CHAPTER – 28: SPECIFICATION FOR DCDB

SCOPE:

This specification covers design, manufacture, assembly, testing, supply, and delivery at site of DC switchboard. This also includes design, supply, commissioning, laying and termination of D.C. supply cables of 1.1KV grade XLPE insulated stranded Copper cables of different sizes as per requirement for distribution of D.C. supply at different points of switchyard, control room building, Fire-fighting pump house etc. for various purpose for 400/220/132/33KV sub-station.

DC PANEL

Two numbers of D.C. Panel for distribution of D.C. supply associated with DC Supply of 400, 220,132 and 33kV System at different points in Control Room, Switch Yard and other locations as per need. The DC Panel shall have Two Incomer connected with Battery Charger -1 & Battery Charger -2 wrt to Battery set - 1 & Battery set - 2. The DC Panel shall have one Bus Coupler with proper Interlocking for independent operation of each DC System.

STANDARDS :

The equipment covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with the applicable sections of the latest Indian Standard Specification and Indian Electricity Rules and as per this technical specification. The degree of protection shall not be less than IP-54. However, Bus bar chamber having a degree of protection of IP:42 as per IS:2147 where continuous bas bar rating exceeds 1000A.

DEVIATION :

Normally the offer should be as per Technical Specification without any deviation, In case of any deviation taken against technical specification same are to be submitted in a separate deviation sheet for review of AEGCL.

MODIFICATION :

If any modification felt necessary to improve performance, efficiency and utility of equipment, the same must be mentioned in the 'Modification schedule' with reasons duly supported by documentary evidences and advantages. Such modifications suggested may or may not be accepted, but the same must be submitted along with Pre-Bid Queries. The modifications not mentioned in Schedule will not be considered.

GENERAL SPECIFICATION OF D.C. SWITCH BOARD :

220 (+/- 10%) volt D.C. supply shall be made available from the station storage battery banks associated with battery charger. In case of existing sub-station, sub-station wise DC voltage shall be intimated to the successful bidder. The charger and battery shall be connected to the load bus of D.C. switchboard through separate 2-pole MCCB of suitable rating. There shall be interlocking arrangement through pad locks and keys so that one breaker can be closed at a time.

The D.C. switch boards shall be of multi-cubicle on multi box factory build air insulated type, fully enclosed with doors for access to the interior, 3.00 mm. thick steel sheet shall be used for the fabrication of the panels. Steel used for manufacturing shall be of reputed MAKE. Boards shall be easily extendible on both side, by addition of the vertical sections after removing the end covers. Dimension shall not be more than 1800 mm. high with channel base and 800 mm depth (or as per requirement) measured from the rear to front face. The working height of the switch board shall be minimum 450 mm. to maximum 1650 mm. The back cover of the switch board shall be provided with hinged door with locking arrangement. Length of the panel shall be determined as per no of circuits to be accommodated. All boards shall be divided into distinct vertical sections each comprising of -

A completely enclosed bus bar compartment for running horizontal and vertical Copper bus bar. Bus bar chamber shall be completely enclosed with metallic portions. Bolted covers shall be provided for access to horizontal and vertical bus bars and all joints for repair and maintenance, which shall be feasible without disturbing feeder compartment. Proper ventilation arrangement shall have to be arranged and that shall be decided by the purchaser at the time of approval. Bus bar rating shall be as per requirement with additional 30% margin.

Completely enclosed switchgear compartments one for each circuit for housing incoming MCCB and outgoing MCCB.

A compartment for power and control cables. Door of compartment shall be hinged. Cable compartment shall have no communication with bus bar chamber.

A compartment for relays and other control devices associated with Incoming MCCB.

Design:

The D.C. switch boards shall be designed to facilitate cable entry from the bottom through entry holes of removable plates provided at the bottom of the cubicle. All the accessories required for termination of cable in the DCDB such as screwed brass cable gland, terminal block etc. shall be within the scope of supply, Gland shall project above the gland plate. Terminating cable shall be

armoured and armoured rods shall be connected to earth bus. After isolation of power and control circuit connections it shall be possible to safely carryout maintenance in a compartment with the bus bar and adjacent circuit live. Necessary shrouding arrangement shall be provided for this purpose over the cable terminations located in cable alley.

In case of providing two incomer MCCB compartment in the same vertical section, insulating barriers and shroud shall be provided in the rear cable compartment in order to avoid accidental touch with live part of one circuit when working with the other circuit.

The connections from bus bars to main switch shall be fully insulated/shrouded and securely bolted. The partition between the feeder compartment and cable alley may be non-metallic and shall allow cable cores with lugs to be easily inserted in the feeder compartment for termination.

