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TECHNICAL SPECIFICATION FOR ENCLOSURE


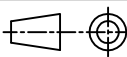
JOB NO.:		CP-14053				BHARAT HEAVY ELECTRICALS LIMITED ELECTROPROCELAIN DIVISION BANGALORE	
DEGND.	NAME	SIGN.	DATE	DEPT.	CODE	TITLE :	
DRN.						TECHNICAL SPECIFICATION FOR LT SWITCHGEAR ENCLOSURE	
CHKD.						DRG. NO. :	REV. NO. : 00
APPD.						EP-4-TS-053-001	
SCALE :		N.T.S.		SHEET NO. :		NO. OF SHEETS : 12	

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TECHNICAL SPECIFICATION	
LT SWITCHGEAR	
1. POWER SUPPLY SYSTEM:-	
VOLTAGE	415V ±10%, 3PH, 4W, 50Hz ±5%, SOLIDLY EARTHED.
FAULT LEVEL	220V DC UNEARTHED 50KA FOR 1 SEC. FOR AC 25KA FOR 1 SEC. FOR DC
AUXILIARIES SUPPLIES	220V DC CONTROL SUPPLY: FROM STATION BATTERY BY CUSTOMER AC CONTROL SUPPLY :110V AC PANEL & MOTOR SPACE HEATER SUPPLY: 240V AC
AMBIENT TEMPERATURE	50°C
MAX. PERMISSIBLE TEMPERATURE RISE	35°C OVER AMBIENT ON CURRENT CARRYING PARTS
2. DESIGN SUPPORT:-	
APPLICABLE STANDARDS	IEC60439-1 SUPERCEDED BY 61439-1,2
TYPE TEST CERTIFICATES	1. SC TEST FOR 50KA RMS PER SEC, 105KA PEAK. 2. HEAT RUN TEST MAIN BUSBAR, BUSBAR LINKS & ALL POWER CONTACTS WHEN CARRYING 100% OF RATED CURRENT ALONG THE FULL RUN, THE MAX TEMPERATURE RISE IS 55°C WITH SILVER PLATED BUSBAR JOINTS & 35°C WITH ALL OTHER TYPES OF BUSBAR JOINTS OVER AN AMBIENT OF 50°C. 3. DEGREE OF PROTECTION FOR CURRENT RATING UPTO & INCLUDING 1600A, THE ENCLOSURE SHALL BE DESIGNED FOR IP-54. FOR CURRENT RATING ABOVE 1600A, THE ENCLOSURE SHALL BE DESIGNED FOR IP-42.
3. GENERAL REQUIREMENTS	
1. MAIN BUSBAR CHAMBER SHALL BE AT THE TOP OF THE PANEL AND SHALL RUN THROUGHOUT THE PANEL. 2. SEPARATE CONTROL BUSBAR CHAMBER PROVISION FOR 10PAIRS OF BUSBAR TO BE PROVIDED, PARALLEL TO MAIN BUSBAR CHAMBER BUT NOT ON TOP OF MAIN BUSBAR CHAMBER. 3. MAIN BUSBAR CHAMBER AND CONTROL BUSBAR CHAMBER SHALL BE SEPARATED BY REMOVABLE PERFORATED SHEET. 4. ENOUGH SPACE TO BE PROVIDED IN THE CONTROL BUSBAR CHAMBER TO RUN A CONDUIT THROUGHOUT THE PANEL. 5. FOR SINGLE FRONT PANELS, THE BACK COVER SHALL BE REMOVABLE. IT SHOULD NOT BE STUDED/WELDED. 6. CABLE ENTRY SHALL BE AT THE BOTTOM OF THE PANEL AND SHALL HAVE ATLEAST 100MM HEIGHT HORIZONTAL CABLE CHAMBER THROUGHOUT THE PANEL. 7. CLEARANCE BETWEEN ANY TWO BUSBARS SHALL BE MIN 25MM IRRESPECTIVE OF THE PHASE-NEUTRAL OR PHASE-PHASE BUSBAR ARRANGEMENT. SAME IS APPLICABLE FOR BUSBAR LINKS IN HIGHER RATED MODULES ALSO. 8. ENCLOSURE SHALL BE DOUBLE FRONT DRAW-OUT TYPE, FLOOR MOUNTING, MODULAR & BOLTED/WELDED. 9. THE BUS BAR SHALL BE WELL SUPPORTED WITH NON- HYGROSCOPIC, ANTI TRACKING, FLAME RETARDANT HIGH DIELECTRIC STRENGTH INSULATING MATERIAL (SMC/ DMC/ FRP) CAPABLE OF WITHSTANDING HIGH DYNAMIC STRESSES. HYLAM SHEET OR SRBP SUPPORT ARE NOT ACCEPTABLE. ONLY MOULDED SUPPORT SHALL BE USED. 10. THE ENCLOSURE SHALL BE DESIGNED IN SUCH A MANNER THAT THE MAIN BUS-BARS ARE EASILY APPROACHABLE. 11. THE ENCLOSURE SHALL BE DESIGNED SO AS TO ENSURE AMPLE WORKING SPACE. 12. THE CABLE ALLEY SHALL BE PROVIDED ADJACENT TO THE MODULE PORTION AND SHALL HAVE FRONT ACCESS.	

