

- 1.03.04 Internal wiring should be terminated uniformly on one side of the terminal block leaving the other side available for termination of outgoing cables. Internal wiring shall be grouped so that all outgoing wiring to each particular remote location is terminated on adjacent terminal blocks. Interior wiring and jumperings shall be arranged so that external connections can be made from internal side of terminal blocks. Common connections shall be limited to two (2) wires per terminal.
- 1.03.05 Wiring shall be arranged to ensure free access to all instrument or devices for maintenance. No wire shall be routed across the face or rear of any device in a manner, which will impede the opening of covers or obstruct access to leads, terminals or devices
- 1.03.06 Wires shall be dressed and run in trays or troughs with clamp-on type covers. Wirings may be neatly bunched in groups by non-metallic cleats or bands. Each group shall be adequately supported along its run to prevent sagging or strain on termination.
- 1.03.07 Shield wires shall be terminated on separate terminal blocks. Common connections shall be limited to two wires per terminal. Signal circuit shields shall be grounded at the power supply end only or as recommended by manufacturer.
- 1.03.08 All low level signal cables shall be separately bundled to from control cable and maintained at 300 mm minimum spacing from control bundles.
- 1.03.09 Panel internal wiring shall follow distinct color-coding to segregate different voltage levels viz. 24V DC, 48V, 110V AC, 240V AC, 220V DC etc.
- 1.03.10 Thermocouple lead wires, analyzer measuring lead wires, or any other lead wires carrying measuring signal of the order of low milli volt or micro volt shall be electrically and physically isolated from other AC and DC wiring. Shielded wires used in such cases for panel internal wiring shall be continuous and ungrounded with the shield terminated individually and separately in panel terminal block.
- 1.03.11 Wiring to door mounted devices shall be provided with multi-strand wires of (49 strands minimum) adequate loop lengths of hinge-wire so that multiple door openings will not cause fatigue failure of the conductor.
- 1.03.12 Internal wiring in factory pre-wired electronic systems cabinets may be installed according to the Contractor's standard wire size, insulation, and method of termination on internal equipment. Insulation for all wiring, including circuit board wiring, back panel wiring, power supply wiring and interconnecting cables between devices shall pass the vertical flame test per IPCEAS-1981. Identification of conductors may be done by insulation color-coding identified on drawings or by printed wiring lists.

- 1.04.00 TERMINAL BLOCKS
- 1.04.01 All terminal blocks shall be rail mounted/ post mounted type, cage clamp type with high quality non-flammable insulating material of melamine suitable for working temperature of 105 Deg C. The terminal blocks in field mounted junction boxes, instrument enclosures racks etc. shall be suitable for cage clamp connections. The terminal blocks in Control Equipment Room termination/ marshalling cubicles shall be suitable for post mounted cage clamp connection at the field input end. The exact type of terminal blocks to be provided by Bidder shall be subject to Owner.
- 1.04.02 All terminal blocks shall be provided complete with all required accessories including assembly rail, locking pin and section, end brackets, small partitions, transparent covers, support brackets, distance sleeves, warning level, marking etc. For RTDs ring - tong type lugs shall be used at Junction Boxes.
- 1.04.03 The characteristics of the terminal blocks shall be as follows.
- i) High contact force, independent of conductor cross-section and large contact surface area.
 - ii) Integrated self-loosening protection to avoid shifting of contact surface that may allow contamination of connection point.
 - iii) Inspection and maintenance free (resistant to thermal aging and vibration)
 - iv) Low and constant voltage drop
- 1.04.04 The insulation of the terminal blocks shall be of suitable thermoplastic material.
- 1.04.05 The spacing between Terminal blocks channels in panels and cubicles shall be adequate for routing the cable troughs and to allow adequate free workspace for termination and removal of wires. The terminal blocks shall be arranged with atleast 100 mm clearance between two sets of terminal blocks and junction box walls.
- 1.04.06 Signals of different voltage levels shall be clearly segregated by providing separate rows to each type of signal and by using terminal blocks of different color for each type of signal and by providing barrier strips between them.
- 1.04.07 Terminal blocks shall be provided with white marking strips / self-adhesive marker cards and where permitted by the safety codes and standards, shall be without covers. Power terminals and high voltage (above 48 volts) terminals shall have protection covers. All terminals shall be provided with permanent terminal identification numbers on both sides.
- 1.04.08 At least 20% spare unused terminals shall be provided on each terminal block for circuit modifications and for termination of all conductors in a multi-conductor control cable.

- 1.04.09 The bottom of the terminal block shall be at least 200 mm above the cable gland for bottom entry type panels.
- 1.04.10 For extending 24 V DC supply to panels, the size of the terminals shall be decided based on voltage drop and not based on current.
- 1.04.11 Other requirements of the terminal blocks are as follows:
- i) The last terminal in a rail-mounted assembly shall be closed with an end plate and end bracket.
 - ii) For visual and electrical separation of terminal groups, partition plates shall be provided, which can be push fitted after forming an assembly.
 - iii) Design shall permit testing of incoming and outgoing signals by using suitable test plug and socket without disconnecting the cable connections.
 - iv) It shall be possible to use jumper plugs through the above test plug socket to connect adjacent terminals. Adequate number of short circuit jumper plugs shall be provided for the purpose.
 - v) Where more than one connection to a terminal block is required, two tier terminals shall be used.
- 1.05.00 **GROUNDING**
- 1.05.01 Separate Protective and Electronic system ground as required shall be provided.
- 1.05.02 All panels, desks, cabinets shall be provided with a continuous bare copper ground bus (Frame ground), bolted to the panel structure at bottom on both sides and effectively ground the entire structure. The bolts shall face inside of panels.
- 1.05.03 For electronic system cabinets the electronic system ground bus (Electronic ground) shall be similar but insulated from the cabinet and shall be separately connected to the system ground. The same ground may be used to earth the shield of shielded signal cables, otherwise a separate ground bus shall be provided for connecting the signal cable shields. Cable shields shall be grounded at the panel end only and shall never be left open. The electronic ground between panels of a shipping section shall be firmly looped.
- 2.00.00 **CONTROL DESKS & PANELS**
- 2.01.00 **GENERAL**
- 2.01.01 All control desk, panels etc. shall be furnished fully wired with necessary provision for convenience outlets, internal lighting, utility receptacles, grounding, ventilation, space heating, anti-vibration pads, internal piping &

