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प्लाज्मा अनुसंधान संस्थान  
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परमाणु ऊर्जा विभाग, भारत सरकार का एक सहायता प्राप्त  
संस्थान  
An Aided Institute of Department of Atomic Energy,  
Government of India



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## ENQUIRY

ENQUIRY NO : IPR/EQL/18-19/050  
Date : 23-05-2018

**Due on : 21-06-2018 by 1:00 PM IST**

Please send your offer in sealed envelope specifying Enquiry No, Date & Due Date, ALONG WITH your credentials for the following items:

### Important Note:

Please note that e-mail quotations are not acceptable however you may send your queries (if any) to [localpurchase@ipr.res.in](mailto:localpurchase@ipr.res.in)

Please ensure your sealed quotation reaches this office not later than above mentioned due date and time.

Kindly go through the following documents properly before quoting which are available on the IPR web portal i.e., [http://www.ipr.res.in/documents/tender\\_terms.html](http://www.ipr.res.in/documents/tender_terms.html) / attached herewith.

- 1) Instructions to the bidders & Terms and conditions (refer Form No: **IPR-LP-01.V4**)
- 2) Bidding format

**GST for Goods and Services (IGST/CGST/SGST TAX BENEFITS):** Please refer **clause no: 8** of Form No: **IPR-LP-01.V4**

### QUOTATION SHOULD BE ADDRESSED TO PURCHASE OFFICER ONLY

| Sr No | Description   | Quantity |
|-------|---|----------|
| 1     | Design, fabrication, inspection, testing and supply of LT A.C. cubical pattern Circuit Breaker panel with all accessories | 3.0 Nos. |
| 2     | Erection, testing and commissioning of the LT A.C. cubical pattern Circuit Breaker panel at site                          | 3.0 Job  |

Note: (1). 90% of order value will be made against delivery of material at IPR site and its verification by IPR representative. Balance 10% will be made within 30 days from the date of acceptance and on receipt of Performance Bank Guarantee for 10% of the order value from SBI/nationalized/scheduled bank (Scheduled banks acceptable to IPR are Axis Bank, HDFC Bank, ICICI Bank and IDBI Bank) valid throughout the warranty period.  
(2). Please quote with complete technical details (Technical compliance sheet and product data sheet).

Encl: As per attachment.

Sd/-  
Mr. D. Ramesh  
Purchase Officer-II

**Information to Vendors:** We are working towards a single platform for our future requirement. Hence, please refer IPR website i.e, <http://www.ipr.res.in/documents/tenderseng.html> for our future requirement.

✓

**PROJECT INFORMATION & AUXILIARY FACILITIES**

|    |  |  |
|----|--|--|
| 1  | Purchaser  | Institute For Plasma Research, Village Bhat, Gandhinagar - 382 428, Gujarat, INDIA.<br>Phone : (079)-23962000<br>Fax : (079)-23969017<br>Web: www.ipr.res.in           |
| 2  | Site elevation (avg.)  | 55 meters above MSL  |
| 3  | Ambient temperature  | Max.(annual):47 °C; Min. (annual): 4 °C;<br>Average (annual): 35 °C<br>Design (max): 50°C, (min): 4°C  |
| 4  | Relative humidity  | Max. : 95%; Min. : 10%   |
| 5  | Rainfall   | 823 mm average (annual) June-August  |
| 6  | Wind data  | Max. wind speed : 130 km/h<br>Prevailing direction : SW to W<br>Design wind pressure : 150 kgm <sup>-2</sup>   |
| 7  | Seismic data   | 0.08 g (as per latest guidelines)  |
| 8  | Accessibility  | by road : Up to site(on Hansol-Gandhinagar H-way)<br>by rail : Ahmedabad Rly. Stn. (12 km.)<br>by sea : Bombay Harbour (525 km.)<br>by air : Ahmedabad Airport (6 km.) |
| 9  | Auxiliary power supply<br>(each of the voltages can be made available at one point of connection to the sources) | AC 230 ± 10% V   |
| 10 | Expected date of commissioning.  | 2 months after the date of approval of drawings  |

## **SPECIFICATION FOR L.T. CIRCUIT BREAKER PANELS**

### **1.1 SCOPE:**

The scope covers design, fabrication, inspection and testing at contractor's/his sub-contractor's work , supply, installation and commissioning of Three (3) number of L.T. AC cubical pattern Circuit Breaker panel, with all accessories, as specified in this document and in the tender drawings.

### **1.2 CODES AND STANDARDS:**

The design, materials, construction, manufacture, inspection, testing and performance of L.T. Breaker Panel shall comply with all currently applicable statutory regulation and safety codes in the locality where the equipment will be installed. The equipment shall also confirm to the latest applicable standards and codes of practice. Some of the reference standards are mentioned in this tender document.

### **1.3 DESIGN FEATURES:**

- a) The L.T. Breaker panels are required for distributing power to various system and utilities.
- b) The breaker panel shall be suitable for use in rated voltage of 415V earthed electrical system having maximum system voltage of 415V+/-10%.
- c) The design and construction of the panel shall be strong enough to take the load of breaker, bus bars, cables, relays instruments etc. and withstand rated maximum fault level and rigorous adverse weather conditions. Provision shall be made for expansion and contraction of enclosure due to temperature.
- d) The breaker, bus bars, cables etc. shall be suitable for continuous operation under site conditions indicated elsewhere with conductor temperature of 105 °C maximum. Also the conductor temperature during short circuit shall not exceed 250 °C. Bus bars shall be suitable for short time overloads.
- e) The panel shall be 100% insulated, which means there shall be no access to any live part All joint shall be shrouded with special removable PVC blocks.
- f) The hinged door shall be designed to withstand internal arcing and shall be interlocked in such a way that it cannot be opened with the breaker in closed position. Further all operations shall be possible with door closed.
- g) Special insulating barrier shall be provided where bus bar passes from one panel to another to restrict arc from propagating, across the full length of the board in event of bus fault.
- h) Wiring circuits fed from a supply common to a number of feeder panels shall be protected so that failure of a circuit in any one feeder does not prevent operation of other feeders.

- i) Circuit of one feeder panel should be capable of isolation for maintenance purposes without affecting other circuits.
- j) Doors, covers and all non-current carrying metallic parts shall be earthed through flexible copper wires. This should also include instrument casing and cable armour, which should also be connected to the earth bus.
- k) For safety, a spring-loaded scraping earth shall be provided on each withdrawable tray of drawout design circuit breaker panel ensures continuous earthing when trolley is withdrawn and having direct connection to the main earth bus.

