

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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CHAPTER-15.0

TECHNICAL SPECIFICATION FOR LOCAL CONTROL BOARDS/PANELS, LOCAL ISOLATING SWITCH UNITS, LOCAL PUSH BUTTON STATIONS AND MISCELLANEOUS ELECTRICAL EQUIPMENT

1.00.00 SCOPE OF SUPPLY

1.01.00 The following equipment shall be furnished with all accessories:

- a) Complete set of Local Control Boards/Panels as required
- b) Local Push Button Stations: As required
- c) Local Isolating Switch Units: As required

1.02.00 Furnishing, Mounting, and wiring of all equipments, devices and accessories.

1.03.00 Floor Channel sill, vibration damping pad, and kick plates for all floor-mounted control boards/panels, complete with holding down bolts and nuts.

1.04.00 Mounting hardware for all control boards/panels, Local Push Button Stations, and Local Isolating Switch Units.

2.00.00 CODES AND STANDARDS

2.01.00 All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

2.02.00 Equipment and material conforming to any other standards, which ensure equal or better quality, may be accepted. In such case, copies of the English version of the standard adopted shall be submitted.

2.03.00 The electrical installation shall meet the requirements of Indian Electricity Rules as amended upto date and relevant IS Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

3.00.00 DESIGN CRITERIA

3.01.00 The Local Control Boards/Panels shall be used for controlling incomers/ bus-section/electrically operated radial breaker feeders of the associated PCC/ PMCC/MCC. Necessary indications, meters, annunciations and mimic representation shall also be provided on these control boards/panels.

Local control of all drives shall be done from Process Control Boards/Panels, as described in respective sections of mechanical specification.

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The Local Control Boards/Panels shall have to be duly matched with the Process Control Boards/Panels.

- 3.02.00 Local Push Button (L.P.B.) stations shall be used for controlling drives from local.
- 3.03.00 Local Isolating Switch (L.I.S) Units shall be used for local isolation of power supply to various machines in the Workshop Building.
- 3.04.00 All equipment except L.I.S. Units and L.P.B stations, shall be located in a clean but hot, humid, and tropical atmosphere. The L.I.S. Units and L.P.B. stations shall be generally installed in a hot, humid, and tropical atmosphere, heavily polluted at places with fly ash and/or coal dust, and shall be suitable for outdoor service with degree of protection specified elsewhere in this specification.
- 3.05.00 All Control Boards/Panels, L.I.S. Units, and L.P.B. stations shall be liberally sized so as to provide spacious layout of equipment and devices with sufficient working space in between.
- 3.06.00 Adequate space/terminals shall be kept in the boards/panels for installing additional equipment in future.
- 3.07.00 For continuous operation at specified ratings, temperature rise of the various components/equipment shall be limited to the permissible values stipulated in the relevant standards and/or this specification.
- 3.08.00 All equipment/components thereof shall be capable of withstanding the mechanical forces and thermal stresses of the system short circuit current without any damage or deterioration of material.
- 3.09.00 Design, material selection, and workmanship shall be such as to present a neat appearance outside and inside with no welds, rivets, screws, or bolt heads apparent from the exterior surface of the boards/panels. All instrument cut-outs, mounting studs, and support brackets shall be accurately located.

4.00.00 SPECIFIC REQUIREMENTS

4.01.00 Construction

4.01.01 Local Control Boards/Panels

- a) Local Control Boards may consist of a number of vertical panels mounted side-by-side, in which case, they shall be bolted together to form a compact unit. Where two panels meet, the joints shall be smooth, close-fitting, and unobtrusive.
- b) The control boards/panels shall be totally enclosed type, conforming to degree of protection IP-54 or better.

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- c) Generally, the local control boards/panels shall be free-standing, floor-mounted, dead-front assemblies. In some cases, however, wall-mounted type control boards/panels may also be accepted.
- d) Floor-mounted control boards/panels shall be assembled on channel/angle base plates with anti-vibration mountings and stainless steel kick-plates.
- e) Control boards/panels shall be of folded sheet steel construction, minimum 2 mm. thick, and free from all surface defects.

The boards/panels shall have sufficient structural reinforcement to ensure a plane surface, to limit vibration, and to provide rigidity during shipment and installation.
- f) All floor-mounted panels shall have rear door.
- g) Doors shall have concealed type hinges and padlocking arrangement. Doors shall be grounded by flexible copper braid.
- h) All doors and removable covers shall be provided with neoprene rubber gaskets all round and latches sufficiently strong to hold them in alignment when closed.
- i) Working height of the panels shall be limited between 550 mm and 1800 mm above floor level.

