2.1	2.1 NOTE -1
			MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-
BHEL			PARTICULARS		BIDDER/VENDOR						
			NAME								
			SIGNATURE								
			DATE								
									BIDDER'S/VENDORS COMPANY SEAL		





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FOR	SECTION :	C	
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	SHEET	OF	

### SECTION – D3

### STANDARD TECHNICAL SPECIFICATION FOR CONTROL PANEL, PR. GAUGE, LEVEL SWITCH



## SPECIFICATION FOR LOCAL PANELS

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

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SECTION D

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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 1.5mm<sup>2</sup> 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 mm<sup>2</sup> to 2.5mm<sup>2</sup> 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 mm<sup>2</sup> 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



## SPECIFICATION FOR LOCAL PANELS

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

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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.



## SPECIFICATION FOR LOCAL PANELS

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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.:	
VOLUME	
SECTION	
REV. NO.	DATE:
SHEET 1	OF 1

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	<input checked="" type="checkbox"/> FOLDED <input type="checkbox"/> WELDED (As per requirement)	
	ENCLOSURE SHEET THICKNESS	3.0 mm	
<b>TECHNICAL</b>	INPUT POWER SUPPLY	<input type="checkbox"/> 240V 50 Hz AC <input type="checkbox"/> 220V DC <input checked="" type="checkbox"/> 415V 3 PHASE, 4WIRE	
	NO. OF FEEDERS	<input type="checkbox"/> ONE <input checked="" type="checkbox"/> TWO	
	CONTROL SUPPLY	<input type="checkbox"/> 110V AC <input checked="" type="checkbox"/> 220V AC <input type="checkbox"/> 220V DC <input type="checkbox"/> During detailed engg. (As per requirement)	
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)	AS REQUIRED	
	PAINT TYPE	<input type="checkbox"/> EPOXY ENAMEL <input checked="" type="checkbox"/> EPOXY POWDER COATED	
	PANEL COLOUR (EXTERNAL)	<input checked="" type="checkbox"/> Exterior- RAL 7035, to be finalized during detailed engineering.	
	FINISH	<input checked="" type="checkbox"/> MATT <input type="checkbox"/> GLOSSY <input type="checkbox"/> SEMI GLOSSY	
	PANEL COLOUR (INTERNAL)	<input checked="" type="checkbox"/> BRILLIANT WHITE <input type="checkbox"/> CREAM <input type="checkbox"/> OFF WHITE	
	FINISH	<input type="checkbox"/> MATT <input type="checkbox"/> GLOSSY <input checked="" type="checkbox"/> SEMI GLOSSY	
	CLASS OF PROTECTION	<input checked="" type="checkbox"/> IP-65	
	CONTROL HARDWARE	<input checked="" type="checkbox"/> RELAY BASED	
	FOUNDATION ARRANGEMENT	<input checked="" type="checkbox"/> FOUNDATION BOLTS <input type="checkbox"/> ANCHOR FASTENERS	
	WEIGHT OF PANEL (Kg.)		
	PANEL TYPE	<input type="checkbox"/> PRESSURISED <input checked="" type="checkbox"/> UNPRESSURISED As per Requirement	
	CABLE GLAND	<input type="checkbox"/> SINGLE COMPRESSION <input checked="" type="checkbox"/> DOUBLE COMPRESSION	
AMMETER (TYPE OF INPUT)	<input checked="" type="checkbox"/> 1 Amp CT <input type="checkbox"/> 4-20 mA		
NAME SIGNATURE DATE	<b>PREPARED BY</b>	<b>CHECKED BY</b>	<b>APPROVED BY</b>
	COMPANY SEAL		
	NAME SIGNATURE DATE		



## DATA SHEET FOR LOCAL PANELS

SPECIFICATION NO.:	
VOLUME	
SECTION	
REV. NO.	DATE:
SHEET 1	OF 1

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)

<b>GENERAL</b>	MANUFACTURER		
	CONSTRUCTION		
	ENCLOSURE SHEET THICKNESS	FRONT	
		OTHER	
DOOR			
<b>TECHNICAL</b>	INPUT POWER SUPPLY		
	NO. OF FEEDERS		
	CONTROL SUPPLY		
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)		
	PAINT TYPE		
	PANEL COLOUR (EXTERNAL)		
	FINISH		
	PANEL COLOUR (INTERNAL)		
	FINISH		
	CLASS OF PROTECTION		
	CONTROL HARDWARE		
	FOUNDATION ARRANGEMENT		
	WEIGHT OF PANEL (Kg.)		
	PANEL TYPE		
	CABLE GLAND		
	AAMETER (TYPE OF INPUT)		
NAME SIGNATURE DATE	<b>PREPARED BY</b>	<b>CHECKED BY</b>	<b>APPROVED BY</b>
	<b>COMPANY SEAL</b>		NAME
			SIGNATURE
			DATE