#### **1.4 CONSTRUCTIONAL FEATURES:**

##### **1.4.1 The Basic Cubicle:**

- a) The basic enclosure shall be fabricated from Cold rolled sheet steel material, of thickness not less than 2 mm in all sides. For all the load bearing application sheet steel thickness shall not be less than 2 mm. Doors and covers shall be made of cold rolled sheet steel of thickness not less than 1.6 mm. Stiffeners shall be provided wherever required. The panel frames shall be fabricated using cold rolled sheet steel of thickness not less than 2.5 mm.
- b) The cubicle shall have four distinct compartments each separately earthed – Breaker compartment, Relay & Instrument chamber, Bus bar chamber, CT & Cable chamber.
- c) The doors and removable covers shall be provided with neoprene gaskets to make the panel dust and vermin proof.
- d) Any metal to metal joint anywhere inside the panel shall be gasketed to achieve zero gap. Between two panels special T type gasket shall be provided for zero gap and aesthetics.
- e) The panel board shall be complete with all internal wiring, bus-bars, labels, accessories etc. as specified.
- f) Labels shall be provided for all identifiable like breakers, relays, indicating lamps, control switches, selector switches and accessories etc.
- g) The panel door shall be opened only by means of tools to prevent unauthorized opening.
- h) Painting: Seven-tank process treatment shall be followed for treatment of the fabrication parts of the panel. Two coats of epoxy based primer shall be applied before applying two final coats of epoxy paint which shall have good weather resistance and heat transfer properties. Electrostatic epoxy powder coating shall be applied after pre-treatment. The colour of painting shall be RAL 7032.

##### **1.4.2 The Breaker Compartment:**

- a) The CB compartment shall receive the trolley in case of ACB, which houses the CB and PT. The trolley engagement to the enclosure is of horizontal isolating horizontal draw out type.
- b) The CB trolley shall have three distinct positions – Service, test and isolated. All three positions shall have latching facility and service and test positions have locking facility. These two positions shall have limit switch with auxiliary contacts for interlocking.
- c) In draw-out air circuit breaker, components of a feeder shall be mounted on withdrawable trolley. The trolley shall be provided with guides and low friction sliding devices. The trolley shall be provided with simple insertion and withdrawal device, which also locks the tray in fully inserted position.
- d) ACB's and MCCB's shall be arranged in multi-tier form if design permits looking at its size and thermal properties for better optimization of overall size of enclosure and of available space.

#### **1.4.3 The Bus bar Chamber:**

- a) The bus bar chamber on the top shall house the bus bars, which shall be accessed only by special tools.
- b) Bus bars shall be of Electrolytic Copper material and shall comply the requirements of IS: 8130. The bus bars should have rectangular section. The size of the bus bar should be clearly indicated in the quotation and the current density while calculating the size of the bus bars should be 1.6 A/sq.mm.
- c) The bus bars shall be supported non-hygroscopic, anti-tracking high impact epoxy cast resin insulator. The support shall be rigid and suitable for all thermal and electro dynamic stresses arising out of short circuit current for 3 sec.
- d) Bus bars shall be designed for rated normal continuous current and fault level for one second as specified in BOM, without injurious heating.
- e) Bus bars in the switchgear may be provided with insulating sleeves OR insulating coatings. The sleeves or coating material shall comply with the following requirements:
  1. The insulating material shall safely withstand the hot-spot temperatures of the bus bars.
  2. The material shall be flame retardant in accordance with ANSI-C37.20.
  3. Thermal cycling tests should have been carried out (on representative samples of insulated bus bars) to prove that insulation will not flake off or deteriorate during the expected life of the switchgear which is 30 years. One cycle is from full – load temperature to no-load temperature. Expected numbers of cycles are 20,000.
  4. Accelerated thermal and dielectric aging tests should have been conducted on the material for expected life of the switchgear.
  5. The thickness of insulation on the bus bars shall be sufficient to withstand 1.5 kV rms for one minute.
  6. Minimum phase to phase and phase to earth clearance shall be 25 mm.
  7. The material shall have low dielectric loss.

8. It shall have good thermal conductivity to dissipate heat.
  9. If there is any de-rating of bus bars due to the above, the same shall be furnished.
- f) The bus bars and every tap off joints shall be colour coded.
  - g) Silver plating of all bus bar joints shall be provided so that temperature rise of 55°C over 50 °C ambient temperature can be allowed as per ANSI C37.20

#### **1.4.4 The CT and Cable Chamber:**

- a) A spacious cable chamber at the rear of the panel shall be provided. It shall be suitable for receiving number of cables of different size as mentioned in Cable schedule. The cable box shall be accessed through removable rear cover.
- b) The cable box shall be design for cable entry from top or bottom as mentioned in BOM.
- c) Sufficient distance between cable gland plate and terminal lug shall be provided for cable termination.
- d) For cable entry, a removable 2 mm MS gland plate shall be provided.
- e) Various Clearances shall be as per the standards and practices.

#### **1.4.5 The Relay and Instrument Chamber:**

- a) Protective relays and indicating instruments shall be mounted on the door. Auxiliary relays should be projection mounted inside the cubicle.
- b) Control wiring shall be done using 650 V grade grey PVC stranded wire 1.5 sq.mm for control and 2.5 sq.mm for CT circuit.
- c) As a standard practice, all control cables shall be neatly bunched together with ferrules at either end of each wire. As per application colour ferrules shall be provided.
- d) The wire bunch shall be passed through PVC ducts.
- e) For safety and reliability, cable bunch shall be routed through flexible metallic conduit wherever it passes through HV compartments like breaker, PT chamber etc.
- f) Bus wiring shall be through grommets. Separate terminal stack shall be provided for inter-panel wiring.
- g) All wiring practices shall be as per IS-375.

#### **1.5 AIR CIRCUIT BREAKER (ACB):**

- a) Air Circuit Breakers shall fully conform to IS: 13947 part I & III.
- b) ACBs shall be designed for circuit protection of 415 V, three phase four wire AC distribution system. They shall be designed for use in panel boards as main breakers and for protection of feeder circuits and connecting equipment.
- c) The ACB's shall be suitable for installation on multi-tier panel box.



- d) The terminals of the ACBs shall be designed to maintain adequate clearances and to accept Aluminium cables and busbars.
- e) ACBs shall be of draw-out type, electrically/motor operated and of ratings as per BOM. The fully draw out type compartments shall be provided.
- f) All ACBs shall be provided with integrated Microprocessor based trip releases for overload, short circuit and earth fault with multiple characteristic curves and adjustable setting for each characteristic to ensure proper co-ordination with upstream and downstream breakers.
- g) For all air circuit breakers, monitoring of close and trip circuit voltages, trip coil shall be provided.
- h) Each circuit breaker shall be provided with distinct SERVICE/TEST/ISOLATED positions.
- i) Potential free auxiliary contacts shall be provided for ACB's status indication (ON, OFF & TRIP) and remote operation (closing and opening).
- j) Motor for ACBs shall be rated at 230V AC.