- accessories as required for completeness of the system.
- 2.01.02 The design shall conform to the EN ISO 11064 (Ergonomical design of Control Room), Part 1, 2 and 3.
- 2.01.03 The exact dimensions, material, construction details, grounding, general arrangement etc. shall be as per actual requirement and shall be finalized during detail engineering and subjected to Owner's approval.
- 2.01.04 Incoming power supply feeders shall be duplicated. Alarm shall be provided for failure of a power supply feed.
- 2.01.05 For Control desk/ panel mounted instruments/ devices etc. which are to be powered from UPS, all required conversion of interface equipments/ accessories to make such devices compatible with UPS supply shall be provided. All necessary hardware like input switches/ fuse unit for each feeder as well as switch fuse unit for each instrument/ device on the power supply line shall be provided. From UPS redundant feeders shall be provided with suitably rated MCB and provision of fast auto changeover of UPS feeders.
- 2.01.06 Crating of the panels and desks shall be suitable for protection against shock, vibration, inappropriate handling and inclement weather conditions during transportation and warehousing. Mounted equipment shall have adequate protection against damage during handling, transit and storage. Suitable desiccant shall be used inside the packing case.
- 2.01.07 Nameplate
- a) Nameplate shall be provided for instrument or device mounted on the panel.
 - b) Nameplates for panels shall be provided both in front and rear.
- 2.02.00 CONTROL DESK
- 2.02.01 Control desk shall be free standing, floor mounting, table top type with doors at back and shall be constructed of 3 mm thick (minimum) CRCA steel or Aluminium extrusion. Aluminium structure shall be anodized or powder coated paint finish. The top surface of control desk shall be 30 mm (minimum) thick with the top 12 mm (minimum) of acrylic solid surface and the remaining 18 mm of laminated medium density fibre (MDF) board.
- 2.02.02 Monitors with retractable keyboard shall be provided on the desk. Desk shall be arranged in arc-like shape without any sharp edges. Edges shall be extruded PVC or rounded post-formed laminate.
- 2.02.03 Desks shall be of modular, scalable and industrially ruggedized design and shall have connections for PA system handsets & telephone sets.
- 2.02.04 Desks shall have concealed cable trays for wire dressing. Both Horizontal & Side Managers (2 separate horizontal cable routing wire baskets for power & data cables) shall be provided.

Each User station will be provided with 2 separate power distribution units (1 for Main line & 1 for UPS line). Each power distribution unit will have 6 points of 5/13 Amp sockets, Mains MCB On/Off Switch & Indicator.

Adequate heat management provision for Exhaust of heat from within the Console Desk Assembly shall be provided. There will be multiple fans provided in the Main Control Desk. Each Fan will be of 230 VAC 250 CFM Ball Bearing based. Ventilation louvers will be provided on both Front & Rear Modesty with special Air Filters. Adequate space for CPU & Other equipments placed with in the desk.

2.02.05 Design shall include Earthing bolts.

2.02.06 Back installed items shall be suitably concealed from front view.

2.02.07 All operator workstations for SG, TG, Auxiliaries & Off-site Plants shall be mounted on this Control Desk. The cabling / wiring between OWS & CPUs, power supply cables etc. shall be aesthetically routed and concealed from view.

2.02.08 HARDWIRED DEVICES ON CONTROL DESK (DRAW OUT SECTION)

Release and Lamp Test push buttons shall be provided for a set of push buttons (decided during detail engineering stage). Depending on the type of control/ function, required number of push buttons/ indicating LEDs & their color, push button stations shall be selected. The size of push button stations shall be 24 x 48 mm or 25 x 50 mm and shall have service inscription details at the front. Emergency push buttons (with cover) shall be mounted on top of Control Desk.

2.03.00 BACK UP PANEL

2.03.01 Construction shall be from CRCA steel of thickness not less than 3mm.

2.03.02 Upright back-up panel shall be provided where hardwired devices shall be mounted on a mosaic grid type console. The mosaic grid tiles shall be of 24 mm x 48 mm (or 25 mm x 50 mm) size, made of heat & flame retardant, self extinguishing and non-hygroscopic material with flat matt finish without glare and non reflecting type.

2.03.03 DDCMIS Back-up Panel (referred as Unit Control Panel-UCP) shall also mount annunciation fascia (minimum 500 nos.) and the flame monitoring cameras along with other hardwired devices as decided during detail engineering stage by Owner. Color coding shall also subject to Owner's approval.

2.03.04 Colored Mimic for different Off-site plant control systems (as enumerated elsewhere in this specification) and hardwired annunciation system shall also

be mounted on the back up panels.

2.04.00 PANELS/CABINETS

2.04.01 All DDCMIS system modules, power supply components and other Local Control panels (PLC/Relay based) shall be housed in cabinets as specified below.

2.04.02 The cabinet mounted equipments shall be fully assembled, installed in mounting racks, wired and fully tested as per specification requirements and Owner approved drawings prior to shipment to the project site.

2.04.03 The Bidder shall ensure that the cabinets are complete & ready for installation before dispatch from manufacturing works. The installation work at project site for these cabinets shall only involve connections through multi-pair cables from marshalling cabinets (wherever provided) to system cabinets and inter-cabinet/cabinet to Control Desk/ Back up Panel.

2.04.04 All electronic cards, network components, power supply modules etc. located shall be suitably housed in cabinets and shall be neatly arranged in sub-racks. Network components shall be visible in door closed condition (e.g. Glass doors etc.) as approved by Owner.

2.04.05 Bidder shall design the cabinet internal arrangement, floor cutout and cable gland plate such that all the cables entering or leaving the cabinet can be properly glanded in the gland plate.

2.04.06 The packaging density of panels shall be such that the temperature rise within the panels shall never exceed 10°C above ambient even under worst operating conditions. Cooling Fans shall be provided wherever required and this shall be of industrial grade.

2.04.07 TECHNICAL PARTICULARS

- | | | | |
|----|--------------------------|---|--|
| 1. | Material of Construction | : | Cold Rolled Coal Annealed (CRCA) steel sheet |
| 2. | Thickness of Sheet | : | a) 2.0 mm for faces supporting instruments / terminals |
| | | : | b) 1.6 mm for other sides and top |
| 3. | Construction | : | Welded throughout as per approved National Standards |
| 4. | Post welding operation | : | a) Grounding of all welds to smoothness |
| | | : | b) Rounding of corners |

- : c) Cleaning of weld spatters
- 5. Panel height : 2300 mm (approx)
- 6. Corners : 7 mm inner radius
- 7. Dimensional Tolerances :
 - a) In height & length - 3 mm
 - b) In height between adjacent sections - 2 mm
 - c) Total for a group - 6 mm
- 8. Doors : Double, recessed, turned back edges, full height front & rear
 - i) Thickness of Sheet : 2 mm
 - ii) Hinges : Stainless steel
 - iii) Door latches : Three point type
 - iv) Door gaskets : Neoprene rubber on fixed frame to result dust proof/weatherproof enclosure
 - v) Opening of the doors : Outward
 - vi) Louvers : With removable wire mesh to ensure dust and vermin proof
- 9. Gland plates : Removable in sections
4 mm thick (bottom)
- 10. Cable entry : Bottom
- 11. Hardware :
 - a) Anti vibration pad- 15 mm
 - b) Predrilled base channel ISMC – 100 or equivalent for all sides
 - c) Stainless steel buff- finished 2 mm thick kick plate for all sides
 - d) Stainless steel scratch strips along desk edges fixed with pan-head recessed screws
 - e) Rubber strips to ensure air

- tightness between kick plate and finished floor
- f) Lifting hook / Eye bolt
- g) Drawing pocket
- h) Door switch, lamps, thermostat, heaters and industrial grade cooling fans,, illumination fixtures
12. Name Plate : Both at front and back surface of the panel
13. Fixing of name plate : Stainless steel pan head screws
14. Name plate material : Laminated phenolic (3 layers)
15. Lettering : Black with white engraved
16. Mounting of terminal blocks : Vertical angle support bracket tack welded on sheet steel plate, screwed on internal wall of enclosure

2.05.00 FURNITURE

All the furnitures in the Central / Local control Room (s), Engineers' rooms, Instrument laboratory , SWAS Room & any other rooms with C&I equipments located in different plant buildings under Bidder's scope shall be included in Bidder's scope of supply. Bidder shall provide following industrial grade furniture items as a minimum from reputed manufacturers/suppliers meeting International Standards. The furniture shall be modular and latest with ease of operational features. The furniture shall be modern, aesthetically designed, modular, flexible, space saving and future safe.