2011.12.7

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BHARAT HEAVY ELECTRICALS LIMITED

PEM - C&I

PROJECT :

CHECK LIST FOR LOCAL PANELS

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **				Remarks
				M	C	B	D	
1	CHECK FOR DIMENSIONS, COLOUR, MAKE OF HARDWARE & SHEET THICKNESS	SEE NOTE-1 BELOW	APPROVED SPEC / DATA SHEETS	P	W	V	R	
2	FUNCTIONAL TEST	-do-	-do-	P	W	V	R	
3	HV TEST	-do-	-do-	P	W	V	R	
4	IR TEST	-do-	-do-	P	W	V	R	
5	ENCLOSURE CLASS TEST	-do-	-do-	P	W	V	R	TYPE TEST CERTIFICATE TO BE FURNISHED BY VENDOR
6	BOM CHECK	-do-		P	W	V	R	
7	PAINTING CHECK	-do-		P	W	V	R	
8	PAINTING SHADE CHECK	-do-		P	W	V	R	
9	ILLUMINATION	-do-		P	W	V	R	
10	WIRING	-do-		P	W	V	R	

Legend :

- \* Records identified with "R" shall be essentially included by Contractor in QA documentation.
- \*\* M= Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, D= Drawings / Documents, P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :  
100 % - By Manufacturer  
100 % - By BHEL
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Manufacturer to carry out ROUTINE TEST on 100 %.



**DATA SHEET FOR  
PRESSURE / DIFFERENTIAL PRESSURE GAUGE**

SPECIFICATION NO.:	
VOLUME	
SECTION	
REV. NO.	DATE:
SHEET 1	OF 1

TAG No. .... Qty.....

Data Sheet No.: **PE-DC-999-145-I026**

**Data Sheet A & B**

DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE  
(TO BE FILLED BY PURCHASER)

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

<b>GENERAL</b>	MANUFACTURER		
	MODEL NUMBER		
<b>TECHNICAL</b>	PRESSURE ELEMENT	<input checked="" type="checkbox"/> BOURDON <input type="checkbox"/> DIAPHRAGM <input type="checkbox"/> BELLOW	
	MATERIAL	SENSING ELEMENT – AISI 316 SS MOVEMENT – AISI 304 SS CASING – <input type="checkbox"/> DIE CAST AL <input checked="" type="checkbox"/> SS	
	ENCLOSURE	<input type="checkbox"/> INDOOR MOUNTED IP-55 <input checked="" type="checkbox"/> OUTDOOR MOUNTED IP-65 <input type="checkbox"/> FUEL GAS HAZARDOUS APPL. EXPL. PROOF	
	DIAL	SIZE: <input type="checkbox"/> 100MM <input checked="" type="checkbox"/> 150MM COLOR: WHITE NUMERALS: BLACK SCALE: <input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> SQUARE ROOT	
	CASE	COLOUR : BLACK	
	ADJUSTMENT	<input checked="" type="checkbox"/> EXT. MICROMETER SCREW <input type="checkbox"/> INT. MICRO SCREW	
	MOUNTING	<input checked="" type="checkbox"/> LOCAL <input type="checkbox"/> PANEL OR RACK	
	OVER RANGE PROTECTION	150% OF FSD	
	BLOW OUT DISC	SUITABLE MATERIAL	
	SWITCHING FACILITY TYPE NO. / TYPE OF CONTACTS CONTACT RATING SETTING RANGE REPEATABILITY POWER SUPPLY	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> MICRO SWITCH <input type="checkbox"/> OTHER 2 NOS. SPDT 5A 230V AC, 0.25A 220V DC FIELD ADJUSTABLE OVER FULL RANGE $\pm 1\%$ OF FSR 230V AC (if required)	
<b>PERFORMANCE</b>	ACCURACY	$\pm 1\%$ OR BETTER OF FULL SCALE DEFLECTION	
<b>CONNECTION</b>	PROCESS	1/2 " NPT(M)	
	LOCATION	<input type="checkbox"/> BACK <input checked="" type="checkbox"/> BOTTOM	
<b>ACCESSORIES</b>	NAME PLATE / METAL TAG	SS	
	MOUNTING	<input type="checkbox"/> WALL <input checked="" type="checkbox"/> PIPE – U CLAMPS & BOLTS <input type="checkbox"/> PANEL / RACK	
	OTHER	AS PER ENCLOSED DIAGRAM OR CUSTOMER SPECIFICATION	
NAME			NAME
SIGNATURE			SIGNATURE
DATE			DATE