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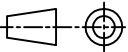
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- THE CABLE ALLEY SHALL HAVE DOORS WITH CONCEALED HINGES AND SCREWS/ HALF TURN CAMS FOR LOCKING. THE SCREW HEAD SHALL BE SLOTTED OR WITH MOULDED METAL KNOBS.
13. FOR EACH VERTICAL SECTION, SEPARATE VERTICAL BUS BAR COMPARTMENT SHALL BE PROVIDED. PROVIDING COMMON VERTICAL BUSBAR COMPARTMENT FOR TWO ADJACENT VERTICAL SECTIONS IS NOT ACCEPTABLE.
 14. IN THE CASE OF DOUBLE FRONT DESIGN, SEPARATE VERTICAL BUS BAR SHALL BE PROVIDED FOR EACH FRONT. PROVIDING COMMON VERTICAL BUS BAR COMPARTMENT FOR REAR & FRONT IS NOT ACCEPTABLE.
 15. EACH TRANSPORT SECTION SHALL BE PROVIDED WITH REMOVABLE LIFTING ANGLE THROUGHOUT THE LENGTH OF PANEL, WHICH CAN BEAR ENTIRE WEIGHT OF THE SHIPPING / TRANSPORT SECTION OF THE PANEL.
 16. THE ENCLOSURE SHALL BE DUST AND VERMIN PROOF. ALL CUT-OUTS SHALL BE PROVIDED WITH SYNTHETIC RUBBER GASKETS.
 17. THE ENCLOSURE HEIGHT SHALL NOT BE MORE THAN 2450MM INCLUDING ISMC100.
 18. EACH VERTICAL SECTION SHALL HAVE VERTICAL CABLE ALLEY COVERING ENTIRE HEIGHT. WIDTH OF THE CABLE ALLEY SHALL BE MIN 300MM, MEASURED BETWEEN CENTRE-CENTRE OF LOAD BEARING MEMBERS.
 19. EACH VERTICAL CABLE ALLEY SHALL PERMIT CABLE ENTRY TO EACH COMPARTMENT OF MCC. THERE SHALL BE PROVISION FOR SUPPORTING THESE CABLE ENTRIES.
 20. THE ENCLOSURE SHALL BE DESIGNED SUCH THAT THE ADJACENT SWITCHGEAR CUBICLES SHALL BE PROVIDED WITH SIDE SHEETS ON EITHER SIDE TO ENSURE COMPLETE ISOLATION. THE ENCLOSURE SHALL BE EXTENDABLE ON BOTH THE SIDES BY THE ADDITION OF VERTICAL SECTIONS. THE BUSBARS IN THE ENCLOSURE SHALL BE EXTENDABLE ON BOTH THE SIDES BY THE ADDITION OF BAR LINKS.
 21. EACH PANEL SHALL BE PROVIDED WITH VERTICAL BUSBAR (DROPPERS) TO FEED FUNCTIONAL UNITS.
 22. ALL THE VERTICAL BUSBARS SHALL BE ABLE TO WITHSTAND FAULT OF 50KA.
 23. EACH PANEL SHOULD BE FULLY SEPARATED FROM THE ADJACENT PANELS BY SHEET STEEL PARTITION EXCEPT FOR THE OPENINGS IN THE HORIZONTAL CHAMBERS AT TOP AND BOTTOM TO ENABLE BUSES AND CABLES/WIRES TO PASS THROUGH.
 24. FEEDER & CABLE ALLEY DOORS SHALL OPEN IN OPPOSITE DIRECTION IN ORDER TO INCREASE WORKING SPACE.
 25. GASKETS SHALL BE PROVIDED FOR ALL DOORS, COVERS AND FOR ALL PARTITIONS BETWEEN ADJACENT UNITS.
 26. SHEET STEEL SURFACES PROVIDED SHALL BE FREE FROM DENTS AND HAMMER MARKS. ALL OPENING AND CUT-OUTS SHALL BE MACHINE MADE AND SHALL BE FREE FROM BURRS.
 27. AT LEAST TWO CONCEALED HINGES SHALL BE PROVIDED FOR EACH MODULE DOOR.
 28. AUXILIARY DOORS SHALL BE PROVIDED FOR ALL MOTOR MODULES. THESE DOORS SHALL BE HINGED OR BOLTED ABOUT AN END. THESE DOORS SHALL BE OPENED IN SUCH A WAY THAT COMPONENTS MOUNTED BEHIND THE AUXILIARY DOORS ARE EASILY ACCESSIBLE.
 29. ALL THE MODULES SHALL BE ELECTRICALLY & MECHANICALLY SEPARATED.
 30. ALL THE BUS BARS SHALL BE SEPARATED FROM INDIVIDUAL FUNCTIONAL UNITS.
 31. OUTGOING POWER TERMINALS OF THE MODULES SHALL BE BROUGHT OUT TO CABLE ALLEY USING SILVER PLATED COPPER EXTENSION LINKS. NECESSARY SUPPORT ARRANGEMENT SHALL BE PROVIDED FOR EXTENSION LINKS. EXTENSION LINKS SHALL NOT SHAKE OR BEND AFTER CABLE TERMINATION.
 32. IT SHALL BE POSSIBLE TO MAKE THE CABLE CONNECTIONS TO ANY MODULE WHILE OTHER MODULES ARE LIVE. CABLE TERMINATION SHALL BE POSSIBLE WITHOUT DRAWING OUT THE MODULES.
 33. CABLE ALLEY SHALL BE PROVIDED FOR ALL OUTGOING MODULES.
 34. FRONT AND REAR MODULES SHALL HAVE SEPARATE CABLE ALLEY.