2.05.01 WORK STATION FURNITURE

Modular work station furniture, suitable for mounting servers & historians, programmer stations, PC based systems, printers (A4/A3 color laserjet) etc. shall be provided.

2.05.02 PC RACK

PC Racks shall be provided to mount CPUs of workstations/PCs of OWS/LVS etc. in control room. For each PC / workstation / monitor at least one chair shall be included.

2.05.03 CHAIRS

Industry standard revolving chairs with wheels and with provision for adjustment of height (hydraulically/gas lift) shall be provided for the operators, unit-in-charge & other personnel in control room area. These shall be designed for sitting for long duration such that these are comfortable for the back.

2.05.04 TABLES

Industry standard computer tables shall be provided & shall be as approved by Owner during detailed Engineering. Glass top teak wood horse shoe shaped table with vertical file mounting arrangement (two layers to house approx. 40 Nos of files and lockable drawers at both ends) for Engineering Room shall be provided.

2.05.05 ALMIRAHs

Steel Almirahs shall be provided for keeping documents in the documentation room. Glass doors for each rack shall be provided such that the documents are visible from outside. Size of the rack shall be sufficient to easily fit technical manuals. The exact details shall be approved by Owner during detailed Engineering.

2.05.06 KEYPAD

One keypad per unit shall be provided for the storing of keys of relevant areas of the unit in the control room.

2.05.07 LOCKERS

Suitable lockers shall be provided in the room adjacent to the control room for storing of personal articles of control room personnel. Also, lockers of bigger size shall be provided in documentation Room for storing of personal documents. Details shall be finalized and approved by Employer during detailed engineering.

3.00.00 LVS PANEL

3.01.00 An arc shaped Large Video Screen (LVS) panel shall be supplied for mounting large video screens in number of tiers in various Control rooms as specified elsewhere in this specification.

Bidder shall provide and fix ACP cladding around the LVS screen including covering the LVS back side and LVS stand. The cladding will be from floor finish to 600 mm above LVS screen like a self-standing partition with necessary openings for system requirement. ACP paneling shall be with 304 grade & approx. 0.5 mm mirror finish SS strip.

3.02.00 The profile, dimensions and the general arrangement shall be finalized & approved by Owner during detailed engineering. Recommendations, if any, for the control room lighting in order to ensure continuous proper viewing of the LVS screen by the operator & shift incharge (without any fatigue) shall be

- clearly brought out by the Contractor in his offer, alongwith all relevant details/basis.
- 3.03.00 Any other requirement for proper LVS mounting & functioning & viewing shall also be specifically brought out by the Contractor in his offer, along with all relevant details.
- 4.00.00 **LOCAL INSTRUMENT RACK (LIR) & LOCAL INSTRUMENT ENCLOSURE (LIE)**
- 4.01.00 GENERAL
- 4.01.01 Devices (Transmitters/ Switches) located in the field shall be suitably grouped together to the extent possible and installed in the LIE (Closed Rack) and LIR (Open Rack) in Boiler/TG Building and Off-site plant areas.
- 4.01.02 Racks and enclosure shall be factory prefabricated & painted and shall complete with internal piping, tubing, manifold, isolation valves, blowdown valves, integral junction box, illumination etc.
- 4.01.03 No more than six instruments shall be grouped in a single rack / enclosure.
- 4.01.04 Racks shall be installed above the tapping points for air, flue gas and coal air mixture application whereas for applications such as for water and steam, racks to be installed below the source point.
- 4.01.05 Attention shall be paid in the layout to avoid air traps in liquid piping and water accumulation in air /gas piping.
- 4.01.06 Racks used for furnace, flue gas and air application shall be provided with intermittent & continuous air purging
- 4.01.07 Welding of impulse lines shall comply with the provisions of the latest applicable ANSI Code for Pressure Piping.
- 4.01.08 Earth stud shall be furnished at rack for safety grounding.
- 4.02.00 LOCAL INSTRUMENT ENCLOSURE (LIE)
- 4.02.01 Enclosure shall be free standing type. Racks shall be adequately reinforced to ensure true surfaces and to provide support. Major load - bearing posts shall be suitably supported by gusset plates or moment members.
- 4.02.02 Enclosure outer shall be constructed from at least 3 mm thick steel plate and epoxy painted to shade gray. Base frame shall be made of ISMC 100 and black colour finish.
- 4.02.03 2" NB galvanized pipes shall be laid horizontally and supported at two end channels to mount transmitters at accessible height. Center posts or any

- member, which would reduce access, shall be avoided.
- 4.02.04 Double leaf interlocking front opening doors with three point locking shall be provided and shall be arranged for maximum possible access to the interior. Key shall be of identical for all enclosures.
- 4.02.05 Doors shall have concealed quick removal type pinned stainless steel hinges and locking handles. Gaskets shall be used between all mating sections to achieve dust and weather proof enclosure rated for IP-65 including the internal junction box. All enclosures shall have access doors on front side.
- 4.02.06 Removable type bulkhead plates of thickness not less than 6 mm shall be mounted at the racks with suitable high temperature gasket. Impulse lines within the enclosures shall be properly clamped.
- 4.02.07 All internal wirings between the instruments and junction box shall run through flexible conduits. No exposed wirings within transmitter racks both open and closed type, is admissible.
- 4.02.08 Racks shall have a common blowdown drain header, which will connect individual instrument blowdown line after suitable pressure breaking through regulating globe type blowdown valves. Covered funnels shall be used for saturated liquid and steam service, whereas, open funnels may be used for cold liquid services. Header (2" NB ASTM A 106, Sch-80 Gr. C) shall be suitably sloped and shall have one end flanged and extending beyond the rack for connection to plant drain header..
- 4.02.09 Each rack shall be provided with one receptacle, light fixtures with wire guard and one lighting switch each at instrument & Junction box compartments with wire guard. Lighting switches may be door actuated & mounted inside the panel. Outlet box, switch box and device covers shall be of galvanized stamped steel. Light switches and receptacles shall be installed inside the enclosure on the wall near the latch side of the enclosure door. Light fixtures shall be installed on the ceilings of the enclosures.
- 4.02.10 Power supplies for miscellaneous devices shall be provided with MCB located within the enclosures. MCB shall be mounted in fuse blocks. Nameplates shall be furnished above the MCB blocks, identifying the devices being served.
- 4.02.11 Vibration dampeners shall be installed for supporting each enclosure. The loading at each corner of the enclosure shall be determined by actual test weighting when construction is complete to determine the correct length of each dampener for proper loading of the dampener in accordance with manufacturer's recommendations
- 4.03.00 LOCAL INSTRUMENT RACK (LIR)
- 4.03.01 Rack shall be free standing type constructed from 6 mm thick steel channel frame provided with a canopy to protect the instrument from dripping water or

falling objects and shall be epoxy painted. Canopy shall be of CRCA steel sheet of at least 3 mm thickness.

4.03.02 Rack Major load-bearing posts shall be suitably supported by gusset plates or moment members. Suitable fenders grill shall be welded to the end-posts of the rack to outline a boundary beyond which no mounted equipment shall project to protect instrument from accidental contact during personnel movement. Center posts or any member, which would reduce access, shall be avoided.

4.03.03 2" NB galvanized pipes laid horizontally and supported at two end channels shall be employed at working accessible height for mounting of instruments.

4.03.04 All internal wirings between the instruments and junction box shall run through flexible conduits. No exposed wirings are admissible.

