###### TECHNICAL SPECIFICATION OF AC DISTRIBUTION BOX

**Annexure – ‘B’**

**1.0 SCOPE:**

This specification covers the design, manufacturing, testing at works andsupply of Indoor type A.C. Distribution Boards for power supply to yardlighting, Battery charger, 33 kV substation equipments, compressors etc.

The system shall be AC 3 Phase, 4 Wire, 433 Volts, 50 HZ with effectivelygrounded neutral.

###### 2.0 SERVICE CONDITIONS:

Equipment to be supplied against this specification shall be suitable forsatisfactory continuous operation under the following tropical conditions.

|  |  |  |
| --- | --- | --- |
| 2.1 | Maximum ambient temperature (Degree C) | 50 |
| 2.2 | Maximum temperature in shade (Degree C) | 45 |
| 2.3 | Minimum temperature of Air in shade (Degree C) | 3.5 |
| 2.4 | Relative Humidity (Percent) | 10-100 |
| 2.5 | Maximum annual rain fall (mm) | 1450 |
| 2.6 | Maximum wind pressure (Kg/ sq.mm) | 150 |
| 2.7 | Maximum altitude above mean sea level (meter) | 1000 |
| 2.8 | Isokeraunic level (Days per year) | 50 |
| 2.9 | Seismic level (Horizontal Acceleration) | 0.3g |
| 2.10 | Moderately HotandHumidtropical climate conducive to rust and fungus growth | - |

###### STANDARDS:

* 1. Components mounted on the ACDB shall confirm to the latestrevisions of the following standards:

|  |  |  |
| --- | --- | --- |
| A | IS: 13947 | Degree ofprotection provided for enclosure forlow voltagecontrolgear and switchgear&MCCB |
| B | IS 5 | Painting |
| C | IS: 13947/1993 Part-III  amended up to date | Switch Fuse Dis-connector unit |
| D | IS2705 amended upto date | CTs |
| E | IS 8828/1996 amended  Upto date | MCB |
| F | IS 1248 | Indicating instruments |
| G | IS 375 | Wiring |
| H | IS: 13703/1993 Part-I& II | HRC Fuses |

###### GENERAL TECHNICAL PARTICULARS:

These A C Distribution Boards shall be supplied as per thisspecification.

###### Rated Voltage:

Rated voltage for the Distribution Board and its constituent items likeSwitch Fuse Disconnector unit, MCBs,

bus ways etc. shall be 3 phase 4 wireA.C. 433 volts, 50 Hz with solidly grounded neutral. The supply voltage mayvary by ± 10% of rated voltage. All the equipment’s used in the Board shalloperate satisfactorily at this voltage variation.

###### General Requirements:

* + 1. Each Distribution Board shall be free standing floor mounted having compact design. The Board shall be closed, dust protected, weather proof and shall be made vermin proof with a special type lining e.g.Neoprene gasket, around the edges of the doors. The distribution board shall comply degree of protection IP 52. MCBs shall be operating vertically upward for ON/OFF operation. The entire distribution board shall have uniform finish and shall be sturdy. The distribution boards shall be of modular construction with provision for complete compartmentalization of all feeders. It shall be

of dead front type comprising dust-tight and vermin proof sheet steel cabinets suitable for indoor installation. The doors of cabinets shall be lockable. Handle shall be made of reputed make. The DB shall be provided with double door in front having 2 nos. hinges (for each door) which should be suitable for movement of 120 degree and 2 no. knobs to be provided on the door corners. All instruments and control devices shall be mounted on the front of cabinets and fully wired to the terminal blocks. All switches provided on the distribution board shall be on front side of the cabinets, operable from outside.

* + 1. Each Distribution Board shall be made out of at least 2.0 mmthick cold rolled steel sheet, suitably

reinforced to provide flat level surface.Size 1000(H) x 750(W) x 300(D) mm. Gland plate shall be 3.0mm thick zinc coated yellow passivated. Nowelds, rivets, hinges or bolts shall be visible from outside. The doors shallbe fitted with double leaf neoprene rubber gaskets.

* + 1. All cables shall enter and leave from bottom. Suitable cableterminal blocks with cable lugs, for a minimum of 22 nos., (to be finalized during detailed engineering as per requirement) shall be provided insideeach cabinet for the incoming and outgoing cables. The terminals shall beserially numbered to facilitate installation and maintenance. Main busbarsshall be accommodated in busbar chambers and cable alleys arranged bytheir side. Compression type cable glands shall be provided to hold thecables to avoid any pressure or tension on the terminal block connections.

The terminal blocks shall be easily accessible for inspection and checking. Panels shall have cable supports and metallic clips for supporting powerand control cables for internal wiring of the panels.

