



Supply Cum Erection of Electrical works at CISF Barrack, Quarter Guard and other allied buildings for OSBL facilities on Item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha

NIT NO. : PNPM/PC-183/E-8006/NCB Dated 11.05.2024

AMENDMENT No.: II Dated 04.06.2024



Sl. No.	Reference of Bidding Document				Existing Clause	Amendment Type	Amended Clause
	Vol-II/ Sec	Page No.	Clause No.	Subject / Heading		M/D/A	
SECTION VI							
1	Section VI- 2.0			Technical Specification -Electrical		A	ES 8061 for High Voltage switch Board attached.

LEGEND:

M: MODIFICATION, A: ADDITION, D: DELETION, C: CLARIFICATION

FOR & On behalf of
(Projects & Development India Ltd.)

Kailash Joshi
Kailash Joshi
(Project Manager)
04.06.2024



ENGINEERING STANDARD
HIGH VOLTAGE SWITCH BOARDS

REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD
2	20.01.07	01.02.07	ISSUED FOR IMPLEMENTATION	<i>Sharma</i> AV	<i>SC</i> BKC / SC	<i>BB</i>
1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	AV	BKC	BB
0	DEC. '97	--	ISSUED FOR IMPLEMENTATION	RNS/JKT/SC	JKT	HSW

**CONTENTS**

SECTION NUMBER	DESCRIPTION	SHEET NUMBER
1.0	SCOPE	3
2.0	STANDARDS TO BE FOLLOWED	3
3.0	SERVICE CONDITIONS	3
4.0	OPERATING REQUIREMENTS	3
5.0	DESIGN AND CONSTRUCTIONAL FEATURES	4
6.0	COMPONENT DETAILS	8
7.0	ACCESSORIES	14
8.0	PAINTING	14
9.0	TESTS AND INSPECTION	15
10.0	DRAWINGS AND DOCUMENTS	15
11.0	SPARES	15
12.0	PACKING	16
13.0	DEVIATIONS	16
ANNEXURE - I	DOCUMENTATION FOR HIGH VOLTAGE SWITCHBOARDS	17
ANNEXURE - II	LIST OF SPARES	18



ENGINEERING STANDARD

ES: 8061

2

DOCUMENT NO.

REV.

HIGH VOLTAGE SWITCH BOARDS

SHEET 3 OF 18

1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and delivery in well-packed condition of High Voltage Switch Boards.
- 1.2 This standard shall be read in conjunction with relevant Specification Sheets, Feeder details & Schematic diagrams etc.

2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment shall comply with the latest issues of the following standard, unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.

IS: 3427 A.C. Metal enclosed switchgear and control gear for rated voltages above 1 kV up to and including 52 kV.

IS: 13118 General requirements for circuit breakers for voltages above 1000 V.

IS: 5578 Guide for marking of insulated conductors.

IS: 11353 Guide for uniform system of marking and identification of conductors and apparatus terminals.

IS: 10118 Code of Practice for selection, installation and maintenance of switchgear and control gear.

Various components housed in the switchboards shall conform to the Indian Standards Specification as mentioned against the component details or IEC Specifications.

- 2.2 The design and operational features of all the equipment offered shall also comply with the provisions of the latest issue of the Indian Electricity Rules and other Statutory Acts and Regulations. The supplier shall, wherever necessary, make suitable modifications in the equipment to comply with the above.
- 2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specifications / IEC Specification, the requirement specified herein shall prevail.

3.0 SERVICE CONDITIONS

3.1 Ambient Conditions

These shall be as indicated in Specification Sheet.

3.2 System Details

These shall be as indicated in Specification Sheet.

4.0 OPERATING REQUIREMENTS

The switchboards shall be suitable for operating at the specified rating continuously, with the specified voltage and frequency variations under the



ambient conditions indicated in Specification Sheet, without exceeding the permissible temperature rise and without any detrimental effect on any part.