#### **1.6 MOLDED CASE CIRCUIT BREAKER (MCCB) :**

- a) Molded Case Circuit Breakers shall fully conform to IS: 13947 part II.
- b) MCCB's shall be designed for circuit protection of 415 V, three phase four wire AC distribution system. They shall be designed for use in panel boards as main breakers and for protection of feeder circuits and connecting equipment.
- c) The terminals of the MCCB's shall be designed to maintain adequate clearances and to accept Aluminium cables.
- d) The insulating case and cover shall be made of high strength, heat resistant, flame retardant thermosetting material, providing a very high dielectric strength, high withstand capability against thermal and mechanical stresses, protection against secondary fire hazards and enhanced safety of operating personnel.
- e) All MCCB's shall be provided with integrated static trip releases for overload, short circuit and earth fault with multiple characteristic curves and adjustable setting for each characteristic to ensure proper co-ordination with overload, short circuit and earth fault protection provided on upstream and downstream (a) air circuit breakers and (b) MCCB shall be provided.

#### **1.7 CURRENT TRANSFORMERS:**

- a) Current transformers shall comply with IS: 2705.
- b) Construction of CT's shall be bar type, separately mounted type.
- c) CT's shall be provided with two ( 2 ) nos. of cores, one for metering and another one for protection. Each core shall carry its own secondary winding.
- d) Protection CT core are intended for Over load, Short circuit current and Earth fault protection, the design should be based on the information provided below.

## **1.8 POTENTIAL TRANSFORMERS:**

- a) Potential transformers shall comply with IS:3156.
- b) PT's shall be of Magnetic type.
- c) PT's shall be single of core and should be used for both metering and protection.
- d) Protection is intended for under voltage protection.

## **1.9 PROTECTION, METERING AND INDICATION:**

### **1.9.1 Protection & Control:**

- a) Each Air circuit breaker (ACB) shall be provided with Microprocessor based releases for overload, short circuit and earth fault (LSIG Protection).
- b) Under-voltage release should be provided in all incoming feeders to monitor the availability of power supply in each bus of LT panels. When loss of supply is detected, designated feeders should be automatically disconnected using multiplied contacts of the Under-voltage release.
- c) Each downstream MCCB shall be provided with Static trip releases for overload, short circuit and earth fault protection (LSIG Protection).
- d) The relays should feature inherent high accuracy, high reliability and stable characteristics for both current and time setting functions.
- e) The relays should provide guaranteed performance in the specified operating conditions at specified ambient conditions without any need for specific ventilation or air conditioning.
- f) Adequate number of relay auxiliary contacts should be available for direct interface with breaker, monitoring and interlocking.
- g) Auxiliary contacts associated with ACBs/ MCCBs /Relays for all above fault conditions or combined fault signal suitable for integrating with computer based supervisory control and data acquisition system (SCADA) shall be provided.
- h) All ACB incoming and outgoing feeder control signals ON, OFF and TRIP shall be available for remote operation.
- i) For all downstream MCCB outgoing feeders control switch shall be provided for local operation in panel itself.
- j) Flexible settings on protection relays and releases shall be provided as follows :
  - i) Over load setting: 0.4 to 1.0 times the rated current.
  - ii) Over load time delay: 3 to 40 sec.
  - iii) Short circuit pick up level setting: 1.5 to 14 times the rated current.
  - iii) Short circuit time delay: Inst., 30 to 300 msec.
  - iv) Earth fault settings: 0.2 to 0.8 times the rated current
  - v) Earth fault time delay: Inst., 100 to 300 msec.
  - vi) Under voltage settings: 0.35 to 1.1 of rated voltage.
  - vii) Under voltage time delay: Inst., to 0.5 sec.

### **1.9.2 Metering:**

- a) As per BOM Incoming/Outgoing feeders shall be provided with Digital Multifunction Meter/Voltmeter/Ammeter. Ammeter range will be same as CT primary rating.
- b) All above meter shall be Panel mounting type and digital, 96 mm<sup>2</sup>size for all feeders.
- c) Protective fuses/MCBs of 4 A rating associated with voltage measurement and protection shall be provided.

### **1.9.3 Indication:**

- a) A set of indicating lamps of reputed make like Siemens or Teknic showing breaker status (ON, OFF & TRIP) shall be provided with auxiliary contacts for remote monitoring.
- b) Visual indication within breaker panel for breaker Service/Test/Isolated position shall be provided for draw out ACBs.
- c) Protective fuses/MCBs of 4 A rating associated with all indicating lamps shall be provided.

### **1.10 ACCESSORIES:**

All breaker panels shall be provided with following accessories -

- a) Motor-wound spring charged closing mechanism with motor suitable for 230V AC for ACB's
- b) Earth fault relay for all downstream MCCB outgoing feeders.
- c) U/V trip release suitable for 380V-400V AC for all incoming feeders.
- d) Closing release/coil suitable for 230 V AC for all ACBs.
- e) CTs of rating specified in BOM for all the feeders.
- f) PTs of rating specified in BOM for all incoming feeders.
- g) Auxiliary contacts - 4 NO + 4 NC for ACB and 2 NO + 2 NC for MCCB.
- h) Door Operating Mechanism with handle for MCCBs

### **1.11 EARTHING:**

- a) A copper earth bus of size not less than 35 x 6 mm<sup>2</sup> continuously runs at the bottom of the panel shall be provided.
- b) The earth bus shall be robust and capable of carrying full short circuit current for 1 sec.
- c) Doors, covers and all non-current carrying metallic parts shall be earthed through flexible copper wires. This should also include instrument casing and cable armour, which should also be connected to the earth bus.
- d) The earth bus shall have provisions for terminals at each end for connecting to grid earthing.

**1.12 BILL OF MATERIAL**

**LTP#36 (PDB#1)**

| <b>Panel</b>        | <b>Load</b>              | <b>Circuit Breaker</b>                 | <b>CT Ratio (A/A)</b> | <b>PT Ratio (V/V)</b> | <b>Meters (Digital)</b>                               | <b>Protection</b>                                  |
|---------------------|--------------------------|--|-----------------------|-----------------------|---|--|
| <b><u>PDB#1</u></b> | Incomer from LT Panel#34 | 3 Pole ACB, 800A, EDO Type, 50 kA Isc. | 800/5                 | 415/110               | MFM:<br>0 - 800 A,<br>0 - 500 V,<br>f, kW,<br>KVA, PF | 50, 51, 50N, 51N                                   |
|                     | O/G F#1:                 | 3 Pole MCCB, 250A, 35 kA Isc.          | 250/5                 |                       | 0 - 250 A,  | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#2:                 | 3 Pole MCCB, 250A, 35 kA Isc.          | 250/5                 |                       | 0 - 250 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#3:                 | 3 Pole MCCB, 250A, 35 kA Isc.          | 250/5                 |                       | 0 - 250 A,  | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#4:                 | 4 Pole MCCB, 100A, 35 kA Isc.          | 100/5                 |                       | 0 - 100 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#5:                 | 4 Pole MCCB, 100A, 35 kA Isc.          | 100/5                 |                       | 0 - 100 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#6:                 | 4 Pole MCCB, 400A, 35 kA Isc.          | 400/5                 |                       | 0 - 400 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#7:                 | 4 Pole MCCB, 400A, 35 kA Isc.          | 400/5                 |                       | 0 - 400 A   | Overload, Short-Circuit and Earth Fault Protection |