4.03.05 Racks shall have a common blowdown drain header, which will connect individual instrument blowdown line after suitable pressure breaking through regulating globe type blowdown valves. Covered funnels shall be used for saturated liquid and steam service, whereas, open funnels may be used for cold liquid services. Header (2" NB ASTM A 106, Sch-80 Gr. C) shall be suitably sloped and shall have one end flanged and extending beyond the rack for connection to plant drain header..

Each rack shall be provided with one receptacle, one light fixture with wire guard and one lighting switch. Outlet box, switch box and device covers shall be galvanized stamped steel. Light fixtures shall be installed on the canopy of the rack

4.03.06 Power supplies for miscellaneous devices shall be provided with MCB located within the enclosures. MCB shall be mounted in fuse blocks. Nameplates shall be furnished above the MCB blocks, identifying the devices being served.

4.04.00 JUNCTION BOX

- | | | | |
|----|-------------------|---|--|
| 1. | Type of Enclosure | : | Dust tight & weatherproof conforming to IP 65 |
| 2. | Material | : | 3 mm sheet steel / fiberglass reinforced polyester(UV stabilized) |
| 3. | Type of Cover | : | Solid unhinged with retention chain / Screwed at all four corners |
| 4. | Paint | : | i) Exterior : Opaline green shade 275 of IS: 5
ii) Interior - Brilliant Glossy White. |

- Surface / Two (2) inch Pipe stanchion
5. Mounting : (At a dry compartment at one side of the enclosure / rack with front opening type door)
6. Cable Entry : 3 mm (min) Bottom / side Gland plate
7. Gasket : Neoprene
8. Grounding : Brass earth lug with green screw head
External-2 nos , Internal-1no. (M6)
9. Number of Drain Holes : Two at bottom capped
10. Identification : Label for JB and Tags for cable
11. Accessories : Rail mounted cage clamp type screwless terminals (suitable for conductor size up to 2.5sq.mm of suitable voltage grade) with markers and 20% spare terminals
- b) Cable gland (Brass) & raceways
- c) Ferrules & lugs (Brass)
- d) Aluminum back panel
- e) Canopy at top
- f) Mounting brackets
- g) bolts and nuts made of brass etc.

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			VOLUME	
			SECTION	
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			SHEET 1	OF 3
TAG No. Qty.....			Data Sheet No.: PES-145A-DS1-0	
Data Sheet A & B				
DATA SHEET-A FOR LOCAL PANEL (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL	MANUFACTURER			
	CONSTRUCTION		☒ FOLDED ☐ WELDED	
	ENCLOSURE SHEET THICKNESS (As per Section 8.13, Volume V of contract specification)	FRONT	☐ 2.0 mm	
		OTHER	☐ 2.0 mm	
		DOOR	☐ 1.6 mm	
		HEIGHT	☐ 2365 mm for stand alone panels. ☐ Other	
OTHER		☐ Load bearing sheet front shall have 3mm thickness		
TECHNICAL	INPUT POWER SUPPLY * (As per Electrical specification) (ANY OTHER POWER REQUIREMENT TO BE DERIVED FROM THIS SUPPLY ONLY)		☐ 240V 50 Hz AC ☐ 220V DC ☒ 415V 3 PHASE 3W ☐ 400V 3 PHASE 4W	
	NO. OF FEEDERS (As per Electrical specification)		☐ ONE ☐ TWO	
	STARTER WITH MCC		☐ REQUIRED ☒ NOT REQUIRED	
	IPR POSITION		☒ MCC ☐ RELAY PANEL	
	CONTACT RATING OF RELAY		☒ 5 Amp, 230 V AC ☒ 0.25 Amp, 220V DC	
	CONTROL SUPPLY		☐ 110V AC ☐ 220V AC ☐ 220V DC ☐ Other. (As per requirement)	
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)		_____ NOS. (AS REQUIRED)	
	TEMP SCANNER (IF REQUIRED –NO. OF CHANNELS TO BE SPECIFIED UNDER SEC-C)		☐ REQUIRED ☒ NOT REQUIRED	
	PAINT TYPE (As per Annex-1, Section 7.6, Volume IV of contract specification)		☐ EPOXY ENAMEL ☐ EPOXY POWDER COATED	
	MIMIC (TYPE OF MIMIC- MATERIAL, THICKNESS TO BE SPECIFIED DURING DETAILED ENGG.)		☒ REQUIRED ☐ NOT REQUIRED	
	PANEL COLOUR (EXTERNAL) (As per Annex-1, Section 7.6, Volume IV of contract specification)		☐ LIGHT GREY ☐ OPALINE GREEN	
	FINISH (EXTERNAL) (As per Annex-1, Section 7.6, Volume IV of contract specification)		☐ MATT ☐ GLOSSY ☐ SEMI GLOSSY	
	PANEL COLOUR (INTERNAL) (As per Annex-1, Section 7.6, Volume IV of contract specification)		☐ WHITE ☐ CREAM ☐ OFF WHITE	
	FINISH (INTERNAL) (As per Annex-1, Section 7.6, Volume IV of contract specification)		☐ MATT ☐ GLOSSY ☐ SEMI GLOSSY	
	CLASS OF PROTECTION		☒ IP-55 (FOR INDOOR SERVICE) ☒ IP-67 (FOR OUTDOOR SERVICE) ☐ ANY OTHER	
	CONTROL HARDWARE		☒ RELAY BASED	
	FOUNDATION ARRANGEMENT		☐ FOUNDATION BOLTS ☐ ANCHOR FASTENERS	
	WEIGHT OF PANEL (Kg.)		(Vendor to specify)	

	DATA SHEET FOR LOCAL PANELS			SPECIFICATION NO.: PE-SS-999-145-054A	
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Data Sheet A & B					
DATA SHEET-A FOR LOCAL PANEL (TO BE FILLED BY PURCHASER)				DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
	PANEL TYPE		☐ PRESSURISED ☐ UNPRESSURISED As per Requirement		
	CABLE GLAND		☒ DOUBLE COMPRESSION		
	AMMETER (TYPE OF INPUT) *		☐ 1 Amp CT ☐ 4-20 mA		
	SCOPE OF SUPERVISION FOR ERECTION & COMMISSIONING		☐ APPLICABLE ☒ NA		
	* TO BE CO-ORDINATED WITH PEM ELECTRICAL				
NAME DESIGNATION SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL NAME: SIGNATURE: DATE:	
	AANCHAL CHOUDHARY	SACHIN SRIVASTAVA	MA MANSOORI		
	SR.ENGR	DY.MNGR	D. GM		
	16.09.2013	16.09.2013	16.09.2013		



DATA SHEET FOR LOCAL PANELS

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Data Sheet C

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

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

	DATA SHEET FOR LOCAL PANELS			SPECIFICATION NO.: PE-SS-999-145-054A	
				VOLUME	
				SECTION	
				REV. NO. 02	DATE: 16.09.2013
			SHEET 3 OF 3		
TAG No. Qty.....			Data Sheet No.: PES-145A-DS1-0		
Data Sheet C					
DATA SHEET-C FOR LOCAL PANEL (TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)					
	PANEL TYPE				
	CABLE GLAND				
	AMMETER (TYPE OF INPUT)				
	SCOPE OF SUPERVISION				
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY		COMPANY SEAL NAME: SIGNATURE: DATE:
	AANCHAL CHOUDHARY	SACHIN SRIVASTYAVA	MA MANSOORI		
	16.09.2013	16.09.2013	16.09.2013		



Technical specification for
CONTROL & INSTRUMENTATION

4 X 270 MW BHADRADRI TPS

SPEC NO.: **PE-TS-411-145-I**

VOLUME

SECTION

REV. NO.

