

**5X200MW OBRA BTPS
(REHABILITATION PACKAGE UNIT 12 & 13)**

***TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHBOARD ENCLOSURE
(DRAWOUT TYPE)***

BHEL DOCUMENT NO. : EPD-TS-CPBG-CPJ070-01, REV-0



**BHARAT HEAVY ELECTRICALS LIMITED
ELECTRIC & PHOTOVOLTAIC DIVISION
BANGALORE – 560012**



**TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHBOARD
ENCLOSURE**

SPECIFICATION NO. EPD-TS-CPBG-
CPJO70-01, REV-0

Monday, 26 April 2019

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IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN
TOTAL & THAT THERE ARE NO TECHNICAL DEVIATIONS.

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TECHNICAL SPECIFICATION

A. Power Supply System

Voltage: 415V $\pm$ 10% for AC, 50Hz $\pm$ 5%.

B. Panel Design

- Installation of the Panels is indoor.
- Operating height: 300mm to 1800mm from floor level.
- Gasket shall be provided around doors, covers and other cut-out edges.
- Incoming & outgoing feeder cable entry is bottom.
- Base-frame of the panel shall be ISMC-50/75/100.
- Main Earth Bus bar shall be brought throughout the length of the panel and extended at both the ends in order to facilitate customer earth connection with Nuts & Bolts.
- Each control module shall be housed in a separate compartment.
- A full height vertical chamber (cable alley) with cable supports shall be provided in each section to facilitate wiring. Width of the cable alley shall be minimum 250mm.
- A horizontal wire way, extending the entire length shall be provided at the top of each PMCC/MCC/DB for inter panel wiring. There shall be separation between main bus bar and this horizontal wire way.
- 500MM & above draw out modules shall be provided with support at top for better alignment.
- Feeder rated 250A and above, outgoing external link shall be suitable for 2run 630Sqmm cable /phase.

C. Bus bar

- Bus bars shall be made up of high conductivity Copper.
- All bus bar sleeves shall be 1100V grade, black colour and heat shrinkable type.
- All Accessible bus bar joints shall be provided with removable shrouds of SMC/DMC/Polyamide.
- All live connections from bus bar up to switches shall be shrouded in order to avoid accidental touch.
- Vertical bus bar rating shall be minimum 600A.
- Temperature rise of the Bus bars shall be limited to 40deg C above an ambient of 50deg C when carrying 90% of rated current.
- Separate Vertical bus bar shall be provided for each vertical panel (front & rear feeders).
- Hardware for bus bar sizes shall be stainless steel (non magnetic material) nuts and bolts.

D. Control Bus bar

- All control bus bars shall be made up of copper.
- AC Control Test Bus: 6mm x 6 mm for Phase & N
- DC Control Bus: 6mm x 6 mm for +ve & -ve
- 240VAC Space heater control supply bus : 6mm x 6 mm for Phase & N
- 24VAC Motor winding heater bus: 6mm x 6 mm for Phase & N



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E. Module

- All incomer, bus-coupler & outgoing feeders rated 2500A & 1000A will be ACB controlled.
- All motors rated 110kw and above will be ACB controlled.
- All motors below and including 90kw will be protected by Fuse Type-II Coordination equipment.
- All indicating instruments will be flush/semi-flush mounted on the module compartment door.
- Draw-out modules of same size will be electrically and physically interchangeable.
- Draw-out mechanism will be either rack-in/out or Lever type.

F. Caution / Safety plates

- "Live terminals" caution inscription plate shall be provided on the top of all the panels where the terminals are likely to remain live.
- "Live Cable" inscription plate shall be provided on all the cable alley chamber doors.
- "Danger" inscription plate shall be provided at Incomers in English as well as regional language (Hindi).
- "Name of Switchboard" shall be provided on HBB chamber of first & last shipping sections.

G. Painting

- Thickness of the finished coat shall be minimum 70microns.
- Shade: Exterior:-Exterior RAL 7035 and Interior Al. Zinc.

H. Others

- All SCPD except ACB will have defeat interlock.
- Mechanical safety interlock shall be provided to prevent ACB from being racked in or out of the service position when ACB is closed.
- All other technical parameters of enclosure shall be as per BHEL Document No.: EP-4-TS-053-001 Rev 00 (Annexure-A).

I. MODUEL SIZE CHART

Sl.no.	Feeder rating	Feeder type	Module Size	No. of SIC(Draw out control contact)
1.	UPTO 7.5KW	DOL	300MM	18 NO's
2	UPTO 22KW	DOL	400MM	18 NO's
3	UPTO 30KW	DOL	500MM	18NO'S
4	UPTO 37KW	DOL	600MM	30 NO's
5	UPTO 45KW	DOL	700MM	30 NO's
6	UPTO 65KW	DOL	800-900MM	30 NO's
7	UPTO 90KW	DOL	1000-1100MM	40 NO's
8	UPTO 7.5KW	RDOL	400MM	24NO'S
9	UPTO 15KW	RDOL	500MM	30NO'S
10	UPTO 100A	SUPPLY FEEDER	300MM	6 no's
11	UPTO 250A	SUPPLY FEEDER	400MM	6 no's

Note: - Above indicated module size is tentative and only for reference purpose however vendor has to accommodate the component as per attached sample schematic drawings.