5.0 DESIGN AND CONSTRUCTIONAL FEATURES

5.1 General

- 5.1.1 The switchboards shall consist of an assembly of a series of floor mounting, identical, metal clad, cubicle type panels placed side by side to form a compact assembly and shall be extensible on either side.
- 5.1.2 The complete assembly shall be dust, damp and vermin proof having minimum degree of protection equivalent to IPH-6 as per IS: 3427. However, in case some ventilation openings are to be provided, these may be permitted for equipment located indoors and such openings shall be covered by fine wire mesh ensuring minimum IPH-3 protection.
- 5.1.3 The framework of the cubicles shall be bolted / welded construction. The minimum thickness of sheet steel shall be 3 mm for base channel and 2 mm for other members. The doors and covers shall be fabricated from cold rolled sheet steel. Suitable reinforcement, wherever necessary, shall be provided.
- 5.1.4 The switchboard shall be mounted on the channel which shall be included in the vendor's scope.
- 5.1.5 Each cubicle shall be provided with front access door with handle lock and key for breaker compartment and a removable back cover. The door hinges shall be concealed type. Front doors of the panels shall mechanically stop in full open position to facilitate removal of breakers and for ease of maintenance.
- 5.1.6 All external hardwares shall be cadmium plated. The hardwares for fixing removable parts shall be provided with retaining devices.
- 5.1.7 The doors and the removable covers shall be provided with non-deteriorating neoprene gaskets. Gaskets without any discontinuity shall be preferred. Gaskets shall be held in position in groove, in shaped sheet steel work or these shall be U-type.
- 5.1.8 Each cubicle shall have separate compartment within the cubicle for circuit breaker, bus-bars, instrument transformers, metering and relaying devices and cable termination.
- 5.1.9 Inter-panel and inter-compartment fire resistant barrier shall be provided. Cast resin seal off bushing shall be provided in the bus compartment, through which connections to breaker compartment/cable compartment/bus compartment of adjacent panel shall be taken. Failure of one of the equipment shall not effect the equipment in the adjacent compartment.
- 5.1.10 All the components shall be accessible for inspection and maintenance without the necessity of removing the adjacent ones. Their mounting shall be accessible and ensure the necessary degree of safety.
- 5.1.11 The layout of the components inside the cubicle shall be liberal to facilitate maintenance and the interconnecting wiring between components shall not be subjected to undue stresses at the bends.



- 5.1.12 Mounting height of components requiring operation and maintenance shall not be lower than 300 mm and higher than 1800 mm.
- 5.1.13 All live parts which are accessible after opening of front and back door/cover shall be properly insulated or provided with insulating barrier to prevent accidental contact. Phase insulating barriers shall be provided between the breaker poles. Removal facility shall be provided for all such barriers.
- 5.1.14 Adequate arrangement for earthing shall be provided to safeguard the operator or other personnel from electric hazards under all conditions of operation.
- 5.1.15 The switchboard shall be provided with following interlocks and safety features:
- The withdrawal and engagement of a circuit breaker shall not be possible unless it is in open position.
 - The operation of a circuit breaker shall not be possible unless it is in fully service, test or isolated position.
 - It shall not be possible to close the circuit breaker in service position unless all auxiliary and control circuits are connected.
 - A breaker of the lower rating shall be prevented from engaging with the stationary element of higher rating.
 - Insertion of the manual mechanism shall render the motorized mechanism inoperable.
 - Circuit breaker "ON", "OFF" indication shall be provided at the back of each panel.
 - Caution name plate shall be provided at the back of incomer panels where terminals are likely to remain live and isolation is possible only from remote end.
 - Automatic safety shutter, with padlocking facility for locking in closed position, to completely cover the spouts for bus-bars and cable connection when the breaker is withdrawn.

5.2 Bus-Bars and Connections

- 5.2.1 The bus-bars shall be for three phases. The bus-bars and connection shall be made of electrolytic grade copper / high conductivity aluminium alloy of rectangular cross-section.
- 5.2.2 Bus-bars and connections shall be sleeved to protect against approach to live parts and to eliminate potential arcing points. Sleeving material shall have adequate electrical, thermal and mechanical properties to withstand impulse level, temperature rise during normal and short circuit condition and allow easy bending of bus bars.
- 5.2.3 The bus-bars shall be amply sized to carry the rated continuous current under the specified ambient temperature without exceeding the limits specified in IS: 8084. The thermal rating of the bus-bars shall be designed to withstand the system fault current for 3 seconds without exceeding the limiting temperature of 250°C for bare copper. Calculation for bus-bar sizing shall be furnished along with the offer.
- 5.2.4 Horizontal bus-bars shall run in a separate compartment through the entire length of the board and shall be of same cross-section throughout. Stepped bus-



bars shall not be acceptable.