**DATA SHEET FOR  
PRESSURE / DIFFERENTIAL PRESSURE GAUGE**

SPECIFICATION NO.:	
VOLUME	
SECTION	
REV. NO.	DATE:
SHEET 1	OF 1

TAG No. .... Qty.....

Data Sheet No.: **PE-DC-999-145-1026**

**Data Sheet C**

DATA SHEET-C FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE  
(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

<b>GENERAL</b>	MANUFACTURER		
	MODEL NUMBER		
<b>TECHNICAL</b>	PRESSURE ELEMENT		
	MATERIAL		
	ENCLOSURE		
	DIAL		
	CASE		
	ADJUSTMENT		
	MOUNTING		
	OVER RANGE PROTECTION		
	BLOW OUT DISC		
	SWITCHING FACILITY TYPE NO. / TYPE OF CONTACTS CONTACT RATING SETTING RANGE REPEATABILITY POWER SUPPLY		
<b>PERFORMANCE</b>	ACCURACY		
<b>CONNECTION</b>	PROCESS		
	LOCATION		
<b>ACCESSORIES</b>	NAME PLATE / METAL TAG		
	MOUNTING		
	OTHER		
NAME			NAME
SIGNATURE			SIGNATURE
DATE			DATE



**CHECK LIST FOR  
PRESSURE / DIFFERENTIAL PRESSURE GAUGE  
(MECHANICAL AUXILIARY PACKAGES)**

SPECIFICATION NO.: PE-TS-394-145-I054  
VOLUME  
SECTION  
REV. NO. 00 DATE: 27.09.2013  
SHEET 13 OF 19

SL NO	TESTS/CHECKS	QUANTM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGENCY			REMARKS
				P	W	V	
1.0	CHECK FOR		APPROVED TECHINCAL REQUIREMENT/ DATA SHEET				MFR TO CARRY OUT ROUTINE TEST ON 100%. WHEN MATL CORELATION ARE NOT AVAILABLE MFR'S COMPLIANCE TO BE PROVIDED
	1.1 DIAL SIZE	100%		M	C	C	
	1.2 MODEL NO/TAG NO	100%		M	C	C	
	1.3 RANGE/SCALE	100%		M	C	C	
	1.4 END CONNECTION	100%		M	C	C	
	1.5 SWITCH CONTACT RATING & NOS	100% M			C	C	
2.0	CALIBRATION						
	2.1 ACCURACY	100%		M	C	B	
	2.2 REPEATABILITY (FOR SWITCH)	100% M			C	B	
	2.3 SET POINT ADJUSTMENT FOR SWITCH	100% M			C	C	
3.0	OVER PRESSURE & LEAK TEST	100% M			C	C	
4.0	OPERATION OF PR. RELEIF DEVICE	ONE PER TYPE		M	C	C	
5.0	REVIEW OF T.C. FOR MATERIAL OF--						
	5.1 SENSOR	FOR LOT		--		B	
	5.2 MOVEMENT			-	-	B	
	5.3 PROCESS CONNECTION		-	-	B		
	5.4 HOUSING		-	-	B		
6.0	REVIEW OF T.C. FOR DEGREE OF PROTECTION	TYPE TEST	-	-	B		
7.0	REVIEW OF T.C. FOR CONTACT RATING OF SWITCH	ONE PER TYPE	--		B		
8.0	ACCESSORIE S AS APPLICABLE	100% M		C	C		

## LEGEND:

M: MANUFACTURER/ SUB CONTRACTOR, C: CONTRACTOR/ NOMINATED INSP AGENCY, B: BHEL. P: PERFORM, W: WITNESS, V: VERIFICATION.

## NOTE:

CONTRACTOR TO PROVIDE COMPLIANCE CERTIFICATE FOR TESTS/CHECKS VERIFIED BY CONTRACTOR AND SUBMIT THE SAME ALONGWITH TEST CERTIFICATES TO BE VERIFIED BY BHEL.