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1	LV Switchgear	
1.1	Make	BHEL-EPD
1.2	Type of Construction	PCC : Single-front draw out type , compartmentalized MCC: Double front draw out type, compartmentalised DCDB : Fixed type and compartmentalized
1.3	Mounting	Floor Mounted
1.4	Reference standard	IEC 60439-1
1.5	Voltage	415V $\pm$ 10% for AC , 50Hz $\pm$ 5% 220V +10% and -15% for DC
1.6	Bus bar Configuration	3 phase 4 wire for AC +Ve & -Ve for DCDB
1.7	Short Circuit(SC) rating	AC : 50kA for 1sec DC : 25kA for 1sec
1.8	Impulse voltage rating (High voltage)	2.5kV(rms) for 1min AC - power circuit
2	Enclosure	
2.1	Degree of protection	IP-42 for PCC/MCC IP-54 for DCDB
2.2	Thickness of sheet metal	Frames & Load bearing member:2.5mm Doors & covers : 1.6mm
2.3	Working height (from floor level)	300mm to 1800mm
2.4	Total height of the panel	2400mm
2.5	Draw out type modules in PMCC/PCC/MCC	ACB feeders O/g supply feeders Motor Feeder
2.6	Fixed type modules in PMCC/PCC/MCC	BUS PT LINE PT SPAEC HEATER SUPPLY WINDING HEATER SUPPLY
2.7	Draw-out mechanism	Rack-in/out or Lever mechanism
2.8	Cable Alley	Width : Minimum 250mm (only for non-breaker outgoing modules) provided with thermostat controlled space heater & LED Lamp
2.9	Shipping section	Lifting hooks or Lifting Rails, Power Socket in cable alley.
2.10	Control terminals	SIC sliding contact
2.11	Gland plate	Multi-core : 3mm for HRCA/CRCA Single Core : 4mm for non-magnetic material
2.12	Gasket	Rubber/EPDM/PU foam
2.13	Conductor size for door-earthing	2.5sq.mm Copper wire
3	Bus Bar	
3.1	Make	
3.2	Material	High conductivity Copper
3.3	Reference standard	IEC 60439-1



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3.4	Max. temperature rise over 50Deg C ambient	plain bolted joint : 40 Deg @90% rated current silver plated joint : 55deg
3.5	Fault level	50kA rms for 1 sec for AC 20KA for 1 sec for DC
3.6	Minimum clearance	Phase- Phase : 25mm Phase - Earth : 25mm
3.7	Bus support insulator type	Non-hygroscopic, Flame retardant, Track resistant type with high creep age.
3.8	Voltage Class	1.1kV
3.9	Creep age	25mm/kV
3.10	Colour coding	Black sleeved. Intermittent colour coding at regular intervals
3.11	Earth bus bar size & material	50x6mm GI
4	Secondary Wiring	
4.1	Type of insulation	PVC
4.2	Type	Fire retardant low smoke
4.3	Voltage grade	1100V
4.4	Conductor material	Copper
4.5	conductor size	2.5 sq.mm for control circuit 2.5 sq.mm for voltage circuit 2.5 sq.mm for current circuit
4.6	identification	Identified with ferrules at both ends
5	Terminal Block	
5.1	Type	Box-clamp
5.2	Voltage Grade	1100V
6	Cable Termination	
6.1	Cable termination provided	Yes
6.2	Power cable	XLPE insulated, FRLSH PVC Sheath
6.3	Cable lugs	Crimp type, material : tinned copper
6.4	Cable gland	Double compression type brass gland
6.5	Gland plate	CRCA : 3mm Non-magnetic material : 4mm
7	Bus duct connection	
7.1	Entry of bus duct	Top
7.2	Ground bus	
7.3	Material	Galvanized steel
7.4	Size	50x6mm
8	Name plate	
8.1	Material	anodized aluminium
8.2	Thickness	3mm



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8.3	Size (length x height)	75x20mm for instrument/ meters 150x40mm for panel
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9	Space heater	
9.1	Operating mechanism	Thermostat controlled
9.2	rating	60W
9.3	Supply voltage	240V AC
10	Plug & Socket	
10.1	Type	5 pin, Industrial grade
10.2	Rating	15/5A
11	Painting	
11.1	Inside finish	Al. Zinc
11.2	Outside finish	RAL 7035
11.3	Painting thickness	Minimum 70 Microns



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INFORMATION TO BIDDER

1. Items to be manufactured as per technical specification.
2. Prices of each line item shall be furnished in separate sealed price bid.
3. Following information shall also be furnished along with bid:
 - a) Catalogue of item offered. Dimension details to be provided.
 - b) Deviation sheet
 - c) Packing shall be as per vendor standard.
 - d) Unpriced bid.
 - e) Type Test reports (TTR) as per Technical specification requirement.
 - f) In case of submitted Type Test report not meeting the NIT/ Technical specification requirement, bidder to conduct fresh Type Test meeting Technical specification requirement without any cost to BHEL-EPD. Delay in submission of TTR as per technical specification shall also be considered under LD clause. Fresh Type Test report shall be submitted before commencement of supplies.

BIDDER'S STAMP & SIGNATURE



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DOCUMENTS TO BE SUBMITTED BY BIDDER IN THE EVENT OF ORDER

1. Manufacturing Quality Plan.
2. Internal General Arrangement of feeders including door cut-outs for each type and rating.
3. Dimension (Sizes) of various types of modules w.r.t schemes and ratings
4. Bus bar sizing calculation.
5. General arrangement drawing as per load data provided by BHEL-EPD.
6. Panel flange drawing for Bus duct.
7. Type test report.

PROTOTYPES TO BE MANUFACTURED BY BIDDER IN THE EVENT OF ORDER

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JOB NO.: CPJ 070						BHARAT HEAVY ELECTRICALS LIMITED ELECTRIC & PHOTOVOLTAIC DIVISION BANGALORE					
DEGND.		NAME		SIGN.		DATE		DEPT.		CODE	
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CHKD.											
APPD.											
TITLE :				TECHNICAL SPECIFICATION FOR LT SWITCHGEAR ENCLOSURE							
DRG. NO. :				EP-4TS-070-001				REV. NO. : 00			
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ANNEXURE-A

TECHNICAL SPECIFICATION

LT SWITCHGEAR

1. POWER SUPPLY SYSTEM:-

VOLTAGE

415V $\pm 10\%$, 3PH, 4W, 50Hz $\pm 5\%$, SOLIDLY EARTHED.