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35. AUTOMATIC SAFETY SHUTTERS SHALL BE PROVIDED FOR ALL TYPES OF DRAW-OUT MODULES IN ORDER TO PREVENT ACCESS TO VERTICAL BUS BAR OR LIVE BUS, WHEN THE MODULES ARE DRAWN OUT OR COMPLETELY ISOLATED.
36. VENDOR SHALL CONSIDER ALL TYPES OF LIMIT SWITCHES WHEREVER APPLICABLE VIZ LINE PT , BUS PT ETC.
37. VENDOR SHALL HAVE STANDARD ORIENTATION OF THE BUSBARS BASED ON THE RATING.
38. A MECHANICAL STOPPER ARRANGEMENT SHALL BE PROVIDED FOR EACH MODULE TO PREVENT ACCIDENTAL FALL -DOWN OF THE MODULE, WHEN IT IS DRAWN UPTO ISOLATED POSITION.
39. DRAW-OUT MODULES SHALL BE DESIGNED IN SUCH A WAY THAT TOP MOST MODULE IN THE PANEL CAN ALSO BE WITHDRAWN WITHOUT THE HELP OF ANY ADDITIONAL ACCESSORIES OR EXTRA MAN POWER.
40. DRAW-OUT MECHANISM OF THE MODULE SHALL BE SUPPORTED BY GUIDE RAILS & BALL BEARINGS/ROLLERS. THIS MECHANISM SHALL BE SMOOTH AND EASILY OPERABLE.
41. DRAW-OUT INCOMER CONTACTS AND THE VERTICAL BUS BAR SHALL BE DESIGNED SO AS TO PREVENT THE OCCURENCE OF FLASH-OVER.
42. INTERCHANGEABILITY OF THE MODULES SHALL BE POSSIBLE WITHOUT CARRYING OUT ANY MODIFICATION. THIS SHALL BE APPLICABLE FOR ALL IDENTICAL EQUIPMENT OF SAME RATING AND SAME TYPE. THIS SHALL ALSO BE APPLICABLE FOR ALL DRAW-OUT CHASIS (MODULES) OF SAME HEIGHT AND SAME TYPE.
43. CABLE ALLEY LOCATION SHALL BE IDENTICAL TO BOTH FRONT AND REAR MODULES. EITHER THE CABLE ALLEY SHALL BE ON THE RIGHT SIDE OF MODULES OR ON THE LEFT SIDE OF MODULES ONLY. ONLY ONE ARRANGEMENT TO BE MAINTAINED THROUGHOUT ALL THE PANELS.
44. EACH MODULE SHALL HAVE INDIVIDUAL DOOR. IT SHALL BE POSSIBLE TO OPERATE OR ACCESS ANY COMPONENT IN THE MODULE WHEN THE OTHER MODULES ARE IN LIVE CONDITION.
45. JOINTING OF HORIZONTAL BUSBARS IN SAME SHIPPING / TRANSPORT SECTION IS NOT ACCEPTABLE. JOINTING OF BUSBARS IN VERTICAL DROPPERS IS NOT ACCEPTABLE.
46. ALL VERTICAL DROPPERS SHALL BE OF SAME HEIGHT, IN ALL SHIPPING SECTIONS FOR BOTH FRONT & REAR.
47. IN CASE OF 3PHASE-NEUTRAL VERTICAL DROPPERS, NEUTRAL SHALL NOT RUN IN THE CABLE ALLEY. ALL THE VERTICAL DROPPERS PERTAINING TO A MODULE SHALL RUN PARALLELY IN THE SAME SPACE.
48. ALL MOTOR MODULES ABOVE 50KW SHALL BE DOUBLE-COMPARTMENT TYPE WITH COMMON DOOR. FOR EX: 75KW MOTOR MODULE HEIGHT IS 900MM. IT HAS TO BE COMPARTMENTALISED INTO TWO IN SUCH A WAY THAT POWER AND CONTROL CIRCUITS SHALL BE IN DIFFERENT COMPARTMENTS BUT HAVING COMMON DOOR.
49. MINIMUM BUSBAR CLEARANCE SHALL BE AS FOLLOWS :
 - A) PHASE TO PHASE: 25MM
 - B) PHASE TO NEUTRAL: 25MM
 - C) PHASE TO EARTH: 19MM
 - D) NEUTRAL TO EARTH: 19MM
 THE ABOVE CLEARANCES ARE APPLICABLE FOR ALL BUSBARS PRESENT IN THE PANEL, BE IT, MAIN BUSBARS, VERTICAL BUSBARS, MODULE INCOMER BUSBARS, MODULE OUTGOING BUSBARS ETC
50. ALL POWER CONTACTS OF DRAW-OUT MODULES SHALL BE TYPE-TESTED FOR FULL LOAD CURRENT, TEMPERATURE RISE TEST AND MILLI-VOLT DROP TEST.
51. ALL SIC CONTACTS SHALL BE RATED FOR MIN 16A WITHOUT ANY DISTORTION OR DISCONNECTING THE CIRCUIT.
52. DOORS SHALL NOT BE PROVIDED WITH BOLT-SCREW. IT SHALL BE PROVIDED WITH KEY MECHANISM.

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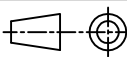
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TECHNICAL SPECIFICATION	
4. PANEL FABRICATION:-	
BASE FRAME	ISMC100
FRAME (LOAD BEARING MEMBER)	2.0 MM CRCA
DOORS & COVERS	1.6 MM CRCA
GLAND PLATES (FOR SINGLE CORE CABLE)	4 MM AL. UNDRILLED.
GLAND PLATES (FOR MULTI CORE CABLE)	3 MM HR. UNDRILLED.
5. PANEL DESIGN:-	
INSTALLATION	INDOOR
MOUNTING	FLOOR MOUNTED
ACB FEEDERS	SINGLE FRONT, DRAWOUT
MCCB/MPCB FEEDERS	DOUBLE FRONT, DRAWOUT
TRF FEEDERS	DOUBLE FRONT, FIXED.
DC FEEDERS & DC CONTROL SUPPLY	FIXED COMPARTMENTS
OTHERS	DOUBLE FRONT, DRAWOUT
DOOR INTERLOCK & PAD LOCKING ARRANGEMENT	NECESSARY ARRANGEMENT SHALL BE PROVIDED.
INTERCHANGEABILITY	ALL IDENTICAL EQUIPMENT & CORRESPONDING PARTS OF PANEL, INCLUDING CHASIS OF DRAWOUT MODULES OF SAME TYPE & RATING SHALL BE INTERCHANGABLE WITHOUT CARRYING OUT ANY MODIFICATIONS.
EXTENSIBILITY	BOTH THE ENDS SHALL BE EXTENSIBLE
OPERATING HEIGHT	MINIMUM: 250MM & MAXIMUM: 1800MM
ENCLOSURE	TOTALLY DUST & VERMIN PROOF
DEGREE OF PROTECTION	UP TO & INCLUDING 1600A , IP-54 ABOVE 1600A , IP42 AS PER IS-13947
GASKET	NEOPRENE/EPDM GASKETS SHALL BE PROVIDED AROUND DOORS, COVERS AND OTHER CUTOUT EDGES.
LOUVERS (NOT APPLICABLE IF THE BIDDER HAS VALID TYPE TEST REPORT FOR IP-42 WITHOUT LOUVERS).	SHALL BE PROVIDED FOR ALL PANELS RATED ABOVE 1600A AT FRONT & REAR OF BUSBAR CHAMBER AND REAR DOORS BACKED WITH FINE WIREMESH.
CABLE ALLEY	CABLE ALLEY WIDTH OF MIN 300MM SHALL BE COMPLETELY ACCESSIBLE AFTER OPENING THE DOOR. OUTGOING TERMINALS SHALL BE VISIBLE WHEN CABLE ALLEY DOOR IS OPENED.
INTERLOCKING	INTERLOCKING BETWEEN COMPARTMENT DOOR AND MODULES SHALL BE PROVIDED SUCH THAT THE DOOR CAN NOT BE OPENED WITH OUT SWITCHING OFF THE POWER SUPPLY TO THE MODULE.
INTERPHASE BARRIERS	INTERPHASE BARRIERS WILL BE PROVIDED TO PREVENT POSSIBILITIES OF PHASE TO PHASE FAULT. THESE INTERPHASE BARRIERS SHALL BE PROVIDED FOR HORIZONTAL AS WELL AS VERTICAL BUSBARS.
SHROUDING MATERIAL : TRANSPARENT ACRYLIC/ FRP SHEET .	ALL LIVE PARTS SHALL BE SHROUDED IN ORDER TO AVOID ACCIDENTAL ACCESS. REAR SIDE OF ALL ACB VERTICALS SHALL BE COMPLETELY SHROUDED.