* + 1. The busbars shall consist of tinned electrolytic copper of cross-sectional area of a minimum of 30mm x 5mm, suitable for carrying theirrated continuous current without their temperature exceeding 85 deg C.The busbars shall be continuous throughout each section. The busbars shall have current rating to suit the requirements corresponding to theloads incident thereon under the various operating conditions and shallwithstand the applicable voltage and maximum short circuit stress. Thebusbars shall be insulated from supporting structure by means of durable non hygroscopic, non- combustible and non-tracking polyester fiberglass material or porcelain. Busbars shall be encased in heat-shrunk sleeves ofinsulating material which shall be suitable for the operating temperature ofbusbars during normal service. The busbar joints shall be provided with

removable thermosetting plastic shrouds.The busbars shall be housed in totally enclosed busbar chambers. Theincoming connections from the busbar to the various feeders shall be so

designed as not to disturb cable connections and to ensure safety to theoperating and maintenance personnel and to facilitate working outside anyoutgoing module without the need for switching off in-feed to the adjacentmodules, as far as possible. The phase and neutral busbar shall be of highconductivity, adequate uniform cross section and current density shall not be more than 1.6 Amp/sq. mm.A cable alley preferably 230 mm wide shall be provided in each verticalsection for taking cables into the compartments.

* + 1. All doors shall be provided with mechanical interlockingarrangements along with keys. The distribution board shall have no dooron rear side.
    2. Danger board (Caution Plate) shall be fitted suitably on inner doorof the DB. Danger board shall be of 100x100 mm size with details as per JBVNL standard format (CAUTION, ‘Danger Sign’, 440V).
    3. The AC boards shall be provided with the following equipment’swherever applicable:
       1. Busbars shall be of rectangular shape of size 30mm x 5mm, madeof tinned electrolytic copper suitable for 200A continuous rating.
       2. Terminal arrangement with necessary equipment for connectingthe incoming supply.
       3. Voltage and current measurement in the incomer feeder.
       4. Outgoing modules with switch / MCB units of adequatecapacity for the outgoing feeders.
       5. Necessary cable glands and terminal blocks.

1. Adequate number of spare terminals on terminal blocks forexternal connections.
2. The number of outgoing feeders from AC boards shall be suchthat each substation equipment is fed by separate feeder with 20%as spare.
   * 1. The ventilating louvers should be covered from inside by a perforated sheet or wire mesh.
     2. All sheet metal used for DB shall undergo seven tank mechanical/chemical cleaning process & painting shall be done using powder coating process. Colour of the Paint shall be admiral gray as per shade no. 632 of IS 5 on exterior and white from interior sides.

###### MAJOR COMPONENTS:

* 1. Incoming cable for ACDB shall be terminated on terminal connectors provided at the bottom. Connection between incomer terminals and Switch Fuse Disconnector unit shall be with 70 sq. mm copper cable. Outgoing shall be connected with 35 sq. mm copper cable.For 200 A MCCB, 70 sq. mm. stranded cable shall be used. For all 32 A rated MCBs, 16 sq. mm. stranded cable; and, for all 16A rated MCBs, 10 sq. mm. cable shall be used.

###### All MCBs, cable used in the DB shall be of reputed make and ISI marked.

* 1. Incoming circuit:

Incoming circuit shall have one no. 3 phase, 433 volt Switch Fuse Disconnector unit of nominal current rating of 200Amps conforming to IS:13947/1993 amended up to date and fitted with HRC fuses and 3 No. LT resin cast CTs having CT ratio of 200/5 A with burden 10VA & accuracy class 1. Switch Fuse Disconnector unit shall be of reputed make.

To receive incoming cable, one no. 4 way bolted type connector of suitablen size shall be provided. Provision for one kWH meter (3 ph, 4 wire) of flush mounted type with complete wiring and connected CTs shall be made inthe panel.

* 1. Outgoing circuits:

|  |  |  |  |
| --- | --- | --- | --- |
| Sr.  No. | Feeder  Rating | Cable size | Purpose |
| 1 | TPN 200 A  MCCB | 4 core 70 sq. mm. LTPVC  cable | a.Filtration/ Miscellaneous |
| 2 | TPN 32 A MCBs | 4 core 16 sq. mm LTPVC  cable | 1. Water supply 2. Outdoor lights 3. Yard light 4. Spare (1 nos.) |
| 3 | TPN 16 A MCBs | 4 core 10 sq. mm LTPVC  cable | a.OLTC for Power Transformers (3 nos.)  b.Spare (1 no.) |
| 4 | DP 32 A MCBs | 2 core 16 sq. mm LTPVC  cable | a.Indoor lights b.Battery Charger1   1. battery Charger 2 2. Spare (1 no.) |

|  |  |  |  |
| --- | --- | --- | --- |
| 5 | DP 16 A MCBs | 2 core 10 sq. mm LTPVC  cable | a.33 kV Panel AC supply (1 nos.)  b.11 kV panel AC supply (1 nos.)  c.Supply for RTU   1. Supply for UPS 2. RTCC (3nos.) 3. Spare (1 nos.) |