FAULT LEVEL

220V DC UNEARTHED
50KA FOR 1 SEC. FOR AC
20KA 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

40°C OVER AMBIENT ON CURRENT CARRYING PARTS

2. DESIGN SUPPORT:-

APPLICABLE STANDARDS

IEC60439-1

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 & 40°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

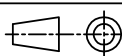
1. MAIN BUSBAR CHAMBER SHALL BE AT THE TOP OF THE PANEL AND SHALL RUN THROUGHOUT THE PANEL.
2. SEPARATE CONTROL BUSBAR CHAMBER PROVISION FOR 10PAIRS OF BUSBAR TO BE PROVIDED, PARALLEL TO MAIN BUSBAR CHAMBER BUT NOT ON TOP OF MAIN BUSBAR CHAMBER.
3. MAIN BUSBAR CHAMBER AND CONTROL BUSBAR CHAMBER SHALL 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 STUDDED/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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TECHNICAL SPECIFICATIONS
LT SWITCHGEAR

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ANNEXURE-A

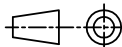
TECHNICAL SPECIFICATION

- 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 ISMC 50/75/100
 18. EACH VERTICAL SECTION SHALL HAVE VERTICAL CABLE ALLEY COVERING ENTIRE HEIGHT. WIDTH OF THE CABLE
ALLEY SHALL BE MIN 250MM 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 ALUMINIUM OR
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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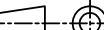
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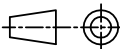
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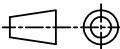
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35. AUTOMATIC SAFETY SHUTTERS SHALL BE PROVIDED FOR ALL TYPES OF DRAW-OUT MODULES IN ORDER TO PREVENT ACCESS TO VERTICAL BUS BAR OR LIVE BUS, WHEN THE MODULES ARE DRAWN OUT OR COMPLETELY ISOLATED.
36. VENDOR SHALL CONSIDER ALL TYPES OF LIMIT SWITCHES 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: 19MMTHE 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.

JOB NO.: CPJ 070						BHARAT HEAVY ELECTRICALS LIMITED ELECTRIC & PHOTOVOLTAIC DIVISION BANGALORE			
	NAME	SIGN.	DATE	DEPT.	CODE	TITLE : TECHNICAL SPECIFICATIONS LT SWITCHGEAR			
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CHKD.									
APPD.						DRG. NO. : EP-4TS-070-001		REV. NO. : 00	
SCALE :		N.T.S.		SHEET NO. : 04		NO. OF SHEETS : 12			

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PANEL DESIGN:-</td> <td>FORM 3B AS PER IEC 60439-1,2</td> </tr> <tr> <td>INSTALLATION</td> <td colspan="2">INDOOR</td> </tr> <tr> <td>MOUNTING</td> <td colspan="2">FLOOR MOUNTED</td> </tr> <tr> <td>ACB FEEDERS</td> <td colspan="2">SINGLE FRONT, DRAWOUT</td> </tr> <tr> <td>MCCB/MPCB FEEDERS</td> <td colspan="2">DOUBLE FRONT, DRAWOUT</td> </tr> <tr> <td>TRF FEEDERS</td> <td colspan="2">DOUBLE FRONT, FIXED.</td> </tr> <tr> <td>DC FEEDERS & DC CONTROL SUPPLY</td> <td colspan="2">FIXED COMPARTMENTS</td> </tr> <tr> <td>OTHERS</td> <td colspan="2">DOUBLE FRONT, DRAWOUT</td> </tr> <tr> <td>DOOR INTERLOCK & PAD LOCKING ARRANGEMENT</td> <td colspan="2">NECESSARY ARRANGEMENT SHALL BE PROVIDED.</td> </tr> <tr> <td>INTERCHANGEABILITY</td> <td colspan="2">ALL IDENTICAL EQUIPMENT & CORRESPONDING PARTS OF PANEL, INCLUDING CHASIS OF DRAWOUT MODULES OF SAME TYPE & RATING SHALL BE INTERCHANGABLE WITHOUT CARRYING OUT ANY MODIFICATIONS.</td> </tr> <tr> <td>EXTENSIBILITY</td> <td colspan="2">BOTH THE ENDS SHALL BE EXTENSIBLE</td> </tr> <tr> <td>OPERATING HEIGHT</td> <td colspan="2">MINIMUM: 3000MM & MAXIMUM: 1800MM</td> </tr> <tr> <td>ENCLOSURE</td> <td colspan="2">TOTALLY DUST & VERMIN PROOF</td> </tr> <tr> <td>DEGREE OF PROTECTION</td> <td colspan="2">UP TO & INCLUDING 1600A , IP-54 ABOVE 1600A , IP42 AS PER IS-13947</td> </tr> <tr> <td>GASKET</td> <td colspan="2">NEOPRENE/EPDM GASKETS SHALL BE PROVIDED AROUND DOORS, COVERS AND OTHER CUTOUT EDGES.</td> </tr> <tr> <td>LOUVERS</td> <td colspan="2">SHALL BE PROVIDED FOR ALL PANELS RATED ABOVE 1600A AT FRONT & REAR OF BUSBAR CHAMBER AND REAR DOORS BACKED WITH FINE WIREMESH.</td> </tr> <tr> <td>CABLE ALLEY</td> <td colspan="2">CABLE ALLEY WIDTH OF MIN 250MM SHALL BE COMPLETELY ACCESSIBLE AFTER OPENING THE DOOR. 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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 4°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 COPPER													
INVENTORY NO. : REV. 01 DATE : ALTERED :		SIGN. & DATE : REV. DATE : ALTERED :		REF. DRG. NO. : REV. DATE : ALTERED :		JOB NO.: CPJ 070						BHARAT HEAVY ELECTRICALS LIMITED ELECTRIC & PHOTOVOLTAIC DIVISION BANGALORE							
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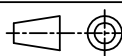
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ELECTRIC & PHOTOVOLTAIC DIVISION BANGALORE

