

**FORMAT F.1****Format for Query / Clarification / Deviation (QCD)**Tender No        **TPCODL / CCG / 25-26/1000003326**

RC for Supply of ACDB &amp; DCDB

Package Name    under TPCODL, TPNODL,

TPSODL and TPWODL.

Bidder :

Note :            The said format to be used only for any Pre-bid Query / Clarification/ Deviation on any of the Tender documents

| Sr. No. | Detailed Reference to concerned Document . Please specify Document No / Clause No / Page No | Description as per Bid Document                                                                         | Query / Clarification / Deviation                                   | CEG Response                                                  |
|---------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------|
| 1       | 2                                                                                           | 3                                                                                                       | 4                                                                   | 5                                                             |
| 4.2.17  | 4.2.17                                                                                      | Make-MCCB- Siemens, L&T, ABB, C&S, Schneider, Havells<br>MCB- Siemens, ABB, Legrand, Schneider, Havells | In MCB it is brand specific.it should include All brands like C & S | Noted.<br>Revised Specifications of ACDB & DCDB are attached. |

**STANDARD TECHNICAL SPECIFICATION COVER SHEET**

**Specification No. : ENG-LV-3021-R-02**

**Specification Name : SPECIFICATION FOR 415V ACDB**

| Revision    | Prepared by       | Reviewed by        | Reviewed by          | Reviewed by      | Approved by              | Released by          |
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|             | 05-07-2025        | 09-07-2025         | 14-07-2025           | 15-07-2025       | 02-08-2025               | 02-08-2025           |
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|             | 09-03-2023        | 09-03-2023         | 09-03-2023           | 13-03-2023       | 15-03-2023               | 24-03-2023           |
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|             | 04-02-2023        | 04-02-2023         | 04-02-2023           | 06-02-2023       | 06-02-2023               | 07-02-2023           |

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## 1.0 SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store and performance of 415Volts ACDB with all accessories and necessary training for trouble free & efficient performance. It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform to practices consistent with sound environmental management and local statues. It is also expected that equipment shall comply in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to the TPCODL/TPNODL/TPSODL/TPWODL, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble-free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

## 2.0 APPLICABLE STANDARDS

The equipment covers by this specification shall unless otherwise stated, be designed, manufactured & tested in accordance with the latest edition of the following standards /IEC and shall conform to the regulation of local statutory authorities.

|                         |                                                                                                                                                   |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| IEC 60947/<br>IEC 61439 | Specification for Low voltage Switchgear and Control gear                                                                                         |
| IS 2705/<br>IS 16227    | Current transformer/ Instrument Transformers                                                                                                      |
| IS 694                  | PVC insulated unsheathed and sheathed cables/cords with rigid and flexible conductor for rated voltages up to and including 1100 V.               |
| IS 2629                 | Recommended practice for Hot Dip Galvanizing of Iron & Steel                                                                                      |
| IS 2633                 | Tests for uniformity of zinc coating                                                                                                              |
| IS 5578                 | Guide for marking of insulated conductors                                                                                                         |
| IEC 60060               | High-voltage test techniques                                                                                                                      |
| IEC 61010-1             | Safety requirement for electrical equipment for measurement, control and laboratory use                                                           |
| IS 11353                | Guide for uniform system of marking and identification of conductors and apparatus terminals                                                      |
| IEC 62052-11            | Electricity metering equipment (a.c.) - General requirements, tests and test conditions                                                           |
| IEC 62053-22            | Static meters for AC active energy (Classes 0.1 S, 0.2 S and 0.5 S)                                                                               |
| IS 14697                | AC Static Transformer Operated Watthour Meters ( Class 0.2 S and 0.5 S ) and Var-Hour Meters ( Class 0.2 S, 0.5 S and 1 S)-Specification          |
| IS/IEC 60529            | Classification of degrees of protection provided by enclosures of electrical equipment/<br>Degrees of protection provided by enclosures (IP code) |
| IS 8623-2               | Low-voltage Switchgear and Controlgear Assemblies - Part 2: Particular Requirements for Busbar Trunking Systems (Busway)                          |
| IEC 60664               | Insulation co-ordination for equipment within low voltage systems including clearances & creepage distances for equipment                         |
| IS 14772                | General requirements for enclosures for accessories for household and similar fixed electrical installation                                       |

### 3.0 CLIMATIC CONDITIONS OF THE INSTALLATION:

The material shall be suitable for following climatic conditions.

|    |                                                     |                                                                                   |
|----|-----------------------------------------------------|-----------------------------------------------------------------------------------|
| 1  | Maximum ambient temperature                         | 50 deg C                                                                          |
| 2  | Max. Daily average ambient temp                     | 35 deg C                                                                          |
| 3  | Min Ambient Temperature                             | 0 deg C                                                                           |
| 4  | Maximum Humidity                                    | 95%                                                                               |
| 5  | Average Annual Rainfall                             | 150cm                                                                             |
| 6  | Average No. of rainy days per annum                 | 120                                                                               |
| 7  | Altitude above MSL not exceeding                    | 1000m                                                                             |
| 8  | Wind Pressure                                       | 300 Km/hr                                                                         |
| 9  | Earthquakes of an intensity in horizontal Direction | Equivalent to seismic acceleration of 0.3g                                        |
| 10 | Earthquakes of an intensity in Vertical Direction   | Equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity) |

TPCODL/TPNODL/TPSODL/TPWODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed up to 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

### 4.0 GENERAL TECHNICAL REQUIREMENTS

| SI no  | Description                                     | Requirement                                                                                                                                                                                                                           |
|--------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.1    | Switchgear Panel                                |                                                                                                                                                                                                                                       |
| 4.1.1  | Architecture                                    | Metal-clad air insulated                                                                                                                                                                                                              |
| 4.1.2  | Normal Service condition                        | Indoor                                                                                                                                                                                                                                |
| 4.1.3  | No of phases                                    | Three                                                                                                                                                                                                                                 |
| 4.1.4  | Rated Voltage                                   | 415                                                                                                                                                                                                                                   |
| 4.1.5  | Rated Frequency                                 | 50 Hz                                                                                                                                                                                                                                 |
| 4.1.6  | Rated Impulse withstand Voltage                 | 8 kVP                                                                                                                                                                                                                                 |
| 4.1.7  | Rated insulation voltage                        | 690 V                                                                                                                                                                                                                                 |
| 4.1.8  | Main Bus Bar Continuous rated current           | 250A                                                                                                                                                                                                                                  |
| 4.1.9  | Busbar Material & Current Density               | Aluminium with Grade E-91E with heat shrinkable PVC sleeves with Red, Yellow, Blue Colour for respective phases & Black colour for neutral suitable for 1.1kV, maximum 1.0A/ sq.mm.<br>Bus bar size of phase & neutral shall be same. |
| 4.1.10 | Cross section area of bus bar (phase & neutral) | 300 sqmm Al                                                                                                                                                                                                                           |
| 4.1.11 | Bus Bar Short circuit withstand current         | 25kA/1sec                                                                                                                                                                                                                             |
| 4.1.12 | Cross section area of earth bus bar             | 50x6mm GI                                                                                                                                                                                                                             |

|        |                                                                                                                                      |                                                                                                                                                                                                                                                                                   |
|--------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.1.13 | Degree of protection for enclosure for meters                                                                                        | IP 54                                                                                                                                                                                                                                                                             |
| 4.1.14 | Temperature Rise                                                                                                                     | Shall be as per IEC/IS 61439                                                                                                                                                                                                                                                      |
| 4.1.15 | Insulation Resistance                                                                                                                | >50 M ohms                                                                                                                                                                                                                                                                        |
| 4.1.16 | Max. operating height from ground Level                                                                                              | 1800mm                                                                                                                                                                                                                                                                            |
| 4.1.17 | Min. operating height from ground Level                                                                                              | 300mm                                                                                                                                                                                                                                                                             |
| 4.1.18 | Cable Entry & Exit                                                                                                                   | From Bottom                                                                                                                                                                                                                                                                       |
| 4.1.19 | System earthing                                                                                                                      | 50x6mm AL. Earthbus shall be provided throughout the length of the panel.<br>2 nos. Earthing stud to be provided at the bottom of the panel All hinged door shall be earthed through 2.5 sqmm tinned braided copper wire Earth connection also to be provided in each compartment |
| 4.1.20 | Paint                                                                                                                                | Shade – RAL 7032<br>Minimum 80 micron                                                                                                                                                                                                                                             |
| 4.1.21 | Material of Sheet<br>Thickness of Enclosure Sheet/Frame<br>Thickness of Doors/Covers Sheet<br>Thickness of Gland Plate<br>Base Frame | CRCA Sheet<br>2.5 mm<br>2.5 mm<br>3 mm<br>ISMC 75                                                                                                                                                                                                                                 |
| 4.1.22 | Type of Gasket                                                                                                                       | Polyurethane                                                                                                                                                                                                                                                                      |
| 4.1.23 | Feeder Description Name plate                                                                                                        | To be provided by the Bidder for each feeder<br>(Feeder details to be provided during drawing approval)                                                                                                                                                                           |
| 4.1.24 | Type of Wire<br>Control Circuit<br>Voltage Circuit<br>CT Circuit<br>Earthing                                                         | PVC Insulated 1.1kV grade FRLSH type<br>2.5 sqmm – Gray, Black<br>2.5 sqmm – Gray<br>4.0 sqmm – R, Y, B<br>2.5 sqmm – Green                                                                                                                                                       |
| 4.1.25 | Size of enclosure                                                                                                                    | <ul style="list-style-type: none"> <li>Max. 500mm (Width) of I/C</li> <li>Max. 300 mm (Width) of Cable Alley</li> <li>Max. 400 mm (Depth)</li> <li>Max. 2200 (Height) including Base Frame</li> </ul>                                                                             |
| 4.1.26 | Indication Lights                                                                                                                    | <ul style="list-style-type: none"> <li>For Incomers – ON, OFF &amp; Trip</li> <li>For Incomers – Phase indication (R, Y &amp; B)</li> <li>For Outgoing MCCB - ON</li> </ul>                                                                                                       |