4.01.02 Local Push Button Stations

- a) L.P.B. Stations shall be provided for all drive motors and shall be in sheet steel enclosure of dust and vermin-proof, weather-proof, gasketed construction and conforming to degree of protection IP-55 or better with canopy for outdoor and IP-54 or better for indoor. Material of LPBS shall be Polycarbonate/FRP/Die cast Aluminium.
- b) L.P.B. Stations shall be suitable for column/structure/wall mounting and shall be complete with push-buttons, terminal blocks, anodised aluminum inscription plate, two (2) nos. earthing terminals, removable gland plate along with crimp type tinned copper lugs and compression type glands for cable/conduit entry from top and bottom. The earthing terminals shall be suitable for connection to one (1) no. 8SWG G.I. wire.
- c) L.P.B. Stations shall be of the following basic type and equipped with:
 - Type-A: One(1) START push-button and one(1) STOP push-button.
 - Type-B: One(1) OPEN push-button, one(1) CLOSE push-button, and one(1) STOP push-button.

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Type-C: Flame proof type as per IS-2148. one(1) START push-button and one(1) STOP push-button.

Type-D: One(1) STOP Lock-out switch.

Any other type of L.P.B. Station, if required, shall be subject to approval of the Owner.

- d) OPEN, CLOSE, and START push-buttons shall be push to actuate type. STOP push-buttons shall have mushroom head actuator with press-to-latch and key-to-release feature. All drives controlled from DCS/PLC shall have emergency stop push button which shall be directly wired to switchgear. For critical loads, two stop push buttons connected in series shall be provided as per scheme requirement.
- e) OPEN/START push buttons shall be GREEN, STOP push buttons shall be RED, and CLOSE buttons may be YELLOW.
- f) All push-buttons shall have a minimum of two (2) Normally-Open and two (2) Normally-Closed electrically separate contacts, rated minimum 10 A at operating voltage. One contact of stop push button shall be directly wired to switchgear module for direct tripping and another contact to DCS/PLC for status indication.
- g) Wiring shall be done by 1/C - 2.5 sq.mm. 660V grade, PVC/XLPE insulated, stranded copper conductor, cable. Each wire shall be identified at both ends by ferrules with wire designation.
- h) Terminals shall have provision for connecting at least two (2) nos. 2.5 sq.mm. copper cable and shall be rated for carrying continuously minimum 10 A at 240V A.C. and 2 A at 220V D.C. 20% spare terminal shall be provided.

4.01.03 Local Isolating Switch Units

- a) L.I.S. Units shall be furnished in sheet steel enclosure of dust and vermin-proof, weather-proof, gasketed construction, suitable for outdoor use without canopy, and conforming to degree of protection IP-55 or better.
- b) L.I.S. Units shall be suitable for column/structure/wall mounting and shall be complete with load-break switch, terminal blocks, anodised aluminum inscription plate, two (2) nos. earthing pads, removable gland plate alongwith crimp type tinned copper lugs and compression type glands for cable/conduit entry from top and bottom. The earthing pads shall be suitable for connection to 25 x 3 mm G.S. flat
- c) Load-break switches shall be four-pole, air break, heavy duty type. Duty class of load-break switches shall be AC-23 for motor feeders. Motor

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feeder switches shall be capable of safely breaking the locked rotor current of the associated motor circuit.

- d) Terminals shall be clip-on type, 10 sq.mm. minimum.

4.02.00 Equipment Mounting

4.02.01 All equipment shall be so mounted that removal and replacement may be accomplished individually without interruption of services to others. No equipment shall be mounted on panel door.

4.02.02 All equipment mounted inside the panels shall be so located that their terminals and adjustments are readily accessible for inspection or maintenance.

4.02.03 For Local Control Boards/Panels control components such as push buttons, indicating lamps, selector switches, indicating meters etc. shall be flush mounted on the front face of the board/panel while switch fuses, supervision relays (AC/DC) etc. shall be mounted inside.

4.03.00 Name Plate

4.03.01 Nameplates shall be furnished for each panel and for each instrument or device mounted on the panel. Each LPB Station shall also be provided with a nameplate.

4.03.02 The material of the nameplate shall be lamicaid or approved equal, 3 mm thick, with white letters on black background.

4.03.03 The nameplates shall be held by self tapping screws. The size of nameplate shall be approx. 20 mm x 75 mm for equipment and 40 mm x 150 mm for the panels. The size of the nameplate shall suit the overall dimensions of LPB station/L.I.S Unit.

4.03.04 Nameplates for panels shall be provided both on the front and on the rear and shall be according to final device/designation list.

4.03.05 Control and meter selection switches shall have integral nameplates. Nameplates for all other devices shall be located below the respective devices.

4.03.06 Instruments and devices mounted on the face of the panels shall also be identified on the rear with the instrument or device number. The number may be painted on or adjacent to the instrument or device case.

4.04.00 Mimic Diagram

4.04.01 Mimic diagram of electrical connections shall be furnished on the front face of all electrical control panels.

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4.04.02 Mimic buses shall be at least 3 mm thick and 10 mm in width, made of suitably treated metal strips or approved equivalent and colour coded to denote different voltages.

4.04.03 The mimic representation, colour and size of diagram are subject to the approval of the Owner.

4.05.00 Illumination, Space Heating and Receptacles

4.05.01 Each panel shall be provided with interior fluorescent tube with door switch, space heater with thermostat and 5A, 3-pin receptacle with plug. Third pin of the socket shall be effectively grounded through the metallic structure.