Necessary and safe earthing arrangement with supply of all accessories required for safe earthing shall be within the scope of supply.

A copper earthing bus bar shall be provided at the bottom of each panel and shall extend through out the length of switchboard. It shall be welded/bolted to the frame work of each panel and breaker. Earthing contact bar vertical bus shall be providein each vertical section which shall in turn be bolted/welded to main horizontal ground bus.

The earth bus shall have sufficient cross-section to carry momentary short circuit and short line fault currents to earth bus without exceeding the allowable temperature rise.

The horizontal earth bus shall be projected out to the switchboard ends and shall have predrilled holes for bolted connection between this bus to sub-station earthing conductor. A joint spaced and taps to earth bus shall be made through at least two bolts.

All non-current metal works of the switchboard shall be effectively connected to the earth bus.

The switchboard shall be dust and vermin proof and suitable for use in tropical climate. All ventilating louvers and holes shall be covered with fine non-ferrous wire mesh from inside. A suitable rust resisting primer paint shall be applied on the panel after the same is polished and the primer shall be evenly sprayed. The colour of the exterior of the panel shall be of same colour as that of the main control and relay panel. The colour of the interior panel should be as to provide a colour contrasting background for the wiring inside the cubicle.

The switchboards shall be mounted on channel and shall be complete with channel bottom plates, grouting bolts, earthing bolts, washers, cable glands etc. Fabrication of the channels shall be robust.

All the MCCB’s shall be of best quality and easy in operation.

The number of outgoing feeders shall be controlled by suitably rated MCCB. Necessary arrangement shall be kept especially for emergency sub-station control building lighting particularly in Control room, ACDB room, Battery room, Fire fighting pump house, Corridor, Lobby, Stairs and oter emergency loads etc. in case of failure of AC main supply. Provision for audio visual indication with lamp and bell with facility for manual cancellation & resetting of alarm for failure of D.C. supply to the load bus or blowing of any fuse of D.C. circuit shall be made. Switchboard shall be installed in the DCDB room of control room building of 400/220/132/33KV sub-station. In case of tripping of any outgoing feeder MCCB, visual and audible alarm arrangement shall be provided in the DC Board as well as in the control room. Necessary arrangement shall also be provided for acceptance and resetting of the audible alarm. In case of tripping of Incoming feeder breaker, arrangement of both audible and visual annunciation shall be made at DC Board and control room. Acceptance and resetting arrangement is also to be provided. Visual indication of the failure of D.C. voltage at the load bus or blowing of any fuse can only be cancelled when the supply at bus will be restored or the fuse is replaced.

Adopter panels and dummy panels required to meet the various bus bar arrangements and layouts required shall be included in bidders’ scope.

The temperature rise of horizontal and vertical bus bars when carrying rated current along its full run shall not exceed 55ºC with Silver plated joints and 40ºC with all other type of joints over an outside ambient temperature of 50ºC.

All identical circuit breakers and module chassis of same test size shall be fully interchangeable without doing any modification work.

MCCB & MCB shall be from one of the following manufacturer’s complying with technical specification & relevant IS & IEC

M/s Siemens

M/s L & T

M/s ABB

M/s Schneider

INTERNAL WIRING AND TERMINAL BLOCK :

All connection terminals shall be brought in the terminal block which shall be fixed in such a position as may be readily accessible.

All switchboards shall be supplied completely wired internally upto the terminal blocks.

All inter cubicle and inter panel wiring and connections between panels of same switchboard including all bus wiring for A.C. and D.C. supply shall be provided by the contractor.

All internal wiring shall be carried out with XLPE insulated stranded copper conductor 2.5 sq. mm. However for annunciation scheme wiring may be drawn with 1.5 sq. mm XLPE insulated stranded copper conductor.

All wiring shall be properly supported, neatly bunched, and readily accessible and securely connected to equipment terminals and terminal blocks.

There shall be ferrule marking at both ends of the connections. Red ferrule with positive marking shall be used for the positive terminals and white ferrule with negative marking for negative terminal for D.C. wiring.

Each wire shall be continuous and there shall not be any joint within itself. Wiring for meter, relays, instruments and MCCB etc. used in the switchboard shall be brought to the terminal block.

Terminal blocks shall be of 1100V grade ‘Elmex’ / ‘Connectwell’ make and have continuous rating to carry the maximum expected current on the terminals as well as short circuit current for specified duration. The terminal blocks shall be fully enclosed with removable covers of transparent, non-deteriorating type plastic material. Insulating barrier shall be provided between the terminals. The terminal blocks shall have locking arrangement to prevent its escape from the rails.