| SI no   | Description                                                | Requirement                                                                                                                                                                                          |                                                                   |       |                        |        |
|---------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------|------------------------|--------|
| 4.2     | Item/ Panel Reference                                      | Incomer                                                                                                                                                                                              | Outgoing                                                          |       |                        |        |
| 4.2.1   | Circuit Breaker Type/<br>Rating (A)                        | MCCB<br>250A with spreaders with<br>FRP separators                                                                                                                                                   | FP MCCB                                                           |       | FP MCB                 | DP MCB |
|         |                                                            |                                                                                                                                                                                                      | 100A                                                              | 63A   | 32A                    | 16A    |
| 4.2.2   | Quantity (Nos.)                                            | 2                                                                                                                                                                                                    | 1                                                                 | 2     | 5                      | 16     |
| 4.2.3   | Nos of Poles                                               | 4                                                                                                                                                                                                    | 4                                                                 | 4     | 4                      | 2      |
| 4.2.4   | Type of release                                            | Microprocessor based with<br>integrated short circuit,<br>overload and earth fault<br>protection                                                                                                     | Thermal Magnetic<br>Release (TMD)<br>based O/L, S/C<br>protection |       | Magnetic with O/L, S/C |        |
| 4.2.4.a | Undervoltage and<br>Overvoltage Protection                 | Undervoltage and<br>Overvoltage Protection to<br>be provided                                                                                                                                         | Not Required                                                      |       |                        |        |
| 4.2.5   | O/L Releases Setting                                       | 80%-100%                                                                                                                                                                                             |                                                                   |       |                        | -      |
| 4.2.6   | Rated Voltage                                              | 415V ± 10%                                                                                                                                                                                           |                                                                   |       |                        | 230V   |
| 4.2.7   | Rated Ultimate Short<br>circuit breaking Capacity<br>(Icu) | 35 KA                                                                                                                                                                                                | 35KA                                                              |       | 10KA                   |        |
| 4.2.8   | Rated Service short<br>circuit breaking capacity<br>(Ics)  | 100% of Icu                                                                                                                                                                                          | 50% of Icu                                                        |       |                        |        |
| 4.2.9   | Utilization Category                                       | A                                                                                                                                                                                                    |                                                                   |       |                        |        |
| 4.2.10  | Rated Insulation Voltage                                   | 690V                                                                                                                                                                                                 |                                                                   |       |                        | 500V   |
| 4.2.11  | Rated Impulse<br>withstand voltage                         | 8kVp                                                                                                                                                                                                 |                                                                   |       |                        | 6kVP   |
| 4.2.12  | 1.1KV Al, XLPE cables<br>(sqmm)                            | 4CX300/150<br>-                                                                                                                                                                                      | 4CX70                                                             | 4CX35 | 4CX25                  | 2CX10  |
| 4.2.13  | Cast Resin type CT (3<br>Nos/ Incomer) -ratio,<br>Burden   | 250/5A, 15VA, CI-0.5S                                                                                                                                                                                | -                                                                 | -     | -                      | -      |
| 4.2.14  | For anti-condensation<br>heaters                           | 230V AC                                                                                                                                                                                              |                                                                   |       |                        |        |
| 4.2.15  | Metering                                                   | Multi-<br>function<br>meter for A,<br>V, kW, kWh<br>with SCADA<br>compatible                                                                                                                         | Not required                                                      |       |                        |        |
| 4.2.16  | Panel illumination and<br>space heating                    | Space Heater – min. 60 W<br>Thermostat – 300C to 110°C<br>LED Lamp with holder – 5 W<br>Door Limit Switch – 6A<br>3Pin Switch & Socket – 15 A<br>Control Fuse with Base – 6A<br>DP AC MCB – 6A, 10kA |                                                                   |       |                        |        |
| 4.2.17  | Make                                                       | MCCB                                                                                                                                                                                                 | Siemens, L&T, ABB, C&S, Schneider, Havells                        |       |                        |        |
|         |                                                            | MCB                                                                                                                                                                                                  | Siemens, ABB, Legrand, Schneider, Havells, C&S                    |       |                        |        |
|         |                                                            | PVC Wire                                                                                                                                                                                             | KEI, Polycab, Havells, Finolex                                    |       |                        |        |
|         |                                                            | Indicating<br>Lights                                                                                                                                                                                 | Esbee, Vaishno, C&S, Werner                                       |       |                        |        |

|  |  |                           |                                              |
|--|--|---------------------------|----------------------------------------------|
|  |  | Meters                    | Secure, Rishab, Satec, AE, Elmeasure, Accord |
|  |  | Space Heater & Thermostat | HOTWEL, SURAJ, ELECO, Girishago              |
|  |  | Light                     | Bajaj, CG, Syska, Philips, Havells           |
|  |  | Door Limit Switch         | SURAJ, KAYCEE                                |
|  |  | Pin & Socket              | Anchor, Legrand, Havells                     |
|  |  | Control Fuse & Base       | ESBEE, VAISHNO, C&S, Siemens, L&T, ABB       |
|  |  | CT                        | Indcoil, Pragati, AE, Kalpa, ECS             |

## 5.0 GENERAL CONSTRUCTION

### 5.1 SWITCHGEAR

- The switchgear panel shall be of sheet steel construction and shall be dust and vermin proof and shall be suitable for indoor installation. The panels shall be of Metal Clad compartmentalized, free standing, continuous from rear, modular type. The switchboards shall be of the cubicle pattern, each circuit being self-contained within its own cubicle (compartmentalized type). The switchgear panels shall be rigid without using any external bracing. The switchboard panels should comply with relevant IS/IEC and revision thereof and shall be designed for easy operation maintenance and further extension. Bus bar, metering, circuit breaker chamber, cables and cable box chamber should have proper access for maintenance, proper interlocks should be provided. Metal enclosed switchgear shall be so designed that normal service, inspection and maintenance operations including visual checking of phase sequence, earthing of connected cables, locating of cable faults, voltage tests on connected cables can be carried out safely.
- Panels shall have structural steel frame-work enclosed on all sides by CRCA sheet steel of minimum thickness as specified below:  
Frame: 2.5 mm  
Doors & Covers: 2.5 mm  
Removable gland plate: 3 mm
- Panels shall consist of a front portion with equipment mounted on it and wiring access from rear. All doors, cut- outs and removable covers shall be gasketed all round by polyurethane gaskets. Panel space heater with thermostat, LED lamp with double door switch and 3pin socket & ON/OFF switch and double pole MCB with control fuses for each circuit shall be provided in each cable alley for each vertical panel.
- Panels shall be mounted and bolted to a common base channel of height 75mm. The channel in turn shall be fixed to the foundation bolts at site. All foundation equipment, anchor bolts etc. including the supporting channel shall be furnished by successful bidder in advance for completion of Civil Works prior to dispatch of panels. The bottom plates of the panels shall be fitted with removable gland plates for fixing the cable glands.
- Height of the panel should be limited to 2200mm. Each Indicating instruments and meters shall be at a suitable height so that the lettering on the dials can be easily read. Control switches/push buttons shall be conveniently located for ease of operation. The centre lines of the switches, push buttons and indicating lamps shall not be at a height more than 1800mm also shall not be less than 300mm that of the lowest unit. MCB with neutral link shall be provided at the panel for incoming AC supplies. All other insulators shall also be made of non-hygroscopic material.
- All components of the same rating and construction which may be needed to be replaced shall be

interchangeable. If there are removable parts with different ratings and if parts are interchangeable within the assembly of metal enclosed switchgear and control gear, any possible combination of removable and fixed parts shall withstand the rated insulation level specified for fixed parts concerned. While making the general arrangement, consideration will be given to the place of sectionalizing to select the location where the minimum electrical connections are transferred from one section to other section.