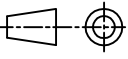
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TECHNICAL SPECIFICATION	
	ALL NECESSARY SHROUDING SHALL BE DONE IN ORDER TO PREVENT ACCIDENTAL CONTACT & SHORT CIRCUIT.
PANEL SEPARATION	EACH PANEL SHALL BE FULLY SEPARATED FROM THE ADJACENT PANELS BY SHEET STEEL PARTITION, EXCEPT FOR THE OPENINGS IN THE HORIZONTAL CHAMBERS AT TOP AND BOTTOM TO ENABLE BUSES AND CABLES TO PASS THROUGH.
ACCESSIBILITY TO THE BUSBARS & BUSBAR JOINTS	BUSBARS & BUSBAR JOINTS SHALL BE ACCESSIBLE FROM TOP, FRONT & REAR AFTER OPENING THEIR COVERS FOR PERIODIC MAINTENANCE
BUSBAR - MODULE COMPARTMENT SEPARATION	BUSBARS SHALL BE IN-ACCESSIBLE AND SEPARATED FROM ALL MODULAR COMJPARTMENTS.
6. BUSBAR SUPORTING ARRANGEMENT	
SUPPORT ARRANGEMENT	BUSBARS SUPPORT ARRANGEMENT SHALL BE AS PER TYPE TESTED DESIGN.
STRESS WITHSTANDABILITY	SUPPORTS SHALL WITHSTAND THE STRESS ARISING OUT OF FULL SYSTEM FAULT CURRENT AS SPECIFIED FOR A PERIOD OF 1SECOND.
CREEPAGE	SUPPORTS SHALL HAVE HIGH CREEPAGE DISTANCE (MIN 28MM/KV) SUITABLE FOR HIGHLY POLLUTED REGIONS.
BUSBAR FIXING	BUSBARS SHALL BE SUPPORTED ON SUPPORT INSULATOR WITH OUT BEING BOLTED TO THE SUPPORTS
7. MAIN BUSBAR CHAMBER	
EXTENSION	MAIN BUSBAR SHALL BE EXTENDABLE ON BOTH SIDES BY CONNECTING SUITABLE FISH PLATES.
DESIGN	BUSBAR CHAMBER SHALL BE DESIGNED CONSIDERING ALL FACTORS, TO LIMIT THE TEMPERATURE RISE TO 35°C WHEN RATED CURRENT IS ALLOWED TO FLOW THROUGH THE BUS BARS IN THE CHAMBER.
BUSBAR MATERIAL	BUSBAR SHALL BE MADE UP OF HIGHLY CONDUCTIVE ALUMINIUM OR ALUMINIUM ALLOY OR TINNED COPPER.

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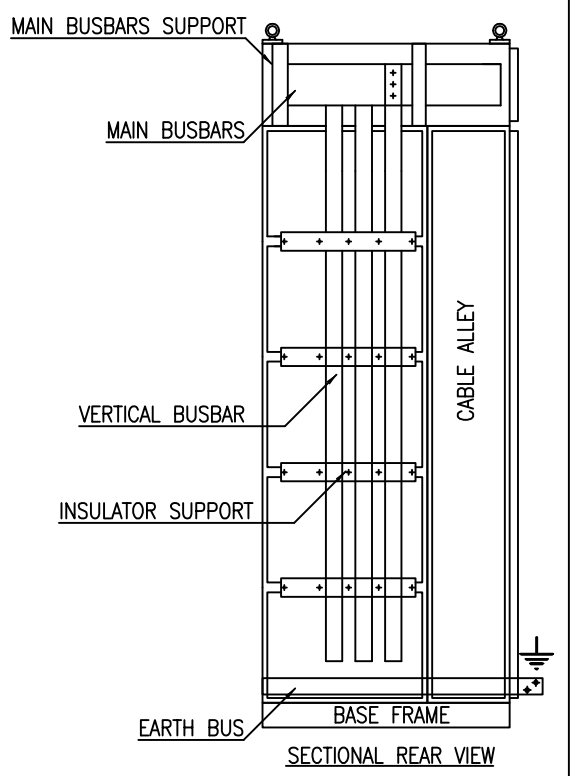
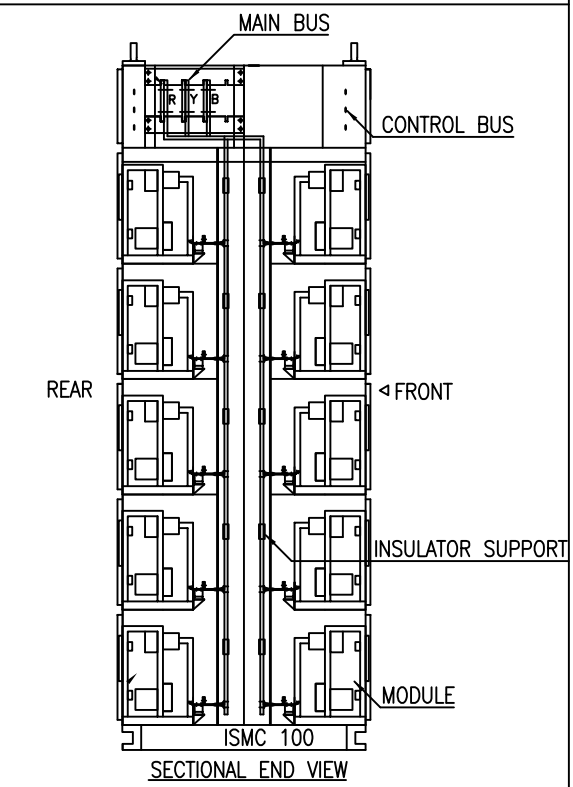
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8. VERTICAL BUSBAR CHAMBER:-

BUSBAR ARRANGEMENT IN VERTICAL BUSBAR CHAMBER (TYPICAL)



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SEPARATION	VERTICAL BUSBAR CHAMBER SHALL BE SEPARATED FROM THE CABLE ALLEY.
STRESS WITHSTANDABILITY	SUPPORTS SHALL WITH STAND THE STRESS ARISING OUT OF FULL SYSTEM FAULT CURRENT AS SPECIFIED FOR A PERIOD OF 1SECOND.
BUSBAR FIXING	BUSBARS SHALL BE SUPPORTED ON SUPPORT INSULATOR WITH OUT BEING BOLTED TO THE SUPPORTS.
RATING	RATING OF THE VERTICAL BUSBAR SHALL BE MINIMUM 630A. IN CASES, WHERE THE LOAD IS > 630A FOR ACB FEEDERS, RATING OF VERTICAL BUSBAR WILL BE ACTUAL LOAD CONNECTED TO IT.

