

Request for Proposal for supply of

LT PANELS

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This Specification covers the design, manufacturing, inspection and testing packing, transportation, delivery of the following at the site.

1. LT KIOSK AS PER SLD.

2. MAIN LT PANEL AS PER SLD.

2.1 General

The switchboard shall be metal clad, totally enclosed, rigid, compartmentalized design, floor mounting, air insulated, extensible cubicle type for use on medium voltage power, 3 phase 4 wire 50 cycles system.

The equipment shall be designed for operation in high ambient temperature and high humidity tropical atmospheric conditions. Means shall be provided to facilitate ease of inspection, cleaning and repairs for use in installations where continuity of operation is of prime importance.

2.2 Standards

The equipment listed below shall conform to the requirements shown:

- a. Air Circuit Breaker (ACB) - IS 13937 - 1.2 / IEC 947 - 1.2
- b. Moulded Case Circuit Breaker (MCCB) - IS 13947 - 1.2/ IEC 947 - 1,2
- c. Contactors- IS 13947-1, 4 Miniature Circuit Breaker (MCB)-IS 8828-1996/IEC898-1995
- e. Residual Current Circuit Breaker (RCCB) - IS 12640 - 1988 / IEC 1008
- f. HRC fuse link - IS 9224 and BS 8:8
- g. Current Transformer - IS 2705 and IEC 185
- h. Potential Transformer- IS 3156
- i. Relay - IS 3231 and IS 8686 (For Static Relays)
- j. Indicating Instrument- IS 1248

2.3 Type and Construction

The switchboard shall be of:

- a. Sheet steel enclosed, indoor floor mounted free standing cubicle type.
- b. Made up of the requisite vertical sections modular type which when coupled together shall form continuous dead front switchboards.
- c. Dust, vermin and damp proof and enclosure protection of not less than IP 54.
- d. Each feeder/instrument compartment shall be provided with a hinged door interlocked with MCCB inside the compartment such that door can only be opened when MCCB in off position.
- e. Readily extendable as required by the addition of vertical sections after removal of the end covers.
- f. Switchboards shall have access to the feeders, bus bars, cable termination, cable alley, etc. as required.
- g. Main Breakers need to be lockable.

Each vertical section shall comprise:

- a. A front framed structure of rolled/folded CRCA sheet steel angle section of minimum 3 mm thickness rigidly bolted together. This structure shall house the components contributing to the major weight of the equipment such as circuit breaker cassettes, main horizontal bus bars, vertical risers and other front mounted accessories.
- b. The structure shall be mounted on a rigid base frame of folded CRCA sheet steel of minimum 6 mm thickness and 75 mm height. The design shall ensure that the weight of the components is adequately supported without deformation or loss of alignment during transit or during operation.
- c. A cable chamber housing the cable end connections and power or control cable terminations. The design shall ensure generous availability of space for ease of installation and maintenance of cabling and adequate safety for working in one vertical or horizontal section without coming into accidental contact with live parts of the adjacent section.
- d. A cover plate at the top of the vertical section, provided with a ventilating hood where necessary. Any aperture for ventilation shall be covered with a perforated sheet having less than 1mm diameter perforations to prevent entry of vermin.
- e. Front and rear doors fitted with dust excluding neoprene gaskets with fasteners designed to ensure proper compression of the gaskets. When covers are

provided in place of doors generous overlap shall be ensured between sheet steel surfaces with closely spaced fasteners to preclude the entry of dust.

The height of the panel shall not be more than 2200 mm unless otherwise specified and maximum height of switch operating handle shall not be more than 1800mm from FFL. The total depth of the panel shall be adequate to cater for proper cabling space.

Doors shall be of minimum 14 gauge sheet steel and covers and partitions of 160 sheet steel. All sheet steel work forming the exterior of switchboards shall be smoothly finished, leveled and free from flaws. The corners shall be rounded.