- g) All the components of a module will be mounted on a component plate using machine screws and taped holes (except the components mounted on the door) to ensure vibration free operation. Circuit breakers shall be mounted such that they are accessible from the front of the panel. These components plates should be fixed with bolts for easy replacements. Standardization will be adopted while making these plates so that the component plates of the same size modules. can be changed from one module to other.
- h) Interlocks between different components shall be provided for safety and ease of operation. All instruments shall be non-draw-out type and safeguard in every respect from damages. The operation of a MCCB shall be impossible when it is in closed position. It shall be impossible to close the incoming MCCB in service position unless it is connected to auxiliary circuit.
- i) The rear of the ACDB shall have bolted covers in sections except cable chamber. Single line diagram for power distribution and wiring diagram for power and control shall be provided inside the panel. All retaining catches, screws and bolts for doors and covers shall be hot dip galvanized screws and bolts shall be captive. All hardware for the complete equipment including foundation bolts, lifting lugs & cable termination lugs etc. shall be supplied along with the panels.
- j) Auxiliary and control equipment installed on the panel shall be suitably protected against disruptive discharge from main circuit. Bus bars shall be insulated with 1.1kV insulating sleeves.
- k) Degree of Protection for the enclosure shall be IP54 and that of partitions shall be IP4X. Compartment shall have its own front located, outward opening lockable hinged door with concealed hinges and bolted back cover. The door shall have interlocking facility with the MCCB or its handle such that the door can be opened only if the MCCB is in 'OFF' position. De- interlocking arrangement shall also be provided. Partitions of metal-clad switchgear and control gear shall be metallic and earthed.
- l) Control supply in individual bay shall to be distributed through MCB of suitable rating for individual control function like:

Trip Circuit & Close Circuit (Only for Incomer)  
Heating and Lighting Circuit for Cable Alley

MCB shall be rated for 10kA short circuit rating. It shall be quick make, quick break, and independent manual type with trip free feature. MCB shall have the following:

- Over current protection
- Short Circuit Protection

- m) Wherever CB contacts are to be multiplied, latch type relay shall be used for contact multiplication. Auxiliary contact multiplier relays shall be reputed make and selected on the basis of continuous current carrying capacity and rated voltage. The fluctuation in voltage level shall be accounted for (+/-) 10% continuously.
- n) Each switchgear panel shall have 20% spare terminals & stopper shall be used for cable to cable termination clearance. All equipment mounted on front side of panel. shall have Individual nameplates with equipment designation engraved. The termination links for cables shall be segregated in vertical plane. The bidder shall deliver to site completely assembled, wired, tested panels and only the interconnecting cables shall be connected at site.
- o) Cable entry arrangement shall be from bottom and suitable for 1.1KV XLPE armored external cables of

sizes as mentioned in the specification. Removable CRCA gland plate of 3mm with cable holes to suit the cable sizes and with 2mm polyurethane type gasket of non-inflammable and insulating vermin proof material shall be provided. A minimum distance of 250mm will be provided between the gland plate and the nearest terminal for proper dressing and termination of the cable.

- p) Separate compartment is required for Incomer & Outgoings MCCBs. Outgoing MCBs shall have also separate compartments from MCCBs. MCCB & MCB compartment shall be separate. Multiple MCB shall be mounted in one compartment. MCCB & MCB shall not be door mounted.
- q) Both Incomer-1 & 2 are connected to common bus bar
- r) Common Busbar shall be for both incomer with interlocking arrangements. Electrical Interlock to be provided between both incomer-1 & 2.

## 5.2 Circuit Breaker

- a) The MCCB shall be fixed type. Comprehensive interlocking system to prevent any dangerous or inadvertent operation shall be provided. The contacts & spare contact of MCCB to be wired up to the terminals.
- b) The MCCB shall be manually operated with three pole simultaneous operations. The indicating device shall show the OPEN, CLOSE and TRIP position of MCCB visible from front of the cubicle.

## 5.3 BUSBAR

- a) Bus bars and all other electrical connections between various components shall be made of Aluminium of rectangular cross-section with current density of maximum 1 A/mm<sup>2</sup>, shall be suitable for 3 phase, 4 wire, 400 volts 50 Hz AC supply and have a fault withstanding capacity of 25 KA for 1 second. The bus bars shall be insulated with heat shrinkable and colour coded insulating sleeves, except at the points of connections. The phase bus bar shall be of ample capacity to carry the rated current of 250A continuously without excessive heating and for adequately meeting the thermal and dynamic stresses in the case of short circuit in the system. Neutral Bus bar shall have same rating of phase bus bars. All bus bars shall be rigidly and firmly mounted and shall be capable of withstanding short circuit stresses and vibrations. The bus bars shall be extensible on both sides depending upon layout.
- b) Minimum electrical clearances shall be maintained between phases, neutral and body as per relevant IS however the minimum clearance between phase to phase and phase to ground shall be 25.4mm & 19.4mm respectively.
- c) The Bus bars shall run in a separate bus bar chamber using suitable Bus bar support of non-hygroscopic, non-combustible, material such as DMC/ SMC at sufficiently close intervals to prevent bus bar sag. All bus bar joints. shall be provided with high tensile steel bolts (electro plated with suitable metal such as Nickel Cadmium), spring washer and nuts so as to ensure good contact. Alternatively, electroplated/ tinned brass bolts shall be used. The joints shall be formed with fish-plates on either side of bus bar to provide adequate contact area. Bus supports shall be provided on either side of joints. Max. Unsupported distance from the joints and between two supports shall not exceed 450mm.
- d) All accessible bus bar joints shall be provided with removable FRP shrouds min 3mm.

## 5.4 CURRENT TRANSFORMER

- a) The Current transformer shall be Epoxy Cast resin type and rated for 25KA (1 Sec) with details as given in GTP. The CT control wiring shall be of 4 mm<sup>2</sup> multi stranded copper wire with 1.1KV insulation grade. AI CTS shall be designed to carry continuously a current of 120% of the rated current.
- b) CTs shall be put outgoing side of incoming MCCB.

## **5.5 METERING. INSTRUMENTATION AND CONTROL DEVICES**

### **5.5.1 MEASURING INSTRUMENTS**

3-phase, 4-wire LT CT operated static multifunction meter with associated CT's (250/5 A, Class 0.5S, 15 VA) shall be provided for only incomers to record Current reading (Range 0-400A), voltage reading (Range 0-500V) and power & energy consumption. The multifunction meter shall necessarily have RS 485 Modbus serial port for communication with SCADA. All meters shall be of flush mounting type with 96x96 sq. mm. The meter shall be enclosed in a dust tight housing providing IP5X or an equivalent provision to completely protect it against dust ingress, and shall protect in a way that performance doesn't get effected due to small dust also. The design and manufacture of the meters shall ensure the preventing of fogging of instrument glass. Instrument meters shall be sealed in such a way that access to the measuring element and to the accessories within the case shall not be possible. Inbuilt selector switches shall be provided to be used on three phase supply.

### **5.5.2 INDICATING LAMPS**

The indicating lamps used in the panel will be pleasant looking, LED type indicating lamps in round shape and suitable for continuous operation at 85% to 110% of their rated voltage. They shall be provided with suitable series resistor and the bulb shall be replaceable from the front of the panel.

The selection of the colors of the indicating lamps will be as follows:

Red - MCCB ON

Green MCCB OFF

Amber MCCB TRIP

Red, Yellow and Blue for incoming 3-ph supply indication.

The various feeders shall be assigned the indicating lamps as mentioned:

Incomer 1 & 2 – ON ,OFF,TRIP and 3-ph supply indications

MCCB Outgoing - ON indication only

All color caps shall be similar and interchangeable and all LEDs shall be of same type and ratings. The LED lamps shall be furnished 20% in excess of actual numbers required and color caps shall be furnished 10% in excess of actual numbers used for each.

## **5.6 PANEL WIRING**

- a) Panels shall be supplied completely wired internally to equipment and terminal blocks and ready for the TPCODL/TPNODL/TPWODL/TPSODL external cable connections at the terminal blocks. The control wiring will be done with PVC single core flexible copper wires and properly dressing all the wires either in a PVC duct of liberal size or bunched together by PVC strapping taps and thereafter fastened to steel members of the panel. When panels are arranged to be mounted adjacent to each other all inter-panel wiring and connections between panels shall be provided by the Bidder.
- b) All wiring shall be carried out with 1100 V grade, single core stranded copper conductor wires with PVC insulation. Extra flexible wires shall be used for wiring of devices mounted on moving parts such as swinging panels and doors.