* + 1. Total 22 Nos. Outgoing circuits shall be provided as per the details given below.MCCBs/MCB shall comply following specifications as per IS 8828/1996.
       1. Rated voltage & freq. shall be 230V & 50 Hz respectively for DPMCBs.
       2. Rated current shall be 200A/ 32A/16 A as mentioned above.
       3. Rated short circuit capacity shall be min. 6 KA at 0.7 p.f. lag
       4. Service short circuit capacity shall be 6KA as per table 15 of IS:8828 /1996.
       5. MCCBs/MCB shall have fixed un adjustable time / currentcharacteristics.
       6. Under voltage release and shunt-trip release coils are not required. Only overload release and short circuit release shall be provided.
       7. Tripping time shall be as per (clause No. 8.6.1) table 6 of IS: 8828/1996. Tripping mechanism thermal magnetic type.
       8. MCBs having precision moulded case and cover of flame retardant high strength thermo plastic material

with highmelting point, low water absorption, high dielectric strength and temperature with stand capacity shall be capable of carrying out given no. of operation cycles as per clause No. 9.11of IS: 8828 /1996.

* + - 1. Limits of temperature rise shall be as per (clause No. 9.8) table 5 of IS: 8828/1996.
      2. Standard range of instantaneous tripping shall be type 'B' as per (clause No.5.3.5) table 2 of IS: 8828

/1996.

* + 1. All MCB outgoing terminals shall be terminated on terminal connectors of 10 mm. Study peprovided at the bottom.
    2. The enclosure shall be provided with proper earthing arrangement. Earthing arrangement shall

consist of 2 G.I. Bolts of 12 mm x 50mm (min.) with 2 spring/ plain washers and 2 check nuts.

* + 1. PVC cable glands of adequate size shall be provided for all incoming and outgoing cables.
    2. The moving contacts of all poles of multipole circuit breaker shall be so mechanically coupled that all poles, except the switched neutral, if any, make and break substantially together, whether operated manually or automatically, even if an overload occurs on one protected pole only.

A switched neutral pole shall open after and close before the protected pole(s). The mechanism should be double make, double break with variable mechanism. Both side terminal should be suitable for direct cabling as well as busbar connection and should take wire up to cross section area of 25 sq. mm

Detailed specification is tabulated below:-

|  |  |
| --- | --- |
| Standard | IS:8828:96 & IEC:60898:2002 |
| Type/Series | B&C |
| Rated Current(AC) | 20A for SPN, 36A for TPN |
| Rated Voltage(AC) Volt | 240/415 |
| Rated short circuit breaking capacity kA | 10 |
| Ambient temperature (deg C) | -5 to +55 |
| Protection class | IP-52 |

###### Indicating Instruments:

Principal requirements of indicating instruments are as follows:

###### Ammeter:

Ammeter shall comply the following requirements

|  |  |
| --- | --- |
| Class of accuracy | 1.0 |
| Range | 0-200 Amps |
| Mounting | Flush type |
| Size | 96 x 96mm |
| Type | Analog |
| Operating Current | 5 A from CT Secondary |

###### Ammeter selector switch:

Ammeter Selector switch shall be a four-position rotary type with R, Y, Band 'OFF' positions marked clearly on 48 x 48 mm brushed aluminum plate with black handle. The Switch should be screw mounting type with finger touch proof terminals. Terminal wire should be inserted from the side of the switch terminal. Terminal screw must be captive to avoid misplace during maintenance. The switch shall be of 12 A rating with insulation level of 1100 V.

###### Volt Meter:

Voltmeter shall comply the following requirements

|  |  |
| --- | --- |
| Class of  accuracy | 1.0 |
| Mounting | Flush type |
| Size | 96x 96 mm |
| Range | 0-600 volts |
| Type | Analog |

###### Volt Meter selector switch:

Voltmeter Selector switch shall be a seven-position rotary type ( 6 way & off)with 3 phase to phase & 3 phase to neutral position marked clearly on 48 x 48mm brushed aluminium plate with black handle. The Switch should be screw mounting type with finger touch proof terminals. Terminal wire should be inserted from the side of the switch terminal. Terminal screw must be captive to avoid misplace during maintenance. The switch shall be of 12 A rating with insulation level of 1100 V.