**LTP#37 (PDB#4)**

| Panel               | Load                     | Circuit Breaker                        | CT Ratio (A/A) | PT Ratio (V/V) | Meters (Digital)                                      | Protection   |
|---------------------|--------------------------|--|----------------|----------------|---|--|
| <b><u>PDB#4</u></b> | Incomer from LT Panel#34 | 3 Pole ACB, 800A, EDO Type, 50 kA Isc. | 800/5          | 415/110        | MFM:<br>0 - 800 A,<br>0 - 500 V,<br>f, kW,<br>KVA, PF | 50, 51, 50N, 51N                                   |
|                     | O/G F#1:                 | 3 Pole MCCB, 250A, 35 kA Isc.          | 250/5          |                | 0 - 250 A,  | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#2:                 | 3 Pole MCCB, 250A, 35 kA Isc.          | 250/5          |                | 0 - 250 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#3:                 | 3 Pole MCCB, 250A, 35 kA Isc.          | 250/5          |                | 0 - 250 A,  | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#4:                 | 4 Pole MCCB, 100A, 35 kA Isc.          | 100/5          |                | 0 - 100 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#5:                 | 4 Pole MCCB, 100A, 35 kA Isc.          | 100/5          |                | 0 - 100 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#6:                 | 4 Pole MCCB, 400A, 35 kA Isc.          | 400/5          |                | 0 - 400 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#7:                 | 4 Pole MCCB, 400A, 35 kA Isc.          | 400/5          |                | 0 - 400 A   | Overload, Short-Circuit and Earth Fault Protection |

**LTP#38 (PDB#5)**

| Panel               | Load                     | Circuit Breaker                        | CT Ratio (A/A) | PT Ratio (V/V) | Meters (Digital)                                      | Protection   |
|---------------------|--------------------------|--|----------------|----------------|---|--|
| <b><u>PDB#5</u></b> | Incomer from LT Panel#34 | 3 Pole ACB, 800A, EDO Type, 50 kA Isc. | 800/5          | 415/110        | MFM:<br>0 - 800 A,<br>0 - 500 V,<br>f, kW,<br>KVA, PF | 50, 51, 50N, 51N                                   |
|                     | O/G F#1:                 | 3 Pole MCCB, 250A, 35 kA Isc.          | 250/5          |                | 0 - 250 A,  | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#2:                 | 3 Pole MCCB, 250A, 35 kA Isc.          | 250/5          |                | 0 - 250 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#3:                 | 3 Pole MCCB, 250A, 35 kA Isc.          | 250/5          |                | 0 - 250 A,  | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#4:                 | 4 Pole MCCB, 100A, 35 kA Isc.          | 100/5          |                | 0 - 100 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#5:                 | 4 Pole MCCB, 100A, 35 kA Isc.          | 100/5          |                | 0 - 100 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#6:                 | 4 Pole MCCB, 400A, 35 kA Isc.          | 400/5          |                | 0 - 400 A   | Overload, Short-Circuit and Earth Fault Protection |
|                     | O/G F#7:                 | 4 Pole MCCB, 400A, 35 kA Isc.          | 400/5          |                | 0 - 400 A   | Overload, Short-Circuit and Earth Fault Protection |

**General Description:** Indoor, Floor mounted, draw-out type 415 V circuit breaker panel suitable for use on 415V  $\pm 10\%$  3 $\emptyset$  4 wire, 50 Hz System, fully confirming to the specifications and SLD, complete with main horizontal bus-bars of **800 A, 50 kA rating** and neutral of half the main bus rating with incoming feeder. Provision for top/bottom cable entry to be provided for incoming and outgoing feeders.

**Accessories:** 1 set of Lamps (Red, Green, Yellow) for CB ON/OFF/TRIP indication for each I/C and O/G Feeder; Shunt Trip Coil, Closing Coil for ACB; Auxiliary s/w 4 NO + 4 NC for ACB; Mechanical ON/OFF indicator and spring charge indicator; 1 no. space heater with s/w and thermostat for each vertical section; 1 no. cubicle lamp with s/w and fuse; independent DP s/w with HRC fuse/MCB for close and trip control supplies and DP s/w with HRC fuse/MCB for AC control Supply.

### **1.13 DRAWING:**

Detailed Power and Control circuit drawing along with fabrication drawings showing breaker arrangement and the overall size of bus bars, enclosure, fixing details, support, joints, etc. shall be submitted by the successful bidder for approval of purchaser. The bidder shall incorporate purchaser's comments/modification suggested. Actual fabrication of the Panels shall be carried out only after the approval of the purchaser.

### **1.13 TESTS:**

1. All Type tests and routine tests shall be conducted, as per relevant IS standard specified.
2. In case supplier has carried out type tests on similar type and rating of Panels during last five years from NABL approved facilities, test reports may be submitted along with the offer.

### **1.14 UNLOADING AND STORAGE:**

VENDOR has to take the complete responsibility of the unloading of the L.T. Circuit Breaker Panel at proper location at the site. The accessories shall be unloaded and store at vendor's responsibility at the site. Vendor will be fully responsible for timely unloading of equipment and accessories. IPR will not bear any expenses for the delay in unloading the equipment in the scope of this specification.