The minimum size of the stranded copper conductor used for panel wiring shall be as follows:

CT circuits: 4mm<sup>2</sup> per lead

All circuits except CT circuits: 2.5mm<sup>2</sup> per lead

- c) Interconnections to adjacent panels shall be brought out to a separate set of terminal blocks located near the slots or holes meant for taking the interconnecting wires. Arrangements shall permit easy inter-connections to adjacent panels at site and wires for this purpose shall be provided by the bidder looped and bunched properly inside the panels. The unused instrument space on the front or rear of the panels shall be kept clear of wiring, to facilitate addition of devices without rewiring associated portion of the panels.
- d) Wire terminations shall be made with solder less crimping type of (ring type lugs for all CT and pin type

lugs for other circuits) tinned copper lugs which firmly grip the conductor and insulation. Insulated sleeves shall be provided at all the wire terminations. Printed type PVC ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of all the control, instrumentation, and protection wiring. Ferrules shall fit tightly on the wires and shall not fall off when the wire is disconnected.

- e) Internal wiring to be connected to external equipment shall terminate on terminal blocks. The terminal blocks for CTS shall be provided with test links and isolating facilities. The CT terminal blocks shall be provided with short circuiting and earthing facilities Switchgear shall have 20% terminals as spare terminals in each panel & should be uniformly distributed in all the blocks.
- f) The Power interconnections shall be carried out by means of bolted connections with washers. The wiring shall be terminated by using crimping sockets. Under no circumstances the wiring should be under any kind of stress for which sufficient length of control wiring should be provided.

### **5.7 TERMINAL BLOCKS**

- a) The terminal blocks shall be 1100 V grade, 10 Amps rated, one piece, moulded, complete with insulated barriers, stud type terminals, washers, nuts and lock nuts and identification strips. Markings on the terminal strips shall correspond to wire numbers on the wiring diagrams. The terminal blocks shall be fully enclosed with easily removable covers and made of moulded non-inflammable plastic material.
- b) All spare contacts of the panel mounted equipment and devices shall be wired up to terminal blocks. All the TB's shall be of single Decker type. Bidder shall be provided with potential free contacts for Mains ON, I/C ON, I/C OFF for SCADA. Supplier will provide wiring of these contacts up to terminal block in ACDB panel.

### **5.8 Space Heaters**

- a) Strip type space heaters of adequate capacity shall be provided inside each panel to prevent moisture condensation on the wiring and panel mounted equipment. Space heaters shall be rated for 240V, 1Phase 50hz supply. Heaters inside the panels shall not be mounted close to the wiring or any panel mounted equipment. Heaters shall be complete with miniature circuit breaker on the phase and link on the neutral of the heater supply.
- b) An adjustable type thermostat shall be provided in the heater control circuit with temperature range of 30-110 deg C.

### **5.9 Interior Lighting**

Each Panel shall be provided with a 5W, 230, 1ph, 50Hz LED for the illumination of the panel during maintenance. The fitting shall be complete with switch-fuse unit and the switching of the fitting shall be controlled by the respective panel door switch.

### **5.10 Power & Control Supplies**

The ACDB panel shall be provided with necessary arrangement for receiving, distributing, isolating and fusing of AC supply for various control, Signaling, lighting and space heater circuits.

### **5.11 CABLE TERMINATION ACCESSORIES**

The TPCODL/TPNODL/TPSODL/TPWODL's external cable connections will be terminated on the terminal blocks provided in the control panel. All necessary cable terminating accessories such as gland plates, cable glands, crimp type tinned copper lugs, supporting clamps and brackets, wiring troughs and gutters etc for cables shall be included in the bidder's scope of supply.

### **5.12 Labels**

- a) All equipment mounted on the front and rear side as well as equipment mounted inside the panels shall be provided with individual labels equipment designation. Also on the top of each bay on front as well as rear side , large and bold nameplates shall be provided for bay designation.
- b) All front mounted equipment feeders shall be provided, at the rear also with individual labels engraved

with tag numbers corresponding to the ones shown in the panel internal wiring to facilitate easy tracing of the wiring.

- c) Labels both external & internal shall be made on non-rusting metal preferably Aluminium anodized one. Labels shall have white letters on black background. The lettering size shall be 6 mm for panel designation shall be subject to the purchaser's approval.
- d) Each switch shall bear clear inscription identifying it's function e.g. 'BREAKER' 52A' etc. Similar inscription shall be also be provided on each device whose function is not otherwise defined. If any switch device doesn't bear this inscription, separate name plate giving its function shall be provided for it. Switch shall also have clear inscription for each position indication e.g. 'Local-Remote-OFF', 'ON-OFF', 'R-Y-B-OFF' etc. Each IED and meter shall be prominently marked.
- e) Description of the feeder name plates shall be as follows:
  - Feeder details to be shared during detailed engineering.

### 5.13 EARTHING

- a) All panels shall be equipped with a separate earth bus securely fixed along with the inside base of panels. When several panels are mounted adjoining each other, the earthy bus shall be made continuous. Provision shall be made on the earth bus bars of the end panels for connecting the same to the earthing grid.
- b) An earthing conductor of 50X6 mm<sup>2</sup> Al. (minimum) shall be provide extending the whole length of switchgear and control gear to sustain the rated short time withstand current. Every equipment mounted in the panel shall be directly earthed to this earth bus by distinct connections.
- c) The earth bus shall be located at sufficient height from the gland plate and shall not be removable from the outside of cubicle. Door earthing shall also be provided with bolted lugs. The earth bus shall be identified by means of the sign I marked on the outer surface of ASB in a legible and indelible manner on the both side.

### 5.14 GALVANIZING

- a) All galvanizing shall be carried out by the hot dip process, in accordance with latest amended IS. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the galvanic bath, which could have a detrimental effect on the durability of the zinc coating.
- b) After galvanizing no drilling or welding shall be performed on the galvanized parts of the equipment except that nuts may be threaded after galvanizing.
- c) All hardware and nut bolts shall be of GI with minimum 80 micron thickness

### 5.15 REMOTE MOITORING AND CONTROL PHILOSOPHY

- a) The multi-function meter shall necessarily have RS485, MODBUS protocol for communication with SCADA such that remote monitoring of its parameter is possible.
- b) Contacts of O/G breaker for ON indication status shall be wired up to the terminals.

## 6.0 NAME PLATE AND MARKING

Name plates shall be suitably embossed with PO no. with date, "PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL" along with following information:

- a) Reference Standard
- b) Manufacturer name/ Trade mark, Country of manufacture
- c) PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL
- d) Rated voltage, Rated frequency
- e) Rated Normal Current
- f) Guarantee (Months)
- g) Manufacturing month & year
- h) Serial number
- i) PO number & Date

## 7.0 TESTS

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by TPSODL/TPCODL/TPNODL/TPWODL authorized representative. All the components shall also be type tested as per the relevant standards.

### 7.1 TYPE TESTS

- a) Dielectric tests
- b) Temperature rise test
- c) Degree of protection test
- d) Short Circuit Withstand Capability Test

### 7.2 ROUTINE TESTS & ACCEPTANCE TESTS

- a) Dimensional and visual check.
- b) All main/auxiliary bus bars joints, wire terminations, nuts & bolts shall be checked and tightened
- c) Operational tests
- d) Test of auxiliary electrical devices
- e) Dielectric tests
- f) Measurement of resistance of main circuit
- g) Verification of clearance & creepage distances
- h) Verification of correct wiring continuity of protective circuit
- i) Suitable injection tests for all measuring instruments to establish accuracy of calibration.

## 8.0 TYPE TEST CERTIFICATE

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA/ Govt. Owned Lab as per relevant IS. Type tests should have been conducted in certified Test laboratories during the period not exceeding CEA latest guidelines from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPSODL/TPCODL/TPNODL/TPWODL.

## 9.0 PRE-DISPATCH INSPECTION

The Material shall be subject to inspection by a duly authorized representative of the TPCODL/TPNODL /TPSODL/TPWODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL /TPSODL/TPWODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL /TPSODL/TPWODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL /TPSODL/TPWODL.

Following documents shall be sent along with material:

- a) Test reports
- b) PO copy
- c) MDCC issued by TPCODL/TPNODL /TPSODL/TPWODL
- d) TPCODL/TPNODL /TPSODL/TPWODL Invoice in duplicate
- e) Packing list
- f) Inspection report
- g) Delivery Challan
- h) Other Documents (as applicable).

## 10.0 INSPECTION AFTER RECEIPT AT STORES

The material received at TPCODL/TPNODL /TPSODL/TPWODL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering and Contracts department.

## 11.0 GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing

of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Purchaser up to a period of at least 36 months from the date of commissioning or 48 months from the date of last supplies made under the contract whichever is earlier. Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame, and to the entire satisfaction of the TPCODL/TPNODL/TPSODL/TPWODL, failing which the Purchaser will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the Purchaser's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be.

In case of Guarantee Period failure, Bidder shall report at site within 72 hours from intimation and arrange for rectification of fault within a mutually agreed time. In case rectification at site is not possible then alternative arrangement (replacement) to be made by Bidder within 15 days of intimation of failure.

## **12.0 PACKING**

Supplier shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

**Note: Single use plastic not to be used for packing of the material.**

## **13.0 TENDER SAMPLE**

Not Applicable

## **14.0 TRAINING**

Not Applicable

## **15.0 QUALITY CONTROL**

The bidder shall submit 'Quality Assurance Plan' followed in respect of bought out Items manufactured by him

- a) Raw materials in process
- b) Final inspection
- c) Packaging
- d) Marking.