The Components in the switchboards shall be so arranged as to facilitate ease of operation and maintenance and at the same time to ensure necessary degree of safety.

Components forming part of the switchboards shall have the following minimum clearances:

- | | |
|-------------------------------|-------|
| a. Between phases | 25 mm |
| b. Between phases and neutral | 25 mm |
| c. Between phases and earth | 25 mm |
| d. Between neutral and earth | 19 mm |

When, for any reason, the above clearances are not available, suitable insulation barrier/shielding shall be provided. Clearances shall be maintained during normal service conditions.

Creepage distances shall comply to those specified in relevant standards. All insulating material used in the construction of the equipment shall be of non-hygroscopic material treated to withstand the effects of high humidity, high temperature and tropical ambient service conditions.

Functional units such as circuit breakers, MCCBs, etc. shall be arranged in multi-tier formation except that not more than two air circuit breakers shall be housed in a single vertical section.

Metallic and/or insulated shrouding shall be provided within vertical sections and between adjacent sections to ensure prevention of accidental contact with:

- Main bus-bars and vertical risers during operation, inspection or maintenance of functional units and front mounted accessories.
- Cable terminations of one functional unit, when working on those of adjacent units.

All covers providing access to live power equipment or circuits shall be provided with tool operated fasteners to prevent unauthorized access. Provision shall be made for permanently earthing the frames and other metal parts of the switch gear by two independent distinct connections. Only CRCA steel sheets shall be used for fabricating the cubicle. Thickness tolerance for sheets shall be as applicable in relevant IS.

2.4 Metal Treatment and Finish

Generally the treatment and finish of the metal surface shall be as per detailed specifications in Clause 8.4 Metal Treatment and Finish.

2.5 Bus bars

The bus bars shall be made of high conductivity high strength E91E aluminium alloy suitable for 440 volts 3phase 4 wires 50 Hz 20KA unless otherwise specified.

The bus bars shall be suitably supported with non-hygroscopic supports to provide a fault withstand capacity as specified.

High tensile bolts and spring washers shall be provided at all bus bar joints.

Fish plates of equal type and size shall be used at all joints.

The bus bars shall have uniform cross section throughout and shall be capable of carrying the rated current at 433V continuously. The bus bars shall be designed to withstand a temperature rise of 45 Deg C above the ambient. A current density of 1.00 Amp/Sqmm shall not be exceeded for copper bus bars.

The neutral bus bars shall have a continuous rating of at least **100%** of the phase bus bars, unless mentioned otherwise.

Bus bars shall be fully sleeved using heat shrunk PVC sleeves appropriately colour coded to identify different phases and neutral bar.

An earth bus of size not less than 40 x 6 mm aluminium shall run throughout the length of switchboard at top or bottom as required.

3.0 MCCB - Moulded Case Circuit Breaker

3.1 General

MCCB shall conform to IS 13947-1&2/IEC60947-1&2; conforming to test sequence 1 and Isolation as per standard. It should be suitable for Horizontal and Vertical mounting and line load reversibility without any duration.

The Moulded Case Circuit Breaker incorporated in the switchboard shall be of the current limiting type, cat-A, upto 630A. 800A and above shall be cat B i.e. with Short time withstand capacity $I_{cw}/0.5$ sec of minimum 20kA. MCCB shall be suitable either for Single Phase AC 230V On Three Phase 415V. The MCCB shall be available in fully rated four pole versions for neutral isolation. It shall have tropicalisation as standard feature.

The MCCB cover and case shall be made of high strength heat-resistant and flame-retardant thermosetting insulating material. The operating handle shall be quick make, quick break, trip - free type. The operating handle shall have suitable 'ON' 'OFF' 'TRIPPED' indicators and in order to ensure suitability for isolation complying with IS 13947-2/IEC60947-2, the operating mechanism shall be designed such that the toggle or the handle can only be in 'OFF' position: if the main contacts are actually separated.

All Breakers shall have adjustable overload and short circuit settings.