**DATA SHEET FOR LEVEL SWITCHES  
(FLOAT / DISPLACER TYPE)**

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET

1

OF

1

**Data Sheet A & B**

DESCRIPTION

Data sheet-C (To be filled by the vendor after the award of contact)

<b>GENERAL</b>	MANUFACTURER		
	MODEL NUMBER		
<b>TECHNICAL</b>	TYPE	<input checked="" type="checkbox"/> TOP MOUNTED <input type="checkbox"/> SIDE MOUNTED (with/without external chamber) <input checked="" type="checkbox"/> DISPLACER TYPE <input type="checkbox"/> FLOAT OPERATED <input type="checkbox"/> EXTERNAL CHAMBER	
	MATERIAL	FLOAT ASSEMBLY SS ANSI 316	
	DISPLACER	AISI 316	
	WIRE ROPE	AISI 316	
	SLEEVE PIPE	AISI 316	
	EXTERNAL CHAMBER	<input type="checkbox"/> CS WELDED CONST. <input checked="" type="checkbox"/> SS WELDED CONST. <input type="checkbox"/> AS WELDED CONST.	
	SWITCH HOUSING	<input checked="" type="checkbox"/> AISI 304 SS <input type="checkbox"/> DIE CAST ALUMINIUM	
	GASKET	<input checked="" type="checkbox"/> NEOPRENE <input type="checkbox"/> TEFLON	
	ENCLOSURE	<input checked="" type="checkbox"/> IP-65 <input type="checkbox"/> OTHER	
	TYPE OF SWITCH	SNAP ACTING MECHANICALLY OPERATED	
	CONTACT RATING	5A/ 240 AC    0.25A/220 VDC	
	ISOLATION VALVE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
	SP. GR. OF FLUID	0.70 TO 1.2	
DIFF. BETWEEN MAKE & BREAK OF SWITCH	<input type="checkbox"/> 12 ±2 mm (SIDE MOUNTED) <input type="checkbox"/> 35 ±3 mm (TOP MOUNTED) <input checked="" type="checkbox"/> ADJUSTABLE		
MAXIMUM PRESSURE RATING	AS APPLICABLE		
MAXIMUM TEMPERATURE RATING	AS APPLICABLE		
<b>PERFORMANCE</b>	REPEATABILITY	+/- 0.5 % OF FULL RANGE OR BETTER	
<b>CONNECTION</b>	EXT. CHAMBER CONNECTION	AS APPLICABLE	
	ELECT.	PLUG IN SOCKET	
<b>ACCESSORIES</b>	INSTALLATION ACCESSORIES	AS REQUIRED.	
NAME			NAME
SIGNATURE			SIGNATURE
DATE			DATE



**DATA SHEET FOR LEVEL SWITCHES  
(FLOAT / DISPLACER TYPE)**

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 1 OF 1

**Data Sheet A & B**

DESCRIPTION

Data sheet-C (To be filled by the vendor after the award of contact)

<b>GENERAL</b>	MANUFACTURER	
	MODEL NUMBER	
<b>TECHNICAL</b>	TYPE	
	MATERIAL	
	DISPLACER	
	WIRE ROPE	
	SLEEVE PIPE	
	EXTERNAL CHAMBER	
	SWITCH HOUSING GASKET	
	ENCLOSURE	
	TYPE OF SWITCH	
	CONTACT RATING	
	ISOLATION VALVE	
	SP. GR. OF FLUID	
	DIFF. BETWEEN MAKE & BREAK OF SWITCH	
	MAXIMUM PRESSURE RATING	
MAXIMUM TEMPERATURE RATING		
<b>PERFORMANCE</b>	REPEATABILITY	
<b>CONNECTION</b>	EXT. CHAMBER CONNECTION	
	ELECT.	
<b>ACCESSORIES</b>	INSTALLATION ACCESSORIES	
NAME		NAME
SIGNATURE		SIGNATURE
DATE		DATE



**STANDARD QUALITY PLAN  
FOR  
LOCAL CONTROL PANEL**

STD QUALITY PLAN NO.: PE-QP-999-145-1056

VOLUME IIB

SECTION D

REV. NO. 01 DATE: 22-02-2008

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	
<b>INCOMING</b>												
1.0	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



