BILL OF QUANTITIES FOR CLAMPS AND CONNECTORS-BIKANER-III-145KV

S.NO.	ITEM DESCRIPTION	CLAMP NO.	UNIT	BAY WISE QUANTITY		TOTAL QUANTITY
				BPS NO. 62 (4 LOT)	BPS NO. 67 (2 SET)	
1	145KV, 25KA FOR 1S, 1250A, CB CONNECTOR SUITABLE FOR TWIN BERSIMIS	101	NO.	0	4	4
2	145KV, 25KA FOR 1S, NGR CONNECTOR SUITABLE FOR TWIN BERSIMIS	102	NO.	0	4	4
3	132KV, 25KA FOR 1S, SURGE ARRESTER CONNECTOR SUITABLE FOR TWIN BERSIMIS THROUGH TYPE	103	NO.	0	2	2
4	145KV, 25KA FOR 1S, BPI CONNECTOR SUITABLE FOR AL TUBE 3 INCH IPS, RIGID-SLIDING THROUGH TYPE	104	NO.	9	0	9
5	145KV, 25KA FOR 1S, BPI CONNECTOR SUITABLE FOR AL TUBE 3 INCH IPS, TUBE CUT	105	NO.	23	0	23
6	145KV, 25KA FOR 1S, BPI CONNECTOR SUITABLE FOR TWIN BERSIMIS CONDUCTOR THROUGH	106	NO.	14	4	18
7	TEE CONNECTOR/PG CLAMP SUITABLE FOR TWIN ACSR BERSIMIS CUNDOCTOR (RUN) AND TWIN ACSR BERSIMIS CONDUCTOR (TAP)	107	NO.	0	8	8
8	145KV, 25KA FOR 1S, 1250A, TEE CONNECTOR/PG CONNECTOR SUITABLE FOR 3" IPS AL TUBE TO TWIN BERSIMIS	108	NO.	23	0	23
9	145KV, REACTOR NEUTRAL BUSHING, 1250A, CONNECTOR SUITABLE FOR TWIN BERSIMIS CONDUCTOR WITH HORIZONTAL APPROACH	109	NO.	13	0	13
10	WELDING SLEEVE SUITABLE FOR 3 INCH IPS AL TUBE	WS3	NO.	28	0	28
11	END CAP SUITABLE FOR 3 INCH IPS AL TUBE	3CB	NO.	10	0	10

Kindly include bus post and associated structure quantities under this item.

BILL OF QUANTITIES FOR CLAMPS AND CONNECTORS-BIKANER-III-72.5KV

S.NO.	ITEM DESCRIPTION	CLAMP NO.	UNIT	BAY WISE QUANTITY		TOTAL QUANTITY
				BPS NO. 63 (6 LOT)	BPS NO. 98 (2 SET)	
1	72.5KV, 25KA FOR 1S, 1250A, CB CONNECTOR SUITABLE FOR TWIN BERSIMIS	501	NO.	0	12	12
2	72.5KV, 25KA FOR 1S, CT CONNECTOR SUITABLE FOR TWIN BERSIMIS	502	NO.	0	12	12
3	72.5KV, 25KA FOR 1S, 1250A, ISOLATOR (HDB) CONNECTOR SUITABLE FOR TWIN BERSIMIS	503	NO.	0	12	12
4	66KV, 25KA FOR 1S, PT CONNECTOR SUITABLE FOR TWIN BERSIMIS	504	NO.	0	6	6
5	72.5KV, 25KA FOR 1S, 1250A, BPI CONNECTOR SUITABLE FOR AL TUBE 3 INCH IPS, SLIDING THROUGH TYPE	505	NO.	146	0	146
6	72.5KV, 25KA FOR 1S, 1250A, BPI RIGID-EXPANSION TYPE CONNECTOR SUITABLE FOR 3" IPS AL TUBE, TUBE CUT	506	NO.	164	0	164
7	72.5KV, 25KA FOR 1S, 1250A, ICT BUSHING CONNECTOR SUITABLE FOR TWIN BERSIMIS (THROUGH TYPE)	507	NO.	38	0	38
8	72.5KV, 25KA FOR 1S, 1250A, TEE CONNECTOR/PG CONNECTOR SUITABLE FOR 3" IPS AL TUBE TO TWIN BERSIMIS	508	NO.	364	0	364
9	72.5KV, 25KA FOR 1S, 1250A, LT TRANSFORMER BUSHING CONNECTOR SUITABLE FOR TWIN BERSIMIS	509	NO.	0	6	6
10	WELDING SLEEVE SUITABLE FOR 3 INCH IPS AL TUBE	WS3	NO.	196	0	196
11	END CAP SUITABLE FOR 3 INCH IPS AL TUBE	3CB	NO.	146	0	146

BILL OF QUANTITIES FOR CLAMPS AND CONNECTORS-BIKANER-III-33KV

S.NO.	ITEM DESCRIPTION	CLAMP NO.	UNIT	QUANTITY
				BPS NO. 63 (6 LOT)
1	33KV, 25KA FOR 1S, BPI CONNECTOR SUITABLE FOR AL TUBE 3 INCH IPS, RIGID-SLIDING THROUGH TYPE	301	NO.	52
2	33KV, 25KA FOR 1S, BPI CONNECTOR SUITABLE FOR AL TUBE 3 INCH IPS, RIGID-EXPANSION TYPE CONNECTOR, TUBE CUT	302	NO.	67
3	33KV, 25KA FOR 1S, BPI CONNECTOR SUITABLE FOR TWIN BERSIMIS CONDUCTOR THROUGH	303	NO.	19
4	33KV, 25KA FOR 1S, 2000A, BUSHING CONNECTOR SUITABLE FOR TWIN BERSIMIS	304	NO.	19
5	33KV, 25KA FOR 1S, 1250A, TEE CONNECTOR/PG CONNECTOR SUITABLE FOR 3" IPS Al tube TO TWIN BERSIMIS	305	NO.	69
6	33KV, 25KA FOR 1S, CURRENT TRANSFORMER CONNECTOR SUITABLE FOR AL TUBE 3 INCH IPS, RIGID TYPE	306	NO.	6
7	33KV, 25KA FOR 1S, CURRENT TRANSFORMER CONNECTOR SUITABLE FOR 75X12 MM FLAT	307	NO.	6
8	WELDING SLEEVE SUITABLE FOR 3 INCH IPS AL TUBE	WS3	NO.	68
9	END CAP SUITABLE FOR 3 INCH IPS AL TUBE	3CB	NO.	46

BPI quantities to be included.

