West Bengal State Electricity Distribution Co. Limited.

TECHNICAL SPECIFICATIONS

FOR

415 V A. C. DISTRIBUTION BOARD

(FOR 33/11 KV SUB STATIONS)

1.0 SCOPE:

This specification covers the design, manufacturing, testing at works and supply of Indoor type A.C. Distribution Boards for power supply to yard lighting, Battery charger, 33 kV substation equipments, compressors etc. The system shall be AC 3 Phase, 4 Wire, 433 Volts, 50 HZ with effectively grounded neutral.

2.0 SERVICE CONDITIONS:

Equipment to be supplied against this specification shall be suitable for satisfactory 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 (metre)	1000
2.8	Isokeraunic level (Days per year)	50
2.9	Seismic level (Horizontal Acceleration)	0.3g
2.10	Moderately Hot and Humid tropical climate conducive to rust and fungus growth	-

3.0 STANDARDS:

3.1 Components mounted on the ACDB shall confirm to the latest revisions of the following standards:

A	IS: 13947	**Degree of protection provided for enclosure for low voltage control gear and switchgear & MCCB**
B	IS 5	Painting
C	IS: 13947/1993 Part-III amended up to date	Switch Fuse Disconnector unit
D	IS 2705 amended up to 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

4.0 GENERAL TECHNICAL PARTICULARS:

These A C Distribution Boards shall be supplied as per this specification.

4.1 Rated Voltage:

Rated voltage for the Distribution Board and its constituent items like Switch Fuse Disconnector unit, MCBs, busways etc. shall be 3 phase 4 wire A.C. 433 volts, 50 Hz with solidly grounded neutral. The supply voltage may vary by ± 10% of rated voltage. All the equipments used in the Board shall operate satisfactorily at this voltage variation.

4.2 General Requirements:

4.2.1 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 43. 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 compartmentalisation 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.

4.2.2 Each Distribution Board shall be made out of at least 2.0 mm thick 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. No welds, rivets, hinges or bolts shall be visible from outside. The doors shall be fitted with double leaf neoprene rubber gaskets.

4.2.3 All cables shall enter and leave from bottom. Suitable cable terminal blocks with cable lugs, for a minimum of 22 nos., (to be finalised during detailed engineering as per requirement) shall be provided inside each cabinet for the incoming and outgoing cables. The terminals shall be serially numbered to facilitate installation and maintenance. Main busbars shall be accommodated in busbar chambers and cable alleys arranged by their side. Compression type cable glands shall be provided to hold the cables 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 power and control cables for internal wiring of the panels.

4.2.4 The busbars shall consist of tinned electrolytic copper of cross-sectional area of a minimum of 30mm x 5mm, suitable for carrying their rated 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 the loads incident thereon under the various operating conditions and shall withstand the applicable voltage and maximum short circuit stress. The busbars shall be insulated from supporting structure by means of durable non-hygroscopic, non-combustible and non-tracking polyester fibreglass material or porcelain. Busbars shall be encased in heat-shrunk sleeves of insulating material which shall be suitable for the operating temperature of busbars during normal service. The busbar joints shall be provided with removable thermosetting plastic shrouds.

The busbars shall be housed in totally enclosed busbar chambers. The incoming connections from the busbar to the various feeders shall be so designed as not to disturb cable connections and to ensure safety to the operating and maintenance personnel and to facilitate working outside any outgoing module without the need for switching off in-feed to the adjacent modules, as far as possible. The phase and neutral busbar shall be of high conductivity, 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 vertical section for taking cables into the compartments.

4.2.5 All doors shall be provided with mechanical interlocking

arrangements along with keys. The distribution board shall have no door on rear side.

4.2.6 Danger board (Caution Plate) shall be fitted suitably on inner door of the DB. Danger board shall be of 100x100 mm size with details as per WBSEDCL standard format (CAUTION, 'Danger Sign', 440V).

4.2.7 The AC boards shall be provided with the following equipments wherever applicable:

i. Busbars shall be of rectangular shape of size 30mm x 5mm, made of tinned electrolytic copper suitable for 200A continuous rating.

ii. Terminal arrangement with necessary equipment for connecting the incoming supply.

iii. Voltage and current measurement in the incomer feeder.

iv. Outgoing modules with switch / MCB units of adequate capacity for the outgoing feeders.

v. Necessary cable glands and terminal blocks.

v. Adequate number of spare terminals on terminal blocks for external connections.

vi. The number of outgoing feeders from AC boards shall be such that each substation equipment is fed by separate feeder with 20% as spare.