4.05.02 Tube, heater and receptacle circuits shall be suitable for available A.C. supply and furnished with individual ON-OFF switch.

4.05.03 The lamp shall be located at the ceiling and guarded with protective cage. Space heater shall be located near the floor so as not to pose any hazard to service personnel.

4.06.00 AC/DC Power Supply

4.06.01 Necessary A.C. and D.C. supplies as required for control and service shall be arranged by the Bidder. Single feeder shall be arranged for A.C. supply and duplicate feeders shall be arranged for D.C. supply.

4.06.02 Isolating switch fuse units shall be provided for the incoming AC/DC power supplies and bus wires shall be run for power distribution to different panels. D.C. supply isolating switches shall be double pole, double throw with off and A.C. supply isolating switches shall be 4-pole, double throw type.

4.06.03 Fuse and link shall be provided for individual circuits for protection and also for isolation from bus wire without disturbing other circuits.

4.06.04 The fuse requirements in each panel shall be grouped in easily accessible fuse blocks or distribution panel. The grouping shall be done in a neat and orderly fashion.

4.06.05 Alarm relays with reverse flag shall be provided to annunciate failure of main incoming A.C. and D.C. power supplies and annunciation D.C. supply in each panel. Lamp indications shall be provided individually for main D.C. supply-1 fail, main D.C. supply-2 fail, and panel annunciation D.C. supply fail. A common A.C. electric bell shall be provided to give an audible alarm in case of failure of D.C. supply-1/D.C. supply-2/annunciation D.C. supply in any panel. A common push-button shall also be provided for cancellation of lamp indications and audible alarm.

4.06.06 Separate circuits shall be provided for (a) indication and alarm (b) tripping, and (c) control.

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4.06.07 For lighting, auxiliary supply and space heating A.C. supply shall be used. D.C. supply shall be used for providing control supply to annunciator.

4.06.08 Bus wires of adequate capacity shall be provided to distribute the incoming supplies to different cubicles of a VDB. Isolating switch fuse units shall be provided at each cubicle for A.C/D.C supplies.

4.07.00 Wiring

4.07.01 The panels shall be fully wired up at the factory to ensure proper functioning of control, protection and metering schemes.

4.07.02 All spare contacts of relays and switches shall be wired upto terminal blocks.

4.07.03 Wiring shall be done with flexible, heat resistant, 660V grade, PVC insulated, switchboard wires with stranded copper conductor, 2.5 Sq.mm for current, control circuits and voltage circuits and 1.5 sq. mm for other circuits.

4.07.04 Each wire shall be ferruled by plastic tube with indelible ink print at both end having terminal Block No., terminal numbers, destination number as per approved wiring drawing.

4.07.05 All wire termination shall be made with insulated sleeve solderless crimping type tinned copper lugs. Wires shall not be tapped or spliced between terminals.

4.07.06 Wiring shall 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 the termination.

4.07.07 Colour codes shall be used for wiring as per latest revision of IS: 375.

4.08.00 Terminal Block

4.08.01 Multi-way terminal blocks complete with necessary binding screws and washers for wire connections and marking strip for circuit identification shall be furnished for terminating the panel wiring and outgoing cables. Terminals shall be box-clamp type, 10 sq.mm. minimum. Terminals for C.T. secondary leads shall have provision of shorting and grounding.

4.08.02 Not more than two wires shall be connected to one terminal. If necessary, a number of terminals shall be jumpered together to provide wiring points.

4.08.03 Each terminal shall be identified with designation as per approved schematic. At least 20% of the total number of active terminals shall be furnished as spare in each panel.

4.08.04 The wiring and terminals shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

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4.08.05 The terminal blocks shall be located to allow easy access and also to suit floor openings for cable entry.

4.08.06 The terminal blocks within the panels shall be mounted on vertical support brackets. The support brackets shall be tack welded to the interior sheet steel mounting plates of the cabinet. Support brackets shall not be welded directly to the walls of the enclosure. The terminal blocks shall be attached to the support brackets with round head machine screws.

4.08.07 Terminal blocks shall generally be mounted vertically with adequate spacing (not less than 100 mm) between adjacent rows.

4.08.08 The bottom of the terminal block shall be at least 200 mm above the incoming cable gland plate.

4.09.00 Cable Entry

4.09.01 The Control Boards/Panels shall have provisions of cable entry from the bottom. Bottom plate shall be provided to make entry dust-tight. L.P.B. stations and Local Isolating Switch Units shall have provision for cable/conduit entry from both top and bottom. Suitable cable gland-plates shall be provided.

4.10.00 Grounding

4.10.01 50 x 6 mm TINNED COPPER ground bus shall be provided in each control panel extending along the entire length of the assembly.

4.10.02 The ground bus shall have two-bolt drilling with GI bolts and nuts at each end and shall be suitable for connection to 50 x 6 mm G.S. flat.

4.10.03 The ground bus shall be bolted to the panel structures and shall effectively ground the entire assembly. The cases of meters, relays and switching devices shall be grounded through the steel structure.