00

DATE : 19.03.2015

SHEET

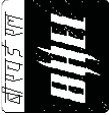
OF

LCP Quality Plan

 PEM :: C&I		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	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
1.0	INCOMING Sheet Steel (CRCA & HR)	1. Chemical Composition	MA	Chemical analysis	Sample	Relevant standard	Relevant standard	Test Certificate	3	---	2	
		2. Bend Test	CR	Mech. test	Sample	Relevant standard	Relevant standard	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	Relevant standard	Relevant standard	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%	Relevant standard	Relevant standard	Log Book	2	---	---	1
3.0	Cables / Wires	1. Visual / Surface defects	MA	Visual	100%	BHEL Spec. and Relevant standard	BHEL Spec. and Relevant standard	Log Book	2	---	---	
		2. IR and HV	MA	Electrical	100%	BHEL Spec. and Relevant standard	BHEL Spec. and Relevant standard	Log Book	2	---	---	
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics \$ P W V 1 - BHEL 2 - Vendor 3 - Sub-vendor												

 PEM :: C&I		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 ^s			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 Relevant standard	BHEL Spec. and Relevant standard	Log Book	2	---	---	---				
		4. Type / Routine Test Certificates	MA	Verification	100%	BHEL Spec. and Relevant standard	BHEL Spec. and Relevant standard	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 standard	Relevant standard	Log Book	2	---	---	---				
		3. Operation / Functional check	CR	Electrical	Sample+ 100% @	Relevant standard & Catalogue	Relevant standard & Catalogue	Log Book	2	---	---	---	+ for relay & contactors only @ for all components except relays & contactors.			
		4. I.R.	MA	Electrical	100%	Relevant standard & Catalogue	Relevant standard & Catalogue	Log Book	2	---	---	---				
		5. H.V.	MA	Electrical	100%	Relevant standard & Catalogue	Relevant standard & Catalogue	Log Book	2	---	---	---				
		6. Calibration	MA	Electrical	100%	Relevant standard & Catalogue	Relevant standard & Catalogue	Log Book	2	---	---	1				
		7. Pick up / Drop off Voltage	MA	Electrical	100%	Relevant standard & Catalogue	Relevant standard & 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	

 PEM :: C&I		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				
5.0	Misc. Components like Gaskets, Terminal Blocks etc.	1. Verification of Type / Make	MA	Visual	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---					
		2. Surface defects	MA	Visual	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---					
		3. IR / HV on Terminal Blocks	MA	Electrical	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---					
6.0	IN PROCESS Blanking / Bending / Forming	1. Dimensions	MI	Measurement	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---					
		2. Surface defects after bending	MA	Visual	100%	Factory Standard	Factory Standard	Log Book	2	---	---					
7.0	Nibbling / Punching	1. Cutout Sizes	MI	Measurement	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---					
		2. Deburring	MA	Visual	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---					
8.0	ASSEMBLY Frame Assembly & Sheet fixing	1. Dimensions	MA	Measurement	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2					
		2. Alignment	MA	Measurement	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2					
		3. Welding Quality	MA	Visual	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2					
		4. Surface defects	MA	Visual	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	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																

 PEM :: C&I		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL										STD QUALITY PLAN NO.: PE-QP-999-145-1056				
												VOLUME		IIB		
												SECTION		D		
												REV. NO.		DATE: 22-02-2008		
												SHEET		4		OF
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					
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 MA MA MA MA MA	Visual Measurement Measurement Visual Visual, Thickness Visual Visual, Thickness Visual Visual, Thickness, Scratch test Colour adhesion	100% Periodic 100% 100% 100% 100% 100%	Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard	Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard Factory Standard & Relevant standard	Log Book Log Book Log Book Log Book Log Book Log Book Log Book Log Book	2 2 2 2 2 2 2 2	--- --- --- --- --- --- --- ---	1 1 1 1 1 1 1 1					
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics																
P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.																
1 - BHEL 2 - Vendor 3 - Sub-vendor																

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

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

1 - BHEL
 2 - Vendor
 3 - Sub-vendor

STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL										STD QUALITY PLAN NO.: PE-QP-999-145-1056					
										VOLUME		IIB			
										SECTION		D			
										REV. NO.		01		DATE: 22-02-2008	
										SHEET		5		OF 7	
Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks			
									P	W	V				
10.	Panel Wiring	1. Wiring Layout 2. Wiring Termination (Crimped Lugs) 3. Ferrule numbers 4. Colour of wiring 5. Size of Conductor	MA MA MA MA MA	Visual Visual Visual Visual Measurement	100% 100% 100% 100% 100%	Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs.	Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs. Approved drgs. & Specs.	Log Book Log Book Log Book Log Book Log Book	2 2 2 2 2	--- --- --- --- ---	--- --- --- 1 1				
11.	Component Mounting	1. Correct components 2. Fixing	MA MA	Visual Visual	100% 100%	Approved drgs., Specs. & BOM Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM Approved drgs., Specs. & BOM	Log Book Log Book	2 2	--- ---	--- ---	--- ---			
12.	FINAL Final Inspection	1. Workmanship 2. Component layout (neatness, accessibility & safety) Mounting / Proper fixing of all components 3. Components identification Marking / Name plates	MA MA MA	Visual Visual Visual	100% 100% 100%	Factory Standard BHEL approved drg. / Spec. BHEL approved drg. / Spec.	Factory Standard BHEL approved drg. / Spec. BHEL approved drg. / Spec.	Inspection Report Inspection Report Inspection Report	2 2 2	1 1 1	1 1 1	1 1 1	At Random by BHEL, based on 100 % internal test reports by Mfr.		
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics															
P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.															
1 - BHEL 2 - Vendor 3 - Sub-vendor															

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

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

1 - BHEL
 2 - Vendor
 3 - Sub-vendor

 PEM :: C&I		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL										STD QUALITY PLAN NO.: PE-QP-999-145-I056				
												VOLUME IIB				
												SECTION D				
												REV. NO. 01 DATE: 22-02-2008				
												SHEET 6				
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. Dimensions	MA	Measurement	100%	BHEL approved drg. / Spec., BOM	BHEL approved drg. / Spec., BOM	Inspection Report	2	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.	Inspection Report	2	1	1					
		7. Paint Shade	CR	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1					
		8. Paint Thickness	CR	Measurement	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1					
		9. Workmanship of Gaskets	MA	Visual	100%	Factory Standard	Factory Standard	Inspection Report	2	1	1					
		10. Wiring Layout	MA	Visual	100%	BHEL approved drg.	BHEL approved drg.	Inspection Report	2	1	1					
		11. Wire Termination	MA	Pulling manually	Sample	-----	Firm termination	Inspection Report	2	1	1					
		12. Continuity	MA	Electrical	100%	-----	Continuity OK	Inspection Report	2	1	1					

LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics		\$	P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.	1 - BHEL 2 - Vendor 3 - Sub-vendor
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 PEM :: C&I		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 7 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					
13.	TYPE TEST	Degree of Protection	CR	Mech. Protection	Sample	BHEL approved spec., drg relevant IEC-60947, IEC-60079	BHEL approved spec., drg relevant IEC-60947, IEC-60079	Type Test Certificate	3	---	1					
14	ROUTINE TEST	IR before & after HV Test	CR	Electrical	100%	BHEL approved spec., drg., BOM & relevant standard	BHEL approved spec., drg., BOM & relevant standard	Test Report	2	1	1					
15	FUNCTIONAL TEST	1. Control Logic Operation	CR	Electrical	100%	BHEL approved spec. / drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1					
		2. Instrument Calibration	CR	Electrical	10%	BHEL approved spec. / drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1					
		3. Temperature rise	CR	Electrical	100%	BHEL approved spec/drg. & relevant standard	BHEL approved spec/drg & relevant standard	Inspection Report	2	1	1					

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



Technical specification for
CONTROL & INSTRUMENTATION

4 X 270 MW BHADRADRI TPS

SPEC NO.: **PE-TS-411-145-I**

VOLUME

SECTION

REV. NO.