Overload – adjustable 0.4 to 1 times nominal rating (In)
 Short-circuit – adjustable fro 2 – 9 times rated current (Ir)
 Earth fault (wherever specified) – adjustable setting with time delay

ACCESSORIES:

All MCCB feeders shall have monitoring & display feature viz. Ammeter, Voltmeter, frequency, KVA, KW, KWAh, p.f, THD with COMM port.

3.2 Accessories

MCCB shall be designed to have following accessories and it shall be fittable at site.

- a. Under voltage trip
- b. Shunt trip
- c. Alarm switch
- d. Auxiliary switch
- e. Remote operation using motor mechanism with facility of using the same in auto / manual mode.

3.3 Interlocking

MCCB shall be provided with following interlocking devices for interlocking the door of a switchboard.

- a. Handle interlock to prevent unnecessary manipulations of the breaker.
- b. Door interlock to prevent door being opened when breaker is in ON position.
 In addition to the above and other features indicated elsewhere shall also be provided.

4.0 Other Equipment

4.1 Contactors

Contactors shall comply with IS 13947-1 for general rules and IS 13947 - 4.1 for Standards pertaining to Contactor and Motor Starter.

The Contactors shall be capable of withstanding breaking and making capacities per following:

AC3 Category	AC4 category
Making Current 10 x Rated Current	12 x Rated Current
Breaking Current 08 x Rated Current	10 x Rated Current

Contactors shall be capable of withstanding an impulse voltage of 8kV and have an insulation voltage of 1000V. Contactors shall be suitable for copper termination with a maximum permissible temperature rise of 65 Deg; C at the terminals with an ambient temperature of 50 Deg; C. The coils shall have three terminals and the insulation shall be of class H type. The auxiliary contact block shall have a switching capacity of 240V at 2A. Contactors shall have one auxiliary in built and it shall be possible to have additional normally opened, normally closed contacts in steps of two.

4.2 Miniature Circuit Breakers [MCB]

MCB shall be in 1, 2, 3 or 4, pole versions. MCB casing shall be made of self-extinguishing, tropicalized material. MCB shall comply with IS 8828-1996/IEC 898-1995. It shall be suitable for use in frequency range 40Hz to 60Hz and shall accommodate AC/DC supply according to requirements. It shall have a trip-free mechanism and toggle shall give a positive contact indication. It shall be suitable for mounting on 35mm DIN rail/surface mounting.

Line supply may be connected to either top or bottom terminals i.e. there shall be no line-load restriction. Degree of protection, when the MCB is flush mounted, shall be IP40. MCB shall be supplied with clamping terminals fully open. Contact closing shall be independent of the speed of the operator. The breaking capacity of the MCB shall be 10kA. The MCB shall be capable of being used as Incomer Circuit Breaker and shall be suitable for use as an isolator. In case of multiple MCBs in a single location (DB), it shall be possible to remove any MCB without having to disturb other MCB's in the vicinity.

4.3 Surge Diverters

Surge diverters shall be provided as specified in Section 16670 Lightning Protection.

4.4 RCCB - Residual Current Circuit Breaker

RCCB shall be available in 2 pole and 4 pole versions and threshold sensitivities of 30mA, 100mA, 300mA and current ratings from 25 to 80A. Rating and sensitivities shall be as specified. RCCB shall comply with IS 12640-1988/IEC 1008. The short circuit withstand of the RCCB without the associated short circuit/overhead protection shall not be less than 3 kA. It shall be operationally independent of line voltage. The sensitivity thresholds (30mA, 100mA, 300mA) shall be of non-user adjustable type by construction.

4.5 Current Transformers

Current transformers shall comply with the requirements of IS 2705. They shall have ratios, outputs and accuracy as specified/required. All CT's shall be of resin cast type unless otherwise specifically called for.

All CTs shall be of bar type primary or suitable for the cable given type and size. For all the CTs suitable type and size clamps are to be supplied for mounting in the switchboards. Polarities and terminal markings of primary and secondary shall be clearly marked on all CTs.