- 5.2.5 The bus-bars shall be arranged and colour coded according to IS: 5578 & IS: 11353.
- 5.2.6 The bus-bars chamber shall be sufficiently spacious and shall have separate screwed covers for maintenance purpose. It shall be adequately ventilated and shall allow the escape of the hot gases.
- 5.2.7 The bus-bars shall be rigidly supported at equal intervals to withstand the stresses due to full short circuit and also to take care of thermal expansion.
- 5.2.8 A minimum of two bolts shall be used per bus-bar joint. Only high tensile electro galvanized cadmium plated bolts, nuts and washers shall be used. The washers shall be spring and plain type. The bus-bar supports shall be of molded construction with built-in anti-tracking barriers. The support materials shall be of DMC or fiber glass reinforced thermosetting plastic.
- 5.2.9 The bus-bars, both horizontal and vertical, shall be PVC sleeved unless otherwise specified in the Specification Sheet. Insulating shrouds shall be provided for all joints of insulated bus-bars.

5.3 **Earth Bus**

A continuous earth bus of Aluminium running along the lower part of the switchboard shall be provided with two end terminals with lugs for external connection. The earth bus shall be rated to carry three phase fault current for a period of 3 sec.

5.4 **Bus Duct**

- 5.4.1 Suitable extension of bus-bars in proper phase sequence on the top or bottom, as specified in Specification Sheet, with connecting bolts shall be provided where connections between transformer and switchboard or between two halves of the switchboard is specified to be through bus duct.
- 5.4.2 Bus duct between two halves of the switchboard, if required, shall be supplied by the switchboard manufacturer. The bus-bars of interconnecting bus duct shall be similar to the main bus-bars of switchboard as specified above and shall conform to IS: 8084.
- 5.4.3 Bus duct between transformer and switchboard, if included in vendor's scope shall conform to IS: 8084.

5.5 **Clearances and Creepage Distance**

The clearance and creepage distance shall be adequate to meet the BIL of the equipment.

5.6 **Insulation**

- 5.6.1 The insulation used shall be non-hygroscopic and shall be of porcelain, epoxy resins or fiber glass molded with plastic. It shall be of adequate electrical, mechanical and thermal strength to give trouble free service during normal operation and short circuit conditions.



5.6.2 The insulation shall be treated suitably to withstand the tropical conditions and atmospheric pollution as specified in Specification Sheet.

5.7 Control Wiring

5.7.1 The switchboard shall be completely factory wired and ready for external connections.

5.7.2 The wiring shall be complete in all respect so as to ensure proper functioning of control, interlocking, protection, metering, indications and annunciations.

5.7.3 The wiring shall be carried out with flexible stranded PVC insulated copper conductor cables of 1100 Volt grade. The minimum size of wires shall be as follows:

C.T. Circuit	--	2.5 Sq. mm
V.T. and Control Circuits	--	1.5 Sq. mm

5.7.4 All wiring shall be provided with dependent both ends marking as per IS: 5578. Numbered ferrules, reading from the terminal outwards, shall be provided at both ends of all wiring for easy identification. These shall be interlocking type plastic ferrules.

5.7.5 Control wiring circuits, fed from a supply common to a number of panels, shall be so protected that failure of a circuit in one panel does not affect the operation of other panels.

5.7.6 The wiring to the equipment mounted on the doors shall be carried out with flexible multi-strand copper conductor cable and so supported that on opening of the door, there is no undue strain on wire leads.

5.7.7 The control cables shall be neatly arranged and properly supported.

5.8 External Cable Termination

5.8.1 All power and control cables shall enter the switchboard from the bottom on the back of the panel. Sufficient space shall be provided for ease of connection and termination of cables.

5.8.2 All power cables and control cables shall be of type, number and size as indicated in Feeder Details.

5.8.3 The termination arrangement for single core cables shall be such that so as to minimize flow of eddy current and heating due to eddy currents.