TB-424-825-000-BOQ-REV D1

Bill of Quantity - String Insulators Hardware - Bikaner-III Station (765kV)

S.No	Engineering Description	Nomenclature	Sl. No. as per BPS	Description as per BPS	ICT-1 TIE FUTURE	ICT-2 TIE FUTURE	ICT-3 TIE NEEMRANA LINE-2 WITH REACTOR	ICT-4 TIE NEEMRANA LINE-1 WITH REACTOR	ICT-5 TIE BUS REACTOR-1	ICT-6 TIE BUS REACTOR-2	MAIN BUS-I	MAIN BUS-II	Engineered Quantity Total (Nos)	Quantity as per BPS (Nos)	UNIT	REMARKS
Tension Hardware																
A1	765 kV Double Tension Hardware without Turnbuckle suitable for Quad Bull AAC Conductor	7H1	72	765KV TENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGSWITHOUT TURN BUCKLE SUITABLE FOR QUAD CONDUCTOR	9	9	12	12	12	12	9	9	84	84	Nos	
A2	765 kV Double Tension Hardware with Turnbuckle suitable for Quad Bull AAC Conductor	7H2	74	765KV TENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGS WITHTURN BUCKLE SUITABLE FOR QUAD CONDUCTOR	9	9	12	12	12	12	9	9	84	84	Nos	
A3	765 kV Double Tension Hardware with Turnbuckle suitable forHexa zebra Conductor	7H5	73	765KV TENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGS WITHTURN BUCKLE SUITABLE FOR HEXA CONDUCTOR	--	--	3	3	--	--	--	--	6	6	Nos	
A4	765kv guy arrangement hardware with Turnbuckle suitable for Quad Bull AAC Conductor	7H6	--	NOT IN BPS	9	9	15	15	12	12	--	--	72	--	Nos	
Suspension Hardware																
A5	765 kV Single Suspension Hardware with Drop Clamp suitable for Quad Bull AAC Conductor	7H3	70	765KV SUSPENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGS WITH DROP CLAMP SUITABLE FOR QUAD CONDUCTOR	--	--	3	3	--	--	3	3	12	12	Nos	
A6	765 kV Single Suspension Hardware with Through Clamp suitable for Quad Bull AAC Conductor	7H4	71	765KV SUSPENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGS WITH THROUGH CLAMP SUITABLE FOR QUAD CONDUCTOR	3	3	6	6	6	6	6	6	42	42	Nos	
COMPOSITE LONG ROD POLYMER INSULATOR-765KV																
B1	765KV COMPOSITE LONG ROD POLYMER INSULATOR STRING - 31mm/kV, 210kN - For Tension Insulators	--	--	--	--	--	--	--	--	--	--	--	696	--	Nos	
B2	765KV COMPOSITE LONG ROD POLYMER INSULATOR STRING - 31mm/kV, 210kN - For Suspension Insulators	--	--	--	--	--	--	--	--	--	--	--	216	--	Nos	
B3	765KV COMPOSITE LONG ROD POLYMER INSULATOR STRING- 31mm/kV, 210kN - For guy wire arrangement	--	--	--	--	--	--	--	--	--	--	--	288	--	Nos	

These are part of LS item under erection hardware, not payable additionally

Bill of Quantity - String Insulators Hardware - Bikaner-III Station (400kV)

S.No	Engineering Description	Nomenclature	Sl. No. as per BPS	Description as per BPS	BIKANER PG LINE-2-TIE-BIKANER II LILO LINE-4	BIKANER PG LINE-1-TIE-BIKANER II LILO LINE-3	765KV ICT-1-TIE - BIKANER-II LINE -2	765KV ICT-2-TIE - BIKANER-II LINE -1	400KV REACTOR-1 - TIE-400KV ICT-1	765KV ICT-3 -TIE-400KV ICT-2	FUTURE-TIE-400KV ICT-3	765KV ICT-4-TIE-400KV ICT-4	765KV ICT-5-TIE-400KV ICT-5	765KV ICT-6-TIE-400KV REACTOR-2	FUTURE BUS SECTIONALISER	400KV MAIN BUS 1	400KV MAIN BUS 2	Engineered Quantity Total (Nos)	Quantity as per BPS (Nos)	UNIT	REMARKS
Tension Hardware																					
A1	400 kV Double Tension Hardware without Turnbuckle suitable for Quad ACSR Bersimis Conductor	4H1	80	400KV TENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGSWITHOUT TURN BUCKLE SUITABLE FOR QUAD CONDUCTOR	6	6	12	12	6	12	6	12	12	12	6	–	–	102	126	Nos	Amendment required for 6 no. additional quantity
A2	400 kV Double Tension Hardware without Turnbuckle suitable for Quad AAC Bull Conductor	4H3			–	–	–	–	–	–	–	–	–	–	–	15	15	30		Nos	
A3	400 kV Double Tension Hardware with Turnbuckle suitable for Quad ACSR Bersimis Conductor	4H2	81	400KV TENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGSWITH TURN BUCKLE SUITABLE FOR QUAD CONDUCTOR	6	6	12	12	6	12	6	12	12	12	6	–	–	102	108	Nos	Amendment required for 42 no. additional quantity
A4	400 kV Double Tension Hardware with Turnbuckle suitable for Quad AAC Bull Conductor	4H4			–	–	–	–	–	–	–	–	–	–	–	15	15	30		Nos	
A5	400 kV Double Tension Hardware with Turnbuckle suitable for Quad ALS9-Moose	4H5			6	6	3	3	–	–	–	–	–	–	–	–	–	18		Nos	
A6	400 kV guy arrangement hardware with Turnbuckle suitable for ACSR Bersimis Conductor	4H6	–	NOT IN BPS	–	–	3	3	–	3	–	3	3	3	–	–	–	18	–	Nos	This is part of LS item
Suspension Hardware																					
A7	400 kV Single Suspension Hardware with Drop Clamp suitable for Quad ACSR Bersimis Conductor	4H7	82	400KV SUSPENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGSWITH DROP CLAMP SUITABLE FOR QUAD CONDUCTOR	6	6	6	6	6	6	3	6	6	6	–	3	3	63	63	Nos	
A8	401 kV Single Suspension Hardware with Through Clamp suitable for Quad ACSR Bersimis Conductor	4H8	83	400KV SUSPENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGSWITH THROUGH CLAMP SUITABLE FOR QUAD CONDUCTOR	–	–	3	3	–	3	–	3	3	3	–	–	–	18	42	Nos	
COMPOSITE LONG ROD POLYMER INSULATOR-400KV																					
B1	400KV COMPOSITE LONG ROD POLYMER INSULATOR - 31mm/kV, 120kN - For Tension Insulators	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	564	–	Nos	
B2	400KV COMPOSITE LONG ROD POLYMER INSULATOR - 31mm/kV, 120kN - For suspension Insulators	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	81	–	Nos	
B3	400KV COMPOSITE LONG ROD POLYMER INSULATOR - 31mm/kV, 120kN - For guy wire arrangement	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	36	–	Nos	