4.6 Specifications for CTs

a) Current Ratios:

1. Primary: As per feeder ratings

2. Secondary: 5A

b) Type: Resin Cast

c) Class: PS-Differential Protection
5P10-O/C,E/F, RPR
Class 1 for metering

d) System Voltage

1. LT:415V, 3Ph, 50Hz

4.7 **Potential Transformers**

All the Potential Transformers shall comply with the requirements of IS 3156 latest edition. All PT's shall be resin cast type and shall have Voltage ratios, output and accuracy class as Specified in Data Sheet.

All PT's shall be single phase, dry type suitable for mounting inside the panel or cubicles. Clamps, brackets and supports required for the mounting shall be supplied along with PT. Polarities and Terminal markings shall be clearly marked in all PT's. Name plate indicating, voltage ratio, burden, accuracy class, type, serial number, make and model plus other related data, shall be provided. A common earth terminal for earthing of core, bolts, clamps (non current carrying metal parts) etc., shall be provided.

For 415V system, Specification of the PT's shall be as follows:

- | | |
|--------------------------------|--------------|
| a) Voltage ratio | : 415V/110V |
| b) Type | : Resin cast |
| c) Burden | : 100VA |
| d) Class (Metering/Protection) | :0.5/3P |

4.8 **Instruments and Meters**

All instruments and meters shall be enclosed in dust proof, moisture resistant black finished cases and shall be suitable for tropical use. They shall be calibrated to read directly the primary quantities. They shall be accurately adjusted and calibrated at Works and shall have means of calibration, check and adjustment at site.

4.9 **Indicating Instruments**

Indicating instruments shall be flush mounted with digital displays. The indicating instruments shall conform to IS: 1248 and shall have an accuracy class of 1.5 or better.

The Ammeter and Wattmeter current coils shall withstand 200% of rated current continuously and 10 times the rated current for 0.5 seconds without loss of accuracy. Voltmeter and Wattmeter potential coils shall withstand 120% of rated voltage continuously and twice the rated voltage for 0.5 sec. without loss of accuracy.

4.10 Voltmeter

Voltmeter shall be suitable for operating directly on LT supply voltage 433V. 50Hz AC. with a scale indicating directly as for LT metering. 0-500V Voltmeter shall be used. All Voltmeters are 96mm x 96mm, suitable for mounting on the panel.

Type, Serial Number, accuracy class and borders of the Voltmeter shall be indicated on the dial.

4.1 Ammeter

All the ammeters shall be CT operated (5A) with a dial marked for line currents.

Type, Serial Number, Accuracy class, Operating Current, Burden etc., shall be indicated on the dial.

All Ammeters shall be digital, panel mounting type and shall be provided with zero adjustment.

All ammeters shall be 96mm x 96mm, suitable for mounting on the panel.

4.12 Energy Meters

WATT HOUR AND VAR HOUR METERS shall be of the three phase two element type suitable for measurement of unbalanced loads in three phase four wire circuits. They shall be of drawout type and suitable for flush mounting with back connecting terminals. The meter shall have glass covers removable from the front of the panel, without dismantling the meter from the panel. All permanent magnets shall be of the non-ageing type. The meter shall be fitted with a separate test block for testing of the reverse direction. They shall be provided with a separate test block for testing of the meters without disturbing the CT and PT secondary connections. They shall have cyclometer type of register. At least two sealing studs for sealing purposes shall be provided. The Energy Meter shall be connected to the secondary's of potential transformers and current transformers rated for 110 Volts and 5 Amp respectively. These meters shall conform to IS: 13010 and have an accuracy of class 1.0 or better for KWH meter and 3.0 or better for LVARH meters.

Meters shall be compensated for temperature errors and factory calibrated to directly read the primary quantities without the use of additional multiplying factor. Multiplying factor, if unavoidable shall be a multiple of 10. Number of digits provided shall be adequate to cover at least 1000hrs of operations.