9. VERTICAL BUSBARS:-

MATERIAL	ALUMINIUM/ AL ALLOY 63401WP(E91E) AS PER IS:5082
MAKE	HINDALCO/JINDAL
NO OF BUSBARS & SIZE	NO OF BUSBARS & SIZE SHALL BE PROVIDED AS PER TYPE TESTED DESIGN.
MAXIMUM TEMP RISE	BUSBAR CONTACTS & DROPPERS AT AN AMBIENT OF 50°C, SHALL NOT EXCEED 35°C AT 100% OF RATED CURRENT
BUSBAR SLEEVES	1100V GRADE HEAT SHRINKABLE PVC COLOUR: BLACK WITH RYB BANDS
BUSBAR JOINTING	BUSBAR JOINTS SHALL BE PROVIDED WITH HIGH TENSILE STEEL BOLTS, NUTS & WASHERS
SHROUDS	ALL ACCESSIBLE BUSBAR JOINTS SHALL BE PROVIDED WITH REMOVABLE SHROUDS OF SMC/DMC/POLYAMIDE.
COPPER BUSBARS	COPPER BUSBARS ARE ALSO ACCEPTABLE IF THE SAME IS THE MANUFACTURERS STANDARD OR THE SAME IS PROPOSED TO MEET ANY OF THE TECHNICAL REQUIREMENTS MENTIONED. IN THIS CASE, REQUIRED TYPE TEST DOCUMENTS SHALL BE FURNISHED TO BHEL-EPD FOR VERIFICATION. INTERPOLATION IS NOT ACCEPTED. FOR COPPER BUSBARS, JOINTS SHALL BE PROVIDED WITH COPPER. ALL THE COPPER BUSBARS SHALL BE TINNED TO PREVENT CARBONISATION.

10. ISMC

ISMC : 100MM THICKNESS : 6 TO 10MM COLOR : BLACK.	VERTICAL LOAD BEARING MEMBER SHALL NOT BE TIGHTENED OR WELDED TO THE ISMC. IN CASE. IF BIDDER DESIGN DOES NOT MEET THE ABOVE REQUIREMENT, BIDDER HAS TO SUPPLY LOOSE ISMC FOR ALL VERTICALS WITHOUT ADDICTIONAL COST.
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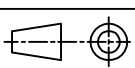


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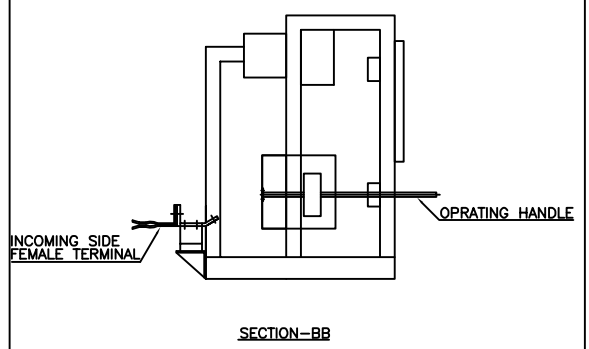
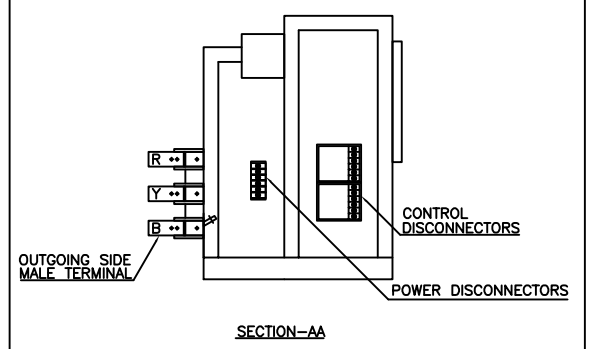
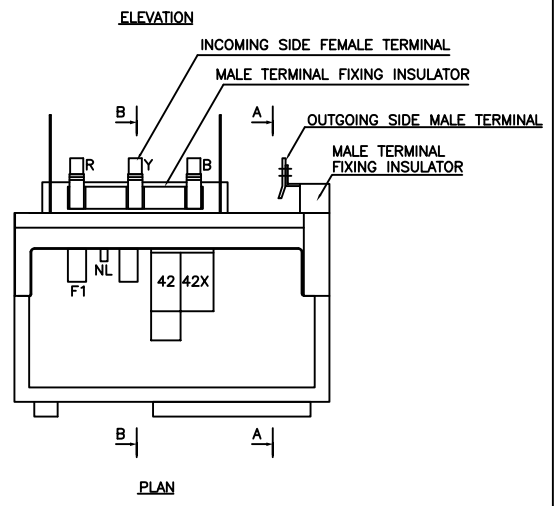
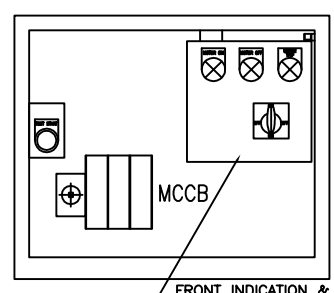
TECHNICAL SPECIFICATION

11. DRAWOUT MODULES:-

DRAWOUT MODULES (TYPICAL)

NOTE:

THE MODULES NEED NOT BE EXACTLY THE SAME AS SHOWN IN DRAWING.
 THE BIDDER CAN HAVE THEIR OWN DESIGN, HOWEVER, EACH MODULE SHALL HAVE ALL NECESSARY COMPONENTS MENTIONED IN THE DRAWING AS WELL AS ALL OTHER HARDWARE REQUIRED FOR SUCCESSFUL & SAFE OPERATION.