Bill of Quantity - String Insulators Hardware - Bikaner-III Station (220kV)

S.No	Engineering Description	Nomenclature	Sl. No. as per BPS	Description as per BPS	220KV SIDE OF ICT 1-TIE-LINE-1	BUS COUPLER-TIE-LINE-2	220KV SIDE OF ICT 2-TIE-LINE-3	220KV SIDE OF ICT 3-TIE-LINE-4	FUTURE-TIE-TBC-1	220KV SIDE OF ICT 4-TIE-TBC-2	220KV SIDE OF ICT 5-TIE-LINE-5	BUS COUPLER-2	220KV MAIN BUS 1	220KV MAIN BUS 2	220KV TRANSFER BUS	Engineered Quantity Total (Nos)	Quantity as per BPS (Nos)	UNIT	REMARKS
Tension Hardware																			
A1	220 kV Double Tension Hardware without Turnbuckle suitable for Quad ACSR Bersimis Conductor	2H1	94	220KV TENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGSWITHOUT TURN BUCKLE SUITABLE FOR QUAD CONDUCTOR	3	6	3	3	9	12	3	6	--	--	21	66	63	Nos	Amendment required for 30 no. additional quantity
A2	220 kV Double Tension Hardware without Turnbuckle suitable for Quad AAC Bull Conductor	2H3		220KV TENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGSWITHOUT TURN BUCKLE SUITABLE FOR QUAD CONDUCTOR	--	--	--	--	--	--	--	--	9	18	--	27		Nos	
A3	220 kV Double Tension Hardware with Turnbuckle suitable for Quad ACSR Bersimis Conductor	2H2	92	220KV TENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGS WITHTURN BUCKLE SUITABLE FOR QUAD CONDUCTOR	3	6	3	3	9	12	3	6			21	66	63	Nos	Amendment required for 30 no. additional quantity
A4	220 kV Double Tension Hardware with Turnbuckle suitable for Quad AAC Bull Conductor	2H4		220KV TENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGS WITHTURN BUCKLE SUITABLE FOR QUAD CONDUCTOR	--	--	--	--	--	--	--	--	9	18	--	27		Nos	
A5	220 kV Double Tension Hardware with Turnbuckle suitable for **Single/twin AL59 Moose Conductor** - Line Side	2H7	91	220KV TENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGS WITHTURN BUCKLE SUITABLE FOR TWIN CONDUCTOR	3	3	3	3	--	--	3	--	--	--	--	15	60	Nos	These quantities shall be finalised after receipt of type of conductor from POWERGRID
Suspension Hardware																			
A6	220 kV Single Suspension Hardware with **Drop Clamp** suitable for Twin ACSR Bersimis Conductor	2H5	95	220KV SUSPENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGSWITH DROP CLAMP SUITABLE FOR TWIN CONDUCTOR	5	2	5	5	--	3	5	--	6	6	3	40	33	Nos	Amendment required for 2 no. additional quantity
A7	220 kV Single Suspension Hardware with Drop Clamp suitable for **Quad AAC Bull** Conductor	2H6	97	220KV SUSPENSION INSULATOR STRING AND ASSOCIATED HARDWARE FITTINGSWITH DROP CLAMP SUITABLE FOR QUAD CONDUCTOR	--	--	--	--	--	--	--	--	6	6	--	12	12	Nos	
COMPOSITE LONG ROD POLYMER INSULATOR-220KV																			
B1	220KV COMPOSITE LONG ROD POLYMER INSULATOR - 31mm/kV, 120kN - For Tension Insulators	--	--	--	--	--	--	--	--	--	--	--	--	--	--	372	--	Nos	
B2	220KV COMPOSITE LONG ROD POLYMER INSULATOR - 31mm/kV, 120kN - For suspension Insulators	--	--	--	--	--	--	--	--	--	--	--	--	--	--	47	--	Nos	

पावरग्रिड POWERGRID

पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड
(भारत सरकार का उपक्रम)
POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Undertaking)

संदर्भ/Ref : CC-ENGG-TB202359-1002269-BS3480-CABTR-LAYOUT

Date : 28/01/2025

From : Somiran Das
Senior GM

To : Bharat Heavy Electricals Limited
Plot No.-7, Sector-142 Noida 201305
201305

Cc :

Subject : Substation Package SS-01 for (i) Establishment of 765/400/220kV Bikaner-III (New) Pooling Station including 400kV class Bus Reactor at Bikaner-III S/s; (ii) Extension of 765kV Neemrana-II S/s for termination of 765 kV D/c line Neemrana-II–Bikaner-III T/L and (iii) Extension of 400kV Bikaner-II S/s for termination of 400kV Bikaner-II Bikaner-III T/L under "Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1) (Bikaner Complex): PART-A"

LOA Ref : CC/T/W-AIS/DOM/A10/23/01956/NOA-1/24-102643/01 & 02 Dated 23/02/2024

Please find enclosed following drawings/ documents for necessary action at your end.