**TECHNICAL SPECIFICATIONS FOR L.T. CIRCUIT BREAKER PANELS**

| <b>Sr. No.</b> | <b>Parameters</b>                          | <b>Data</b>          |                       |
|----------------|--|----------------------|-----------------------|
| <b>1</b>       | <b>General :</b>                           |                      |                       |
|                | Type of L. T. Panel                        | Breaker              |                       |
|                | Application                                | For Distribution     |                       |
|                | Quantity                                   | 3 nos.               |                       |
|                | Installation                               | Indoor               |                       |
|                | Type of panel mounting                     | Body mounted         |                       |
|                | Ambient temperature                        | as per Proj. Inf - I |                       |
| <b>2</b>       | <b>System Data :</b>                       |                      |                       |
|                | Rated Voltage                              | 415 V                |                       |
|                | Rated Frequency                            | 50 Hz                |                       |
|                | No. of Phases                              | 3 ph, 4 wire         |                       |
|                | Fault Level                                | As per BOM           |                       |
|                | Grounding                                  | Effective            |                       |
| <b>3</b>       | <b>Ratings :</b>                           | <b>ACB</b>           | <b>MCCB</b>           |
|                | Rated normal current                       | as per BOM           | as per BOM            |
|                | No. of Poles                               | 3 P                  | 3 P                   |
|                | Rated Voltage                              | 415 V                | 415 V                 |
|                | Rated Frequency                            | 50 Hz                | 50 Hz                 |
|                | Rated insulation voltage                   | 1.1 kV               | 690 V                 |
|                | Rated impulse voltage                      | 8 kV                 | 8 kV                  |
|                | Rated short circuit breaking capacity      | as per BOM           | as per BOM            |
|                | Rated short circuit making capacity (peak) | 2.5 times            | 2.5 times             |
|                | Type of Mounting                           | Drawout              | Fixed                 |
|                | Releases                                   | Microprocessor       | Static/Microprocessor |
|                | Operating Mechanism                        | Motorised            | Trip Free             |
|                | Operating time:                            | ≤70 ms               | ≤ 70 ms               |
|                | Opening time                               | ≤ 70 ms              | ≤ 70 ms               |
|                | Closing time                               |                      |                       |
|                | Method of operation                        | Local & Remote       | Local                 |
|                | Auxiliary supply Voltage                   | 230V, AC             | 230VAC                |
| <b>4</b>       | <b>Bus Bar :</b>                           |                      |                       |
|                | Rated normal current                       | as per BOM           |                       |
|                | Rated voltage                              | 415 V                |                       |
|                | Rated Frequency                            | 50 Hz                |                       |
|                | No. of phases                              | TPN                  |                       |
|                | Rated insulation test voltage              | 2.5 kV               |                       |



|          |  |  |
|----------|--|--|
|          | Rated short circuit current            | As per SLD   |
|          | Rated peak short circuit current       | 2.5 times short ckt. Current                             |
|          | Max. rise in temperature above ambient | 55 °C  |
|          | Insulation                             | Heat shrinkable PVC sleeves                              |
| <b>5</b> | <b>Terminal Connections :</b>          | as per BOM   |
|          | Incoming Feeders                       | By XLPE Cables   |
|          | Outgoing Feeders                       | By XLPE Cables   |
| <b>6</b> | <b>CT :</b>                            |  |
|          | Type                                   | Cast resin   |
|          | Ratio                                  | as per BOM   |
|          | Accuracy Class :                       |  |
|          | a) Measuring core                      | 1  |
|          | b) Protective core                     | 5P   |
|          | Rated Burden :                         |  |
|          | a) Measuring core                      | 10 VA  |
|          | b) Protective core                     | 15 VA  |
|          | Accuracy limit factor :                |  |
|          | a) Measuring core                      | 1  |
|          | b) Protective core                     | 10   |
|          | Short time current rating              | of breaker rating with which it is associated as per BOM |
|          | Rated insulation test voltage          | 2.5 kV   |
| <b>7</b> | <b>PT :</b>                            |  |
|          | Type                                   | Cast Resin   |
|          | Number of secondary                    | 1 ( One )  |
|          | Ratio                                  | 415 V / 110 V  |
|          | Accuracy class :                       |  |
|          | a) Measuring core                      | 3  |
|          | Rated burden :                         |  |
|          | a) Measuring core                      | 50 VA  |
|          | Voltage factor and rated time          | 1.2 continuous   |
|          | Rated insulation test voltage          | 2.5 kV   |
| <b>8</b> | <b>Accessories :</b>                   |  |
|          | Under voltage relay                    | 1) with Trip contacts required<br>2) Local /Remote       |
|          | Earth fault relay                      | 1) with Trip contacts required<br>2) Local/Remote        |
|          | Shunt trip                             | 1) with contacts required<br>2) Local/Remote             |
|          | Closing coil                           | 1) with contacts required<br>2) Local/Remote             |
|          | Auxiliary contacts                     | 4 NO + 4 NC – for ACB<br>2 NO + 2 NC – for MCCB          |

|           |   |   |
|-----------|---|---|
|           | Visual indicating lamp                    | ON, OFF & TRIP -230V 1ph AC   |
|           | Ammeters and Voltmeter                    | as per BOQ digital type   |
|           | Current Transducer and Voltage Transducer | 4-20 mA   |
|           | Door lock                                 | 1) with contacts required<br>2) Local/Remote  |
|           | Safety Shutter                            | 1 no. for each ACB  |
|           | Space heater with s/w & thermostat        | 1 no. for each vertical section   |
| <b>9</b>  | <b>Enclosure :</b>                        | Cubical pattern, sheet steel, dust and vermin proof suitable for indoor installation with IP-52 degree of protection.   |
| <b>10</b> | <b>Clearances :</b>                       | Various electrical clearances like phase to phase & phase to earth on poles, busbars, cable & busduct terminating boxes etc. shall be in accordance with applicable standards and Indian Electricity Rules. |

### INSPECTION/TESTING

The vendor shall arrange all the testing facilities for below mentioned factory acceptance tests and inspection in presence of purchaser's representatives, at factory on his own cost.

The factory acceptance test certificates shall be furnished to the purchaser for prior approval before dispatch of any equipment from the works and the approval in writing from the purchaser to affect the dispatch of the equipment.

The test reports shall be submitted completed with identification data including serial number of equipment.

Test shall be performed in presence of purchaser's representative, if so desired by the purchaser.

The successful bidder should give at least two weeks advance notice of the date when the tests are to be carried out.

Following Factory Acceptance Tests shall be carried out at on the complete panel at factory:

- Physical inspection of LT Panel.
- Verification of BOM
- High Voltage Test at 2500 V for one minute.
- Insulation Resistance Test at 1000 V Megger.
- Phase Sequence Test.
- Continuity Test.

#### REFERENCE STANDARDS:

| <b>Sr. No.</b> | <b>Description</b>               | <b>Standard No.</b>   |
|----------------|----------------------------------|-----------------------|
| 1.             | L.T. Panels                      | IS - 8623             |
| 2.             | ACB                              | IS - 13947 part 1 & 3 |
| 3.             | MCCB                             | IS - 13947 part 2     |
| 4.             | Current Transformer              | IS - 2705             |
| 5.             | Potential Transformer            | IS - 3156             |
| 6.             | Distribution Board               | IS - 13032 / 8623     |
| 9.             | Bus bars and bus bars connection | IS - 159              |
| 10.            | Bus bar supporting insulators    | IS - 2544             |

## **INSTALLATION AND COMMISSIONING**

The vendor shall be responsible for the site mobilization to install and commissioning of the L.T Circuit Breaker Panel.