4.10.04 Whenever a circuit is grounded, a single wire from the circuit shall be run independently to the ground bus and connected to it.

4.11.00 Painting

4.11.01 All panels/equipments paint shade shall be as per enclosed chapter of paint shade details in the respective volume .

4.11.02 Caution Notice plate shall be affixed at the back of each vertical panel.

4.12.00 Switches

4.12.01 Switches shall be dust protected, heavy duty, switchboard type, complete with escutcheon plate. Contacts shall be silver surfaced and rated minimum 10A at operating voltage.

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4.12.02 415V Breaker control switches shall be 3-position TRIP/NORMAL/-CLOSE), 120°, spring return to neutral with lost motion device, non-lockable, sequence device, pistol grip handle, RED/AMBER/GREEN (circuit breaker CLOSED/TRIPPED-OR-TRIP CIRCUIT UNHEALTHY/OPEN) indicating lamps shall be provided with each breaker control switch.

4.12.03 Contact details and type of handle required for other types of switches are given below:

Sl.No.	Application	Switch description
a)	Synchronising Selector switch	180°, 4-position (INCOMER-1/BUS-SECTION/INCOMER-2/OFF), stayput type, pistol grip handle. OR 120°, 3-position (INCOMER/TIE/OFF) stayput type, pistol grip handle.
b)	Trip Selector Switch	120°, 3-position (INCOMER-1/BUS-SECTION OR TIE/INCOMER-2), stayput type, pistol grip handle.
c)	Meter Selector Switch	4-position (OFF/R/Y/B for ammeter selector switch and OFF/R/Y/YB/RB for voltmeter selector switch), maintained contact, stay-put type, knob handle. Ammeter selector switches shall have make-before-break contacts.
d)	Auto-Manual Selector switch	120°, 2-position (AUTO/MANUAL), stayput type, non-lockable, spade handle.
e)	On-off Switch/Local-Remote Selector Switch	90°, 2-position (ON/OFF OR LOCAL/REMOTE), stayput type, non-lockable, spade handle.

4.12.04 Any other type of switch, if required, shall be subjected to approval of owner.

4.12.05 Bidder shall decide the number of switch contacts taking into account the scheme requirements and spares.

4.13.00 Fuses

4.13.01 Fuses shall be HRC, preferably link type, with a minimum interrupting capacity equal to the system short circuit current.

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4.13.02 Fuses shall be furnished complete with fuse boxes and fittings of such design as to permit easy and safe replacement of fuse element. Visible indication shall be provided on blowing of the fuse.

4.13.03 Motor fuse characteristics and ratings shall be chosen to ride over motor starting period without blowing. The fuse on incoming feeder, wherever provided, shall be chosen to provide discrimination with motor/feeder fuses.

4.14.00 Contactors

4.14.01 Contactors shall be three pole, air break type, with non-bouncing silver/silver alloy contacts. Contactor duty shall be class III - category AC3 for unidirectional drives and AC4 for bi-directional and inching drives/class I - category DC2.

4.14.02 Each contactor shall be provided with minimum two (2) N/O and two (2) N/C auxiliary contacts rated 10 A at operating voltage. The exact requirement of contacts shall be decided by the Bidder taking into account the scheme requirements and spares.

4.14.03 Contactor starters shall comply with the requirements of IS-8544 (Part - 1) in respect of co-ordination of the characteristics of contactor, overload relay, and fuse. The type of co-ordination shall be Type-C as per IS-8544.

4.15.00 Thermal Overload

4.15.01 Thermal overload relays shall be three elements, positive acting, ambient temperature compensated with adjustable settings.

4.15.02 Single phasing preventor shall be provided as an inbuilt feature of the thermal overload relay.

4.15.03 Overload relays shall be manual reset type with change over contacts. Resetting of relays shall be possible with compartment door closed. Colour of resetting button shall be BLACK.

4.15.04 Relays for fan motors having long starting time shall be saturable core C.T. operated.

4.16.00 Current Transformers

4.16.01 Current Transformers shall be cast resin type. All secondary connections shall be brought out to terminal blocks where wye or delta connection shall be made.

4.16.02 Accuracy class of the current transformers shall be:

- a) Class PS for differential
- b) Class 5P20 for other relaying
- c) Class 1.0, ISF<5 for metering.

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4.16.03 Drives requiring current monitoring shall be provided with current transducers with calibration for full-scale reading. The dual output shall be 4-20 mA D.C; 4-18mA of which shall correspond to the normal range and 18-20 mA shall correspond to the suppressed range.

4.17.00 Voltage Transformers

4.17.01 Voltage Transformers shall be cast-resin type and shall have an accuracy class of 0.5.

4.17.02 High voltage windings of voltage transformer shall be protected by current limiting fuses.

4.17.03 Low voltage fuses, sized to prevent overload, shall be provided in all ungrounded secondary leads. Fuses shall be suitably located to permit easy replacement while the board/panel is energised.