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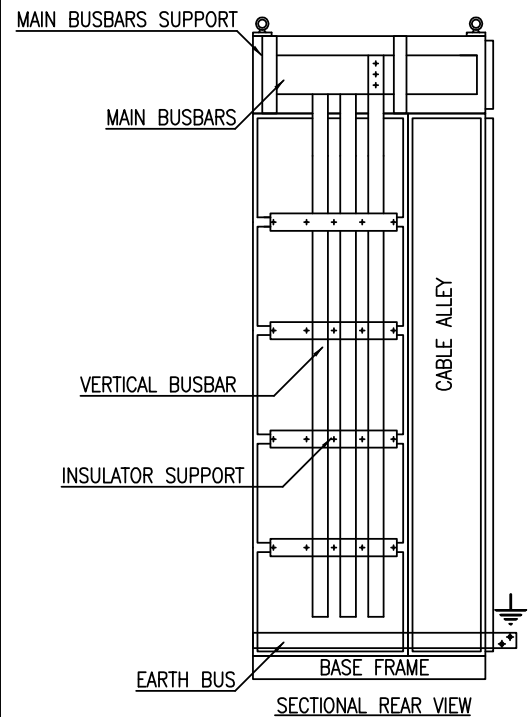
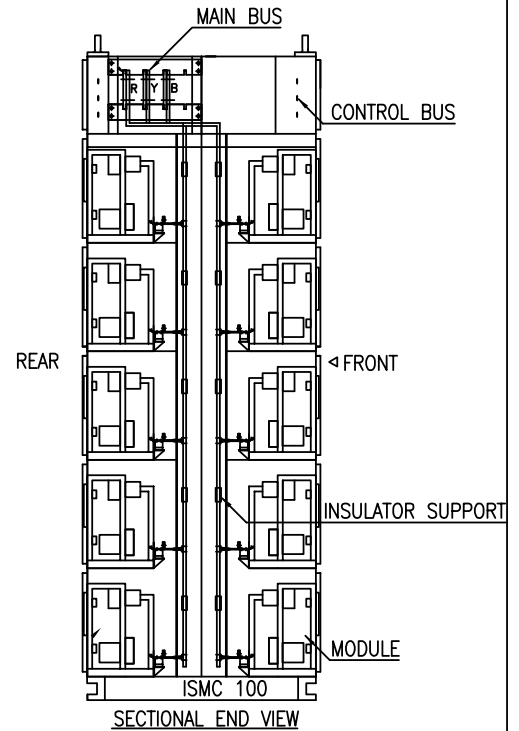
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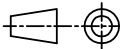
ANNEXURE-A

TECHNICAL SPECIFICATION

8. VERTICAL BUSBAR CHAMBER:-

BUSBAR ARRANGEMENT IN VERTICAL BUSBAR CHAMBER
(TYPICAL)



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		TECHNICAL SPECIFICATION									
		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.				
		9. VERTICAL BUSBARS:-									
		MATERIAL					COPPER				
		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 40°C AT 90% 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 : 10075/50MM 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 ADDITIONAL COST.						
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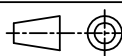
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ANNEXURE-A

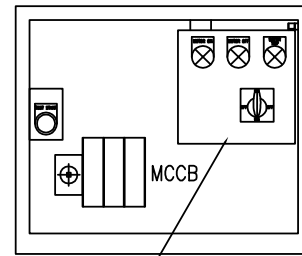
TECHNICAL SPECIFICATION

11. DRAWOUT MODULES:-

DRAWOUT MODULES
(TYPICAL)NOTE:

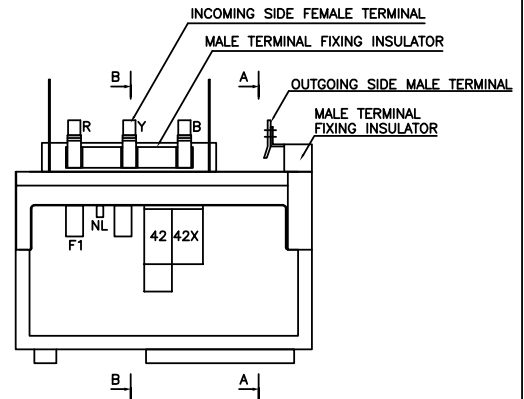
THE MODULES NEED NOT BE EXACTLY THE SAME AS SHOWN IN DRAWING.

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.

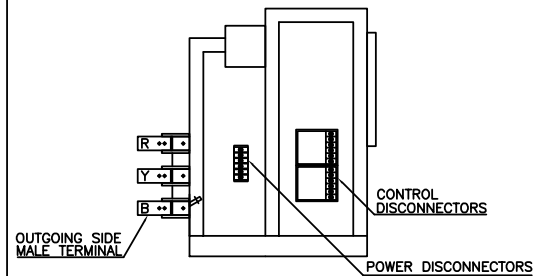


FRONT INDICATION & CONTROL PANEL

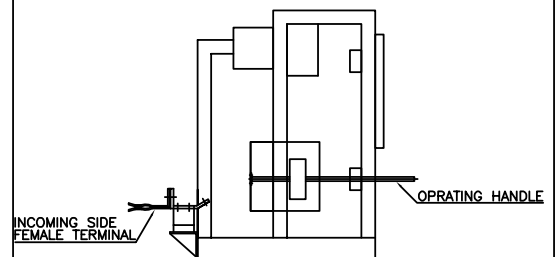
ELEVATION



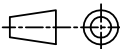
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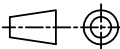