The current coil of the meters shall have a continuous overload capacity of 200% for both accuracy and thermal limits. Also the current coils shall withstand at least 10 times the rated current for 0.5 seconds without loss of accuracy.

4.13 Push Buttons

Push buttons shall be of momentary contact type with rear terminal connection. These shall be suitably shrouded to prevent inadvertent operation. Integral inscription plates engraved with their functions shall be provided. All push buttons shall have two normally Closed and two normally Open contacts comprising rivets of pure silver. The contacts shall be able to make and carry 5 A and break up one amp inductive loads at 250V DC.

4.14 Cable Terminations

Cable entries and terminals shall be provided in the switchboard to suit the number, type and size of copper conductor power cables and copper conductor control cable specified in the detailed specifications. Provision shall be made for top or bottom entry of cables as required. Generous size of cabling chambers shall be provided with the position of cable gland and terminals such that cables can be easily and safely terminated. Barriers or shrouds shall be provided to permit safe working at the terminals of one circuit without accidentally touching that of another live circuit. Cable risers shall be adequately supported to withstand the effects of rated short circuit currents without damage and without causing secondary faults. Cable sockets shall be of tinned copper and of the crimping type.

4.15 Control Wiring

All control wiring shall be carried out with 660/1100V grade single core PVC cable having stranded copper conductors with minimum cross section of 1.5Sqmm for potential circuits and 2.5Sqmm for current transformer circuits. Wiring shall be neatly bunched, adequately supported and properly routed to allow for easy access and maintenance. Wires shall be identified by numbered ferrules at each end. The ferrules shall be of ring type and of non-deteriorating material. They shall be firmly located on each termination so as to prevent free movement. All control circuit fuses shall be mounted for easy accessibility.

4.16 Terminal Blocks

Terminal blocks shall be of 500 Volts grade and of stud/screw less type. Terminal blocks shall have a minimum current rating of 10 Amps and shall be shrouded. Provisions shall be made for label inscriptions. At least 20% spare terminals shall be provided on each panel and these spare terminals shall be uniformly distributed on all terminal blocks. Terminal blocks for current transformer and voltage transformer secondary leads shall be provided with test links and isolating facilities. Also current transformer secondary leads shall be provided with short circuiting and earthing facilities. There shall be a minimum clearance of 250mm between the first row of terminal blocks and the associated cable @land plate. Also, the clearance between two rows of terminal blocks shall be a minimum of 150mm.

4.17 Relays

All Relays shall conform to the requirement of IS : 3231/IS 8686 or other applicable approved standards Relays .

All AC Relays shall be suitable for operation at 50Hz. AC Voltage operated relays shall be suitable for 110v 3 Volts PT secondary and Current operated relays for 5Amp CT secondary, as specified in this specification. Voltage operated relays shall have adequate thermal capacity for continuous operation.

Auxiliary Relays and Timers, shall have pairs of contacts as required to complete the scheme. Contacts shall be silver faced with spring action.

All Protective Relays, Auxiliary Relays and Timers except the lockout relays and Interlocking relays specified, shall be provided with self reset type contacts. All Trip relays and Timers shall be provided with externally hand reset positive action provided with inscription subject to Consultant/Developer approval. Timers shall be of the electromagnetic or solid state type.

Wherever solid state relays are used the following requirement shall be met:

- (a) All Relays shall be designed for operating under an ambient temperature 55 Deg; C and 100% relative humidity.
- (b) All accessories required for correct operation of each relay shall be supported by the Contractor without any extra cost.
- (c) The solid state relays shall be stable and suitably protected against transient or induced over voltages. The Bidder shall state clearly in his list special requirements, if any, for DC input arrangement or cabling considered necessary for satisfactory operation of solid state relays quoted by him.

6.0 Labelling

6.1 General

Every switchboard, switchboard control contactor, time switch, relay, indicator lamp, meter, motor starter, link and any control or protection equipment within or on a switchboard shall be clearly and accurately labelled.