5.8.4 Heavy duty double compression type rolled Aluminium cable glands along with the cable lugs, as required shall be provided for termination of control cables and auxiliary power supply cables.

5.8.5 The cable glands shall be mounted on a removable gland plate, provided at a minimum height of 75 mm from the bottom of the switchboard. Two number spare knockouts of size 20 mm shall also be provided on the gland plate for future use.

5.8.6 Terminal blocks shall be provided at suitable locations inside the panels for termination of control and auxiliary power supply wiring. These terminal blocks shall be pressure clamp type up to 35 sq. mm cables and bolted lug type for



higher sizes of cables. These shall be protected type and rated for 1100 Volt service. The minimum current rating of the terminal block shall be 16 Amp.

- 5.8.7 Where more than two cables in parallel are required to be terminated, a system of bus links shall be provided with adequate clearance and spacing.
- 5.8.8 The terminal block shall be grouped according to circuit functions and numbered suitably. 20% extra terminals shall be provided in the terminal block.
- 5.8.9 Suitable clamps to support the vertical run of cables shall be provided.
- 5.8.10 For power connections, suitable marking on the terminals shall be provided to identify the phases.

5.9 Feeder Details

- 5.9.1 The requirements of incomer, bus coupler and outgoing feeders shall be as indicated in the single line diagram, feeder details and corresponding schematic diagrams.
- 5.9.2 Non-paralleling interlocks shall be provided between incomers and bus section panels. The interlocks shall be either electrical or mechanical type. Arrangement for defeating the interlock shall also be provided.
- 5.9.3 Auto changeover scheme, wherever specified, shall be provided.

5.10 Dummy Panels

Dummy panels complete with bus-bar system in 400 mm width shall be required for which unit price shall be indicated.

5.11 Control Power Supply

- 5.11.1 D.C. power required for closing, tripping and indication shall be supplied at the bus coupler panel through two completely separate circuits by the owner, one for tripping and another for closing and indication for the whole board.
- 5.11.2 For receiving each external control power supply, a double pole miniature circuit breaker shall be provided. This power shall be distributed inside the switchboard for each feeder having its MCB unit.

5.12 Space Heater Power Supply

- 5.12.1 Panel space heaters shall be fed from a separate bus, common for the whole board. This bus shall be fed from owner's supply for which a double pole MCB shall be provided in bus section panel.
- 5.12.2 Power supply for space heaters of motors shall be tapped from this bus by means of miniature circuit breakers located in the motor feeder panels. These MCB's shall be of triple pole and rated for 15 Amp.

6.0 COMPONENT DETAILS

The make of the components shall be as specified in Specification Sheet.

6.1 Circuit Breakers

**ENGINEERING STANDARD****ES: 8061****2**

DOCUMENT NO.

REV.