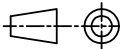
SECTION-AA



SECTION-BB

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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.						
INVENTORY NO. : REV. 01 DATE :		SIGN. & DATE : REV. DATE :		REF. DRG. NO. : REV. DATE :		ALTERED : DATE :		ALTERED : DATE :		ALTERED : DATE :	
JOB NO.: CPJ 070				BHARAT HEAVY ELECTRICALS LIMITED ELECTRIC & PHOTOVOLTAIC DIVISION BANGALORE							
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		DRG. NO. :		EP-4TS-070-001						REV. NO. : 00	
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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: RAL 7035 INTERIOR SHADE: Al. zinc FINISH: NAT 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.	
INVENTORY NO. : REV. 01 DATE : SIGN. & DATE : REF. DRG. NO. : REV. : DATE : ALTERED : ALTERED : ALTERED : ALTERED :		JOB NO.: CPJ070	
			
		BHARAT HEAVY ELECTRICALS LIMITED ELECTRIC & PHOTOVOLTAIC DIVISION BANGALORE	
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ANNEXURE-A

TECHNICAL SPECIFICATION

SCOPE OF WORK :

- DIN RAIL ARRANGEMENT AND PUNCHING OF HOLES REQUIRED FOR MOUNTING OF COMPONENTS IN THE MODULE SHALL BE PROVIDED BY THE BIDDER.
- 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.
- 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.
- THE BIDDER HAS TO PROVIDE THE FOLLOWING COMPONENTS IN EACH CABLE ALLEY
 - 1NO. OF SPACE HEATER OF 100WATTS.
 - 1NO. OF THERMOSTAT
 - 1NO. OF LED LAMP OF 11WATT
 - 1NO. OF 16A 5PIN PLUG & SOCKET, INDUSTRIAL GRADE
 - 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.
- SUPPLY OF CT'S, FIXING AND MOUNTING OF CT'S IN ACB PANEL 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.
- 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.
- GASKET OF 3METRES PER SHIPPING SECTION SHALL BE SUPPLIED LOOSE BY THE BIDDER.
- 25X6MM AL OR CU FLATS SHALL BE PROVIDED FOR CONNECTING EVERY ACB BODY TO EARTH BUSBAR.
- 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.
- SHROUDING OF ALL LIVE INCOMING TERMINATIONS IN MODULES & OUTGOING TERMINATIONS IN CABLE ALLEY SHALL BE PROVIDED BY THE BIDDER.
- THE BIDDER SHALL PROVIDE GLAND PLATE CUT-OUT BASED ON BHEL-EPD INPUTS.
- BASE PLATE PUNCHING SHALL BE CARRIED OUT AS PER APPROVED IGA DRAWING. THE BIDDER SHALL SUBMIT
- 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.
- THE BIDDER HAS TO SUBMIT QP AND RAISE THE INSPECTION CALL FOR THE PROTOTYPE PREPARED.
UNTIL AND UNLESS THE BIDDER OBTAINS THE APPROVAL FROM BHEL-EPD, THE BIDDER SHALL NOT START THE MANUFACTURING OF THE ENCLOSURE/PANEL.

JOB NO.:

CPJ 070
BHARAT HEAVY ELECTRICALS LIMITED
ELECTRIC & PHOTOVOLTAIC DIVISION BANGALORE

	NAME	SIGN.	DATE	DEPT.	CODE
DEGND.					
DRN.					
CHKD.					
APPD.					

 TITLE :
SCOPE OF WORK

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INVENTORY NO. :	REF. DRG. NO. :	SIGN. & DATE :		REV. DRG. NO. :	
		REV.	DATE :	REV.	DATE :
REV. 01 DATE :	ALTERED :	ALTERED :	ALTERED :	ALTERED :	ALTERED :

ANNEXURE-A

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.

JOB NO.: CPJ 026						BHARAT HEAVY ELECTRICALS LIMITED ELECTROPROCELAIN DIVISION BANGALORE	
	NAME	SIGN.	DATE	DEPT.	CODE	TITLE : SCOPE OF WORK	
DEGND.						DRG. NO. : SCALE : N.T.S. REV. NO. : 00 SHEET NO. : 01 NO. OF SHEETS : 02	
DRN.							
CHKD.							
APPD.							

SCHEMATIC DRAWING FOR
UPTO 30KW DOL

CONSULTANT:-					PROJECT:-					END USER:- OBRA TPS (5x200MW) UPRVUNL		
REV	DRN.BY:	CHD.BY:	DATE:	APP.BY:	REMARKS	DRN.BY:		PO No.	PROJECTION			DRAWING No.
						CHD.BY:		PROJ.No		TITLE:- TITLE SHEET FOR UPTO 30KW DOL		02-01-06-2718
						APP.BY:		DEPT:		CUSTOMER:- RMSG,BHEL		1
						DATE:		SCALE:		SHEET 1 OF 1	REV.	