**STANDARD QUALITY PLAN  
FOR  
LOCAL CONTROL PANEL**

STD QUALITY PLAN NO.: PE-QP-999-145-1056

VOLUME IIB

SECTION D

REV. NO. 01 DATE: 22-02-2008

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
									P	W	V	
4.0	Electrical Components like Annunciator Transformers Lamps Switches PBs Contactors Relays Timers Space Heaters Thermostat Indicating meters etc.	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	
		1. Verification at make and Type	CR	Visual	Sample	BHEL Spec. and BOM	BHEL Spec. and BOM	Log Book	2	---	---	
		2. Verification of Test Certificates	CR	Scrutiny of Type / Routine T.Cs.	100%	Relevant IS	Relevant IS	Log Book	2	---	---	
		3. Operation / Functional check	CR	Electrical	Sample+ 100%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Log Book	2	---	---	+ for relay & contactors only
		4. I.R.	MA	Electrical	100%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Log Book	2	---	---	@ for all components except relays & contactors.
		5. H.V.	MA	Electrical	100%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Log Book	2	---	---	
6. Calibration	MA	Electrical	100%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Log Book	2	---	---	1		
7. Pick up / Drop off Voltage	MA	Electrical	100%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	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



## STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL

STD QUALITY PLAN NO.: PE-QP-999-145-1056

VOLUME IIB

SECTION D

REV. NO. 01 DATE: 22-02-2008

SHEET 3 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	
5.0	Misc. Components like Gaskets, Terminal Blocks etc.	<ol style="list-style-type: none"> <li>Verification of Type / Make</li> <li>Surface defects</li> <li>IR / HV on Terminal Blocks</li> </ol>	MA	Visual	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---	
6.0	<b>IN PROCESS</b> Blanking / Bending / Forming	<ol style="list-style-type: none"> <li>Dimensions</li> <li>Surface defects after bending</li> </ol>	MI	Measurement	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---	
7.0	Nibbling / Punching	<ol style="list-style-type: none"> <li>Cutout Sizes</li> <li>Deburring</li> </ol>	MA	Visual	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---	
8.0	<b>ASSEMBLY</b> Frame Assembly & Sheet fixing	<ol style="list-style-type: none"> <li>Dimensions</li> <li>Alignment</li> <li>Welding Quality</li> <li>Surface defects</li> </ol>	MA	Measurement	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2	
			MA	Measurement	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2	
			MA	Visual	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2	
			MA	Visual	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2	

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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	

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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records			Remarks	
								P	W	V		
10.	Panel Wiring	1. Wiring Layout	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		2. Wiring Termination (Crimped Lugs)	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		3. Ferrule numbers	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		4. Colour of wiring	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
		5. Size of Conductor	MA	Measurement	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
11.	Component Mounting	1. Correct components	MA	Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
		2. Fixing	MA	Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
12.	FINAL Final Inspection	1. Workmanship	MA	Visual	100%	Factory Standard	Factory Standard	Inspection Report	2	1	1	At Random by BHEL, based on 100 % internal test reports by Mfr.
		2. Component layout (neatness, accessibility & safety) Mounting / Proper fixing of all components	MA	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	
		3. Components identification Marking / Name plates	MA	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	

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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records				Remarks
								P	W	V	Agency #	
5.		Dimensions	MA	Measurement	100%	BHEL approved drg. / Spec., BOM	BHEL approved drg. / Spec., BOM	2	1	1	1	At Random by BHEL, based on 100 % internal test reports by Mfr.
6.		Door functioning	MA	Functional	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	2	1	1	1	
7.		Paint Shade	CR	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	2	1	1	1	
8.		Paint Thickness	CR	Measurement	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	2	1	1	1	
9.		Workmanship of Gaskets	MA	Visual	100%	Factory Standard	Factory Standard	2	1	1	1	
10.		Wiring Layout	MA	Visual	100%	BHEL approved drg.	BHEL approved drg.	2	1	1	1	
11.		Wire Termination	MA	Pulling manually	Sample	-----	Firm termination	2	1	1	1	
12.		Continuity	MA	Electrical	100%	-----	Continuity OK	2	1	1	1	

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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records			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 2. Instrument Calibration 3. Temperature rise	CR	Electrical	100%	BHEL approved spec./drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1	
			CR	Electrical	100%	BHEL approved spec./drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1	
			CR	Electrical	100%	BHEL approved spec./drg. & relevant IS.	BHEL approved spec./drg. & relevant IS.	Inspection Report	2	1	1	

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## STANDARD QUALITY PLAN FOR LEVEL SWITCHES

QUALITY PLAN NO.: PE-QP-999-145-I033

VOLUME

SECTION

REV. NO.