HIGH VOLTAGE SWITCH BOARDS

SHEET 9 OF 18

- 6.1.1 The circuit breakers shall comply with the requirements of IS: 13118.
- 6.1.2 All circuit breakers shall be of 0-3 min-CO-3 min-CO rated operating sequence capable of carrying the specified current at the site conditions and making/breaking of the system fault current.
- 6.1.3 Type test certificates from an independent testing authority shall be furnished along with the offer for each circuit breaker rating and type.
- 6.1.4 The circuit breakers controlling motors shall be suitable for DOL starting and stopping induction motor a number of times and shall have provision to limit over voltage to the value safe for motor insulation. Unless otherwise specified this value shall be taken as 2.5 times the rated voltage. The magnitude of the voltage surge produced by the breaker when switching off the smallest motor shall be indicated.
- 6.1.5 The circuit breakers controlling capacitors shall be suitable for energizing and de-energizing the rated capacitor bank.
- 6.1.6 The circuit breakers shall be of the 3 phase, single/double break, horizontal draw-out, vertical/horizontal isolation type. The medium of arc quenching shall be minimum Oil/Bulk oil/vacuum/SF6 as specified elsewhere.
- 6.1.7 The circuit breakers shall be suitable for electrical/manual closing as specified in Feeder details. Electrically operated circuit breakers shall preferably have motor wound spring closing mechanism with provision for manual closing arrangement. Manually operated circuit breakers shall have independent manual spring closing mechanism. In all cases tripping shall be by means of shunt trip coil, unless otherwise specified in Specification Sheet.
- 6.1.8 All circuit breaker units of the same rating shall be physically and electrically interchangeable.
- 6.1.9 The circuit breakers shall be electrically and mechanically trip free and provided with anti-pumping feature.
- 6.1.10 The circuit breakers shall have three positions, i.e. service, test and isolated with the cubicle door closed. Necessary stoppers shall be provided to prevent the excessive movement of the breaker cradle than desired for the position. Service and test positions of the breaker shall have monitoring switch having 1NO+1NC contacts.
- 6.1.11 The circuit breakers shall be provided with emergency manual trip device, mechanical 'ON', 'OFF', 'ISOLATED' position and spring 'CHARGED', 'DISCHARGED' indicators and operation counter.
- 6.1.12 A maintenance truck/device, if required, for raising, lowering and withdrawals of the circuit breaker shall be supplied for each switchboard.
- 6.1.13 In case of vacuum circuit breakers, contact wear indicator viewable while the unit is in service shall be provided.
- 6.1.14 The arc interrupting devices shall be capable of interrupting satisfactorily current from zero to the rated interrupting current when used on predominantly capacitive or inductive circuits, without requiring excessive maintenance of the contacts. The arc shall be restricted within the interrupting chamber and no emission of flame shall be allowed which may cause electrical breakdown or



damage to insulation on the apparatus.

- 6.1.15 Mechanical safety interlock shall be provided for safe operating and movement of the breaker.
- 6.1.16 The circuit breakers shall be provided with minimum of four normally open and four normally closed auxiliary switch contacts, over and above those required for its own control scheme, for owner's use. These contacts shall be wired separately to the terminal board.
- 6.1.17 The closing coil and other associated auxiliary relays shall operate satisfactorily at all voltages between 85% and 110% of the rated control voltage. The tripping coil and other associated relays shall operate satisfactorily at all voltages between 70% and 110% of the rated control voltage.
- 6.1.18 Cable earthing facility shall be provided in the circuit breaker for discharging of power cable through the circuit breaker contact with circuit breaker in drawn-out position. An integral earthing arrangement shall be preferred. In case the integral earthing arrangement is not feasible due to circuit breaker design, a separate earthing truck, which shall be inserted in place of circuit breaker, shall be provided per board.
- 6.1.19 Positive earthing of circuit breaker frame shall be maintained at every position of circuit breaker. The earthing contact shall be line/scraping type and not of point type.

6.2 Current Transformers

- 6.2.1 The current transformers shall conform to IS: 2705.
- 6.2.2 C.T.s shall be class F insulated and vacuum impregnated or resin cast type. The C.T.s shall be rigidly mounted and shall be easily accessible for maintenance and testing.
- 6.2.3 The short time thermal withstand ratings of the C.T.s shall be same as the thermal withstand ratings of the breakers.
- 6.2.4 The C.T.s output shall be minimum 15 VA per phase and in any case, the output shall be adequate for the protection and metering duties involved with sufficient margin. The C.T.s shall have the following accuracies for the various applications:

<u>Application</u>	<u>Class of Accuracy as per IS: 2705</u>
i) For metering service	1
ii) For use with protective relays	5 P
iii) For use with restricted earth fault and differential relays	PS

- 6.2.5 The C.T. cores for metering and protection shall be separate.
- 6.2.6 The ratios of the current transformers shall be as indicated in Feeder details.
- 6.2.7 All the C.T.s shall be provided with terminals and shorting links. One of the terminals of the C.T. shall be earthed. The polarity of the C.T. shall be clearly marked.
- 6.2.8 Provision of interposing C.T. is not acceptable.



6.2.9 The C.T.s shall be capable of withstanding momentary open-circuit on the secondary side without injurious effects.

6.3 Voltage Transformers

6.3.1 The V.T.s shall be class F insulated and vacuum impregnated or resin cast type conforming to IS: 3156.

6.3.2 The primary nominal voltage shall be equal to the system nominal voltage. The secondary terminal voltage shall be $110 / \sqrt{3} V$.