As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPCODL/TPNODL /TPSODL/TPWODL reserves the sole rights for the type test of random sample from the lot and in case of any discrepancy or deviation from the Type test certificates submitted along with the bid, the complete Lot shall be rejected. TPCODL/TPNODL /TPSODL/TPWODL's nominated representative shall have free access to the bidder's works to carry out inspections.

The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections. The bidder shall ensure that the material supplied is as per the Guaranteed Technical Particulars as specified in the specifications.

## **16.0 MINIMUM TESTING FACILITIES**

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards. In case of supply by the channel partner, the manufacturer shall have the in-house testing facilities to carry out the routine and acceptance tests.

## **17.0 MANUFACTURING ACTIVITIES**

CAT-B/CAT-A approval is mandatory to start manufacturing works.

## 18.0 SPARES, ACCESSORIES AND TOOLS

Not applicable

## 19.0 DRAWINGS AND DOCUMENTS

Following documents to be submitted along with the bid for evaluation :

- Completely filled–in clause wise compliance of this specification.
- Signed and stamped copy of General Arrangement Drawing
- Complete type test reports
- Completely filled signed and stamped copy of technical specification
- Any other technical document if required

Following documents shall be submitted after award of RC/PO, before manufacturing:

- Completely filled GTP of the specification.
- Signed and stamped copy of General Arrangement Drawing
- Compliance of all undertaking submitted during technical evaluation

All the Documents and Drawings shall be in English Language.

## 20.0 GUARANTEED TECHNICAL PARTICULARS

Bidder to submit clause wise compliance of the Technical Specification.

## 21. SCHEDULE OF DEVIATIONS

### (TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

| S. No | Clause No. | Details of deviation with justifications |
|-------|------------|------------------------------------------|
|       |            |                                          |

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

**STANDARD TECHNICAL SPECIFICATION COVER SHEET**

**Specification No.: ENG-LV-3021 (A)**

**Specification Name: SPECIFICATION FOR DCDB**

| Revision | Prepared by     | Reviewed by  | Reviewed by     | Reviewed by     | Approved by      | Released by  |
|----------|-----------------|--------------|-----------------|-----------------|------------------|--------------|
| -        | Yashobanta Rout | Tapan Behera | Amisha Pattnaik | Debi Prasad Roy | Niranjan Khuntia | Pourush Garg |
|          | TPCODL          | TPNODL       | TPWODL          | TPSODL          | TPCODL           | TPCODL       |
|          | 09-07-2025      | 14-07-2025   | 16-06-2025      | 18-07-2025      | 02-08-2025       | 02-08-2025   |

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## 1.0 SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store and performance of 48V/24V DCDB with all accessories and necessary training for trouble free & efficient performance. It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform to practices consistent with sound environmental management and local statutes. It is also expected that equipment shall comply in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to the TPCODL/TPNODL/TPSODL/TPWODL, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble-free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

## 2.0 APPLICABLE STANDARDS

The equipment covers by this specification shall unless otherwise stated, be designed, manufactured & tested in accordance with the latest edition of the following standards /IEC and shall conform to the regulation of local statutory authorities.

| SL. NO. | IEC/IS                  | Description                                                                                                                                    |
|---------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | IS: 1248                | Specification for Indicating instrument.                                                                                                       |
| 2.      | IS:375 /1963            | Specification for wiring                                                                                                                       |
| 3.      | IS:13947/ 1993          | Specification for Air Brake Switch/Contactor                                                                                                   |
| 4.      | IS: 8828/1993           | Specification for Miniature circuit breaker                                                                                                    |
| 5.      | IS:6619                 | Safety code for semiconductor rectifier Equipment                                                                                              |
| 6.      | IS:2147                 | Degree of protection for cubicle                                                                                                               |
| 7.      | IS 6619: 1972           | Safety Code for Semi-conductor Rectifier Equipment                                                                                             |
| 8.      | UL 1564                 | UL Standard for Safety Industrial Battery Chargers                                                                                             |
| 9.      | IEC 61000-4-17          | Electromagnetic compatibility (EMC) – Part 4-17: Testing and measurement techniques – Ripple on DC input power port immunity test              |
| 10.     | IEC 60947/<br>IEC 61439 | Specification for Low voltage Switchgear and Control gear                                                                                      |
| 11.     | IS 694                  | PVC insulated unsheathed and sheathed cables/cords with rigid and flexible conductor for rated voltages up to and including 1100 V.            |
| 12.     | IS 2629                 | Recommended practice for Hot Dip Galvanizing of Iron & Steel                                                                                   |
| 13.     | IS 2633                 | Tests for uniformity of zinc coating                                                                                                           |
| 14.     | IS/IEC 60529            | Classification of degrees of protection provided by enclosures of electrical equipment/ Degrees of protection provided by enclosures (IP code) |
| 15.     | IEC 60664               | Insulation co-ordination for equipment within low voltage systems including clearances & creepage distances for equipment                      |

## 3.0 CLIMATIC CONDITIONS OF THE INSTALLATION:

The material shall be suitable for following climatic conditions.

|   |                                 |          |
|---|---------------------------------|----------|
| 1 | Maximum ambient temperature     | 50 deg C |
| 2 | Max. Daily average ambient temp | 35 deg C |

|    |                                                     |                                                                                   |
|----|-----------------------------------------------------|-----------------------------------------------------------------------------------|
| 3  | Min Ambient Temperature                             | 0 deg C                                                                           |
| 4  | Maximum Humidity                                    | 95%                                                                               |
| 5  | Average Annual Rainfall                             | 150cm                                                                             |
| 6  | Average No. of rainy days per annum                 | 120                                                                               |
| 7  | Altitude above MSL not exceeding                    | 1000m                                                                             |
| 8  | Wind Pressure                                       | 300 Km/hr                                                                         |
| 9  | Earthquakes of an intensity in horizontal Direction | Equivalent to seismic acceleration of 0.3g                                        |
| 10 | Earthquakes of an intensity in Vertical Direction   | Equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity) |

TPCODL/TPNODL/TPSODL/TPWODL service area has heavy saline conditions along the coast and High cyclonic intensity winds with speed up to 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

#### 4.0 GENERAL TECHNICAL REQUIREMENTS

| SI no | Description                                     | Requirement                                                                                                                                                                                                                                                                               |
|-------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.    | Switchgear Panel                                |                                                                                                                                                                                                                                                                                           |
| 2.    | Architecture                                    | Metal-clad air insulated                                                                                                                                                                                                                                                                  |
| 3.    | Normal Service condition                        | Indoor                                                                                                                                                                                                                                                                                    |
| 4.    | Rated Voltage                                   | 24/48V DC                                                                                                                                                                                                                                                                                 |
| 5.    | Main Bus Bar Continuous rated current           | 100 A                                                                                                                                                                                                                                                                                     |
| 6.    | Busbar Material & Current Density               | Aluminum with Grade E-91E with heat shrinkable PVC sleeves, maximum current density 1.0A/ sq.mm                                                                                                                                                                                           |
| 7.    | Cross section area of bus bar (phase & neutral) | 125 sqmm Al                                                                                                                                                                                                                                                                               |
| 8.    | Degree of protection for enclosure for meters   | IP 54                                                                                                                                                                                                                                                                                     |
| 9.    | Temperature Rise                                | Shall be as per IEC/IS 61439                                                                                                                                                                                                                                                              |
| 10.   | Insulation Resistance                           | >50 M ohms                                                                                                                                                                                                                                                                                |
| 11.   | Max. operating height from ground Level         | 1800mm                                                                                                                                                                                                                                                                                    |
| 12.   | Min. operating height from ground Level         | 300mm                                                                                                                                                                                                                                                                                     |
| 13.   | Cable Entry & Exit                              | From Bottom                                                                                                                                                                                                                                                                               |
| 14.   | System earthing                                 | 50x6mm GI. Earthbus shall be provided throughout the length of the panel.<br>2 nos. Earthing stud (M8x40) to be provided at the bottom of the panel All hinged door shall be earthed through 2.5 sqmm tinned braided copper wire Earth connection also to be provided in each compartment |
| 15.   | Paint                                           | Shade – RAL 7032<br>Minimum 80 micron                                                                                                                                                                                                                                                     |