4.18.00 Push Button

4.18.01 All push buttons shall be oil tight, heavy duty, push to actuate type, with coloured button and inscription plate marked with its function. The colour of "ON" and "OFF" push buttons shall be RED and GREEN respectively. RESET push buttons shall be coloured black.

4.18.02 Each push button shall have minimum 2 NO. + 2 NO. contacts, rated 10A at 240V AC and 2A at 220V DC.

4.18.03 Push buttons shall be shrouded type except for emergency trip button, which shall be mushroom type for easy identification.

4.19.00 Lamps

4.19.01 Lamps shall be LED type.

4.19.02 LED lamp shall be made in accordance with InP Technology (Aluminium Indium Gallium Phosphide Technology). The body shall be made of Poly Carbonate Unbreakable Lens. LED shall be protected by inbuilt fuse with surge suppressor or leakage voltage glow protection. LED circuit shall be PCB mounted. Intensity shall be greater than 200 mcd. All Push Button lamp shall be as per LED indicating lamp.

4.20.00 Operating Range

All instruments shall be generally suitable for operation on 1A or 5A C.T. secondary circuit and/or 110V V.T. secondary circuit.

4.21.00 Meters

4.21.01 All indicating instruments shall be flush mounted on panel front, back connected, suitable for flush mounting, 96 x 96 mm with 90 Deg. scale, antiglare glass and

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accuracy class 2. The dials shall be made of such material as to ensure freedom from warping, fading, and discolouring during the lifetime of the instruments.

4.21.02 All indicating instruments shall be enclosed in dust-tight cases suitable for tropical use.

4.21.03 Meters shall have provision for zero-adjustment from front of the panel.

4.21.04 Meters shall be compensated for temperature errors and factory calibrated to read the primary quantities directly without using a multiplying factor.

4.21.05 D.C. ammeters, wherever required, shall be provided with external shunt if the current exceeds 5A. The rated voltage drop for the shunts shall be 75mV.

4.22.00 Annunciator System

4.22.01 Each control panel shall be provided with an annunciator window board. The annunciator boards shall be back-connected and suitable for semi-flush mounting.

4.22.02 The annunciator system shall be solid state type with optical isolation for input signals. The functional requirements shall be as per Annexure-C.

4.22.03 Each annunciator group shall be independent, complete with its own power supply, acknowledge-reset-test buttons and other necessary accessories. Hooter for audible alarm shall be common for each control panel assembly.

4.22.04 Each annunciator group shall be provided with a common alarm relay for group alarm annunciation in remote control room. The common alarm relay shall operate on actuation of any alarm point of the group.

4.22.05 The annunciator shall be non-integral type with hardware box mounted separately for easy access and maintenance.

4.22.06 Audible alarms with different tones shall be used for trip, non-trip and ring back functions.

4.22.07 The window size shall be such as to accommodate minimum three (3) lines of twelve (12) characters each. Each character shall be minimum 4.75 mm high.

4.22.08 The annunciator system shall be suitable for operation from both NO and NC type initiating contacts.

4.22.09 At least 10% spare channels and window facia shall be provided in each annunciator group.

4.23.00 Relays

4.23.01 Auxiliary relays shall be furnished in fixed, dust-tight, casings and mounted inside the panel.

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4.23.02 The relays shall have adequate numbers of contacts to suit scheme requirements. Besides, each relay shall have spare contacts for future use.

4.23.03 Contacts shall be silver-surfaced, bounce-free, and capable of repeated operation without deterioration.

4.24.00 Auxiliary Devices

4.24.01 The Bidder shall furnish, install, and wire-up all auxiliary devices such as timing / switching / lockout / auxiliary relays/auxiliary contactors, etc. as required for the proper functioning of the approved schemes.

4.24.02 The Bidder shall number the various types of relays and contactors as per the numbers appearing in the approved Schematic/Wiring appearing in the approved Schematic/Wiring diagrams.

4.24.03 MISCELLANEOUS ITEMS

A Pull Cord Switches

Pull cord switches shall be provided at 30M intervals on both sides of conveyor. For small length (less than 30 meters) conveyors, one pair of pull cord switches shall be provided. The location of switches shall start from 4.0 meters from drive pulley / tail pulley

These shall be of heavy-duty, dust & vermin proof design conforming to IP-65 class of enclosure and flame proof suitable for groups I, IIA & IIB as per IS:2148. with minimum 2 N.O. + 2 N.C contacts rated for 6 amperes at 500V A.C. The material of enclosure shall be aluminium alloy LM6 or cast iron.

Each switch shall be bi-directional in operation and has two ropes fitted to it from opposite directions terminating with a spring at the anchor points. The spring shall operate the switch in the event of rope breakage.

Pull cord switches shall have "ON/ operated" indication lamps on it. It shall have a separate terminal box with a separate hinged cover which shall be totally sealed from main box containing actuating mechanism / limit switch etc. Local pull chord actuation shall be provided by means of mechanical flap.

The Pull cord switch shall have approval from DGMS-Dhanbad / DGFASLI-Mumbai / CCE-Nagpur.