All terminal blocks shall be normally suitable for terminating on each side two nos. of 2.5 sq. mm. size stranded copper conductor.

If required TBs of other sizes shall also be provided.

All terminals shall be numbered for identification and grouped according to the function. Engraved white on black anodized aluminum labels shall be provided on the terminal blocks.

Terminal blocks shall be arranged with at least 200 mm clearance between two sets of terminal block. The minimum clearance between the first row of terminal block and the associated cable gland plate shall be 250 mm.

Interlocks shall be designed for both the incomer breakers and bus coupler breaker. Interock logics shall be decided during detailed engineering.

NAMEPLATES AND LABELS :

D.C. distribution boards shall be provided with prominent, engraved identification plates. The module identification plate shall clearly give the feeder number and feeder designation. For single front switchboards, similar panel and board identification labels shall be provided at the rear also.

EQUIPMENT AND OTHER TECHNICAL INFORMATION FOR D.C. SWITCHBOARD :

One set of copper bus bar of adequate continuous rating as well as specified short circuit rating of specific duration, having continuous current density shall be provided.

Aux. Relay and contactor for alarm as well as visual indication against tripping of incoming MCCB as well as outgoing feeder MCCB shall be provided. However, indication will not go off till the restoration of failure.

‘ON’, ‘OFF’ and ‘TRIP’ indicating lamps for both the incoming MCCB along with required number of push button shall be within the scope of supply.

Digital D.C. voltmeters having a scale range of 0-300 V.D.C. flush mounted, type having accuracy. +/- 1% of full scale, shall be provided as per requirement. The meters shall conform to the appropriate IS specification.

Digital D.C. ammeters, flush mounted, having range of 0-300 Amps. and accuracy +/- 1% of full scale, shall be provided for measurement of load current flowing to the D.C. switchboard. Rating of ammeter hall change if the load requirement is changed. Changed rating meters shall be under the scope of the successful bidder.

The ampere rating of MCCB for feeder protection shall be as per requirement of the feeder current but shall not be less than 32 Amps.

Doors at the back of the panel shall be provided for inspection with door switch for illumination of the lamp to be provided inside the panel with separate switch fuse unit for controlling the lamp.

All the indicating lamps shall be of panel mounting cluster LED type. The lamps shall have suitable size plates marked with its function, wherever necessary. Lamps shall have translucent lamp covers of ‘RED’, ‘GREEN’ & ‘WHITE’ colour for indicating , ‘ON’, ‘OFF’ and ‘AUTO-TRIP’ indication of incoming MCCB’s. One no. Indicating lamp is to be provided for tripping of outgoing feeder & DC supervision.

Space heater shall be provided for preventing harmful moisture condensation in all the D.C. Boards. The space heaters shall be suitable for continuous operation of 240V AC, 50HZ single phase supply and shall be automatically controlled by thermostats. Necessary isolating switches and HRC fuses shall be provided.

All the D.C. and A.C. HRC fuses, D.C. Aux. Relays, isolating copper links, D.C. emergency fuse,

D.C. emergency & A.C. emergency contactor, A.C. bell, indicating lamp for indicating D.C. fail of main bus, D.C. contactor etc. shall be within the scope of supply of the contractor. Three nos. Push Button for testing annunciation scheme, resetting annunciation scheme and accept of fault and bell cancellation shall be provided.

Moulded case circuit breaker for both incomer circuit shall be of suitable Amp. rating (as per requirement) and double pole type. Each MCCB shall be provided with trip coil. MCCB shall be capable of safely breaking the fault current of the associated incoming feeder.

All the MCCB shall be flush mounted on D.C. Distribution boards.

MCCB's shall be provided with thermo-magnetic type release for over current and short circuit protection.

The setting range of thermal release and breaking capacity of MCCB's are to be specified and shall conform to circuit requirement.

MCCB shall have Mechanical Anti-reclosing and facilities for over load and short circuit setting adjustment. MCCB knob shall indicate the true position of the equipment. MCCB's shall conform to relevant Indian Standard.

Interlocks shall be provided such that it is possible to open the cubicle door only when the MCCB is in 'OFF' position and to close the MCCB when the door is closed.

GUARANTEE :

Electrical characteristics shall be guaranteed by the contractor. In case of failure of materials to meet the guarantee, AEGCL shall have right to reject the material. Guaranteed Technical particulars are to be submitted by successful bidder during detailed engineering along with submitted drawings/documents. However, format for submission of GTP shall be handed over to intending bidders at the time of sale of tender documents.