|     |                                                                                                                                      |                                                                                                                                                                                                                                                                                        |                                                |
|-----|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| 16. | Material of Sheet<br>Thickness of Enclosure Sheet/Frame<br>Thickness of Doors/Covers Sheet<br>Thickness of Gland Plate<br>Base Frame | CRCA Sheet<br>2.5 mm<br>2.5 mm<br>3 mm<br>ISMC 75                                                                                                                                                                                                                                      |                                                |
| 17. | Type of Gasket                                                                                                                       | Polyurethane                                                                                                                                                                                                                                                                           |                                                |
| 18. | Feeder Description Name plate                                                                                                        | To be provided by the Bidder for each feeder<br>(Feeder details to be provided during drawing approval)                                                                                                                                                                                |                                                |
| 19. | Type of Wire<br>Control Circuit<br>Voltage Circuit<br>CT Circuit<br>Earthing                                                         | PVC Insulated 1.1kV grade FRLSH type<br>2.5 sqmm – Gray, Black<br>2.5 sqmm – Gray<br>4.0 sqmm – R, Y, B<br>2.5 sqmm – Green                                                                                                                                                            |                                                |
| 20. | Size of enclosure                                                                                                                    | <ul style="list-style-type: none"><li>Max. 500mm (Width) of I/C</li><li>Max. 300 mm (Width) of Cable Alley</li><li>Max. 400 mm (Depth)</li><li>Max. 2200 (Height) including Base Frame</li></ul>                                                                                       |                                                |
| 21. | Indication Lights                                                                                                                    | <ul style="list-style-type: none"><li>MCCB (Incomer) – ON, OFF &amp; Trip</li><li>DC ON Indication for Incomer</li></ul>                                                                                                                                                               |                                                |
| 22. | <b>Incoming:</b><br>MCCB incomer with spreader link<br>Qty. – 1 no.                                                                  | 100A, DP,25kA, Microprocessor based with integrated Overload, Short Circuit protection; Suitable for 24/48V DC                                                                                                                                                                         |                                                |
| 23. | <b>Outgoing:</b>                                                                                                                     |                                                                                                                                                                                                                                                                                        |                                                |
| 24. | MCB (1 No)                                                                                                                           | 32A DC DP, 10kA; Suitable for 24/48V DC                                                                                                                                                                                                                                                |                                                |
| 25. | MCB (6 No)                                                                                                                           | 25A DC DP, 10kA; Suitable for 24/48V DC                                                                                                                                                                                                                                                |                                                |
| 26. | MCB (6 No)                                                                                                                           | 16A DC DP, 10kA; Suitable for 24/48V DC                                                                                                                                                                                                                                                |                                                |
| 27. | DC Ammeter (1 No) – Communicable Type                                                                                                | 0-100A Range                                                                                                                                                                                                                                                                           |                                                |
| 28. | DC Voltmeter (1No) - Communicable Type                                                                                               | 0-60V DC                                                                                                                                                                                                                                                                               |                                                |
| 29. | Panel illumination and space heating                                                                                                 | <ul style="list-style-type: none"><li>Space Heater – min. 60 W</li><li>Thermostat – 30°C to 110°C</li><li>LED Lamp with holder – 5 W</li><li>Door Limit Switch – 6A</li><li>3Pin Switch &amp; Socket – 15 A</li><li>Control Fuse with Base – 6A</li><li>DP AC MCB – 6A, 10kA</li></ul> |                                                |
| 30. | Protection Required with display                                                                                                     | <ul style="list-style-type: none"><li>Under Voltage</li><li>Over Voltage</li><li>DC Earth Leakage</li></ul>                                                                                                                                                                            |                                                |
| 31. | Make                                                                                                                                 | MCCB                                                                                                                                                                                                                                                                                   | Siemens, L&T, ABB, C&S, Schneider, Havells     |
|     |                                                                                                                                      | MCB                                                                                                                                                                                                                                                                                    | Siemens, ABB, Legrand, Schneider, Havells, C&S |
|     |                                                                                                                                      | PVC Wire                                                                                                                                                                                                                                                                               | KEI, Polycab, Havells, Finolex                 |
|     |                                                                                                                                      | Indicating Lights                                                                                                                                                                                                                                                                      | Esbee, Vaishno, C&S, Werner                    |
|     |                                                                                                                                      | Meters                                                                                                                                                                                                                                                                                 | Secure, Rishab, Satec, AE, Elmeasure, Accord   |
|     |                                                                                                                                      | Space Heater & Thermostat                                                                                                                                                                                                                                                              | HOTWEL, SURAJ, ELECO, Girishgo                 |

|  |  |                     |                                        |
|--|--|---------------------|----------------------------------------|
|  |  | Light               | Bajaj, CG, Syska, Philips, Havells     |
|  |  | Door Limit Switch   | SURAJ, KAYCEE                          |
|  |  | Pin & Socket        | Anchor, Legrand, Havells               |
|  |  | Control Fuse & Base | ESBEE, VAISHNO, C&S, Siemens, L&T, ABB |
|  |  | CT                  | Indcoil, Pragati, AE, Kalpa, ECS       |
|  |  | Terminal Block      | PHOENIX/ELEMAX/CONNECTWEL/WAGO         |
|  |  | Protection Relay    | GE, Ashida                             |

## 5.0 GENERAL CONSTRUCTION

### 5.1 SWITCHGEAR

- a) The switchgear panel shall be of sheet steel construction and shall be dust and vermin proof and shall be suitable for indoor installation. The panels shall be of Metal Clad compartmentalized, free standing, continuous from rear, modular type. The switchgear panels shall be rigid without using any external bracing. The switchboard panels should comply with relevant IS/IEC and revision thereof and shall be designed for easy operation maintenance and further extension. Bus bar, metering, circuit breaker chamber, cables and cable box chamber should have proper access for maintenance, proper interlocks should be provided. Metal enclosed switchgear shall be so designed that normal service, inspection and maintenance operations including visual checking of phase sequence, earthing of connected cables, locating of cable faults, voltage tests on connected cables can be carried out safely.
- b) Panels shall have structural steel frame-work enclosed on all sides by CRCA sheet steel of minimum thickness as specified below:  
Frame: 2.5 mm  
Doors & Covers: 2.5 mm  
Removable gland plate: 3 mm
- c) Panels shall consist of a front portion with equipment mounted on it and wiring access from rear. All doors, cut- outs and removable covers shall be gasketed all round by polyurethane gaskets. Panel space heater with thermostat, LED lamp with double door switch and 3pin socket & ON/OFF switch and double pole MCB with control fuses for each circuit shall be provided in each cable alley for each vertical panel.
- d) Panels shall be mounted and bolted to a common base channel of height 75mm. The channel in turn shall be fixed to the foundation bolts at site. All foundation equipment, anchor bolts etc. including the supporting channel shall be furnished by successful bidder in advance for completion of Civil Works prior to dispatch of panels. The bottom plates of the panels shall be fitted with removable gland plates for fixing the cable glands.
- e) Height of the panel should be limited to 2200mm. Each Indicating instruments and meters shall be at a suitable height so that the lettering on the dials can be easily read. Control switches/push buttons shall be conveniently located for ease of operation. The centre lines of the switches, push buttons and indicating lamps shall not be at a height more than 1800mm also shall not be less than 300mm that of the lowest unit. MCB with neutral link shall be provided at the panel for incoming AC supplies. All other insulators shall also be made of non-hygroscopic material.
- f) All components of the same rating and construction which may be needed to be replaced shall be interchangeable. If there are removable parts with different ratings and if parts are interchangeable within the assembly of metal enclosed switchgear and control gear, any possible combination of removable and fixed parts shall withstand the rated insulation level specified for fixed parts concerned.

While making the general arrangement, consideration will be given to the place of sectionalizing to select the location where the minimum electrical connections are transferred from one section to other section.

- g) All the components of a module will be mounted on a component plate using machine screws and taped holes (except the components mounted on the door) to ensure vibration free operation. Circuit breakers shall be mounted such that they are accessible from the front of the panel. These components plates should be fixed with bolts for easy replacements. Standardization will be adopted while making these plates so that the component plates of the same size modules. can be changed from one module to other.
- h) Interlocks between different components shall be provided for safety and ease of operation. All instruments shall be non-draw-out type and safeguard in every respect from damages. The operation of a MCCB shall be impossible when it is in closed position. It shall be impossible to close the incoming MCCB in service position unless it is connected to auxiliary circuit.
- i) The rear of the DCDB shall have bolted covers in sections except cable chamber. Single line diagram for power distribution and wiring diagram for power and control shall be provided inside the panel. All retaining catches, screws and bolts for doors and covers shall be hot dip galvanized screws and bolts shall be captive. All hardware for the complete equipment including foundation bolts, lifting lugs & cable termination lugs etc. shall be supplied along with the panels.
- j) Auxiliary and control equipment installed on the panel shall be suitably protected against disruptive discharge from main circuit. Bus bars shall be insulated with 1.1kV insulating sleeves.
- k) Degree of Protection for the enclosure shall be IP54 and that of partitions shall be IP4X. Compartment shall have its own front located, outward opening lockable hinged door (Additional padlock arrangement to be included) with concealed hinges and bolted back cover. The door shall have interlocking facility with the MCCB or its handle such that the door can be opened only if the MCCB is in 'OFF' position. De-interlocking arrangement shall also be provided. Partitions of metal-clad switchgear and control gear shall be metallic and earthed.
- l) Control supply in individual bay shall to be distributed through MCB of suitable rating for individual control function like:  
  
Trip Circuit & Close Circuit (Only for Incomer)  
Heating and Lighting Circuit for Cable Alley  
  
MCB shall be rated for 10kA short circuit rating. It shall be quick make, quick break, and independent manual type with trip free feature. MCB shall have the following:
  - Over current protection
  - Short Circuit Protection
- m) Wherever CB contacts are to be multiplied, latch type relay shall be used for contact multiplication. Auxiliary contact multiplier relays shall be reputed make and selected on the basis of continuous current carrying capacity and rated voltage. The fluctuation in voltage level shall be accounted for (+/-) 10% continuously.
- n) Each switchgear panel shall have 20% spare terminals & stopper shall be used for cable to cable termination clearance. All equipment mounted on front side of panel. shall have Individual nameplates with equipment designation engraved. The termination links for cables shall be segregated in vertical plane. The bidder shall deliver to site completely assembled, wired, tested panels and only the interconnecting cables shall be connected at site.
- o) Cable entry arrangement shall be from bottom and suitable for 1.1KV XLPE armored external cables of sizes as mentioned in the specification. Removable CRCA gland plate of 3mm with cable holes to suit the cable sizes and with 2mm polyurethane type gasket of non-inflammable and insulating vermin proof

material shall be provided. A minimum distance of 250mm will be provided between the gland plate and the nearest terminal for proper dressing and termination of the cable.