B Belt Sway Switches

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Belt displacement switches shall be provided at every 100M interval along the conveyor and at the head end, tail end, horizontal bends/curvature, either side of horizontal bends / curvature etc.

These shall be of heavy-duty type with dust & vermin proof enclosure conforming to IP-65 and the flame proof suitable for group I ,IIA & IIB as per IS:2148. Minimum 2 NO + 2 NC contacts (for each position) rated at 5A & 240V shall be provided. The material of enclosure shall be aluminium alloy LM6 or cast iron.

Each switch shall have “ON/OFF operated” indication lamps on it.

The Belt Alignment Switches shall have approval from DGMS-Dhanbad / DGFASLI-Mumbai / CCE-Nagpur.

It shall have a separate terminal box with a separate hinged cover totally sealed from the main box containing actuating mechanism/ limit switch etc. Each switch shall have two NO and two NC contacts one for alarm and one for trip, which shall be wired upto terminal block. The terminal block shall have facilities for cable looping. The contacts of the switches shall be rated for at least 5 Amps. breaking at 240 VAC at 0.3 p.f. lagging.

C Controls and indication for field devices

NO. & N.C contacts, of all the pull-cord and belt sway switches, from both sides of conveyor shall be connected in groups and wired to remote I/O boxes, placed at suitable intervals. These remote I/O boxes in turn shall be wired up to Local Control boxes at the drive end of the conveyor

Each pull-rope switch and belt sway switch shall have at least one Intelligent addressable contact.

One contact of each pull-cord and belt sway switch shall be hard wired to a category 4 safety relay in MCC.

This addressable contact of each pull-cord and belt sway switch shall be wired to PLC, through serial bus communication system connected through Remote I/O box so that the exact status of each pull cord / belt sway shall be available at any time in the PLC, a remote station or a portable service PC.

D Zero Speed / Under Speed Switches

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Electronic speed sensors shall be provided for each conveyor to detect under speed/ belt slippage. They shall be suitable for operation at 240V single phase AC. These shall be suitable for operation in dusty atmosphere with minimum maintenance. In case of belt slippages, the contact shall give signal wired to PLC so as to stop the conveyor. Enclosure class shall be IP 65.

The material of enclosure shall be Aluminum alloy LM6 or cast iron.

Speed switches shall be flame proof suitable for group I , IIA & IIB as per IS: 2148.

E Limit Switches

Limit switches as required shall be supplied along with technological / mechanical equipment for interlocking, monitoring & control of equipment. The quantities of limit switches shall be as per process / technological requirement and to be indicated in equipment data sheet by Bidder. For over travel positions mechanical lever operated limit switches and normal operation zone end position limit switches shall be proximity type electronic switch.

Limit switches for electromechanical sensor shall be suitable for heavy duty, high impact operation with robust construction and capable of withstanding repetitive operations. The contacts making and breaking arrangements shall be reliable and having high mechanical endurance.

Limit switches shall be flame proof suitable for group I , IIA & IIB as per IS: 2148.

Number of making and breaking contacts shall be as per requirement with minimum 2NO + 2NC contacts adequately rated for handling the inductive currents in the circuit. The limit switches shall be housed in Aluminum alloy LM6 (or cast iron) of robust construction having dust and oil tight enclosure conforming to IP 65. The roller shall be made of high grade, wear resistant material with provision for roller lever to be mounted in steps of 90 deg. Precision limit switches, where adopted, shall be designed for reliable accurate operation having exceptionally long life.

The normal travel end / intermediate position limit switches shall be 2-wire proximity type.

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F Proximity Switches

The Proximity switches shall be suitable for detecting the metals without contact and indicate their presence by providing a switched signal. They shall be suitable for operating in any mounting position. Nominal sensing range 35mm (min), operating distance 0 to 28.3 mm (value based on standard measurement with mild steel a shorter sensing range for other metals).

The same shall be suitable for operating under high mechanical and ambient stress (i.e. high temperature, dust etc.) conditions. The proximity switches shall be universal type, with 2 sensors in one housing, 2 wire system suitable for use with 20V to 250V AC/DC control supply. The switch shall be provided with LED indications for indication of operating status. The switches shall be provided with enclosure class of IP-67.

G Digital Techogenerator

It shall be of robust construction and designed to give guaranteed accuracy of speed sensing. It shall generate consistent output pulses (minimum 1500 ppr) of positive or negative polarity as applicable by accepting shaft rotation .The output pulses shall be suitable for feeding into high impedance electronic circuit / instrument for digital measurement and control or PLC. The enclosure class shall be IP 67. It shall be provided with ambient temperature compensating device. It shall be also provide 4-20 mA output for required for interlocking, operation and monitoring. This specification shall also be applicable for Belt weigh scale encoder.

Arrangement of mounting of taco generators and its coupling with motor or equipment shall be decided considering ease of maintenance, accuracy of measurement and safety of equipment.

H SHOE / DISC TYPE THRUSTER BRAKES

The brake shall be fail-safe electrically released type.