Vendor Drg. No.	:	TB-0-424-316-007
Orgn. Drg. No.	:	TB202359-1002269-BS3480-CABTR-LAYOUT
Revision No.	:	03
Drg. Title	:	BIKANER III NEW S/S-CABLE TRENCH LAYOUT
App. Category	:	CAT-I
Release Date	:	28/01/2025

Scan to verify

Comments : Generally in order.

अनुमोदित श्रेणी/App. Category:

I. फेब्रिकेशन/निर्माण/टाइप टेस्टिंग हेतु जारी।
Approved/released for fabrication/construction.

II. फेब्रिकेशन/निर्माण/टाइप टेस्टिंग हेतु अनुमोदित/जारी बशर्ते दिए गए टिप्पणियाँ एवं आशोधनों को सम्मिलित किया जाये। कृपया रिवाइज़ड दस्तावेज अनुमोदनार्थ प्रस्तुत करें।
Approved/released for fabrication/ construction subject to incorporation of comments and modification as noted. Revised drawing required for approval.

III. टिप्पणियाँ सम्मिलित करने के उपरांत दस्तावेज़ को अनुमोदनार्थ प्रस्तुत करें।
To be resubmitted for approval after incorporating the comments.

IV. सूचनार्थ एवं रिकार्ड हेतु।
For information and record.

CATREL/ REL-CON निर्माण हेतु जारी।
Released for construction.

नोट/Note:

1. Approval/Comments conveyed herein neither relieve the contractor of his contractual obligations and his responsibilities, weights, quantities, design details assemble fits, performance particulars and conformity of the supplies with the Indian Statutory Laws as may be applicable, nor does it limits the purchaser's right under the contract.
2. The approval conveyed vide this letter does not cover the approval of make for sub-vendor items.

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRG. NO. TB-0-424-316-007

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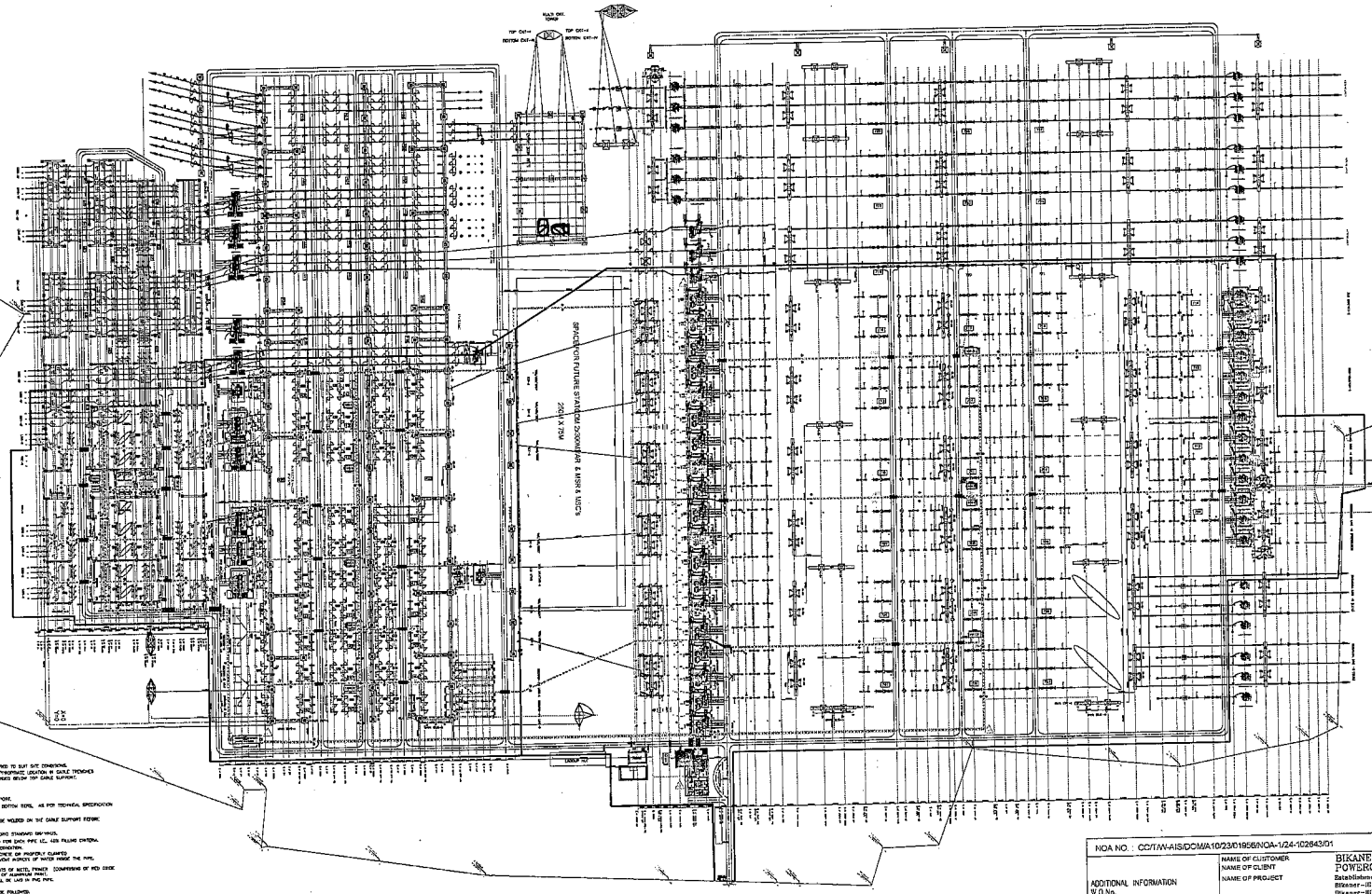
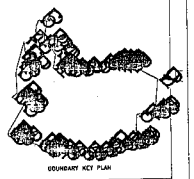
COMPUTER DRG. PATH NAME :

REF. DRG. NO.