Labels shall be engraved laminated plastic or photo anodised rigid aluminium and shall comply with the following requirements.

Except where otherwise required, labels shall be fixed adjacent to, but not on any item of equipment. Engraved lettering shall be black on a white background, except that the label for a main switch shall have red lettering on a white background, and warning and caution labels shall have white lettering on a red background. The minimum height of lettering shall be 3mm and of sufficient definition to allow easy reading.

6.2 Fixing of Labels

Labels shall be securely fixed by:

- (a) Screws and adhesive, or
- (b) Fixed in an extruded aluminium section which shall be countersunk screw fixed or countersunk riveted to the panel.

Screws shall be tightened with nuts or into tapped holes in the switchboard. Mechanically expanded plastic rivets of minimum 6mm head diameter are acceptable instead of screws. Aluminium rivets may be used to fix aluminium labels only. Self-tapping screws, thread-cutting screws or other fixings are not acceptable.

6.3 Labels on Exterior of Switchboards and Schedules

All switchboards shall be labeled with the manufacturer's name.

A switchboard designation label shall be provided. For other than main switchboards, the designation label shall also state the source of electrical supply. Separate sections of enclosures shall be identified. The label for any section or enclosure containing Supply Authority equipment shall be to the satisfaction of the Consultant / Developer and the Supply Authority.

Every switchboard control shall be labeled and shall include:

- (a) Circuit designation for all main switches, main controls and submain controls.
- (b) Details of the consumer's mains and all submains.
- (c) Incoming busbar or cable rating to the first tee-off.

The minimum height of lettering shall be 6 mm.

For identification of final sub circuits, a typed schedule, cross-referenced to the lighting and power layout plans shall be provided. The schedule shall be protected by a plastic sheet and fixed in a suitable frame mounted on the inside of the relevant switchboard door or, if the switchboard has no door, on the wall immediately adjacent to the switchboard.

6.4 Labels on Interiors of Switchboards

Labels identifying equipment within a switchboard shall be located such that the item referred to is obvious and the lettering is not substantially obscured by the temporary or permanent position of any equipment or wiring.

For plug-in equipment where items are physically but not functionally interchangeable, the label wording shall be expanded to clearly identify the removable section (e.g. to identify the contact configuration or timing range). Where this is not possible, a second identifying label shall be glue fixed to the removable section.

The function and coding shown on the circuit diagram shall be used.

The MEN link shall be labeled, or stamped and infilled, 'MEN LINK' on the link.

6.5 Warning Labels

Where copolymer membrane coating is used anywhere on live conductors without further insulation, a warning label shall be provided on the front cover near the main switch or local main switch and in a prominent position within each section of the switchboard. The label shall have the following wording in 6mm high lettering:

WARNING

PAINTED COATING ON BUSBARS OR TERMINATIONS IS NOT INSULATION.

If a stand-by power supply is installed, an appropriate warning label shall be fixed at the main switch or local main switch. An example of a typical label is:

WARNING

IN THE EVENT OF LOSS OF NORMAL SUPPLY GENERATOR SET WILL AUTOMATICALLY START AND BE CONNECTED TO THIS SWITCHBOARD

When anti-condensation heaters are fitted, a label shall be provided at each heater reading

WARNING

THERMOSTATICALLY CONTROLLED ANTI-CONDENSATION HEATER-DO NOT SWITCH OFF

7.0 Tests

7.1 General

The routine tests shall be conducted as per IS standards on each Power Control Center and shall comprise:

Inspection of the Switchboards including inspection of wiring and electrical operational and functional tests where necessary. Checking of protective measures and electrical continuity of the protective circuits.

7.2 Dielectric Tests

Insulation resistance of the power circuit between each pole and the earth and that between the poles shall be measured.

Insulation resistance of all secondary wiring between phase and earth shall be measured. Insulation test shall be carried out both before and after high voltage test.