PACKING AND DESPATCH :

All equipment shall have to be dispatched suitably and securely packed in wooden crates, suitable for handling during transit by rail and / or road.

CONTRACT DRAWINGS AND CATALOGUE :

After placement of Letter of Award four (4) copies of following drawing, G.T.P and literature shall be submitted for approval.

Single line diagram for each type of switchboard.

Dimensional drawing showing clearly the location of meter switches, MCCB etc. in the

D.C. switchboard arrangement in plan and elevation with foundation details.

Wiring diagram of D.C. switchboard showing the interconnection between terminals of various equipment and devices on and within the panel including approved schematic drawings.

Take off terminal connection arrangement.

Catalogue of D.C. switchboard equipment.

TEST AT MANUFACTURER'S WORKS AND TEST CERTIFICATES :

Acceptance and routine test at manufacturers' works shall be carried out on each A.C. Board as per stipulation of relevant Indian Standard. The following tests on each switchboard shall be carried out and two copies of the test certificates to be submitted.

Checking of wiring and continuity of the circuit.

(ii) Power frequency voltage test of 3KV for one minute between wiring and earth terminal.

(iii) Insulation resistance value of all equipment. Connected in switchboard and function of the same.

All the acceptance and routine tests shall be carried out in presence of representative of AEGCL. 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 the representative that the material is being supplied is in accordance with this specification. The proto of DCDB shall be inspected & checked by Ordering Authority or his representative for approval before commencement of supply. The entire cost of acceptance and routine tests that are to be carried out as per relevant IS shall be treated as included in quoted price of DCDB.

QAP: The bidder shall submit the standard Quality Assurance Plan mentioning all the routine test, FAT, site test etc.

TESTS REPORTS AND TYPE TESTS :

Type test reports of identical equipment shall be submitted in three copies.

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

SPECIFIC TECHNICAL PARTICULARS OF D.C. DISTRIBUTION BOARDS

SNO	DESCRIPTION	TECHNICAL PARTICULARS
1.	Dimensions : Height of complete panel (mm.) Working height (mm.) Width (mm.) Depth	1800 (max.) 450(min.)to 1650(max.) As per requirement. 800 mm (max.) or as per manufacturers type tested design
2.	Sheet steel thickness of panel (mm.)	3 (min.)
3.	Grade of insulation Level of equipments and wiring (KV)	1.1
4.	Annunciation for blowing of fuse or tripping of breaker	Alarmandvisual indication
5.	Ammeter range	0 to 300 (or as per requirement of the load)
6.	Voltmeter range	0 to 300
7.	Accuracy class of Ammeter & Voltmeter	1% of full scale deflection
8.	Current density of Aluminium for Busbar (A/sq.mm.)	As per bus bar sizing
9.	Wiring for annunciation scheme shall be done with copper of cross-section area (sq.mm.)	1.5 (Stranded)
10.	MCCB System Voltage Insulating Voltage Rated Imp withstand Voltage of main Ckt Uimp Ambient Temperature Rated Continuous Current at 50oC Ultimate Short Ckt Breaking Capacity Icu Service Short Ckt Breaking Capacity Ics Utilisation Category Suitable for Isolation No. of Poles Shunt Release Voltage Permissible Variation in Voltage Termination suitable for Aluminium as per IS 13947 Part-II Insulation Material conforming to Glow Wire Test Thermal Over load Settings Short Circuit Setting	220 V DC 690 V 8 KV 50oC As per Rating 10 KA (DC Breaking) for < 100 A & 30 KA for > 100 A 100% of Icu A Yes 4Poleor2Pole–asper requirement 220 V DC 85% to 110% Yes Yes Adjustable Adjustable for 4 Pole and Fixed for 2 Pole

Note: The contractor is to supply DC switch board as per requirement after detailed engineering. Emergency lamp circuit in control room shall be automatically put into service through contactors when the AC supply will fail. Catalogue of all relays with characteristic curve shall be submitted with tender documents.