SIGN. AND DATE

INVENTORY NO





NOTE:-

1. ALL DIMENSIONS ARE IN MM.
2. THE LOCATION OF CABLE TRENCHES MARKED IN THIS DWG MAY BE SLIGHTLY MODIFIED TO SUIT SITE CONDITIONS.
3. OPENINGS FOR TRANSITION PIPE FROM PIPES TO COMPONENTS SHALL BE PROVIDED AT APPROPRIATE LOCATION IN CABLE TRENCHES SIZE OF OPENING SHALL BE SLIGHTLY TO DIA. 50/10 MM MIN. SHALL BE PROVIDED BELOW TOP CABLE SUPPORT.
4. CABLES SHALL BE LAID IN MULTILAYER ON CABLE SUPPORT (MULTI)
5. CABLE SUPPORT SHALL BE PROVIDED AT EVERY 0.7m INTERVAL.
6. INSERTS MUST BE CHECKED AT EVERY 750mm INTERVAL FOR FIXING CABLE SUPPORT.
7. AUXILIARY POWER CABLES SHALL BE LAID IN TOP TIERS AND CONTROL CABLES IN BOTTOM TIERS. AS PER TECHNICAL SPECIFICATION
8. BURIED CABLES FOR LIGHTING PURPOSE SHALL BE AS PER LIGHTING LAYOUT.
9. EARTH CONDUCTOR 50x6 MM FLAT SHALL BE RUN ALONG THE TOP TIER AND TO BE WELDED ON THE CABLE SUPPORT FIXTURE INSTALLATION OF EARTH.
10. DETAILS OF CABLE TRENCHES AND ITS ROAD CROSSING SHALL BE AS PER POWERGRID STANDARD DWG NO.
11. FOR PIPES & CONDITS, SEWAGE PIPES SHALL BE USED CONSISTING 50% VOID FOR EACH PIPE I.E. 40% FILLING CRITERIA. ACCORDINGLY, ADDITIONAL PIPES (IF REQUIRED) WILL BE PROVIDED AS PER SITE CONDITION.
12. PVC PIPES SHALL BE SECURELY FIXED AT BOTH ENDS. OTHER CONDITIONS IN CONCRETE OR PROPERLY CLAMPED.
13. AFTER LAYING PVC CABLES, THE ENDS OF PIPES SHALL BE FINALLY SEALED TO PREVENT INGRESS OF WATER INSIDE THE PIPE.
14. CABLE TRENCH SHALL BE PROVIDED ON WHICHEVER BOX FIRST.
15. CABLE RACK AND SUPPORTS SHALL BE PAINTED WITH ZIN CHROMATE PRIMER (COMPRISING OF RED OXIDE ZINC CHROMATE, ALKYD TYPE) AND FINISHED WITH TWO COATS OF ALUMINIUM PAINT.
16. SUFFICIENT PULL OUT BOX SHALL BE PROVIDED IF REQUIRED, WHERE CABLE SHALL BE LAID IN PVC PIPE.
17. LONGITUDINAL SLOPE IN CABLE TRENCH SHALL BE AS PER CIVIL SPEC.
18. FOR ALL CIVIL WORKS EXCAVATION PROCEDURE APPROVED/REVISED DWGS SHALL BE FOLLOWED.
19. PROVISION FOR CONNECTING EARTH FLAT TO EXTERNAL EARTH GRID AT AN INTERVAL OF 30 METRE SHALL BE PROVIDED.
20. ALL CABLE TRENCH BUT CABLE TRENCH TO EQUIPMENT AND ALL INTERFACE CABLES (BOTH POWER & CONTROL) FOR ALL EQUIPMENT SHALL BE LAID IN PVC PIPE.
21. FIRING OPTICS CABLES SHALL RUN THROUGH 0.1 PIPES IN BOTTOM TIER OF TRENCH/AVOIDE DUCT. (100mm) (NO APPLICABLE)
22. THE PURPOSE OF TRENCH LAYOUT DRAWING IS FOR USE AS FOLLOWS: - TO BE USED AS CIVIL INPUT FOR CABLE TRENCHES. FOR EXCESS OF CABLE PIPES AT SITE. - FOR CABLE LAYING AND PULLING AT SITE.
23. ALL OTHER DETAILS PERTAINING TO CIVIL WORKS SHALL BE INTEGRATED IN THE RESPECTIVE CIVIL DRAWINGS.
24. ----------PROPOSED CABLES LAID IN PVC PIPES OF 50/100mm OUTER DIA AT DEPTH OF 300mm (MIN.) CABLE FROM EQUIPMENT TO CABLE TRENCH SHALL RUN IN PVC PIPES.
25. ▨▨▨▨▨ ANGLE PVC COVER.
26. ROAD BAY NO ARE MARKED FROM BAY-1 TO BAY-12, ADDNL BAY NO MARKED BAY-1 TO BAY-10
27. 220kV BAY NO MARKED BAY-01 TO BAY-13
28. TRENCH CROSSING DETAIL ARE INDICATIVE OF THE REQUIREMENT OF NO. OF PIPES, CONSTRUCTION DETAILS SHALL BE ACCORDING TO CIVIL DRAWING.
29. TRENCH CROSSING THROUGH CONDUIT OF TRANSFORMER/REACTOR IS SHOWN THROUGH CULVERT, NECESSARY DETAILS SHALL BE SHOWN IN CIVIL DRAWING.
30. TRENCH CROSSING THROUGH CABLE TRENCHES ROUTE, "RAILS TRACK" TO BE LAID AS PER K.T./RAILS TRACK" TO BE LAID AS PER K.T./RAILS TRACK.
31. 220/66 KV, 220/33 KV POWER TRANSFORMER, 66/11 KV-100MVA AT TRENCH CROSSING IN ROAD CROSSING AREA.
32. FILTER PLANT & CLEAR IS APPROX. OVERALL DIMENSIONS (L&B) OF CABLE TO BE LAID IN PIPES TRENCH, RETAIN, O.D. SHALL BE USED AT SITE FOR CABLE DURING.
33a. CLEARANCE BETWEEN POWER CABLE TO CONTROL CABLE SHALL BE 300mm AS PER IS 12926 1983.
33. MODULAR MULTI-PARAMETER CABLE MONITORING SYSTEM CONSISTING OF SENSORS, MODEM AND MONITORING SOFTWARE SHALL BE INSTALLED WHERE THE UNDERGROUND CABLE TRENCHES ARE PASSING THROUGH THE CABLE TRENCHES. THE DATA FROM A CENTRAL PRINTER IN THE CONTROL ROOM.
33. THE CABLE NO. IS MARKED BASED ON PHASE (YR) NO. - WORK (REGION) AND SHALL BE SPACED AT AN INTERVAL OF 30 METRES AND AT CHANGE OF DIRECTION. THE CABLE NO. SHALL BE 10-12-1 OR MORE. WHEN IT ROAD AND DRAIN CROSSINGS AS PER PREVIOUSLY DESIGNED.THE VOLTAGE GRADE OF CABLES SHALL BE DISPLAYED ON THE OUTER CABLE MARKERS SHALL BE GROUNDED IN A SUITABLE MANNER.