00

DATE : 19.03.2015

SHEET

OF

PC SPECIFICATION

	Technical specification for Computer For 4X270 MW BHADRADRI TPS	SPEC NO.: PE-TS-411-145-I	
		VOLUME	
		SECTION	
		REV. NO. 00	DATE : 19.03.2015
		SHEET 1 OF 2	

SPECIFICATION FOR PC

a. CPU

1. Processor : Intel core i5 or better, 32 bit
2. RAM : 4 GB min. and expandable to 16 GB
3. Hard Drive : 500 GB or more
4. Removable bulk storage : DVD (R/RW)
5. Graphic accelerator : 8MB (minm.)
6. Graphic Memory : dedicated 1GB or better
7. Operating System : Windows 7 or better
8. Audio controller : 16 bit
9. Communication Port : 2 serial, one parallel, 8 USB, Dual 100Mbps Ethernet
10. Expansion Slot : 3
11. Cache : 512 KB Level 2
12. Video Card : PCI

b. MONITOR

1. Type : LCD COLOUR MONITOR
2. Screen Diagonal : 24" (approx.) flat
3. Display : XGA or better
4. Resolution : 1024 by 768 or better
5. Degree of Protection : IP-30
6. External Controls : Brightness, contrast, Horizontal/Vertical, amplification & Shift
7. Version : To suit Industrial application

	Technical specification for Computer For 4X270 MW BHADRADRI TPS	SPEC NO.: PE-TS-411-145-I	
		VOLUME	
		SECTION	
		REV. NO. 00	DATE : 19.03.2015
		SHEET 2 OF 2	

c. KEY BOARD & MOUSE

1. Type : Flat spill proof membrane or positive depression type ASCII
2. Life Expectancy : 50 million cycles per key
3. Version : To suit Industrial application
4. Mouse : Optical mouse

d. SOFTWARE

Diagnostic Software, Anti Virus, Microsoft office, Acrobat Adobe Software and other application software.



Technical specification for
CONTROL & INSTRUMENTATION

4 X 270 MW BHADRADRI TPS

SPEC NO.: **PE-TS-411-145-I**

VOLUME

SECTION

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00

DATE : 19.03.2015

SHEET

OF

FURNITURE SPECIFICATION

	Technical specification for FURNITURE For 4X270 MW BHADRADRI TPS	SPEC NO.: PE-TS-411-145-I	
		VOLUME	
		SECTION	
		REV. NO. 00	DATE : 19.03.2015
		SHEET	OF

SPECIFICATION FOR FURNITURE

- a) 4 Nos. cushioned revolving, independently adjustable seat and back chairs.
- b) Glass top Teak wood / MDF table for mounting Operator Station monitors.
- c) Printer tables.
- d) Glass top Teak wood / MDT table for System Engineering Room / Engineering stations with drawer at end.
- e) Glass top teak wood / MDF table with vertical file mounting arrangement (two layer to house approx. 40 Nos of files and lockable drawers at both end) for System Engineering Room / Engineers.



Technical specification for
CONTROL & INSTRUMENTATION

4 X 270 MW BHADRADRI TPS

SPEC NO.: **PE-TS-411-145-I**

VOLUME

SECTION

REV. NO.

00

DATE : 19.03.2015

SHEET

OF

CABLE BOQ

CABLE BOQ FOR 4 X 270 MW BHADRADRI TPS PROJECT JOB NO. 411 (PER UNIT)		
Sl no.	Cable Type	Qty (in Km)
	G-TYPE	
1	2P X 0.5 sqmm	40
2	4P X 0.5 sqmm	40
3	8P X 0.5 sqmm	90
4	12P X 0.5 sqmm	5
	F-TYPE	
1	4P X 0.5 sqmm	60
2	8P X 0.5 sqmm	30
3	12P X 0.5 sqmm	15
4	24P X 0.5 sqmm	10
	CONTROL CABLE	
1	3C X 2.5 sqmm	20
2	5C X 2.5 sqmm	8
3	12C X 1.5 sqmm	7

NOTE:

The referred table of Cable BOQ is given for information of applicable cable types for this project.

	Technical specification for CONTROL & INSTRUMENTATION 4 X 270 MW BHADRADRI TPS	SPEC NO.: PE-TS-411-145-I	
		VOLUME	
		SECTION	
		REV. NO. 00	DATE : 19.03.2015
		SHEET	OF

KKS PHILOSOPHY



DOCUMENT TITLE

KKS NUMBERING PHILOSOPHY

4X 270 MW BHADRADRI TPS

KKS NUMBERING PHILOSOPHY

For identifying (tagging) an instrument / equipment in Power plant KKS numbering scheme is used. The purpose is to assign a unique number to every equipment in the power plant. For C&I equipment unique number are to be provided up to the signal level so that a unique number Input / Output exist in DCS for every signal.

Normally KKS number is a 10 digit alpha-numeric code and is typically split into the following:

X	X	X	A A Y			Y B B	B		
---	---	---	-------	--	--	-------	---	--	--

First three digits indicate the Sub-System. The Code for the major system are given as per **Annexure-1**.

Fourth and Fifth digits are the **Numerical Keys at System Code Level** and used to distinguish between main systems having same Alpha Codes.

Sixth and Seventh digits are the **Equipment / Apparatus / Measuring Circuit Code**. The code of various Equipment / Apparatus / Measuring Circuit is shown in **Annexure-2**

Eight, Nine and tenth digits are the **Numerical Keys at Equipment / Apparatus / Measuring Circuit Code** and used to distinguish between various instruments in the same sub-group. Numerical keys at System / Equipment / Apparatus / Measuring Circuit is shown in **Annexure-3**.