28.15 Sub Vendor List FOR DCDB:

Sl No.	PRODUCT	MAKE	
1	METERS DIGITALANDANALOGUE AMMETER,VOLTMETER,	MECO,SECURE,RISHABH, VAISHNO	
2	KWHMETER	L&T, SECURE, RISHABH	
3	FREQUENCYMETER	RISHABH, MECO, VAISHNO	
4	FUSE FITTING &FUSELINK	COPPERBUSHMANN, ABB, SIEMENS, L&T, GE	
5	TRANSDUCERSVOLTAGET RANSDUCER,CURRENTTR ANSDUCER,FREQUENCY TRANSDUCERETC.	ELSTER, RISHABH, SIEMENS	
6	CONTACTORS	L&T, SIEMENS, SCHNEIDER,GE, ABB	
8	PROTECTIONANDOTHERRELAYS	ABB,GE,SIEMENS,Schneider	
7	SFU, MCCB,	GE, ABB, L&T, SIEMENS,LEGRAND, SCHNEIDER	
8	MCB,	SCHNEIDER,LEGRAND,ABB, SPRECHER &SCHUH(S&S)	
9	CT	C&S, KAPPA, GILBERT MAXWELL, ABB,PRAGATI, GE, BHEL, SIEMENS	
10	PT	C&S, KAPPA, GILBERTMAXWELL, CGL	
11	LTCONTROLSWITCHESAMMETER, VOLTMETERSELECTORSWITCHES,BREAKER	KAYCEE, RECOM, SWITRON, VAISHNO, GE, ABB	
	CONTROLSWITCHES,ROTARYCAM/ ROTARYSWITCH		

Sl No.	PRODUCT	MAKE	
12	ANNUNCIATOR,HOOTER,BUZZER, ELECTRONICBELL.	PROTON,MINILEC,ALAN,VAISHNO.,PROCON,PIRI	
13	TERMINAL BLOCK,TERMINALENDPLATE	ELMEX, CONNECTWELL	
14	SPACEHEATER	SOFIA,GIRISH(EGO), VIKASELECT., GIRISH,APTCONTROL, KONTACT PYROS, TELELEC,HOTWELL,	
15	THERMOSTAT	GIRISH(EGO),VIKASELECT.,APTCONTROL, KONTACTPYROS	
16	PANELTUBEFIXTURE,CHOKE, STARTER,ILLUMINATINLAMP	PHILIPS,BAJAJ	
17	3PIN SWITCH SOCKET(INDUSTRIAL/SERVICE)/RECEPTACLE	ANCHOR, CGL,SCHNEIDER, LEGRAND,ABB	
18	BUS BAR SUPPORTINSULATOR	RAMANUJ,POWERMAT,VINAYAK,SUNINSULATOR, TECHNO, ESBEECONTROL	
19	PVC/FRLSWIRE	KEI, POLYCAB, FINOLEX	
20	LUGS	DOVELLS,COMET,JAINELECTRONICS,SJMETAL	
21	HARDWAREMS&SS	TVS,KUNDAN,AGRWALFASTENERS,FITRIGHT	
22	POWERPACKS	ALAN	
23	INDICATINGLAMP/LED,FILLAMENTLAM P	L&T, GE,SIEMENS,SCHNEIDER	
24	PUSHBUTTONSWITHELEMENTS	L&T, ABB,SIEMENS	
25	ELECTRONICTIMER	L&T, GE, ABB, SCHNEIDER, SIEMENS	
26	RUBBERGASKET(NEOPRINE/EPDM)	MINERVARUBBER&ENGGIND.,HANUIND.,JSONPOLYMER,RITTAL, R K PROFILE, ASP MINERVA, RKPROFILE	
27	M.S.CRCA/HRCASHEETS/COILS	TATA,SAIL,ESSAR	
28	ALUMINIUMBUSBAR	SUDAL,HINDALCO,JINDAL, BALCO	
29	COPPERBUSBAR	VIJAY IND., NEW INDIA CUPROTEC, CUBEXTUBING LTD(HYDERABAD)., ALCOBEXJODHPUR(MUMBAI),,MODISONMETAL, CITIZENMETALLOYS(AHMEDABAD),RHJ EXTRUSION(DAMAN)	
30	LIMITSWITCH/DOORLIMIT SWITCH	KAYCEE,RECOM,SIEMENS, VAISHNO, L&T	
31	ALLUMINIUM SHEET/STAINLESSSTEELSHEET/COILS	ESSAR,BALCO, HINDALCO, SAIL, TATA	
32	OIL & WINDINGTEMPERATURE INDICATOR	PRECIMEASURE,PERFECTCONTROL(CHENNAI)	
33	AIR CIRCUITBREAKER(ACB)	L&T, GE, ABB, SCHNEIDER, SIEMENS	
34	TIMESWITCH	L&T, GE, ABB, SCHNEIDER, SIEMENS	
35	2POLEAC/DCSWITCH	GE, SCHNEIDER	
36	LIGHTINGTRANSFORMER	INDCOIL, GUJARATPLUGIN,LOGICSTAT	