4.2.8 The ventilating louvers should be covered from inside by a perforated sheet or wire mesh.

4.2.9 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.

5.0 **MAJOR COMPONENTS**:

5.1 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 50 sq. mm copper cable. Outgoing shall be connected with 35 sq. mm copper cable.

For 125 A MCB, 50 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.

5.2 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 suitable 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 in the panel.

Incoming cable for incomer LT XLPE, 4 C, 120 sq. mm shall be provided by WBSEDCL.

5.3 Outgoing circuits:

Sr. No.	Feeder Rating	Cable size	Purpose
1	TPN 125 A MCB	4 core 50 sq. mm. LT PVC cable	a. Filtration/ Miscellaneous
2	TPN 32 A MCBs	4 core 16 sq. mm LT PVC cable	a. Water supply b. Outdoor lights c. Yard light d. Spare (1 nos.)
3	TPN 16 A MCBs	4 core 10 sq. mm LT PVC cable	a. OLTC for Power Transformers (3 nos.) b. Spare (1 no.)
4	DP 32 A MCBs	2 core 16 sq. mm LT PVC cable	a. Indoor lights b. Battery Charger1 c. battery Charger 2 d. Spare (1 no.)
5	DP 16 A MCBs	2 core 10 sq. mm LT PVC cable	a. 33 kV Panel AC supply (1 nos.) b. 11 kV panel AC supply (1 nos.) c. Supply for RTU d. Supply for UPS e. RTCC (3nos.) f. Spare (1 nos.)

5.3.1 Total 22 Nos. Outgoing circuits shall be provided as per the details given below.

MCBs shall comply following specifications as per IS 8828/1996.

a) Rated voltage & freq. shall be 230V & 50 Hz respectively for DP MCBs.
b) Rated current shall be 125A/ 32A/16 A as mentioned above.

c) Rated short circuit capacity shall be min. 6 KA at 0.7 p.f. lag
d) Service short circuit capacity shall be 6KA as per table 15 of IS: 8828 /1996.
e) MCBs shall have fixed un adjustable time / current characteristics.

f) Under voltage release and shunt-trip release coils are not required. Only overload release and short circuit release shall be provided.

g) Tripping time shall be as per (clause No. 8.6.1) table 6 of IS: 8828 /1996. Tripping mechanism thermal magnetic type.

h) MCBs having precision moulded case and cover of flame retardant high strength thermo plastic material with high melting 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. 9.11 of IS: 8828 /1996.

i) Limits of temperature rise shall be as per (clause No. 9.8) table 5 of IS: 8828/1996.

j) Standard range of instantaneous tripping shall be type 'B' as per (clause No.5.3.5) table 2 of IS: 8828 /1996.

5.3.2 All MCB outgoing terminals shall be terminated on terminal connectors of 10 mm. Stud type provided at the bottom.

5.3.3 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.

5.3.4 PVC cable glands of adequate size shall be provided for all incoming and outgoing cables.

5.3.5 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 quick make, quick break with trip free mechanism.

Both side terminal should be suitable for direct cabling as well as bus bar 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-20

5.4 Indicating Instruments:

Principal requirements of indicating instruments are as follows:

5.4.1 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

5.4.2 Ammeter selector switch:

Ammeter Selector switch shall be a four-position rotary type with R, Y, B and '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.

5.4.3 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

5.4.4 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 48 mm 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.

5.4.5 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.

5.4.6 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. Name-plates with full and clear inscriptions shall be provided inside the panels for all isolating 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.

5.4.7 Earthing Arrangements:

Two nos. Earthing studs of galvanized M.S. 25 X 6 mm shall be provided for external earth connections at the bottom. These should be complete with plain washer, spring washer, nuts etc. Earthing Bolts must be welded to prevent removal of the same from the cabinet.

Flexible stranded copper connector (braided conductor) should be connected of copper equivalent 10 sq. Mm size between door and box enclosure. This flexible braided cable should be terminated using gland and proper size nut/bolts at both ends.

5.4.8 Mounting Clamps:

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

5.4.9 Gland Plate:

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

5.4.10 Name Plate:

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

a. ACDB
b. P.O No.
c. 'Property of WBSEDCL'
d. 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 copper wires 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 copper wire 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 co-operation 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 accepts such deviations, it shall be constructed that the offer fully complies with the specification.