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ON/OFF

SCHEME DRAWING FOR UPTO 30KW DOL

24V AC
SPACE HEATING SUPPLY

B1
B2

X1-11 X1-12

H20 H21

Q11 MCB

H22 H23

42X4

415V,50Hz,3PH.,3 WIRE SYSTEM

R Y B

R1 Y1 B1

29

R2

Y2

B2

49

42

R3

Y3

B3

R4

Y4

B4

M

3

T2

415/110V AC
-VA

H1 F1

42Y
TIMER

15

18

23

12

3

4

23

24

K12

PB1

LOCAL
START

X1-13

X1-14

STOP
FROM
LPB

STOP
FROM
BSSS

X1-15

X1-16

X1-17

X1-18

X1-19

X1-20

X1-21

X1-22

X1-23

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X1-25

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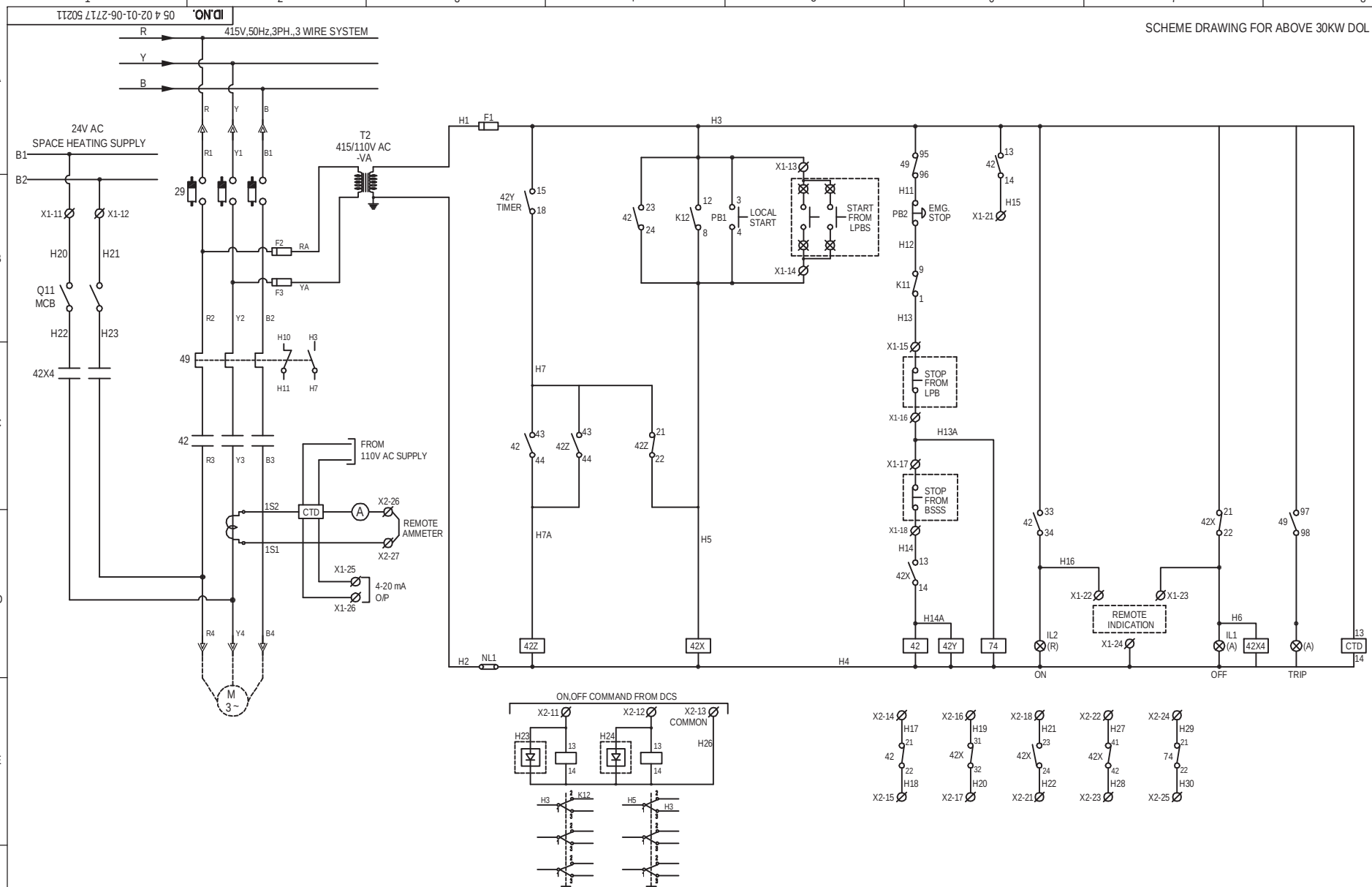
X1-254

X1-255

SCHEMATIC DRAWING FOR
ABOVE 30KW DOL WITH
CTD

CONSULTANT:-					PROJECT:-					END USER:- OBRA TPS (5x200MW) UPRVUNL			
REV	DRN.BY:	CHD.BY:	DATE:	APP.BY:	REMARKS	DRN.BY:		PO No.	PROJECTION			DRAWING No.	
						CHD.BY:		PROJ.No:		TITLE:- TITLE SHEET FOR UPTO 30KW DOL WITH CTD		02-01-06-2717	1
						APP.BY:		DEPT:		CUSTOMER:- RMSG,BHEL		SHEET 1 OF 1	REV.
						DATE:		SCALE:					

SCHEME DRAWING FOR ABOVE 30KW DOL WITH CTD



CONSULTANT:-					PROJECT:-				END USER:- OBRA TPS (5x200MW) UPRVUNL			
REV	DRN.BY:	CHD.BY:	DATE:	APP.BY:	REMARKS	DRN.BY:	CHD.BY:	PO No.	PROJECTION	DRAWING No.		
								PROJ.No:		TITLE:- SCHEME DRAWING FOR UPTO 30KW DOL WITH CTD		
								DEPT:		CUSTOMER:- RMSG,BHEL		
								SCALE:		SHEET 1 OF 1		
										REV.		