DATE

SHEET 1

OF 4

SI. 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	
<b>1.0 Material / Components</b>												
1.1	Non wetted parts	Physical, chemical properties	MA	Physical, chemical analysis	1/cast	Approved drg. / data sheet / BHEL Spec.	Relevant raw material std.	Test report	3/2	---	2,1#	# Compliance certificate to be verified.
1.2	<b>Float Assembly and wetted parts</b>	Physical for float only and chemical properties for all wetted parts including float assembly	MA	Physical, chemical analysis	1/batch	SI:3.16/ BHEL spec/drg/approved data sheet	AISI:3.16/ BHEL spec/drg/approved data sheet/relevant material std.	Internal Inspection Report	3/2		2/1	
1.3	<b>Chamber</b>	Dimensions and leak tightness	MA	Measurement, visual,hyd test	100%	- do -	- do -	- do -	3/2	2	1	
1.4	Float	Leak Tightness	MA	Hyd Test	100%	- do -	No Leakage	Internal Inspection Report	3/2	2	1	

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QUALITY PLAN NO.: PE-QP-999-145-I033

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SECTION

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SHEET 2

OF 4

SI. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency <sup>§</sup>			Remarks
									P	W	V	
1.5	Switch	1. Make, type and rating 2. Contact Continuity	MA CR	Visual Electrical	100 % 100 %	BHEL/ Mtr Spec - do -	BHEL/ Mtr Spec - do -	Internal Inspection Report To have continuity	3/2 --- 3/2 ---		2/1 2/1	
2.0 2.1	Final Inspection Assembly	1. Marking, Range, Model, Tag No, SI No. 2. Correct assembly, workmanship and finish 3. Connection 4. Scale marking 5. Cleanliness 6. Overall dimensions	MA MA MA MA MA MA	Visual Visual Visual & measurement Visual Visual Visual	100% 100% 100% 100% 100% 100%	Approved drg. / data sheet / BHEL Spec. Manufacturer standard Approved drg. / data sheet / BHEL Spec. Approved drg. / data sheet / BHEL Spec. Approved drg. / data sheet / BHEL Spec. Manufacturer standard Approved drg. / data sheet / BHEL Spec.	Approved drg. / data sheet / BHEL Spec. Manufacturer standard Approved drg. / data sheet / BHEL Spec. Approved drg. / data sheet / BHEL Spec. Free from scratches ,dirt etc Approved drg. / data sheet / BHEL Spec.	Inspection Report Log book Inspection Report Inspection Report Log book Inspection Report	2 2 2 2 2 2	1 1 1 1 1 1	- -    -	

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									P	W	V	
2.2	Routine test	1. Overload	CR	Measurement	100%	Approved drg. / data sheet / BHEL Spec.	Approved drg. / data sheet / BHEL Spec.	TEST REPORT	2	1	1	
		2. Repeatability	CR	Measurement	100%	Approved drg. / data sheet / BHEL Spec.	Approved drg. / data sheet / BHEL Spec.	TEST REPORT	2	1	1	
		3. Set point adjustment	CR	Measurement	100%	Approved drg. / data sheet / BHEL Spec.	Approved drg. / data sheet / BHEL Spec.	TEST REPORT	2	1	1	
		4. Differential	CR	Measurement	100%	Approved drg. / data sheet / BHEL Spec.	Approved drg. / data sheet / BHEL Spec.	TEST REPORT	2	1	1	
		5. Contact rating	CR	Measurement	100%	Approved drg. / data sheet / BHEL Spec.	Approved drg. / data sheet / BHEL Spec.	Inspection report	2	-	1	
		6. Insulation resistance and HV	CR	Electrical	100%	Manufacturer standard	Approved drg. / data sheet / BHEL Spec.	TEST REPORT	2	1	1	
2.3	Type Test	Weather proofness	CR	Measurement	Sample/design	Approved drg. / data sheet / BHEL Spec.	IS:2147/NEMA-4	TEST REPORT	3/2		1	

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									P	W	V	
2.4	Packin g	Soundness of packing	MA	Visual	100 %	Approved drg. / data sheet / BHEL Spec.	Approved drg. / data sheet / BHEL Spec.	Log Book	3/2	2		

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