- p) Separate compartment is required for Incomer & Outgoings. Multiple MCB shall be mounted in one compartment. MCCB & MCB shall not be door mounted.

## 5.2 Circuit Breaker

- a) The MCCB shall be fixed type. Comprehensive interlocking system to prevent any dangerous or inadvertent operation shall be provided. The contacts & spare contact of MCCB to be wired up to the terminals.
- b) The MCCB shall be manually operated with two pole simultaneous operations. The indicating device shall show the OPEN, CLOSE and TRIP position of MCCB visible from front of the cubicle.

## 5.3 BUSBAR

- a) Bus bars and all other electrical connections between various components shall be made of Aluminium of rectangular cross-section with current density of maximum 1 A/mm<sup>2</sup>, shall be suitable for 48/24V DC supply. The bus bars shall be insulated with heat shrinkable and colour coded insulating sleeves, except at the points of connections. The phase bus bar shall be of ample capacity to carry the rated current of 100A continuously without excessive heating and for adequately meeting the thermal and dynamic stresses in the case of short circuit in the system. All bus bars shall be rigidly and firmly mounted and shall be capable of withstanding short circuit stresses and vibrations. The bus bars shall be extensible on both sides depending upon layout.
- b) Minimum electrical clearances shall be maintained between phases, neutral and body as per relevant IS however the minimum clearance between bus bar to bus bar & bus bar to enclosure shall be 40mm.
- c) The Bus bars shall run in a separate bus bar chamber using suitable Bus bar support of non-hygroscopic, non-combustible, material such as DMC/ SMC at sufficiently close intervals to prevent bus bar sag. All bus bar joints, shall be provided with high tensile steel bolts (electro plated with suitable metal such as Nickel Cadmium), spring washer and nuts so as to ensure good contact. Alternatively, electroplated/ tinned brass bolts shall be used. The joints shall be formed with fish-plates on either side of bus bar to provide adequate contact area. Bus supports shall be provided on either side of joints. Max. Unsupported distance from the joints and between two supports shall not exceed 450mm.
- d) All accessible bus bar joints shall be provided with removable FRP shrouds min 3mm.

## 5.4 METERING, INSTRUMENTATION AND CONTROL DEVICES

### 5.4.1 MEASURING INSTRUMENTS

The Ammeter & Voltmeter meter shall necessarily have RS 485 Modbus serial port for communication with SCADA. All meters shall be of flush mounting type with 96x96 sq. mm. The meter shall be enclosed in a dust tight housing providing IP5X or an equivalent provision to completely protect it against dust ingress, and shall protect in a way that performance doesn't get effected due to small dust also. The design and manufacture of the meters shall ensure the preventing of fogging of instrument glass. Instrument meters shall be sealed in such a way that access to the measuring element and to the accessories within the case shall not be possible. Inbuilt selector switches shall be provided to be used on three phase supply.

### 5.4.2 INDICATING LAMPS

The indicating lamps used in the panel will be pleasant looking, LED type indicating lamps in round shape and suitable for continuous operation at 85% to 110% of their rated voltage. They shall be provided with suitable series resistor and the bulb shall be replaceable from the front of the panel.

The selection of the colors of the indicating lamps will be as follows:

Red - MCCB ON

Green MCCB OFF

Amber MCCB TRIP

Red for incoming DC supply indication.

The various feeders shall be assigned the indicating lamps as mentioned:

Incomer – ON ,OFF,TRIP and 3-ph supply indications

DC ON Indication for Incomer

All color caps shall be similar and interchangeable and all LEDs shall be of same type and ratings. The LED lamps shall be furnished 20% in excess of actual numbers required and color caps shall be furnished 10% in excess of actual numbers used for each.

## 5.5 PANEL WIRING

- a) Panels shall be supplied completely wired internally to equipment and terminal blocks and ready for the TPCODL/TPNODL/TPWODL/TPSODL external cable connections at the terminal blocks. The control wiring will be done with PVC single core flexible copper wires and properly dressing all the wires either in a PVC duct of liberal size or bunched together by PVC strapping taps and thereafter fastened to steel members of the panel. When panels are arranged to be mounted adjacent to each other all inter-panel wiring and connections between panels shall be provided by the Bidder.
- b) All wiring shall be carried out with 1100 V grade, single core stranded copper conductor wires with PVC insulation. Extra flexible wires shall be used for wiring of devices mounted on moving parts such as swinging panels and doors.

The minimum size of the stranded copper conductor used for panel wiring shall be as follows:

CT circuits: 4mm<sup>2</sup> per lead

All circuits except CT circuits: 2.5mm<sup>2</sup> per lead

- c) Interconnections to adjacent panels shall be brought out to a separate set of terminal blocks located near the slots or holes meant for taking the interconnecting wires. Arrangements shall permit easy inter-connections to adjacent panels at site and wires for this purpose shall be provided by the bidder looped and bunched properly inside the panels. The unused instrument space on the front or rear of the panels shall be kept clear of wiring, to facilitate addition of devices without rewiring associated portion of the panels.
- d) Wire terminations shall be made with solder less crimping type of (ring type lugs for all CT and pin type lugs for other circuits) tinned copper lugs which firmly grip the conductor and insulation. Insulated sleeves shall be provided at all the wire terminations. Printed type PVC ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of all the control, instrumentation, and protection wiring. Ferrules shall fit tightly on the wires and shall not fall off when the wire is disconnected.
- e) Internal wiring to be connected to external equipment shall terminate on terminal blocks. The terminal blocks for CTS shall be provided with test links and isolating facilities. The CT terminal blocks shall be provided with short circuiting and earthing facilities Switchgear shall have 20% terminals as spare terminals in each panel & should be uniformly distributed in all the blocks.
- f) The Power interconnections shall be carried out by means of bolted connections with washers. The wiring shall be terminated by using crimping sockets. Under no circumstances the wiring should be under any kind of stress for which sufficient length of control wiring should be provided.

## 5.6 TERMINAL BLOCKS

- a) The terminal blocks shall be 1100 V grade, 10 Amps rated, one piece, moulded, complete with insulated barriers, stud type terminals, washers, nuts and lock nuts and identification strips. Markings on the terminal strips shall correspond to wire numbers on the wiring diagrams. The terminal blocks shall be

fully enclosed with easily removable covers and made of moulded non-inflammable plastic material.

- b) All spare contacts of the panel mounted equipment and devices shall be wired up to terminal blocks. All the TB's shall be of single Decker type. Bidder shall be provided with potential free contacts for Mains ON, I/C ON, I/C OFF for SCADA. Supplier will provide wiring of these contacts up to terminal block in DCDB panel.

#### **5.7 Space Heaters**

- a) Strip type space heaters of adequate capacity shall be provided inside each panel to prevent moisture condensation on the wiring and panel mounted equipment. Space heaters shall be rated for 240V, 1Phase 50hz supply. Heaters inside the panels shall not be mounted close to the wiring or any panel mounted equipment. Heaters shall be complete with miniature circuit breaker on the phase and link on the neutral of the heater supply.
- b) An adjustable type thermostat shall be provided in the heater control circuit with temperature range of 30-110 deg C.

#### **5.8 Interior Lighting**

Each Panel shall be provided with a 5W, 230, 1ph, 50Hz LED for the illumination of the panel during maintenance. The fitting shall be complete with switch-fuse unit and the switching of the fitting shall be controlled by the respective panel door switch.

#### **5.9 Power & Control Supplies**

The DCDB panel shall be provided with necessary arrangement for receiving, distributing, isolating and fusing of DC supply for various control, Signaling, lighting and space heater circuits.