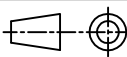
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DEGND.	NAME	SIGN.	DATE	DEPT.	CODE	TITLE : TECHNICAL SPECIFICATIONS LT SWITCHGEAR
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TECHNICAL SPECIFICATION	
FABRICATION MATERIAL	2MM THICK CRCA SHEET TO THE REQUIRED SHAPE
MODULE SIZES	MODULES SIZES SHALL BE MULTIPLE OF BASIC MODULE SIZE BY 100MM. HOWEVER MIN HEIGHT SHALL BE 200MM.
DRAWOUT FACILITY	MODULES SHALL MOVE ON SLIDING RAILS PROVIDED BY BALL BEARING OR ROLLERS OR EQUIVALENT.
POWER DRAWOUT CONTACTS	MINIMUM RATING OF POWER DRAWOUT CONTACTS SHALL BE 63A. CONTACTS SHALL BE SILVER PLATED(10MICRON).
MAKING & BREAKING CONTACTS	MAKING & BREAKING CONTACTS SHALL BE PROVIDED IN ENCLOSURE WITH SMC/EPOXY SHROUDS. RYBN BUSES SHALL BE SEPARATED BY THE SMC/DMC/EPOXY SHROUDS TO PREVENT ARC & HEAT TRAVEL FROM ONE PHASE TO OTHER.
ISOLATED, TEST & SERVICE POSITIONS	DRAWOUT MODULES SHALL BE PROVIDED WITH THREE POSITIONS NAMED ISOLATED, TEST & SERVICE POSITIONS.
MODULES EARTHING	EFFECTIVE EARTHING OF THE MODULES SHALL BE ESTABLISHED BEFORE THE MODULE IS TAKEN TO TEST POSITION FROM ISOLATED POSITION.
CONTROL DRAWOUT CONTACTS	SHALL BE PROVIDED WITH SELF ISOLATING, SLIDING TYPE CONTACTS. THESE SHALL BE COPPER DULY SILVER PLATED. ANTI TRACKING BARRIER SHALL BE PROVIDED BETWEEN ADJACENT CONTACTS. CONTACTS SHALL MAKE CONTACT IN BOTH SERVICE & TEST POSITION. THESE CONTACTS SHALL HAVE PROVISION TO CONVERT IT INTO EITHER TEST OR SERVICE OR TEST-SERVICE.
INSTRUMENT DOOR	THE WITHDRAWABLE MODULES SHALL BE PROVIDED WITH A SWING-OUT INSTRUMENT DOOR AT THE FRONT. A CUTOUT SHALL BE PROVIDED IN THE COMPARTMENT DOOR TO ENABLE TO READ THE FLUSH MOUNTED METERS, RESET THE OVER LOAD RELAY ETC.
TROLLEY EARTHING	PHOSPHOR BRONZE EARTHING OR EQUIVALENT SYSTEM SHALL BE USED TO PROVIDE POSITIVE DOUBLE EARTHING. THE CONTACTS SHALL SCRAPE AGAINST THE ELECTRO PLATED EARTH PLATE CONNECTED TO THE EARTH BUS. THE SYSTEM SHALL ENSURE EARTHING BEFORE & AFTER THE MAIN CONTACTS MAKE AND BREAK.
INCOMER & OUTGOING	POWER INCOMER & OUTGOING LINKS/CABLES/FLEXIBUS OF SUFFICIENT RATING SHALL BE PROVIDED FOR EACH TYPE OF MODULE AND THE SAME SHALL BE IN BIDDER SCOPE. **RATING OF INCOMER & OUTGOING BUSBARS SHALL BE FINALISED DURING DETAILED ENGINEERING.

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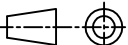
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TECHNICAL SPECIFICATION	
12. MAIN BUSBARS:-	
MATERIAL	ALUMINIUM/ AL ALLOY 63401WP(E91E) AS PER IS:5082
MAKE	HINDALCO/JINDAL
NO OF BUSBARS	NO OF BUSBARS & SIZE SHALL BE AS PER TYPE TESTED DESIGN.
CROSS-SECTION OF BUSBAR	BUSBAR CROSS-SECTION (SIZE) SHALL BE SAME THROUGH OUT THE LENGTH OF THE SWITCH BOARD. DIFFERENT CROSS SCTIONS ARE NOT ACCEPTABLE
MAXIMUM TEMP RISE	BUSBAR CONTACTS & DROPPERS AT AN AMBIENT OF 50°C SHALL NOT EXCEED 35°C AT 100% OF RATED CURRENT.
BUSBAR SLEEVES	1100V GRADE HEAT SHRINKABLE PVC, BLACK COLORED WITH INTERMITTENT RYB BANDS AT REGULAR INTERVALS.
BUSBAR JOINTING	BUSBAR JOINTS SHALL BE PROVIDED WITH HIGH TENSILE STEEL BOLTS, NUTS & WASHERS
UNWANTED DRILLING	BUSBARS SHALL NOT BE DRILLED ANY WHERE EXCEPT FOR THE FISH PLATE CONNECTIONS
BUSBAR CLEARENCE	1. PHASE TO PHASE: 25MM 2. PHASE TO NEUTRAL: 25MM 3. PHASE TO EARTH: 19MM 4. NEUTRAL TO EARTH: 19MM
BUS CONNECTIONS	ALL BUS CONNECTIONS SHALL BE SILVER PLATED. ALL BUSBARS AT THE ENDS SHALL BE PROVIDED WITH DRILLED HOLES FOR EXTENSION OF PANEL ON EITHER SIDE.
BUS COMPARTMENT	ALL BUS COMPARTMENTS SHALL BE FULLY ENCLOSED.
13. AUXILIARY BUS:-	
CONTINUOUS RUN THROUGHOUT THE PANEL.	
MATERIAL	TINNED COPPER
SIZE FOR PANEL SPACE HEATER : 240V AC	MINIMUM 6MMx6MM FOR PHASE & NEUTRAL
MOTOR SPACE HEATER BUS : 240V AC	MINIMUM 6MMx6MM FOR PHASE & NEUTRAL
SIZE FOR DC CONTROL BUS : 220V DC	MINIMUM 6MMx6MM FOR +VE & -VE
SIZE FOR TEST SUPPLY BUS : 110V AC	6MMx6MM THK FOR PHASE & NEUTRAL
SIZE FOR DC ALARM BUS : 220V DC	6MMx6MM FOR +VE & -VE
SIZE FOR DC ACKNOWLEDGE BUS : 220V DC	6MMx6MM FOR +VE & -VE
SIZE FOR AC ALARM BUS : 110V AC	6MMx6MM THK FOR PHASE & NEUTRAL
SIZE FOR AC ACKNOWLEDGE BUS : 110V AC SIZE	6MMx6MM THK FOR PHASE & NEUTRAL
14. EARTH BUS:-	
MATERIAL	TINNED CU/AL FLAT
	50MMx6MM
LENGTH	EARTH BUS SHALL RUN THROUGHOUT THE LENGTH OF THE PANEL.
LOCATION	BOTTOM OF THE PANEL.