S.NO.	TRENCH SECTION	TRENCH LENGTH	LEGEND
1.	1-1	0.04 km (APPROX)	
2.	2-2	1.50 km (APPROX)	
3.	2A-2A	1.51 km (APPROX)	
4.	3-3	2.03 km (APPROX)	
5.	4-4	0.07 km (APPROX)	

Tentative location of CMB marked in Y phase of Each ICT/Reactor near to cable trench, however, exact location of same may be finalized at site based on actual site conditions

Power & Control Cable should not be laid in same PVC Pipe, same may be ensured at Site

No.	Date	Altered	Checked	Approved
03	17.01.2025	JBS	DR	SKS
01	25.11.24	SY	SS	SKS

ZONE: REVISED AS PER CUSTOMER COMMENTS DATED-17.01.2025

ZONE: REVISED AS PER CUSTOMER COMMENTS DATED-01.12.2024

ZONE: REVISED AS PER CUSTOMER COMMENTS DATED-11.10.24

NOA NO. : CC/TAN-AIS/DCM/A10/23/01956/NOA-1/24-102643/01

ADDITIONAL INFORMATION W.O.No.

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

NAME OF CUSTOMER

NAME OF CLIENT

NAME OF PROJECT: BIKANER-III NEEMRANA TRANSMISSION LIMITED POWERGRID CORPORATION OF INDIA LIMITED
Establishment of 6x500 MVA, 765/400 kV & 5x500 MVA 400/220 kV Bikaner-III Pooling Station (including 400kV, 5x125MVAR, reactor at Bikaner-III)

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP

	BY	SIGN	DATE
DRAWN	SY	-SGD-	05.10.24
CHKD CLIENT	SS	-SGD-	05.10.24
CHKD & APPROVED	SKS	-SGD-	05.10.24

POWERGRID DRAWING NO. TB202359-1002269-BS3480-CABTR-LAYOUT

DIV. / DEPT. / SEC. CODE

स्केल / SCALE

शीर्षक/TITLE: BIKANER III NEW S/S-CABLE TRENCH LAYOUT

DWG CODE

DRAWING NO. TB-0-424-316-007

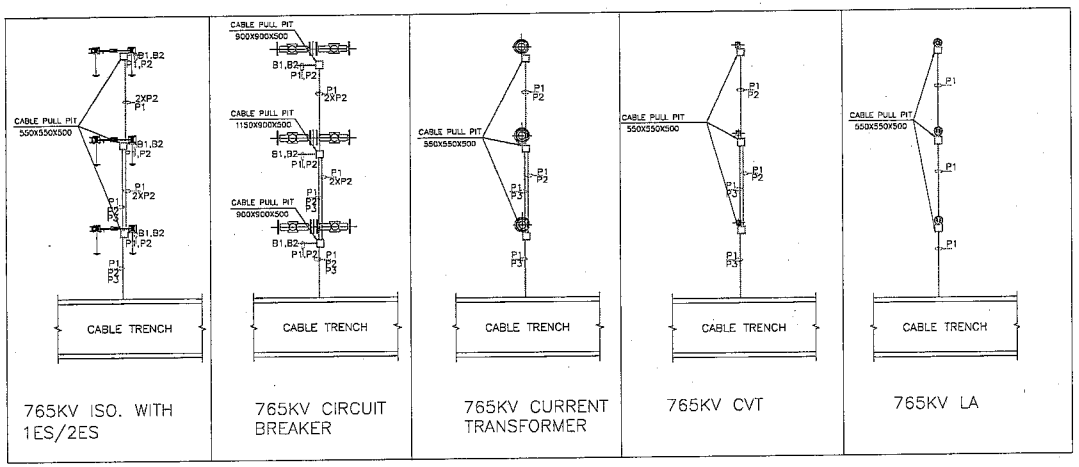
REV. 03

SHEET No. 01 / NEXT SHEET 02

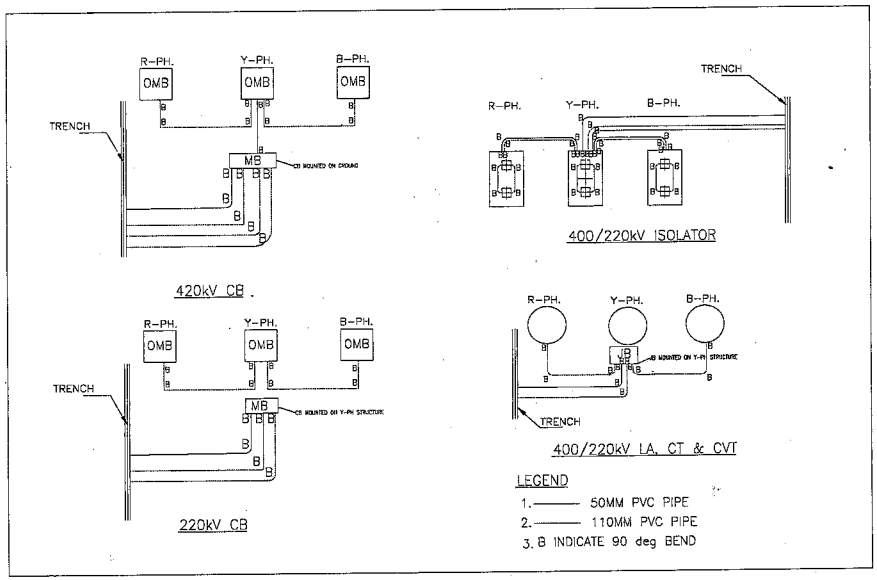
FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRG. NO. TB-0-424-316-007