	DOCUMENT TITLE KKS NUMBERING PHILOSOPHY 4X 270 MW BHADRADRI TPS																																												
ANNEXURE-1 List of System / Sub-System Codes used in Power Plant: 1) Compressed air system : QEA, QEC 2) Ventilation System : SAA TO SAZ 3) Fire Detection & Protection System + Fire Water pumps : SGM, SGN, SGO, SGP 4) Sewage Treatment : SJA TO SJZ 5) Pre-treatment Plant : GBI, GBM, GBV 6) RO DM Plant : GCI, GCM, GBV ANNEXURE-2 Standard Equipment Codes: <table> <tr><td>AA</td><td>Valves including drives, also hand operated</td></tr> <tr><td>AB</td><td>Seclusions, Lock, Gates, Doors</td></tr> <tr><td>AC</td><td>Heat Exchanger</td></tr> <tr><td>AE</td><td>Turning, Driving, Lifting equipment</td></tr> <tr><td>AF</td><td>Continuous conveyors, Feeders</td></tr> <tr><td>AG</td><td>Generator Units</td></tr> <tr><td>AH</td><td>Heating and Cooling Units</td></tr> <tr><td>AK</td><td>Pressing and Packaging equipment</td></tr> <tr><td>AM</td><td>Mixer, Stirrer</td></tr> <tr><td>AN</td><td>Blower, Air Pumps / Fans, Compressor Units</td></tr> <tr><td>AP</td><td>Pump Units</td></tr> <tr><td>AT</td><td>Purification, Drying, Filter</td></tr> <tr><td>AV</td><td>Combustion Equipment e.g. grates</td></tr> </table> Standard Apparatus Codes: <table> <tr><td>BB</td><td>Vessels and Tank</td></tr> <tr><td>BF</td><td>Foundation</td></tr> <tr><td>BG</td><td>Boiler Heating Surfaces</td></tr> <tr><td>BN</td><td>Injector, Ejector</td></tr> <tr><td>BP</td><td>Flow and throughput limitation equipment (Orifice)</td></tr> <tr><td>BQ</td><td>Holders, Carrying Equipment, Support</td></tr> <tr><td>BR</td><td>Piping, Ducts, Chutes, Compensator</td></tr> <tr><td>BS</td><td>Sound Absorber</td></tr> <tr><td>BU</td><td>Insulations, Sheatings</td></tr> </table>		AA	Valves including drives, also hand operated	AB	Seclusions, Lock, Gates, Doors	AC	Heat Exchanger	AE	Turning, Driving, Lifting equipment	AF	Continuous conveyors, Feeders	AG	Generator Units	AH	Heating and Cooling Units	AK	Pressing and Packaging equipment	AM	Mixer, Stirrer	AN	Blower, Air Pumps / Fans, Compressor Units	AP	Pump Units	AT	Purification, Drying, Filter	AV	Combustion Equipment e.g. grates	BB	Vessels and Tank	BF	Foundation	BG	Boiler Heating Surfaces	BN	Injector, Ejector	BP	Flow and throughput limitation equipment (Orifice)	BQ	Holders, Carrying Equipment, Support	BR	Piping, Ducts, Chutes, Compensator	BS	Sound Absorber	BU	Insulations, Sheatings
AA	Valves including drives, also hand operated																																												
AB	Seclusions, Lock, Gates, Doors																																												
AC	Heat Exchanger																																												
AE	Turning, Driving, Lifting equipment																																												
AF	Continuous conveyors, Feeders																																												
AG	Generator Units																																												
AH	Heating and Cooling Units																																												
AK	Pressing and Packaging equipment																																												
AM	Mixer, Stirrer																																												
AN	Blower, Air Pumps / Fans, Compressor Units																																												
AP	Pump Units																																												
AT	Purification, Drying, Filter																																												
AV	Combustion Equipment e.g. grates																																												
BB	Vessels and Tank																																												
BF	Foundation																																												
BG	Boiler Heating Surfaces																																												
BN	Injector, Ejector																																												
BP	Flow and throughput limitation equipment (Orifice)																																												
BQ	Holders, Carrying Equipment, Support																																												
BR	Piping, Ducts, Chutes, Compensator																																												
BS	Sound Absorber																																												
BU	Insulations, Sheatings																																												



DOCUMENT TITLE

KKS NUMBERING PHILOSOPHY

4X 270 MW BHADRADRI TPS

Standard Measuring Circuits Codes:

CD	Density
CE	Electrical Quantities
CF	Flow, throughput
CG	Distance, Length, Position
CK	Time
CL	Level
CM	Humidity
CQ	Analysis (SWAS)
CS	Speed, Velocity, Frequency
CT	Temperature
CY	Vibration, Expansion

ANNEXURE-3**Numerical Keys****A) Numerical Keys at System Code Level**

- i) Use 10, 20, 30, To distinguish between main systems having same Alpha Codes. Examples:
 - a) Main Steam (Left) and Main Steam (Right)
 - b) BFP – A/B/C
 - c) ID Fan – A/B, FD Fan A/B, AH – A/B
- ii) For branch off from main system path having code say 10, keep the same alpha code and use 11, 12, 13 etc. Similarly for other branch off from main system path having code say 20, keep the same alpha code and use 21, 22, 23 etc and shall carry on further in the same way.
- iii) If the branch off from main system / sub system path is used for some other system, where different alpha codes can be applied, then in that case the said branch line will be designated by the alpha codes of the system to which it is providing the input.

B) Numerical keys at Equipment Code level:

There are three numerical keys available for each type of equipment code. Following has been agreed upon considering present practice, better flexibility and ease in sorting.

- i) Valves and Dampers --- *Equipment Code – AA*

N1N2 N3

DOCUMENT TITLE			
	KKS NUMBERING PHILOSOPHY		
	4X 270 MW BHADRADRI TPS		
Motorised (<i>on/off duty</i>)	-	0	01 to 50
Motorised (<i>inching duty</i>)	-	0	51 to 99
Pneumatic (Control)	-	1	01 to 50
Motorised (<i>thyrestor Control</i>)	-	1	51 to 99
Sol. Operated	-	2	01 to 99
(Open / Close duty (Valves, NRVs, Gate)			
Hydraulic	-	3	01 to 99
NRV (Without actuation)	-	4	01 to 99
Manual	-	5	01 to 99
Manual	-	6	01 to 99
Relief & Safety Valves	-	7	01 to 99
Reserve	-	8	01 to 99
Reserve	-	9	01 to 99
ii) Field Instruments			
Field Transmitters & Analog Signals	-	0	01 to 99
Field Switches & Binary Signals	-	1	00 to 99
PG Test Point	-	4	00 to 99
Gauges	-	5	00 to 99
Automatic Turbine Tester (ATT)-HWR	-	2	00 to 99
(Reserved for protection Signals used by Hardwar)			
Example of Numerical Key Usage:			
In line with the philosophy adopted for Valves / Dampers /instruments etc. pumps and fans in the main systems (having different system code) can be numbered as AP/N100 and as AP/N101, 102, Where system code is same.			



Technical specification for
CONTROL & INSTRUMENTATION

4 X 270 MW BHADRADRI TPS

SPEC NO.: **PE-TS-411-145-I**

VOLUME

SECTION

REV. NO.