SCHEMATIC DRAWING FOR
ABOVE 30KW DOL

CONSULTANT:-					PROJECT:-					END USER:- OBRA TPS (5x200MW) UPRVUNL				
REV	DRN.BY:	CHD.BY:	DATE:	APP.BY:	REMARKS	DRN.BY:		PO No.	PROJECTION			DRAWING No.		
						CHD.BY:		PROJ.No:		TITLE:- TITLE SHEET FOR ABOVE 30KW DOL		02-01-06-2717	1	
						APP.BY:		DEPT:						
						DATE:		SCALE:						
						CUSTOMER:- RMSG,BHEL					SHEET 1 OF 1		REV.	

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DRAWING No.

SCHEMATIC DRAWING FOR RDOL
INTERGRAL VALVE FEEDERS

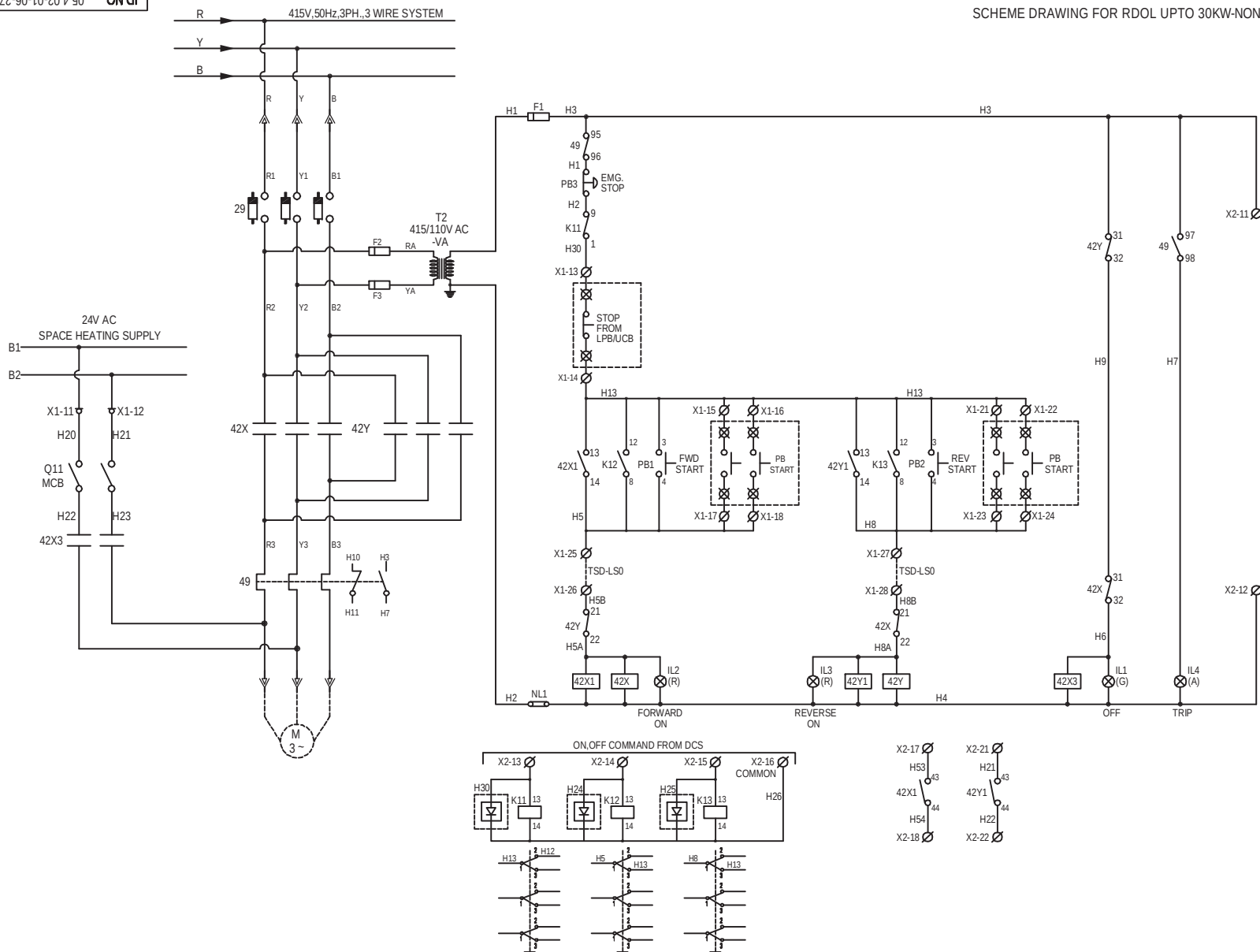
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					APP.BY:		DEPT:							
					DATE:		SCALE:							
										SHEET 1 OF 1		REV.		

SCHEMATIC DRAWING FOR
RDOL NON
INTERGRAL VALVE FEEDERS

CONSULTANT:-					PROJECT:-					END USER:- OBRA TPS (5x200MW) UPRVUNL				
REV	DRN.BY:	CHD.BY:	DATE:	APP.BY:	REMARKS	DRN.BY:		PO No.	PROJECTION	TITLE:- TITLE SHEET FOR RDOL UPTO 30KW-NON INTERGRAL VALVE FEEDERS		DRAWING No. 02-01-06-2715		0
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						DATE:		SCALE:						
										CUSTOMER:- RMSG,BHEL		SHEET 1 OF 1		REV.

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SCHEME DRAWING FOR RDOL UPTO 30KW-NON INTERGRAL VALVE FEEDERS



CONSULTANT:-					PROJECT:-					END USER:- OBRA TPS (5x200MW) UPRVUNL				
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						APP.BY:		DEPT:		CUSTOMER:- RMSG,BHEL		SHEET 1 OF 1		
						DATE:		SCALE:				REV.		