6.3.3 The rated output of each VT shall be adequate for the relays, meters and associated wiring connected to it with sufficient margin and shall not be less than 200 VA per phase.

6.3.4 The accuracy class of V.T.s shall be 1 as per IS: 3156.

6.3.5 The primary and secondary winding shall be protected by HRC fuses in each phase except in the grounded phase of the secondary side.

6.3.6 The V.T. shall be mounted on a with-drawable carriage. Shutters with padlocking facility, provided on high voltage sides, shall be so arranged that the live orifices are automatically closed when the V.T. is withdrawn.

6.3.7 Mechanical interlocking arrangement shall be provided so that the access to the high voltage fuse is possible only when the V.T. is fully withdrawn.

6.4 Relays

6.4.1 All protective relays shall conform to IS: 3231 and shall be provided in draw out and dust proof cases and shall be flush mounted type. Auxiliary relays shall be fixed type. They shall be fully tropicalized.

6.4.2 IDMTL over current relays shall generally have adjustable plug settings ranging from 50% to 200% in steps of at least 25% and time multiplier settings ranging from 0.1 and 1 in steps of 0.1. Earth fault relays shall have a setting range of 10% to 40% in steps of 5%.

6.4.3 All IDMTL relays shall have inverse characteristics similar to GECA make CDG-11 of 3.0 sec. version.

6.4.4 High set instantaneous over current relays shall have adjustable settings varying from 500% to 2000% and shall be immune to transients.

6.4.5 The differential relays shall be of high speed type and shall be stable under through faults and magnetic inrush currents.

6.4.6 The restricted earth fault relays shall be high impedance and high speed type and shall be complete with required stabilizing resistor. The relays shall be stable under through fault and magnetic inrush currents.

6.4.7 Motor protection relays shall be suitable to cater wide range of motor characteristics. This shall include elements for over current, high set instantaneous, earth fault, negative sequence and stalling protection. Stalling protection relay contact shall not be connected across other relay contact and left free in the terminal block of the relays for external looping.

6.4.8 Under voltage relays for motor protection shall be IDMTL type having setting



range 50% to 90%. All other relays shall have a setting range as specified in Specification Sheet.

- 6.4.9 The D.C. relay operating coils shall be so placed in the circuit that they are not connected to the positive pole of the battery except through contacts which are normally open.
- 6.4.10 Mechanical/self powered flag indicators shall be provided for all protective relays and for auxiliary relays, where required. All relays directly tripping the circuit breakers shall be provided with hand reset contacts.
- 6.4.11 The flag indicators shall be suitable for external hand resetting and shall be mechanically interlocked to prevent them from falling when the relays are subjected to vibration. Access to the setting device shall be possible only after the front covers are removed. Access to resetting device shall be external to the case.
- 6.4.12 All relays shall be provided with test plugs.
- 6.4.13 All relays shall be suitably marked as per relevant standards.
- 6.4.14 Where relays are required to operate with a time delay, the delaying attachment shall not be of dash pot type.
- 6.4.15 All relays and other protective devices shall be properly coordinated.
- 6.4.16 Necessary auxiliary relays shall be provided wherever required.
- 6.4.17 The VA burden of all the relays and instruments shall be clearly indicated in technical particulars.
- 6.4.18 All contacts of the relays, whether utilized or not, shall be wired up to the terminal board of the panel.
- 6.4.19 The relays shall be visibly marked to indicate the purpose for which it is used.
- 6.4.20 Static relays, if provided, shall be suitable for the installation condition.

6.5 Timers

- 6.5.1 The timers shall be electronic, pneumatic or synchronous type with manual/ auto reset features as per the functional requirements. The timers shall be 'ON' delay or 'OFF' delay type as specified. The repeat accuracy shall be 0.5% or better.

6.6 Instruments and Meters

- 6.6.1 All instruments shall be flush mounting type with square face of 96 mm x 96 mm. They shall be tropicalized and dust tight.
- 6.6.2 Dials shall be parallax free with scale marked in black on white background and shall be suitable for direct reading.
- 6.6.3 Zero adjusters shall be provided for operation from the front of the cases.
- 6.6.4 All ammeters and voltmeters shall have 0-240° scale and shall be moving iron spring controlled type of class 1.5 accuracy as per IS: 1248. The scale range of the ammeters and voltmeters shall be as indicated in the Feeder details.