Fixing the panel at the desired location in the IPR is in the scope of the Vendor. This includes grouting, fixing bolts; foundation bolts etc. along with supply of required hardware for fixing of L.T. Panels. The Vendor shall take the approval of the Engineer-in-charge before the commencement of the work.

All the installation tools and commissioning spares are to be provided by Vendor. This includes crane of suitable capacity, trailer, megger (5 kV) and any other instruments or tools required during the erection and commissioning.

The installation work should be carried out immediately after receipt of intimation from IPR in that regard.

During commissioning the successful Vendor has to perform all the required operational tests mentioned in the scope.

Following acceptance tests should be carried out at site:

- Physical inspection of LT Panel.
- Insulation Resistance Test at 1000 V Megger.
- Phase Sequence Test.
- Continuity Test.
- Interlocks and Operation test

### **1. DRAWINGS, OPERATION/INSTRUCTION MANUALS :**

1. Drawing shall be submitted to IPR for approval after placement of the purchase order before commencing the manufacture and construction. The drawing and data to be submitted after Purchase Order should include the following:
  - a) Assembly drawing of the switchgear showing plan, elevation and typical sectional views and locations of breaker compartment, cable terminations, busbar chamber, metering and relay compartment and terminal blocks for external wiring connections. Marshalling panel GA drawing showing the layout of the terminal block and cabling etc.
  - b) Schematic diagrams for control and protection of circuit breakers.
  - c) Foundation plan showing location of foundation channels, anchor bolts and anchors, floor plans and openings for cables/bus ducts etc.  
Foundation plan showing location of foundation channels, anchor bolts and anchors, floor plans etc.

2. Along with the delivery of L.T. Circuit Breaker Panels and the Vendor shall supply operation/instruction manuals/catalogs for all the equipment, drawings of accessories and circuit diagram.
3. Three sets of final drawings shall be provided along with the delivery of the Panels.
4. Reproducible for all drawings shall be supplied.

Important Notes :

1. Bidders are requested to complete the technical particulars in the data sheets enclosed and submit them with their offer.
2. Bidders are also required to offer price details in the format enclosed.
3. Bidders or its authorized agencies must have valid electrical contractor's license, photocopies of the same shall be submitted along with offer.

**A - TECHNICAL PARTICULARS TO BE SUBMITTED ALONGWITH THE TENDER**

(Bidders are requested to complete the data sheets and submit the same with their bids)

**L. T. CIRCUIT BREAKER PANELS**

**(Please fill the Data separately for individual type and size of breaker offered)**

| Sr. No. | Parameter Description                                 | IPR Specifications                       | Data |      |
|---------|---|--|------|------|
|         |   |  | ACB  | MCCB |
| 1.      | <b>General :</b>                                      |  |      |      |
|         | Name of the manufacturer                              | -  |      |      |
|         | Manufacturer's type                                   | -  |      |      |
|         | Type of construction                                  | Floor Mounted / Fixed Mounted            |      |      |
|         | Suitable for indoor/outdoor application               | Indoor                                   |      |      |
|         | Design ambient temperature                            | max 47°C, average 35°C                   |      | °C   |
|         | Meters (Voltmeter, Ammeter, MFM)                      | 96x96 mm, Digital (Schneider/LT)         |      |      |
|         | Indicating Lamps                                      | LED type , 230 V AC Siemens, Teknic      |      |      |
|         | Control wire size and make                            | 1.5 sq. mm Cu; Finolex, Havells, Polycab |      |      |
|         | Auxiliary Contactors/Push Buttons/TNC/Selector Switch | 230 VAC L&T, Siemens, Schneider, ABB     |      |      |
|         |   |  |      |      |
| 2.      | <b>Breaker :</b>                                      |  |      |      |
|         | Name of the Manufacturer                              | Schneider, L&T, ABB,                     |      |      |
|         | Number of Poles                                       | As Per BOM                               |      |      |
|         | Rated Current   | As Per BOM                               | A    | A    |
|         | Rated Voltage   | 415 V                                    |      |      |
|         | Frequency   | 50 Hz                                    | Hz   | Hz   |
|         | Rated insulation Voltage                              | 1.0 kV(ACB)<br>≥690 V (MCCB)             | V    | V    |