NOTE: ALL DIMENSIONS ARE IN mm
OVERALL TOLERANCE ± 2mm

PATH: IT/CAD/ANSERVER/50211
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SCHEME DRAWING FOR SINGLE PHASE
SUPPLY TRANSFORMER 10KVA, 415/240V
(CTF)

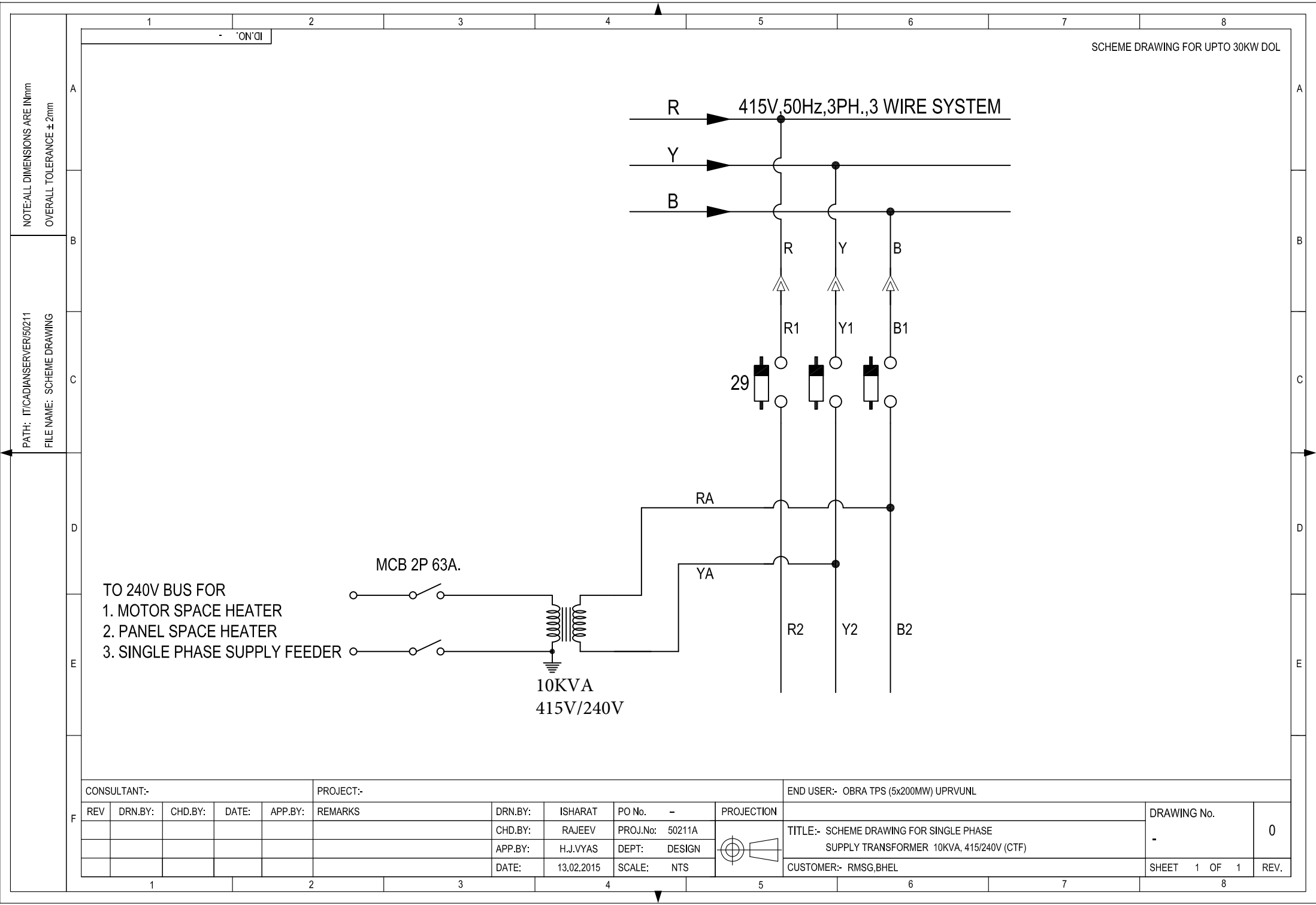
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PROJECT:-

END USER:- OBRA TPS (5x200MW) UPRVUNL

REV	DRN.BY:	CHD.BY:	DATE:	APP.BY:	REMARKS	DRN.BY:	ISHARAT	PO No.	-	PROJECTION		DRAWING No.	
						CHD.BY:	RAJEEV	PROJ.No:	50211A		TITLE:- SCHEME DRAWING FOR SINGLE PHASE SUPPLY TRANSFORMER 10KVA, 415/240V (CTF)	-	0
						APP.BY:	H.J.VYAS	DEPT:	DESIGN		CUSTOMER:- RMSG,BHEL	SHEET 1 OF 1	REV.
						DATE:	13.02.2015	SCALE:	NTS				

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NOTE: ALL DIMENSIONS ARE IN mm
OVERALL TOLERANCE ± 2mm

PATH: IT\CAD\ANSERVER\50211
FILE NAME: SCHEME DRAWING

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SCHEME DRAWING FOR WINDING
SPACE HEATER-24V (CS1)

CONSULTANT:-

REV	DRN.BY:	CHD.BY:	DATE:	APP.BY:	REMARKS	DRN.BY:	ISHARAT	PO No.	--	PROJECTION
						CHD.BY:	RAJEEV	PROJ.No:	50211A	
						APP.BY:	H.J.VYAS	DEPT:	DESIGN	
						DATE:	13.02.2015	SCALE:	NTS	

PROJECT:-

END USER:- OBRA TPS (5x200MW) UPRVUNL

TITLE:- SCHEME DRAWING FOR WINDING
SPACE HEATER-24V (CS1)

CUSTOMER:- RMSG,BHEL

DRAWING No.
-

0

SHEET 1 OF 1
REV.