Hydraulic / hydraulic thruster operated brakes only shall be used in this project

Floor mounting electro-hydraulic self-aligning double shoe type thruster brakes (with brake drums), suitable for arduous duty and having long mechanical life

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Brake shoes shall be provided with tough wear and heat resistant lining.

The thruster motor shall be suitable for continuous duty operation and having class F insulation with temperature rise limited to that for Class B. The thruster with motor shall have enclosure protection of IP: 65.

The starters for these brakes motor shall be DOL starters with MPCB, contactor, overload relay etc. located in respective drive control panel or module

Disc brakes, if required, on low speed shaft for emergency operation may also be provided for longer conveyors.

Brake operation limit switches shall be provided for interlocking and monitoring

I DC Electromagnetic Brakes

In general the brakes shall be of heavy duty, robust design, self aligning, and quick acting type with self-lubricating robust bearings and complete with brake mechanism, brake wheel, shoes, motor / solenoid etc. The brake wheel shall be of high strength material to prevent flake off the wheel.

The brake mechanism shall be provided with suitable means for adjustment of gap, brake torque, shoe positioning and shoe adjustment etc. The shoe linings shall be made from tough heat resistant material with fixing rivets adequately counter-sunk to prevent rubbing against the brake wheel. Alternatively, shoe linings shall be glued with epoxy based fixing compound having adequate adhesive strength

J SIREN

Dedicated siren along with LED type warning lamp shall be provided for each conveyor. The sirens shall be of electrically operated type with an audible range of 0.50km. For two streams of conveyors in the conveyor galleries, it shall be possible to adjust the output level of the sirens to differentiate the sound level in respect of each conveyor. The siren along with LED warning lamp (flickering type) shall come into service first prior to starting of the concerned conveyor either in auto/Manual mode. The LED type warning lamp shall be clearly

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visible

5.00.00TESTS

5.01.00All Control Boards/Panels, L.I.S. Units and L.P.B. Stations shall be completely assembled, wired, adjusted and tested at the factory prior to shipment to ensure accuracy of wiring, correctness of control scheme and proper functioning of all components.

5.02.00Routine Tests

5.02.01The tests shall include wiring continuity tests, high voltage tests, insulation measurement test both before and after high voltage test, and functional tests to ensure accuracy of wiring operation of the control/ protection/metering schemes and individual equipment. Detailed test report including procedure and drawing shall be furnished.

5.02.02All switches, meters, relays and other devices shall be tested and calibrated in accordance with relevant IS standards.

5.03.00 TYPE TESTS

5.03.01 All equipment to be supplied shall be of type tested design. During detail engineering, the bidder shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

5.03.02 However if the bidder is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the bidder shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

5.01.03 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

5.01.04 The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NSPCL, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design change". Minor changes if any shall be highlighted on the endorsement sheet.

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6.00.00DRAWINGS, DATA & MANUALS

6.01.00Drawings,data & manuals to be submitted.

6.01.01General Arrangement drawings and cross-section of each equipment showing constructional features, cable entry points etc.

6.01.02Typical foundation plan.

6.01.03Bill of Materials.

6.01.04Technical leaflet and Catalogues of:

- a) Local Control Boards and Local Starter-cum-Control panels
- b) Local Isolating switch units
- c) Local Push Button Stations
- d) Switches and Lamps
- e) Meters, relays, push buttons
- f) Switch fuse units
- g) Annunciator System
- h) Auxiliary Devices
- i) Terminal Blocks/glands.
- j) Temperature Scanner

6.02.00To be submitted after award of Contract

6.02.01Dimensional general arrangement of all Local Control Boards, Local Starter-cum-control panels, Local Push Button Stations, and Local Isolating switch units showing equipment disposition and identification along with space requirements and cable entry points.

6.02.02Foundation plan and loading diagram, clearly showing panel fixing arrangement, floor opening for cable entry etc.

6.02.03Cross section with parts list.

6.02.04Schedule of materials and label inscriptions.

6.02.05Detailed Control Schematics clearly showing terminal and wire numbering.

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6.02.06 Wiring diagram showing all equipment and devices in their relative physical positions and all wiring upto the terminal blocks.

Equipment/Device and terminals shall be identified with designations/numbers as per approved schematic and connection diagrams.

6.02.07 Data Sheets and Instruction Manual for each piece of equipment.

6.03.00 Bidder may note that the drawings, data and manuals listed are minimum requirements only. The Bidder shall ensure that all other necessary write-ups, curves and information required to fully describe the equipment are submitted .