7.3 High Voltage Test

A high voltage test with 2.5 kV for power circuit and 1.5kV for Control Circuit, Duration one minute shall be applied between each pole and earth and between poles. Test certificate shall be submitted along with panel.

8.0 Storing, Erection and Commissioning

8.1 Storing

The panels shall be stored in a well ventilated dry place. Suitable polythene covers shall be provided for necessary protection against moisture, dust, and vermin.

8.2 Erection

Switchboards shall be installed over trench/floor as required. Suitable grouping holes shall be provided in the flooring. Suitable MS base channel shall be embedded in the flooring on which the panel can directly be installed. The switchboards shall be properly aligned and bolted to the flooring by at least four bolts. Cables shall be terminated on the bottom plate or top plate as the case may be, by using brass compression glands. The individual cables shall then be led through the panel to the required feeder compartments for necessary terminations. The cables shall be clamped to the supporting arrangement. Either side, the switchboard earth bus shall be connected to the local earth grid. The base channel used for erection of panels shall form part of the cost of the panel and shall not be measured or paid separately.

8.3 Pre-commissioning Tests

The panels shall be commissioned only after successful completion of the following tests. The tests shall be carried out in the presence of the Consultant / Developer.

- (a) All main and auxiliary bus bar connections shall be checked and tightened.
- (b) All wiring terminations and bus bar joints shall be checked and tightened.
- (c) Wiring shall be checked to ensure that it is according to the approved drawing.
- (d) All wiring shall be tested for insulation resistance by a 500 volt megger
- (e) Phase rotation tests shall be conducted.
- (f) Suitable injection tests shall be applied to all the measuring instruments to establish the correctness and accuracy of calibration and working order if required by the Developer.
- (g) All relays and protective devices shall be tested for correctness of settings and operation by introducing a current generator and an ammeter in the circuit or shall produce calibration or test certificate as required by the inspectorate or Consultant / Developer.
- (h) Functional tests on all feeders.
- (i) Make, type and ratings of all components shall be checked and verified as per the approved drawings.

8.4 Metal Treatment and Finish

All steel work used in this Contract shall in general, undergo the following process of treatment and finish.

- (a) Degreasing: by hot alkaline degreasing solution followed by cold water rinsing to remove traces of alkaline solution.
- (b) Phosphating: by a recognized phosphating process to facilitate durable coating of the paint on the metal surfaces and also to prevent the spread of rust in the event of the paint film being mechanically damaged. This again shall be followed by hot water rinsing to remove traces of phosphate solution.
- (c)Drying in dust-free atmosphere.
- (d)Primer: Primer coating with a coat of corrosion resistant primer applied on wet surface.
- (e)Finish coat: Two finishing coats of stoving synthetic enamel paint to the specified shade of IS 5. Both the finish coats shall be only spray painted.
- (f) For outdoor units the finishing coat shall be of weather resistant stoving epoxy paint of specified shade of IS5.

8.5 Warranty and Maintenance

The installation shall be guaranteed against faulty workmanship for minimum of one year from the date of practical completion. All faulty workmanship shall be replaced and restored to full operation at no cost to the Developer within the guarantee period.

Manufacturer's guarantees and warranties shall be obtained in accordance with Clause 9.11 of the Preliminaries. The warranty period shall be for eighteen months commencing from the date of installation or twelve months from the date of practical completion, whichever is the first to occur.

Make of components:

- | | | |
|-----------------------|---|------------------------|
| 1. ACB EDO | - | L&T. |
| 2. MCCB | - | L&T. |
| 3. Multi Data Meters | - | ELMeasure. |
| 4. CT`s | - | Voltamps/Kapco/Kalpa |
| 5. Indication Lamps | - | Vishnu/Teknic. |
| 6. Digital KWH meter- | | Enercon/Elmeasure/L&T. |
| 7. ELR with CBCT | - | prok DVs |
| 8. Push Buttons | - | Vishnu Teknic. |