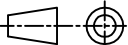
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TECHNICAL SPECIFICATION	
15. EARTHING:-	
EARTHING	A TINNED COPPER/ ALUMINIUM EARTH BUS BAR RATED TO CARRY THE MAXIMUM FAULT CURRENT.
	MAIN EARTH BUS SHALL BE BROUGHT THROUGH OUT THE LENGTH OF THE PANEL & EXTENDED ON BOTH ENDS TO FACILITATE CUSTOMER EARTH CONNECTION WITH M10 BOLTS AND NUTS.
	EVERY METAL PART OTHER THAN THOSE FORMING PARTS OF AN ELECTRICAL CIRCUIT SHALL BE CONNECTED TO THE EARTH BUS BY MEANS OF HIGH CONDUCTIVITY CU WIRE.
	ALL STATIONARY STRUCTURES SHALL BE DIRECTLY CONNECTED TO EARTH BUS FOR EFFECTIVE GROUNDING.
	THE FRAME OF DRAWOUT MODULES SHALL BE EARTHED AT ALL TIMES EXCEPT WHEN THE POWER DISCONNECTS ARE SEPARATED BY A SAFE DISTANCE.
	DOORS SHALL HAVE A FLEXIBLE COPPER WIRE CONNECTED TO THE FIXED UNIT.
16. CONTROL WIRING:-	
	SPACE HEATER CIRCUITS: 2.5 SQ. MM
	EARTH WIRE: 2.5 SQ. MM
COLOUR	SPACE HEATER CIRCUITS: BLACK
	EARTH WIRE: GREEN
TYPE OF CONTROL TERMINALS	SELF ALIGNING TYPE FOR DRAWOUT TYPE MODULES
	CAGE CLAMP TYPE FOR NON DRAWOUT TYPE MODULES
	DISCONNECTING TYPE FOR CT CIRCUITS
17. PAINTING:-	
FRAME STRUCTURES, DOORS, COVERS, DRAW-OUT TROLLEY, CHASIS, GLAND PLATE, PARTITIONS & SHROUDS ETC.	PAINT: EPOXY POWDER COATING. EXTERIOR SHADE: (LIGHT GREY SHADE) 631 AS PER IS-5 INTERIOR SHADE: BRILLIANT WHITE FINISH: SEMI GLOSSY PROCESS: MINIMUM 7TANK
BASE CHANNEL	PAINT: SYNTHETIC ENAMEL, SHADE: BLACK
18. MISCELLANEOUS :-	
A) A CLEARANCE OF 300MM SHALL BE MAINTAINED BETWEEN THE GLAND PLATE AND THE BOTTOM MOST TB IN CABLE ALLEY.	
B) ALL THE GUIDE RAILS IN THE MODULE & PANEL SHALL BE ZINC PASSIVATED OR GALVANISED.	
C) CONNECTIONS BETWEEN INCOMER POWER TERMINALS / OUTGOING POWER TERMINALS TO SWITCHING/ ISOLATING DEVICE SHALL BE AS FOLLOWS : UPTO 125A RATING, COPPER FLEXIBLE/CABLE (XLPE, HRLS) SHALL BE USED ABOVE & INCLUDING 125A RATING, LINKS SHALL BE USED. DIMENSIONS OF THE LINKS SHALL BE SUBMITTED BY THE BIDDER FOR BHEL-EPD APPROVAL.	
D) CT SUPPORTING ARRANGEMENT SHALL BE PROVIDED BY THE BIDDER. DIRECT LOADING ON BUSBARS IS NOT ACCEPTED.	

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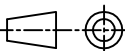
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SCOPE OF WORK :