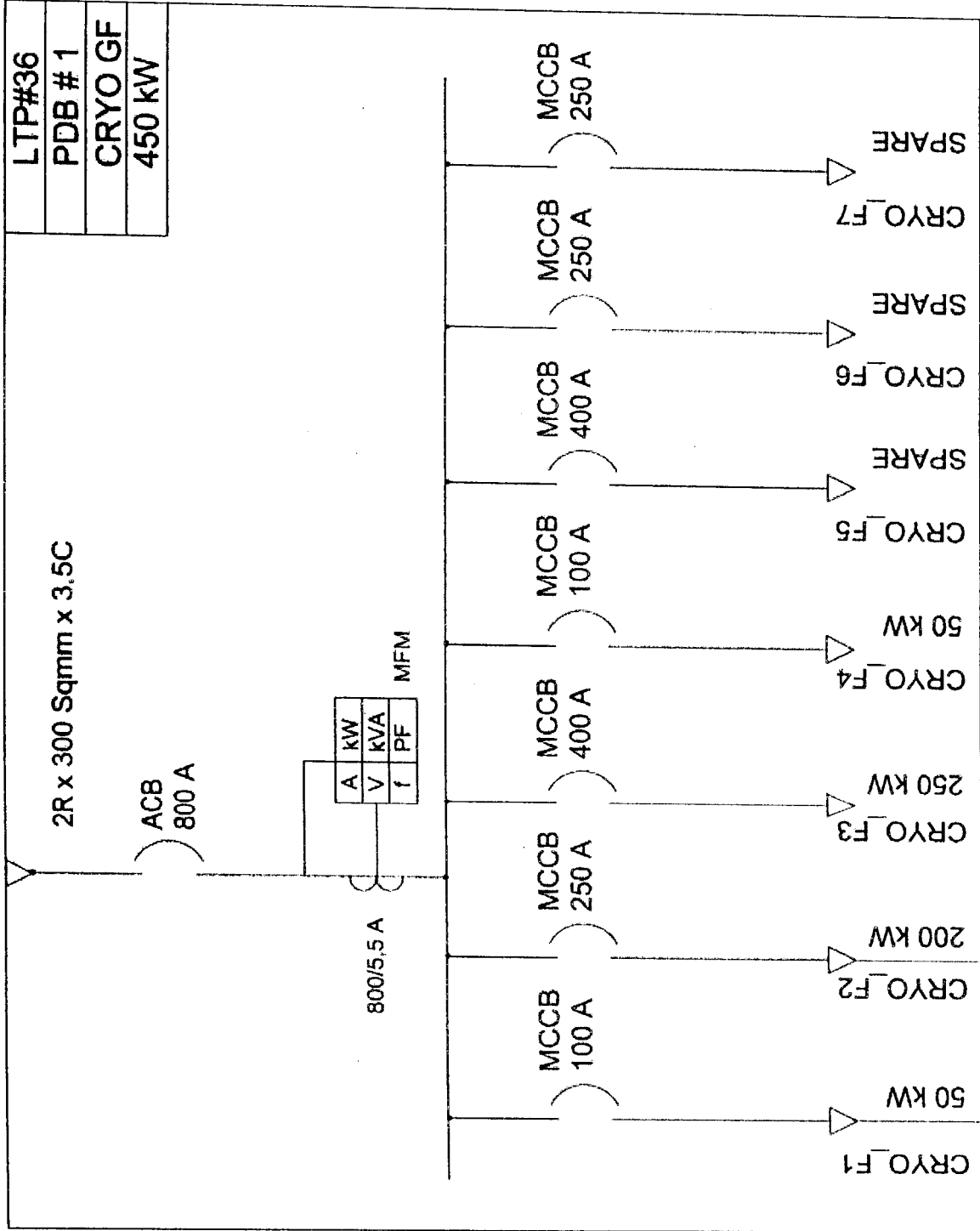
| Sr. No. | Parameter Description  | IPR Specifications  |                   | Data                             |                                  |
|---------|--|---|-------------------|----------------------------------|----------------------------------|
|         |  |   |                   |                                  |                                  |
|         | Rated impulse withstand Voltage  | 8 kV  |                   | kV                               | kV                               |
|         | Power frequency withstand Voltage  | 2.5 kV  |                   | kV                               | kV                               |
|         | Rated short time withstand current for 1 sec.  | 50 kA (ACB) / 35kA (MCCB)   |                   | kA                               | kA                               |
|         | Releases :<br>Microprocessor / Static  | Microprocessor (ACB)<br>Static/Microprocessor (MCCB)                                    |                   |                                  |                                  |
|         | Operating Mechanism  | Electrical Drawout type (ACB)<br>Manual fixed type (MCCB) with Door Operating Mechanism |                   |                                  |                                  |
|         | External protection relay provided<br>If yes, List out indicating type, quantity, make, rating, settings etc.  |   |                   | YES / NO                         | YES / NO                         |
|         | Protection available for   |   |                   | Enclose separate sheet           |                                  |
|         | <ul style="list-style-type: none"> <li>• Overload</li> <li>• Short circuit</li> <li>• Earth Fault</li> </ul>   | YES<br>YES<br>YES   | YES<br>YES<br>YES |                                  |                                  |
|         | Whether following contacts for remote monitoring of breaker provided -   |   |                   |                                  |                                  |
|         | <ul style="list-style-type: none"> <li>• Breaker Status Indication and No. Of Contacts</li> <li>• Contacts for Breaker Releases Operation No. of Contacts</li> <li>• Breaker Remote Operation and No. of Contacts</li> </ul> | Yes<br>Yes<br>Yes   | Yes<br>Yes<br>No  | YES / NO<br>YES / NO<br>YES / NO | YES / NO<br>YES / NO<br>YES / NO |
| 3.      | <b>Bus bar :</b>   |   |                   |                                  |                                  |
|         | Material& Size   | Copper, size as per current density 1.6A/ sq. mm  |                   |                                  |                                  |

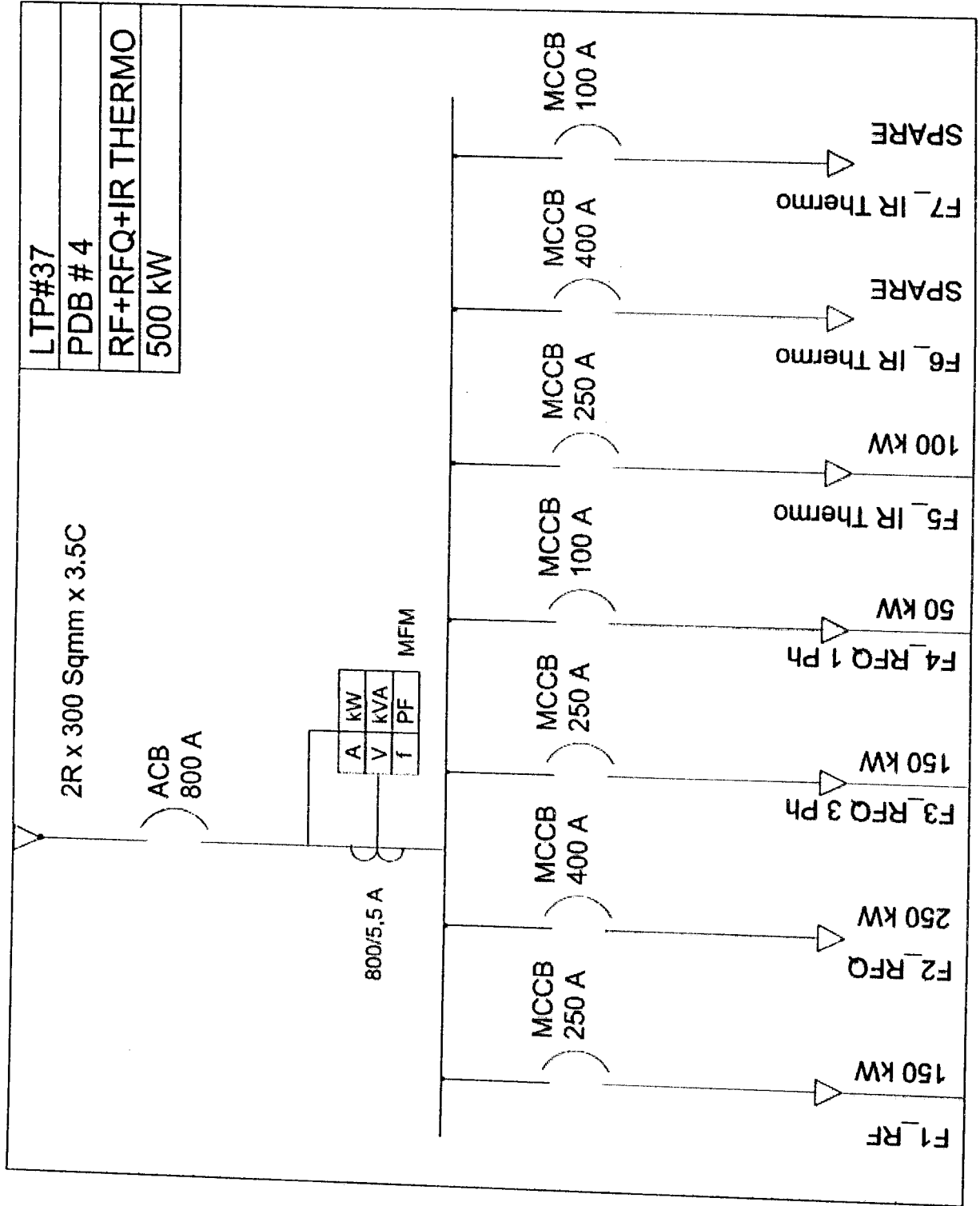
| Sr. No. | Parameter Description   | IPR Specifications          | Data |
|---------|---|-----------------------------|------|
|         | Rated continuous current  | As per BOM                  | A    |
|         | Rated short circuit withstand current                             | As per BOM                  | kA   |
|         | Rated peak short circuit withstand current                        | 105 kA                      | kA   |
|         | Temperature rise at rated current over design ambient temperature | 55 °C                       | °C   |
|         | Insulation  | Heat Shrinkable PVC Sleeves |      |
|         | Earth Bus: Material & size  | 35 x 6 sq. mm Copper        |      |
| 4.      | <b><u>Current Transformer :</u></b>                               |                             |      |
|         | Make and type   | AE / Kappa                  |      |
|         | Current ratio   | As per BoM                  | A/A  |
|         | Insulation withstand level  | 2.5 kV                      | kV   |
|         | CT wiring   | 2.5 sq. mm Cu               |      |
|         | CT terminals  | Short link type             |      |
| 5.      | <b><u>Potential Transformer :</u></b>                             |                             |      |
|         | Make and type   | AE / Kappa                  |      |
|         | Voltage ratio   | As per BoM                  | V/V  |
|         | Insulation withstand level  | 2.5 kV                      | kV   |
| 7.      | <b><u>Enclosure :</u></b>   |                             |      |
|         | Suitable for indoor/outdoor application                           | Indoor                      |      |
|         | Thickness of sheet steel  | 2mm                         | mm   |
|         | Sheet metal cold rolled/hot rolled                                | CRCA                        |      |
|         | Degree of protection ( as per IS:2147)                            | IP 52                       |      |
|         | Colour of finish paint :<br>a) Outside<br>b) Inside               | RAL 7032                    |      |