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ANNEXURE-A
RATINGS & REQUIREMENTS

- | | | | |
|-----|----------------------------|---|-----------------------------|
| 1.0 | Local Control Board | | |
| 1.1 | General | | |
| | Type | : | Fixed type |
| | Service | : | Indoor |
| | Enclosure | : | IP-54 |
| 1.2 | System | | |
| | Voltage | : | 415 Volt $\pm$ 10% |
| | Phase | : | 3 |
| | Frequency | : | 50 Hz $\pm$ 5% |
| | System | : | Solidly grounded |
| 1.3 | Rated Current at 50 Deg.C | | |
| | Bus bar | : | To be decided by the Bidder |
| | Switches | : | To be decided by the Bidder |
| 1.4 | Short Circuit Rating | | |
| | Interrupting | : | 50 KA |
| | Short time for
1 Second | : | 50 KA |
| 1.5 | Insulation Level | : | 2.5 KV for 1 min. |

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ANNEXURE-B
A.C./D.C. POWER SUPPLY

1.0 System Voltages

All systems shall be designed for satisfactory operation from the following power supply: -

A.C. Supply : 240 Volt, 1 Phase, 50 Hz, 2 wire, effectively grounded system.

Fault level 50 KA rms Symmetrical.

D.C. Supply : 220V, 2 Wire, ungrounded.

Fault level 25* KA

* Indicative only actual value shall be decided by the Bidder, after substantiating the same by calculation.

2.0 Permissible Variation

Equipment and accessories shall be suitable for operation over the entire range of voltage/frequency variation as listed below :

A.C. Supply : Voltage $\pm 10\%$

: Frequency $\pm 5\%$

: Combined Volt + Freq. 10% (absolute sum)

D.C. Supply : Voltage $\pm 10\%$

Service Voltage for
Control Panels/
Distribution Boards

: 240V $\pm 10\%$, 1ph, 50Hz $\pm 5\%$

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ANNEXURE-C
FUNCTIONAL REQUIREMENTS OF ANNUNCIATOR

TYPE

The annunciation system shall be manually reset type with ring back facility, suitable for operation from 220V DC ungrounded supply.

FUNCTION

The sequence of operation shall be similar to ISA-2A with fast/slow blinking as detailed below:

Field Condition	Visual Display	Audible Alarm	Ringback Alarm
Normal	Off	Silent	Silent
Abnormal	Fast blinking	On	Silent
Acknowledge	Steady On	Silent	Silent
Return to normal	Slow blinking	Silent	On
Reset	Off	Silent	Silent
Normal Before Acknowledge	Slow blinking	On	On
Acknowledge	Steady On	Silent	On
Reset	Off	Silent	Silent
Test	Fast blinking	On	On

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ANNEXURE- D
TECHNICAL PARTICULARS OF MISCELLANEOUS ITEMS

A	Pull Chord Switches	
Sl.No	Particulars	Requirements
1)	Type	Snap action, Local manual, reset type
2)	Enclosure	Flame Proof as per gas group-I and group-IIA & IIB
3)	Degree of protection	IP-65
4)	Material of enclosure	Aluminium Alloy LM6 / Cast Iron
5)	Operation	Rope operated, as per spec
6)	Contacts	2NO + 2NC Pf, Cad – silver alloy tipped
7)	Switching capacity	6A / 500 V AC & 1A / 50 V DC
8)	Cover	With threaded screws S.S & nitrile rubber 'O'rings.
9)	Local indication	Lamp for ON/OFF for indication.
10)	Mechanical Durability	30000
11)	Frequency of Operations	3000 O/H
12)	Mounting arrangement	Bracket mount
13)	Painting	Epoxy, based shade as per approved drawing.
14)	Termination	Specified during Detail Engineering.
15)	Terminal box	Specified during Detail Engineering.
B	Belt Sway Switches	
Sl.No	Particulars	Requirements
1)	Type	Roller & Cam shaft Type
2)	Enclosure	Flame Proof as per gas groups-I, IIA & IIB.
3)	Degree of protection	IP-65
4)	Material of enclosure	Aluminium Alloy LM6 / Cast Iron

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5)	Operation	Self reset type
6)	Contacts	2NO + 2NC, Cad – silver tipped
7)	Switching capacity	6A / 500 V AC & 1A / 50 V DC
8)	Cover	With captive screws S.S & nitrile rubber 'O'rings
9)	Mechanical Durability	30000
10)	Frequency of Operations	3000 O/H
11)	Mounting arrangement	Bracket mount
12)	Painting	Epoxy, based shade.
13)	Termination	During Detail Engineering.
14)	Terminal box	During Detail Engineering.

C	Zero Speed / Under Speed Switches	
Sl.No	Particulars	Requirements
1)	Type	Electronic, non contact sensing speed mon. device
2)	Speed range RPM = 5-50/50-500	5-50 & 50-500
3)	Speed setting accuracy	± 5% of set value
4)	Repeat accuracy	Better than 1%
5)	Activation differential	<5% of set value
6)	Operating Voltage	110V AC ±15%, 50Hz ±3%
7)	Sensing device	Inductive, non contact type sensor probe, sensing distance 20-25 mm.
8)	Features to be provided by Bidder	Initial delay 1-20 sec. Nuisance delay 1-20 sec.
9)	Enclosure of Monitoring device, probe and terminal box.	Cast Iron / Aluminum alloy LM6
10)	a) Out put contacts	During Detail Engineering.

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	b) Switching capacity c) Material	
11)	Visual indication	During Detail Engineering.
12)	Termination accessories	During Detail Engineering.
13)	Terminal box	During Detail Engineering.