###### Indicating Lamps:

Indicating lamps, for indicating voltage presence in three phases, shall be panel mounting type 23 mm with rear terminal connections having low wattage LEDs cluster type. Lamps shall have translucent lamp covers to diffuse lights, coloured red, yellow, green or blue as specified. The lamp cover shall be preferably of screw-on type, unbreakable and moulded from heat resisting fast

coloured material. Conventional bulbs are not acceptable. The intensity of light should be minimum 100 milli cd at 20 mA. Indication lamp should be suitable to operate on 230 V AC.

Necessary wiring shall be provided accordingly.

###### MARKING

Each compartment shall be provided with legible and indelibly marked/engraved name plate. Name plates shall be white with black engraved letters. On top of each module, name plates with bold letters shall be provided for feeder designation. Each device shall also suitably marked for identification inside the panels. Nameplates with full and clear inscriptions shall be provided inside the panels for allisolating switches, links, fuse blocks, test blocks and cable terminals. Every switch shall be provided with a nameplate giving its function clearly. Switches shall also have clear inscriptions for each position indication e.g. ‘ON’ ‘OFF’ etc.

###### Earthing Arrangements:

Two nos. Earthing studs of galvanized M.S. 25 X 6 mm shall be providedfor external earth connections at the bottom. These should be complete withplain washer, spring washer, nuts etc. Earthing Bolts must be welded toprevent removal of the same from the cabinet.Flexible stranded copper connector (braided conductor) should beconnected of copper equivalent 10 sq. Mm size between door and boxenclosure. This flexible braided cable should be terminated using gland andproper size nut/bolts at both ends.

###### Mounting Clamps:

The CTs box, ACDB box are to manufacture with suitable mountingarrangement on wall/steel support by means of 4 nos. 25X6 mm size clampshaving hole dia. 14mm, fixed over the body as per drawing.

###### Gland Plate:

The removable gland plate should be provided in the lower portion of thebox to accommodate all brass glands (according to requirement) for incomingand outgoing cables.

###### Name Plate:

Aluminium sheet 2 mm engraved with details should be provided dulyrefitted over front door.

1. ACDB
2. P.O No.
3. ‘Property of JBVNL R-APDRP Part B’
4. Name of the Manufacturer

###### 6.0 CONTROL WIRING

Each ACDB shall be furnished completely factory wired upto terminal blocks ready for external connections.All wires shall consist of 1100V grade PVC insulated flexible stranded copperwires with a cross- section of 2.5 sq. mm suitable for switchboard wiring and complying with the requirement of relevant IS. Each wire shall bear an identifying ferrule or tag at each end or connecting point.

Control cables for external connections shall consist of stranded copperwire with 1.5, 2.5, 4.0 sq. mm or higher cross-sectional areas and shall enter from the bottom.

All interconnecting/outgoing control wiring shall terminate on stud type terminals on terminal blocks. The terminals shall be marked with identification numbers to facilitate connections.

The terminal blocks shall be made of moulded, non-inflammable, plastic material and arranged to provided maximum accessibility for inspection and maintenance. All terminal block shall have transparent plastic cover.

The terminals shall be made of hard brass and diameter of not less than 6 mm. The studs shall be securely locked within the mounting base to prevent turning. The terminal blocks shall be provided with twenty(20) percent spare terminals. The terminals shall be suitable for connections through tinned copper crimped lugs. Wiring shall be complete in all respect to ensure proper functioning of the control, protection and monitoring scheme. Each wire shall be identified at both ends with permanent markers bearing wire numbers as per wiring diagram.

###### 7.0 TYPE TEST CERTIFICATES:

MCBs & other components used in ACDB shall be fully type tested as per relevant IS and this specification. The successful Bidder shall furnish detailed type test reports before commencement of supply.

All the Type Tests shall be carried out from laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Government of India such as CPRI Bangalore/ Bhopal,

ERDA Baroda, to prove that the MCBs & other components used in ACDB meet requirements of the specification.

###### 8.0 DRAWINGS:

Successful bidder shall submit the detailed drawings along with component details/makes etc. for necessary approval.

###### 9.0 INSPECTION:

All tests and inspection shall be made at the place of manufacturer. The manufacturer shall provide reasonable testing and inspection facilities and cooperation without any charge to satisfy him that the material is being supplied is in accordance with this specification. The proto of ACDB shall be inspected& checked by Ordering Authority or his representative for approval before commencement of supply.

###### 10.0 SCHEDULES:

The tenderer shall fill in the following schedules, which form part of the tender specification and order. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule ‘A’ - Guaranteed Technical Particulars. Schedule ‘B’ - Tenderer’s Experience

###### 11.0 Deviations

Deviation from this specification, if any, shall be clearly bought out in the offer. Unless owner explicitly a accepts such deviations, it shall be constructed that the offer fully complies with the specification.