- 6.6.5 In case of motor feeders, the ammeters shall be graduated uniformly upto C.T. primary current and with compressed end scale upto 6 times C.T. primary current. Red pointer shall be provided, which shall be adjusted at site for indicating full load current of the motor.
- 6.6.6 KWH meter shall be 3 phase 3 wire type. These shall conform to the requirements of relevant IS and shall be C.T. operated. The current coil shall be rated for 5 Amps. The potential coils shall be rated for 110 V, 1 phase, 50 Hz A.C.
- 6.6.7 All kWh meters shall be provided with test blocks for current and voltage coils for testing them at the site without interrupting their recording while in service.

6.7 Push Buttons and Control Switches

- 6.7.1 The switches and push buttons shall conform to utilization category AC11/DC11 as per IS: 13947. The contact shall be rated to make, break and carry inductive current of 5 Amps. at 415 V AC and 1 Amp. at 220 V DC.
- 6.7.2 The control switches shall be spring return rotary type, unless otherwise specified and provided with Pistol grip type handle. The control switches for circuit breakers shall be additionally fitted with lost motion devices and sequencing devices, if required.
- 6.7.3 The selector switches shall be stay put rotary type and provided with oval shape handles.
- 6.7.4 The push buttons shall be of momentary contact spring loaded type with a set of normally close and open contacts. The start push button shall be shrouded type and coloured green. The stop push button shall be un-shrouded type and coloured red and other push buttons shall be un-shrouded type and coloured black. The fixing ring shall be metallic white.
- 6.7.5 Emergency stop push buttons, if specified, shall be lockable in pushed position.

6.8 Control Fuses

- 6.8.1 The fuses shall be non-deteriorating HRC cartridge link type and shall conform to IS: 13703. They shall be suitable for load and service required in the circuit.
- 6.8.2 One fuse puller shall be supplied along with each board.

6.9 Miniature Circuit Breakers

- 6.9.1 The miniature circuit breakers shall conform to IS: 8828 and shall be of duty category M-9.
- 6.9.2 It shall be provided with overload and short circuit protective devices in a heat resistant housing.
- 6.9.3 Type test certificate for short circuit rating and current time tripping curve shall be furnished along with the offer.

6.10 Signal Lamps

- 6.10.1 Signal lamps shall be provided to indicate the various circuit conditions as shown



in scheme drawings. The colour of the lamps for various functions shall be as follow:

Red	-	Circuit breaker 'ON'
Green	-	Circuit breaker 'OFF'
White	-	Trip circuit healthy
Amber	-	Alarm and auto trip
Blue	-	Non-Trip

6.10.2 The lamps shall LED type with lumen output of 200 millicandella in axial direction.

7.0 ACCESSORIES

7.1 The supply shall include the following accessories.

- Maintenance truck/device for raising, lowering and withdrawal of circuit breaker, if required.
- Earthing truck, in case the integral earthing arrangement is not feasible in the circuit breaker.
- Fuse puller.
- Test plug for relays.
- Test plug for kWh meters.
- Special tools and tackles, as required.

7.2 Space Heater

7.2.1 Each panel shall be provided with a thermostatically controlled space heater, rated for 240 V, 50 Hz and controlled through double pole miniature circuit breaker.

7.3 Name Plates

7.3.1 The switchboard shall have large name plate on the top to indicate its name and designation.

7.3.2 Each panel shall be provided with name plate both in front and back.

7.3.3 All control switches, push buttons, lamps etc. shall have functional identification labels.

7.3.4 Name plate shall be of black Perspex with white engraving and of minimum 3 mm thick.

7.4 Any other accessories required, but not specified, shall also be supplied to make the switchboard complete in all respects and ensure safe and proper operation.

8.0 PAINTING

8.1 The enclosure, after degreasing, pickling in acid, cold rinsing, phosphatising, passivating etc. shall be painted with two coats of anti-rust paint followed by two



coats of anti-corrosive paint.

- 8.2 Epoxy based paint shall be used, if indicated in Specification Sheet.
- 8.3 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.
- 8.4 Unless otherwise specified, the finishing shade shall be light grey having shade No.631 as per IS: 5.
- 8.5 One litre of paint shall be supplied along with each board for touch up at site.