765KV EQUIPMENTS TYPICAL CABLE TRENCH DETAILS



PVC PIPE DETAILS OF 400/220KV EQUIPMENTS



LEGENDS

- PVC PIPE ROUTING
- 2/3x ø PVC PIPE FOR REACTOR AND ICT MOM BOX.
- PULL CHAMBER
- ROAD/PIT CROSSING THROUGH CABLE CULVERT
- P1 1X50 MM ø PVC PIPE FOR POWER CABLE
- P2 1X110 MM ø PVC PIPE FOR CONTROL CABLE
- P3 1X200 MM ø PVC PIPE FOR CONTROL CABLE
- BMC BAY MARSHALLING KIOSK

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COMPUTER DRG. PART NAME :
REF. DRG. NO.
SIGN. AND DATE
INVENTORY NO

REV.	DATE	ALTERED	BY	REV.	DATE	ALTERED	BY	REV.	DATE	ALTERED	BY
03	17.01.2025	CHECKED	SS	02	27.12.2024	CHECKED	SS	01	25.11.24	CHECKED	SS
		APPROVED	SKS			APPROVED	SKS			APPROVED	SKS
ZONE	REVISED AS PER CUSTOMER COMMENTS DATED-10.01.2025			ZONE	REVISED AS PER CUSTOMER COMMENTS DATED-01.12.2024			ZONE	REVISED AS PER CUSTOMER COMMENTS DATED-11.10.24		

NOA NO. : CC/T/W-AIS/DOM/A10/23/01956/NOA-1/24-102643/01

ADDITIONAL INFORMATION W.O.No.

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

NAME OF CUSTOMER
NAME OF CLIENT
NAME OF PROJECT

BIKANER-III NEEMRANA TRANSMISSION LIMITED
POWERGRID CORPORATION OF INDIA LIMITED
Establishment of 8x500 MVA, 765/400 kV & 8x500 MVA 400/220 kV Bikaner-III Pooling Station (including 400kV, 2x125MVAR, reactor at Bikaner-III)

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP

तैयार किया DRAWN	BY	-SGD-	05.10.24
जांच किया CHECKED	SS	-SGD-	05.10.24
स्वीकृत अनुमोदित APPROVED	SKS	-SGD-	05.10.24

डि-सा DSPT. / सी.ए. CODE

उपयोग / SCALE

कार्ड कोड CARD CODE

शीर्षक/TITLE
BIKANER III NEW S/S-CABLE TRENCH LAYOUT

POWERGRID DRAWING NO.
TB202359-1002269-BS8480-CABTR-LAYOUT

पावरग्रिड ड्रा./DRAWING NO.
TB-0-424-316-007

पुन./REV.
03

पृष्ठ सं./SHEET No. 02 अगला पृष्ठ/NEXT SHEET --

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRG. NO. TB-0-424-316-005

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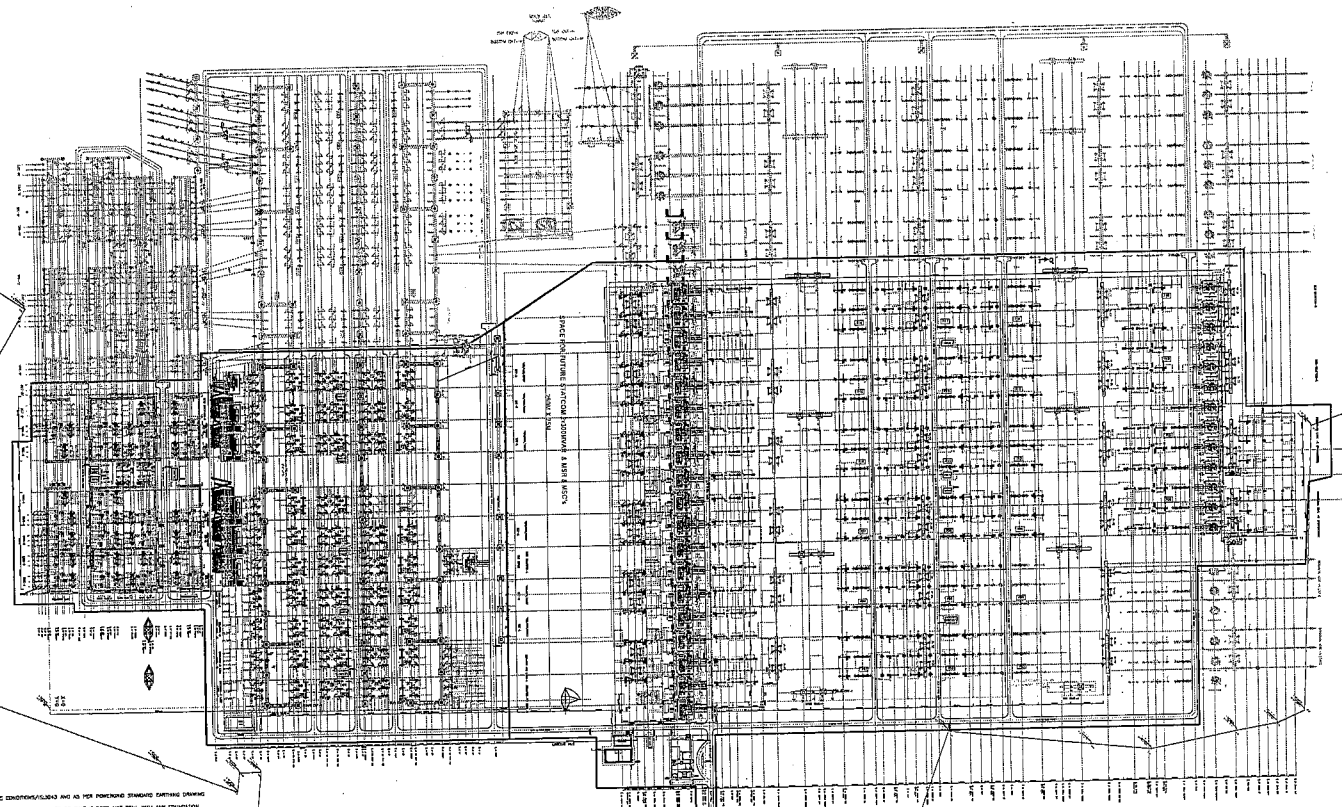
COMPUTER DRG. PATH NAME :