#### **5.10 CABLE TERMINATION ACCESSORIES**

The TPCODL/TPNODL/TPSODL/TPWODL's external cable connections will be terminated on the terminal blocks provided in the control panel. All necessary cable terminating accessories such as gland plates, cable glands, crimp type tinned copper lugs, supporting clamps and brackets, wiring troughs and gutters etc for cables shall be included in the bidder's scope of supply.

#### **5.11 Labels**

- a) All equipment mounted on the front and rear side as well as equipment mounted inside the panels shall be provided with individual labels equipment designation. Also on the top of each bay on front as well as rear side , large and bold nameplates shall be provided for bay designation.
- b) All front mounted equipment feeders shall be provided, at the rear also with individual labels engraved with tag numbers corresponding to the ones shown in the panel internal wiring to facilitate easy tracing of the wiring.
- c) Labels both external & internal shall be made on non-rusting metal preferably Aluminium anodized one. Labels shall have white letters on black background. The lettering size shall be 6 mm for panel designation shall be subject to the purchaser's approval.
- d) Each switch shall bear clear inscription identifying it's function e.g. 'BREAKER' 52A' etc. Similar inscription shall be also be provided on each device whose function is not otherwise defined. If any switch device doesn't bear this inscription, separate name plate giving its function shall be provided for it. Switch shall also have clear inscription for each position indication e.g. 'Local-Remote-OFF', 'ON-OFF', 'R-Y-B-OFF' etc. Each IED and meter shall be prominently marked.
- e) Description of the feeder name plates shall be provided during drawing approval.

#### **5.12 EARTHING**

- a) All panels shall be equipped with a separate earth bus securely fixed along with the inside base of panels. When several panels are mounted adjoining each other, the earthy bus shall be made continuous. Provision shall be made on the earth bus bars of the end panels for connecting the same to

the earthing grid.

- b) An earthing conductor of 50X6 mm<sup>2</sup> GI (minimum) shall be provide extending the whole length of switchgear and control gear to sustain the rated short time withstand current. Every equipment mounted in the panel shall be directly earthed to this earth bus by distinct connections.
- c) The earth bus shall be located at sufficient height from the gland plate and shall not be removable from the outside of cubicle. Door earthing shall also be provided with bolted lugs. The earth bus shall be identified by means of the sign I marked on the outer surface of panel in a legible and indelible manner on the both side.

### 5.13 GALVANIZING

- a) All galvanizing shall be carried out by the hot dip process, in accordance with latest amended IS. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the galvanic bath, which could have a detrimental effect on the durability of the zinc coating.
- b) After galvanizing no drilling or welding shall be performed on the galvanized parts of the equipment except that nuts may be threaded after galvanizing.
- c) All hardware and nut bolts shall be of GI with minimum 80 micron thickness

### 5.14 REMOTE MOITORING AND CONTROL PHILOSOPHY

- a) The indicating meters shall necessarily have RS485, MODBUS protocol for communication with SCADA such that remote monitoring of its parameter is possible.
- b) Contacts of MCB for ON indication status shall be wired up to the terminals.

### 5.15 Radio Interference:

- a) The equipment shall be efficiently screened against interference to radio and also other communication equipment, which may be installed in the same building. All sources of noise shall be filtered, if necessary, with suppressors generally in accordant with relevant standards.

**Following are the minimum mandatory signal requirement for DCDB signals for ADMS (SCADA):**

#### **Measurement signals:**

1. DC load voltage
2. Load current

#### **Alarm signals:**

1. DC earth Leakage
2. UV Alarm
3. OV Alarm
4. DC fail

DCDB shall be integrated with TPCODL/TPNODL/TPSODL/TPWODL SCADA over Modbus-RTU protocol. It shall be noted that voltage exact value to be mapped in SCADA.

## 6.0 NAME PLATE AND MARKING

Name plates shall be suitably embossed with PO no. with date, "PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL" along with following information:

- a) Reference Standard
- b) Manufacturer name/ Trade mark, Country of manufacture
- c) PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL
- d) Rated voltage, Rated frequency
- e) Rated Normal Current & Voltage
- f) Guarantee (Months)
- g) Manufacturing month & year

- h) Serial number
- i) PO number & Date

## 7.0 TESTS

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by TPSODL/TPCODL/TPNODL/TPWODL authorized representative. All the components shall also be type tested as per the relevant standards.

### 7.1 TYPE TESTS

- i. Temperature Rise Test
- ii. Degree of Protection Test
- iii. Dielectric Test

### 7.2 ROUTINE TESTS and ACCEPTANCE TESTS

- a) Dimensional and visual check.
- b) All main/auxiliary bus bars joints, wire terminations, nuts & bolts shall be checked and tightened
- c) Operational tests
- d) Test of auxiliary electrical devices & Protection Device
- e) Dielectric tests
- f) Measurement of resistance of main circuit
- g) Verification of correct wiring continuity of protective circuit
- h) Suitable injection tests for all measuring instruments to establish accuracy of calibration.

## 8.0 TYPE TEST CERTIFICATE

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA/ Govt. Owned Lab as per relevant IS. Type tests should have been conducted in certified Test laboratories during the period not exceeding CEA latest guidelines from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPSODL/TPCODL/TPNODL/TPWODL

## 9.0 PRE-DISPATCH INSPECTION

The Material shall be subject to inspection by a duly authorized representative of the TPCODL/TPNODL /TPSODL/TPWODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL /TPSODL/TPWODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL /TPSODL/TPWODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL /TPSODL/TPWODL.

Following documents shall be sent along with material:

- a) Test reports
- b) PO copy
- c) MDCC issued by TPCODL/TPNODL /TPSODL/TPWODL
- d) TPCODL/TPNODL /TPSODL/TPWODL Invoice in duplicate
- e) Packing list
- f) Inspection report
- g) Delivery Challan
- h) Other Documents (as applicable).

## 10.0 INSPECTION AFTER RECEIPT AT STORES

The material received at TPCODL/TPNODL /TPSODL/TPWODL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of

the report shall be sent to Engineering and Contracts department.

#### 11.0 GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Purchaser up to a period of at least 36 months from the date of commissioning or 48 months from the date of last supplies made under the contract whichever is earlier. Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame, and to the entire satisfaction of the TPCODL/TPNODL/TPSODL/TPWODL, failing which the Purchaser will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the Purchaser's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be.

In case of Guarantee Period failure, Bidder shall report at site within 72 hours from intimation and arrange for rectification of fault within a mutually agreed time. In case rectification at site is not possible then alternative arrangement (replacement) to be made by Bidder within 15 days of intimation of failure.

#### 12.0 PACKING

Supplier shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

**Note: Single use plastic not to be used for packing of the material.**

#### 13.0 TENDER SAMPLE

Not Applicable

#### 14.0 TRAINING

Not Applicable

#### 15.0 QUALITY CONTROL

The bidder shall submit 'Quality Assurance Plan' followed in respect of bought out Items manufactured by him

- a) Raw materials in process
- b) Final inspection
- c) Packaging
- d) Marking.

As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPCODL/TPNODL /TPSODL/TPWODL reserves the sole rights for the type test of random sample from the lot and in case of any discrepancy or deviation from the Type test certificates submitted along with the bid, the complete Lot shall be rejected. TPCODL/TPNODL /TPSODL/TPWODL's nominated representative shall have free access to the bidder's works to carry out inspections.

The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections. The bidder shall ensure that the material supplied is as per the Guaranteed Technical Particulars as specified in the specifications.

#### 16.0 MINIMUM TESTING FACILITIES

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards. In case of supply by the channel partner, the manufacturer shall have the in-house testing facilities to carry out the routine and acceptance tests.

#### **17.0 MANUFACTURING ACTIVITIES**

CAT-B/CAT-A approval is mandatory to start manufacturing works.

#### **18.0 SPARES, ACCESSORIES AND TOOLS**

Not applicable

#### **19.0 DRAWINGS AND DOCUMENTS**

Following documents to be submitted along with the bid for evaluation:

- a) Completely filled–in clause wise compliance of this specification.
- b) Signed and stamped copy of General Arrangement Drawing
- c) Complete type test reports
- d) Completely filled signed and stamped copy of technical specification
- e) Any other technical document if required

Following documents shall be submitted after award of RC/PO, before manufacturing:

- a) Completely filled GTP of the specification.
- b) Signed and stamped copy of General Arrangement Drawing
- c) Compliance of all undertaking submitted during technical evaluation

All the Documents and Drawings shall be in English Language.

#### **20.0 GUARANTEED TECHNICAL PARTICULARS**

Bidder to submit clause wise compliance of the Technical Specification.

#### **21. SCHEDULE OF DEVIATIONS**

##### **(TO BE ENCLOSED WITH TECHNICAL BID)**

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

| S. No | Clause No. | Details of deviation with justifications |
|-------|------------|------------------------------------------|
|       |            |                                          |

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

**TPNODL**

**Document No: ENG-LV-3021 (A)**

Designation

**TPCODL**

**TPSODL**

**Document Title: SPECIFICATION  
FOR DCDB**

**TPWODL**