SCHEDULE 'A'

Mandatory particulars of ACDB

1.	**ACDB Panel**	
	Type	Floor standing, Structure mounted Indoor type.
	Rated voltage	433 Volt
	Highest voltage	600 Volt
	Frequency	50 Hz
	Rated normal current	200 A
	Dimension of the panel	H : 1000 mm, W : 750 mm, D : 300 mm
	Sheet material	CRCA
	Thickness of metal sheet	Load bearing member : 3.0 mm Non Load bearing member : 2.0 mm
	Panel door	Double door at the front side
	Cable entry	Bottom
2.	Bus Bars	
	Type	Three phase four wire
	Rated Voltage	433 V
	Normal Current	200 Amps.
	Material	High conductivity Tinned Electrolytic Copper.
	Shape	Rectangular
	Size	30 mm X 5 mm
	Cross sectional area	150 sq. mm
	Type of plating	Tin plated
	Insulation	Insulating sleeve.
	No. of Bus	Four
3.	Switch Fuse Disconnector	

	Make	Havells
	Type	TPN Switch Fuse Unit with HRC Fuse Link
	Current Rating	200A
4.	TPN MCB	
	Make	Havells/ C&S
	Current rating	125A, 32A, 16A
	Voltage rating	433 Volt
5.	DP MCB	
	Make	Havells/ C&S
	Current rating	32A, 16A
	Voltage rating	230 V
6.	Low Voltage Terminal connector	
	Make	Elmex / Connectwel / Phonix
	Type	Locking Stud
	Size	Suitable for 4.0 sq. mm control wire.
7.	Low Voltage CT	
	Make	KAPPA
	Type	Ring Type
	Voltage level	600 volt
	Ratio	200/5 Amps
	Class	1.0
	Burden	10 VA
8.	Ammeter	
	Make	AE
	Type	Analog
	CTR	200/5 Amps
	Accuracy Class	1.0
	Size	96 mm X 96 mm
	Mounting	Flush mounting
9.	Ammeter Selector Switch	

	Make	KAYCEE
	Type	4 Position (R Y B and Off)
	Current rating	16 Amps
10.	Volt meter	
	Make	AE
	Type	Analog
	Accuracy Class	1.0
	Size	96 mm X 96 mm
	Mounting	Flush mounting
11.	Voltmeter Selector Switch	
	Make	KAYCEE
	Type	4 Position (RN-YN-BN-Off)
	Current rating	10 Amps
12.	Energy meter	
	Type	3 Phase 4 Wire, CT operated
	CTR	200/ 5 Amps
	Accuracy Class	1.0
	Voltage	433 V
13.	Control wire	
	Make	KEI/Relicab/Polycab/RR Cable
	Voltage grade	750V
	Size	2.5 sq.mm
	Colour	Red Phase : Red, Yellow Phase : Yellow Blue Phase : Blue Neutral : Black. Earth circuit : Green.
14.	Earthing Terminal	
	Material	Copper
	Shape	Rectangular
	Size	25 mm x 6 mm
	Provision	To be provided on both sides of the panel
15.	Painting details	

	Surface cleaning process	7 Tank process.
	Paint thickness	60-80 micron
	Paint shade	RAL 7032
16.	Indicating Lamp	
	Make	VAISHNO
	Type	LED
	Rated Voltage	230V AC
	Colour	Red Phase : Red, Yellow Phase : Yellow Blue Phase : Blue
17.	Name Plate details	
	Manufacturer	To be provided
	Rated voltage	440 Volt.
	Rated current	200 Amps
	Rated frequency	50 Hz
	Serial number	To be provided
	Purchase Order reference	To be provided
	Size	60mm x 40mm
	Plate thickness	2 mm
18.	HRC Fuse Link & Neutral Link with base	
	Make	GE
19.	Caution Board	
	Size	100mm x 100mm
	Plate thickness	3 mm
20.	Property Plate	'PROPERTY OF WBSEDCL'
21.	Guarantee	12 months from the date of commission and 18 months from the date of supply, whichever is earlier.

SCHEDULE 'B'

SCHEDULE OF TENDERER's EXPERIENCE

The tenderer shall furnish here the list of the similar orders executed/under execution by him to whom a reference may be made by the purchaser in case he considers such reference necessary.

Sr. No.	Name of the client & description of the order	Value of order	Period supply & commissioning	Name and address to whom ref can be made

NAME OF THE FIRM _____

NAME & SIGNATURE OF THE TENDERER _____

_____

DESIGNATION _____

DATE _____