1. DIN RAIL ARRANGEMENT AND PUNCHING OF HOLES REQUIRED FOR MOUNTING OF COMPONENTS IN THE MODULE SHALL BE PROVIDED BY THE BIDDER.
2. BIDDER SHALL PROVIDE ALL NECESSARY CUT-OUTS AND HOLES REQUIRED FOR MOUNTING OF COMPONENTS ON THE DOORS AS PER THE APPROVED SCHEME, WHICH WILL BE PROVIDED BY BHEL-EPD.
3. ALL SIC CONTACTS SHALL BE WIRED UPTO EXTERNAL TERMINAL BLOCKS.
WIRING OF SIC TO EXTERNAL TBs SHALL BE DONE BY THE BIDDER.
REQUIRED NUMBER OF SICs AND TBs SHALL BE PROVIDED BY THE BIDDER.
4. THE BIDDER HAS TO PROVIDE THE FOLLOWING COMPONENTS IN EACH CABLE ALLEY
 - A) 1NO. OF SPACE HEATER OF 100WATTS.
 - B) 1NO. OF THERMOSTAT
 - C) 1NO. OF CFL LAMP OF 11WATT
 - D) 1NO. OF 16A 5PIN PLUG & SOCKET, INDUSTRIAL GRADE
 - E) 1NO. LIMIT SWITCH FOR CABLE ALLEY DOOR
 THE ABOVE COMPONENTS SHALL BE FROM APPROVED MAKE. THE WIRING OF COMPONENTS SHALL BE AS PER APPROVED SCHEME, WHICH WILL BE PROVIDED BY BHEL-EPD.
5. FIXING OF CT'S, MOUNTING & TERMINATION OF ACB'S AT BHEL-EPD SHALL BE PERFORMED BY THE BIDDER. SEPARATE CLAMP ARRANGEMENT SHALL BE PROVIDED FOR CT SUPPORTING. FIXING OF CTs DIRECTLY ON BUS BAR IS NOT ACCEPTABLE. THE CLAMP ARRANGEMENT SHALL BE FITTED TO CHANNEL, WHICH SHALL BE FURTHER FITTED TO LOAD BEARING MEMBER OF ENCLOSURE.
6. THE BIDDER SHALL PROVIDE NECESSARY AND ADEQUATE NO. OF FISH PLATES, NUTS, BOLTS, PLAIN WASHERS AND SPRING WASHERS. THESE SHALL BE FITTED IN THE TRANSPORT SECTION. LOOSE SUPPLY OF THESE HARDWARE IS NOT ACCEPTABLE.
7. GASKET OF 3METRES PER SHIPPING SECTION SHALL BE SUPPLIED LOOSE BY THE BIDDER.
8. 25X6MM AL OR CU FLATS SHALL BE PROVIDED FOR CONNECTING EVERY ACB BODY TO EARTH BUSBAR.
9. ALL THE CONNECTIONS FROM INCOMER POWER TERMINALS TO SWITCHING/ ISOLATING DEVICE SHALL BE IN THE SCOPE OF VENDOR.
ALL THE CONNECTIONS FROM SWITCHING/ ISOLATING DEVICE TO OUTGOING POWER TERMINAL SHALL BE IN THE SCOPE OF VENDOR.
10. SHROUDING OF ALL LIVE INCOMING TERMINATIONS IN MODULES & OUTGOING TERMINATIONS IN CABLE ALLEY SHALL BE PROVIDED BY THE BIDDER.
11. THE BIDDER SHALL PROVIDE GLAND PLATE CUT-OUT BASED ON BHEL-EPD INPUTS.
13. BASE PLATE PUNCHING SHALL BE CARRIED OUT AS PER APPROVED IGA DRAWING. THE BIDDER SHALL SUBMIT
14. THE BIDDER SHALL SUBMIT IGA OF EACH MODULE OF DIFFERENT TYPE AND RATING TO BHEL-EPD FOR APPROVAL. ONLY AFTER OBTAINING THE APPROVAL, PROTOTYPE HAS TO BE PREPARED.
15. THE BIDDER HAS TO SUBMIT QP AND RAISE THE INSPECTION CALL FOR THE PROTOTYPE PREPARED.
UNITL AND UNLESS THE BIDDER OBTAINS THE APPROVAL FROM BHEL-EPD, THE BIDDER SHALL NOT START THE MANUFACTURING OF THE ENCLOSURE/PANEL.

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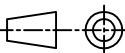
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TECHNICAL SPECIFICATION

16. DOORS SHALL BE DESIGNED SUCH THAT THERE SHALL NOT BE ANY SAG AFTER MOUNTING OF COMPONENTS. THE BIDDER SHALL PROVIDE REQUIRED NUMBER OF HINGED AND SUPPORTS TO AVOID SAG. IF NECESSARY, VENDOR SHALL INCREASE THE CRCA THICKNESS TO AVOID SAG.
17. EXTENSION LINKS FOR FEEDERS FOR OUTGOING TERMINATION DECIDED DURING DETAILED ENGINEERING SHALL BE PROVIDED BY THE BIDDER WITHOUT PRICE IMPLICATION.
18. ALL DRAW-OUT TROLLEYS SHALL BE POWDER COATED INLINE WITH OUTSIDE ENCLOSURE
19. PAINTING SHALL BE CARRIED OUT AS PER THE 7-TANK PROCESS.
20. ENCLOSURE SHALL BE OF TYPE TESTED QUALITY AS PER THE TECHNICAL SPECIFICATION.
21. ALL DRAW-OUT MODULES SHALL BE PROVIDED BY MECHANICAL POSITION INDICATOR FOR ALL THE POSITIONS.
22. ALL INSTRUMENT DOORS SHALL BE PROVIDED BY SCREW ARRANGEMENT OR EQUIVALENT. MAGNETIC ARRANGEMENT IS NOT ACCEPTABLE.
23. TYPE TESTS WILL BE CONDUCTED FOR ALL RATINGS ON BHEL-EPD NAME. THE BIDDER SHALL MAKE SURE THAT TYPE TEST AS PER TECHNICAL SPECIFICATION IS PASSED AT CPRI.

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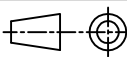
TECHNICAL SPECIFICATION

DOCUMENTS TO BE SUBMITTED ALONG WITH THE BID :

PART-A : TECHNICAL BID

1. TYPE TEST REPORTS OF ENCLOSURES : (TESTS TO BE CONDUCTED AS PER IS/IEC 60439-1,2)
 - A) TEMPERATURE RISE TEST FOR ALL CURRENT RATINGS AS PER SPECIFICATION WITH ACB.
 - B) SHORT CIRCUIT TEST : 50KA FOR 1SEC.
 - C) DEGREE OF PROTECTION : IP-54 & IP-42.
2. TYPE TESTS OF POWER CONTACTS
 - A) MILLI-VOLT DROP TEST
 - B) TEMPERATURE RISE TEST
3. MAIN BUSBAR SIZES & SUPPORTING CALCULATIONS FOR ALL CURRENT RATINGS RANGING FROM 630A TO 4000A.
4. SIZE OF COPPER FLEXIBUS/ CABLES USED FOR POWER INCOMER/ OUTGOING TERMINAL TO SWITCHING/ ISOLATING DEVICE RATED FOR LESS THAN 125A.
5. SIZE OF ALUMINIUM/COPPER LINKS/ COPPER FLEXIBUS USED FOR POWER INCOMER/ OUTGOING TERMINAL TO SWITCHING/ ISOLATING DEVICE RATED FOR 125A & MORE.

NOTE : ALL THE TYPE TESTS SHOULD HAVE BEEN CARRIED OUT AT NABL ACCREDITED LAB.

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Capacity Requirement

Minimum Capacity of the Vendor per month shall be as follows:

1. ACB Incomer verticals – 16Nos
2. ACB Bus-coupler Vertical – 8Nos
3. ACB OG Vertical – 19Nos
4. Single Front Draw-out Verticals – 4Nos
5. Double front Draw-out MCC Verticals – 85Nos
6. Draw-out trolleys – 700Nos
7. Instrument Doors – 350Nos
8. Fixed Verticals – 4nos
9. Fixed Compartment – 35Nos
10. Wall Mounted DBs- 7Nos
11. ISMC – 500metres
12. Dummy Panels – 2Nos

The Vendor will be evaluated on the cumulative Basis i.e **vendor should have manufacturing capacity of all the items mentioned above in one month** and not few of the above items. Vendor should be able to manufacture items 1 to 12 with the above mentioned capacity in one month.