9.0 TESTS AND INSPECTION

- 9.1 All the switchboards shall be subjected to routine test as per IS: 3427 and their components as per relevant standards.
- 9.2 Additional tests, wherever specified, shall be carried out.
- 9.3 All the above tests shall be carried out in presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection during process of manufacture at works and site inspection.
- 9.4 These inspection shall, however, not absolve the vendor from his responsibility for making good any defect which shall be noticed subsequently.

10.0 DRAWINGS AND DOCUMENTS

- 10.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.
- 10.2 All drawings and documents shall have the following description written boldly.
- Name of client
 - Name of consultant
 - Enquiry / Order Number with plant / project name
 - Code No. and Description

11.0 SPARES

- 11.1 Spares for operation and maintenance
- Item wise unit prices of spare parts with recommended quantity shall be quoted along with the equipments as listed in the specification sheet.
- 11.2 Commissioning Spares
- Commissioning Spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.

**ENGINEERING STANDARD****ES: 8061****2**

DOCUMENT NO.

REV.

HIGH VOLTAGE SWITCH BOARDS

SHEET 16 OF 18

11.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

11.4 All spare parts shall be identical to the parts used in the equipments.

12.0 PACKING

12.1 The switchboard shall be properly packed before dispatch to avoid damage during transport, storage and handling.

12.2 The packing box shall contain a copy of the installation, operation and maintenance manual.

12.3 A sign to indicate the upright position of the panels to be placed during transport and storage shall be clearly marked. Also proper arrangement shall be provided to handle the equipment.

13.0 DEVIATIONS

13.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

13.2 Deviations, if any, from the data furnished in specification sheet shall be indicated therein beside the data by encircling it.



ANNEXURE - I

DOCUMENTATION FOR HIGH VOLTAGE SWITCHBOARDS

Sl. No.	Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheets, duly completed	Y	Y	Y
2.	Technical Particulars, duly filled-in	Y	Y	Y
3.	Feeder Details	Y	Y	Y
4.	General arrangement and Foundation Drawings	Y	Y	Y
5.	Schematic/Wiring Diagrams	N	Y	Y
6.	Calculation for Bus-bar sizing	Y	Y	N
7.	Terminal Arrangement Drawings	N	Y	Y
8.	Illustrative and Descriptive Literature	Y	N	Y
9.	Catalogues for bought out accessories	Y	N	Y
10.	Installation, Operation and maintenance manual	N	N	Y
11.	Test Certificates			
	i) Type - Switchboard	Y	N	N
	- Circuit Breaker	Y	N	N
	- MCB	Y	N	N
	ii) Routine	N	N	Y
12.	Guarantee Certificates	N	N	Y
13.	Spare Parts List	Y	N	Y

Note:

1. 4 hard copies & 1 soft copy shall be supplied with bid.
2. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
3. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No

**ANNEXURE - II****LIST OF SPARES**

The following spare parts shall be quoted along with the offer:

A. BREAKERS (OF EACH RATING)

- i) Trip bar spring and any other spring used in the circuit breaker mechanism
- ii) Shunt trip coil
- iii) Closing coil
- iv) Diodes, if used
- v) Secondary Isolating contact blocks
- vi) Release devices, if any
- vii) Any other spares recommended for VACCUM/SF6 circuit breakers

B. CONTROL SWITCHES

- i) Trip-Neutral-Close Control Switch
- ii) Local-Remote Selector Switch
- iii) Thermostat
- iv) Ammeter Selector Switch
- v) Voltmeter Selector Switch
- vi) Push Button Element
- vii) Push Button Actuator of each type

C. MINIATURE CIRCUIT BREAKER (OF EACH RATING)**D. RELAYS**

- i) Relays of each type

E. METERS

- i) Ammeter
- ii) Voltmeter
- iii) KWh Meter

F. INSTRUMENT TRANSFORMERS**G. FUSES (OF EACH RATING)**

- i) Fuse link
- ii) Fuse fittings

H. MISCELLANEOUS

- i) Alarm bell
- ii) Alarm buzzer