00

DATE : 19.03.2015

SHEET

OF

LIST OF DELIVERABLES

LIST OF DELIVERABLES OF PEM - C&I DEPARTMENT FOR MAUX PACKAGES							
4 X 270MW BHADRADRI TPS							
DOCUMENT NUMBER PE-GL-411-145-I100							
SI.No.	DRAWING NO.	DRAWING/DOCUMENT TITLE	CATEGORY	CUSTOMER	FROM	USER	REMARKS
INSTRUMENTATION							
1	PE-V9-411-XXX-I901	INSTRUMENT DATA SHEETS	A	-	VENDOR	C&I	
2	PE-V9-411-XXX-I902	INSTRUMENT SCHEDULE	I	-	VENDOR	C&I	
3	PE-V9-411-XXX-I903	INSTRUMENT INSTALLATION/ HOOK UP DIAGRAMS	A	-	VENDOR	C&I	
4	PE-V9-411-XXX-I904	FIELD JB TERMINATIONS /GROUPING DOCUMENT	I	-	VENDOR	C&I	
5	PE-V9-411-XXX-I905	QUALITY PLANS (CV,FE, Tx and Analyser)	A	-	VENDOR	C&I	
PLC PANEL							
1	PE-V9-411-XXX-I906	PLC CONFIGURATION DRAWING	A	A	VENDOR	C&I	
2	PE-V9-411-XXX-I907	PLC PANEL GA (INTERNAL & EXTERNAL) DRAWING	A	-	VENDOR	C&I	
3	PE-V9-411-XXX-I908	CONTROL SCHEMES (BLOCK LOGIC)	A	-	VENDOR	C&I	
4	PE-V9-411-XXX-I909	PLC INPUT / OUTPUT SIGNAL LIST	I	-	VENDOR	C&I	
5	PE-V9-411-XXX-I910	UPS BATTERY CHARGER/ BATTERY DATASHEET & SLD	I	\$\$	VENDOR	C&I	
6	PE-V9-411-XXX-I911	UPS SIZING CALCULATIONS	I	-	VENDOR	C&I	
7	PE-V9-411-XXX-I912	BATTERY SIZING CALCULATIONS	I	-	VENDOR	C&I	
8	PE-V9-411-XXX-I913	CONTROL DESK LAYOUT / GA DRAWING	A	-	VENDOR	C&I	
9	PE-V9-411-XXX-I914	PLC-OWS/PRINTER FURNITURE BOM	A	-	VENDOR	C&I	
10	PE-V9-411-XXX-I915	PLC CONTROL ROOM LAYOUT DRAWING	A	-	VENDOR	C&I	
11	PE-V9-411-XXX-I916	PLC CATALOGUE	I	-	VENDOR	C&I	
12	PE-V9-411-XXX-I917	PLC QUALITY PLAN & FAT PROCEDURE	A	-	VENDOR	C&I	
13	PE-V9-411-XXX-I918	LIST OF SIGNAL EXCHANGE WITH DDCMIS (BOTH HARDWIRED & SERIAL INTERFACE IN BHEL FORMAT)	A	`	VENDOR	C&I	
14	PE-V9-411-XXX-I919	PROCESS GRAPHIC MANUSCRIPTS PLC	I	-	VENDOR	C&I	
15	PE-V9-411-XXX-I920	PROCESS GRAPHIC MANUSCRIPTS FOR DDCMIS	I	-	VENDOR	C&I	
16	PE-V9-411-XXX-I921	CABLE SCHEDULE (IN BHEL EXCEL FORMAT) & CABLE INTERCONNECTION DETAILS	I	-	VENDOR	C&I	
17	PE-V9-411-XXX-I923	PANEL & ELECTRONIC EARTHING REQUIREMENT	I	-	VENDOR	C&I	
18	PE-V9-411-XXX-I924	PANEL HEAT DISSIPATION DATA	I	-	VENDOR	C&I	
19	PE-V9-411-XXX-I925	MANDATORY SPARES BILL OF MATERIAL	A	A	VENDOR	C&I	
20	PE-V9-411-XXX-I926	PLC O & M MANUAL	I	-	VENDOR	C&I	
21	PE-V9-411-XXX-I927	PLC EARTHING SCHEME	I	-	VENDOR	C&I	
	Notes:	411 - Project No					
		XXX -SI No of MAX Package					
		\$\$ -Approval by BHEL if Vendor BBU Item Approval by Customer if Customer BBU Item					



TITLE: 4 X 270 MW BHADRADRI TPS	SPECIFICATION NO. PE-TS-411-673-A001	
	TECHNICAL SPECIFICATION FOR SEWAGE TREATMENT PLANT	REV. NO. 00 DATE : 29/05/2017

SECTION – III



TITLE: 4 X 270 MW BHADRADRI TPS	SPECIFICATION NO. PE-TS-411-673-A001	
	TECHNICAL SPECIFICATION FOR SEWAGE TREATMENT PLANT	REV. NO. 00 DATE : 29/05/2017

LIST OF DOCUMENTS TO BE SUBMITTED ALONG WITH BID

- Technical pre-bid clarification if any strictly in the enclosed Schedule of pre bid clarifications only with mention of specification clause for which clarification is being asked. (Stamped & Signed).
- Technical Deviation if any strictly in the enclosed Schedule of deviation with cost of withdrawal only with mention of specification clause for which deviation is being asked. (Stamped & Signed).
- Compliance cum confirmation certificate (Stamped & Signed).
- Un Price Schedule duly filled in (Stamped & Signed).
- Schedule of Declaration (Stamped & Signed).
- No deviation certificate in 'Schedule of deviation with cost of withdrawal' format stating "No Deviation" to technical specification.

NOTE: Any other documents submitted by bidder except as asked above shall not be evaluated & considered as null & void.

**TITLE:****4 X 270 MW BHADRADRI TPS**

SPECIFICATION NO. PE-TS-411-673-A001

**TECHNICAL SPECIFICATION FOR
SEWAGE TREATMENT PLANT**

REV. NO. 00

DATE : 29/05/2017

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnishing same with the offer:

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions/ deviations with regard to same.
2. QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification & QP enclosed therein.
3. QP will be subject to BHEL/Customer approval in the event of order & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. The charges for 3rd party inspection (Lloyds, TUV or equivalent) for imported components shall be included in the base price of the equipment by the bidder.
4. All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/Customer review/ approval. GA drawings, as submitted with offer at tender stage are for reference purpose only and shall be subject to approval during contract stage.
5. There are no other deviations with respect to specification other than those furnished in the 'Schedule of Deviations'.
6. The offered materials shall be either equivalent or superior to those specified. Also for components where material is not specified it shall be suitable for intended duty, materials shall be subject to approval in the event of order.
7. The commissioning spares (if any) are supplied on 'As Required Basis' & prices for same included in the base price (If bidders reply to this is "No commissioning spares are required" and if some spares are actually required during commissioning same shall be supplied by bidder without any cost to BHEL).
8. All sub vendors shall be subject to BHEL/CUSTOMER approval.
9. Any special tools & tackles, if required, shall be in bidder's scope.
10. Performance guarantee test parameters shall stand valid till the satisfactory completion of Performance guarantee test and its acceptance by BHEL/Customer.

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



TITLE: 4 X 270 MW BHADRADRI TPS	SPECIFICATION NO. PE-TS-411-673-A001	
	REV. NO. 00	DATE : 29/05/2017

**TECHNICAL SPECIFICATION FOR
SEWAGE TREATMENT PLANT**

PRE BID CLARIFICATION SCHEDULE

All clarification from the Technical Specification shall be filled in by the BIDDER clause by clause in this format only.

VOLUME	SECTION	CLAUSE NO.	PAGE NO.	SPECIFICATION REQUIREMENT	CLARIFICATION	REASONS FOR CLARIFICATION

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

THIS IS A PART OF TENDER TECHNICAL SPECIFICATION PE-TS-411-673-A001

SCHEDULE OF DEVIATIONS WITH COST OF WITHDRAWAL



PROJECT:-4 X 270 MW BHADRADRI TPS

SEWAGE TREATMENT PLANT

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF withdrawal OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF withdrawal OF DEVIATION IS APPLICABLE	NATURE OF COST OF withdrawal OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
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TECHNICAL DEVIATIONS

COMMERCIAL DEVIATIONS

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATIONS	SIGN & DATE

NOTES:

1. For self manufactured items of bidder, cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawal of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
14. In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.



TITLE: 4 X 270 MW BHADRADRI TPS	SPECIFICATION NO. PE-TS-411-673-A001	
TECHNICAL SPECIFICATION FOR SEWAGE TREATMENT PLANT		
	REV. NO. 00	DATE : 29/05/2017

SCHEDULE OF DECLARATION

Icertify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our format proposal number Dated and there is no deviation to the specification. I hereby certify that I am duly authorized representative of the Bidder's company whose name appears above my signature.

Bidders Company Name

Authorized representative's
Signature

Name

Bidder's Name	The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated
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