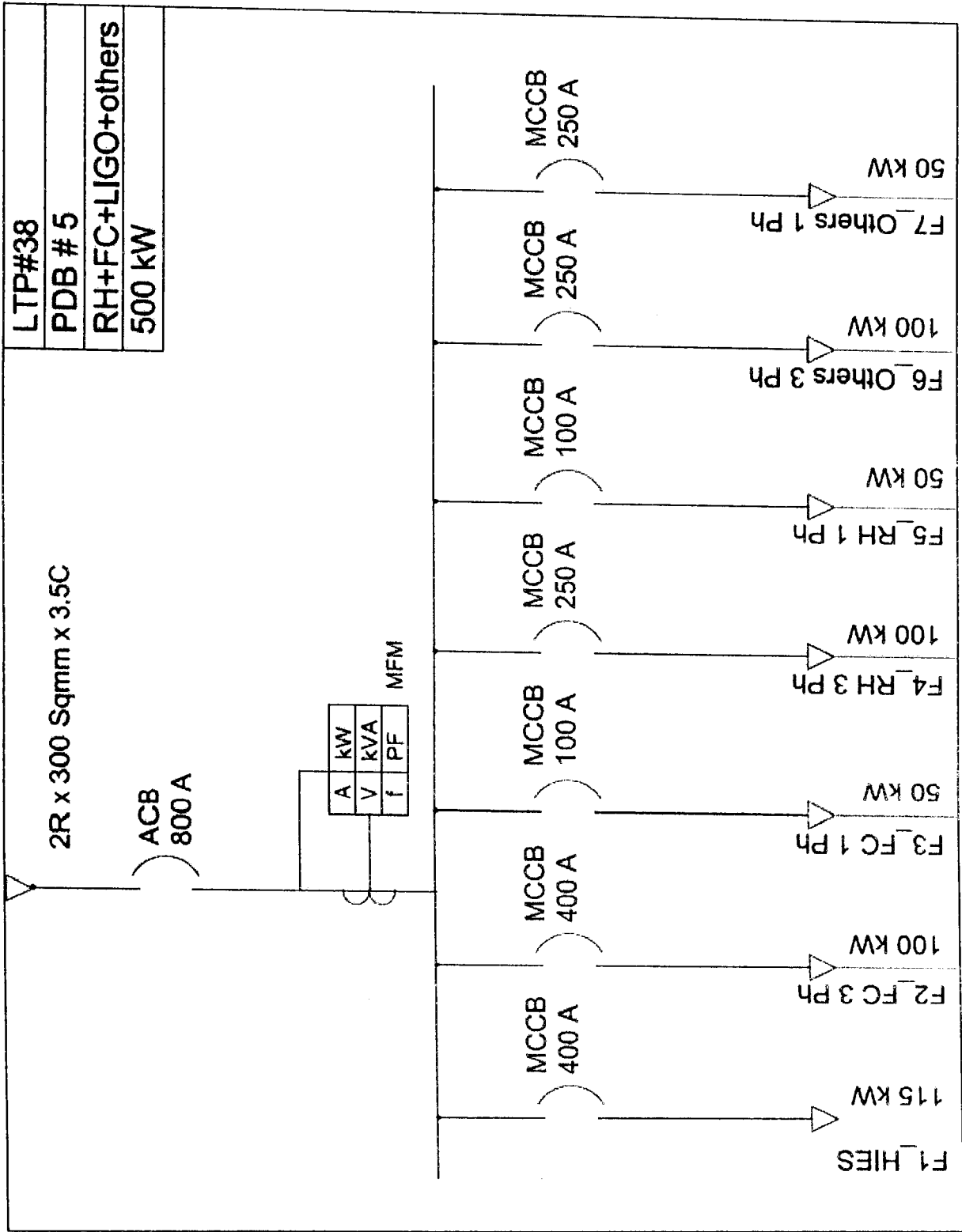




**SINGLE LINE DIAGRAM**







**Price Bid Format:**

(Bidders are requested to offer their price bids in the following format)

| Sr. No. | Description  | Qty       | Basic Rate (In ₹) | Packing and Forwarding (P&F) | Applicable GST | Rate (Incl. P&F and GST) | Total Amount (In ₹) |
|---------|--|-----------|-------------------|------------------------------|----------------|--------------------------|---------------------|
|         |  | units     | (a)               | (b)                          | (c)            | (d)                      | e= b+c+d            |
| 1.      | Design, fabrication, inspection, testing & Supply of L.T. AC cubical pattern Circuit Breaker panel, with all accessories | 03<br>No. |                   |                              |                |                          |                     |
| 3.      | Erection, Testing & commissioning of L.T. AC cubical pattern Circuit Breaker panel at site.                              | 03<br>Job |                   | NA                           |                |                          |                     |