REF. DRG. NO.

SIGN. AND DATE

INVENTORY NO



BOUNDARY KEY PLAN

NOTES:

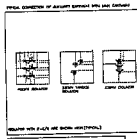
1. ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE SPECIFIED.
2. FOR PIPE AND ERS EARTHING THE MIN-ROD IS TO BE LAID 1500MM FROM THE WALL.
3. EQUIPMENT EARTHING CONNECTION ARE DIAGRAMATIC ONLY. HOWEVER ACTUAL CONNECTION SHALL BE DONE AS PER ACTUAL SITE CONDITIONS/IS3043 AND AS PER POWERGRID STANDARD EARTHING DRAWING NO: E/DWG/WB/EARTHING/01 ATTACHED WITH THE STANDARD ERECTION REV.10.
4. THIS DRAWING IS ONLY DIAGRAMATIC REPRESENTATION OF EARTHING CONNECTOR LAYOUT. AT SITE, THE CONNECTION SHALL BE DONE IN SUCH A MANNER SO THAT IT DOES NOT FOUL WITH ANY FOUNDATION, BUILDING, ETC.
5. ALL EQUIPMENTS, JUNCTION BOX, EQUIPMENT STRUCTURES, CONTROL METALLIC STAND IN PHASE, SCOPE SHALL BE CONNECTED WITH MAIN EARTHMAT TO DIFFERENT PARTS OF THE MATS WITH SHORTEST POSSIBLE POSSIBLE DISTANCE, ON ALTHOUGH THE MAIN BUS IS ORIENTED IN ONE IN EACH X & Y DIRECTION) WHETHER SHOWN IN DRAWING OR NOT. THERE SHALL BE CONNECTED TO DIFFERENT PARTS OF THE MATS WITH SHORTEST POSSIBLE
6. ALL TRANSFORMERS AND STRUCTURES EARTHING SHALL BE DONE AS PER TYPICAL EARTHING DRAWING.
7. WHERE EARTHING OF A STRUCTURE EARTHING SHALL BE DONE AS PER TYPICAL EARTHING DRAWING.
8. LOCATION OF MAIN EARTHMAT FOR SQUARES IS INDICATIVE, THE SAME SHALL BE PLACED AT SITE DEPENDING BELOW THE MAIN BUS. EACH AUXILIARY MAT SHALL BE CONNECTED TO MAIN MAT AT TWO POINTS AS
9. FOR POWERGRID STANDARD DRAWING NO: E/DWG/WB/EARTHMAT/01
10. EARTHING CONNECTIONS IN OUTDOOR AREAS SHALL BE BURIED AT LEAST 600 MM BELOW FINISHED GROUND LEVEL UNLESS STATED OTHERWISE.
11. WHEREVER EARTHING CONDUCTOR CROSSES CABLE TRENCHES, UNDERGROUND PIPES, TUNNELS, RAILWAY TRACKS ETC., IT SHALL BE LAID MINIMUM 300 MM BELOW THEM AND SHALL BE CONDUCTED IN CASE IT FOULS WITH EQUIPMENT FOUNDATIONS, FOUNDATIONS.
12. NON-CONNECTIONS FROM THE EARTHING GRID TO THE EQUIPMENT/STRUCTURE TO BE CARRIED SHALL BE TERMINATED ON THE EARTHING TERMINALS OF THE EQUIPMENT/STRUCTURE AS PER STANDARD EARTHING DETAILS = 3RD NO. E/DWG/WB/EARTHING/03 ATTACHED WITH THE STANDARD ERECTION REV.10.
13. EARTHING CONNECTIONS OR LEADS ALONG THEIR RUN ON CABLE TRENCH, LADDER, WALLS ETC. SHALL BE SUPPORTED BY SUITABLE WELDING/CLEATS AT INTERVALS OF 750 MM. WHEREVER IT PASSES THROUGH THE SLEEVES.
14. EARTHING CONNECTOR AROUND THE BUILDING SHALL BE BURIED IN EARTH AT A MINIMUM DISTANCE OF 1500 MM FROM THE OUTER BOUNDARY OF THE BUILDING.
15. EARTHING CONNECTORS CROSSING THE ROAD SHALL BE LAID 300 MM BELOW THE ROAD SURFACE OR AT GREATER DEPTH TO SUIT THE SITE CONDITIONS.
16. EARTHING CONNECTORS CROSSING THE ROAD SHALL BE LAID 300 MM BELOW THE ROAD SURFACE OR AT GREATER DEPTH TO SUIT THE SITE CONDITIONS.
17. EARTHING CONNECTION DIAGRAMS IN R.C.C. CONCRETE, STEEL/RCC COLUMNS, METALLIC STAIRS SHALL BE CONNECTED TO THE NEARBY EARTHING GRID CONNECTION BY TWO EARTHING ELECTRICAL CONTINUITY SHALL BE ENSURED IN SUCH A MANNER THAT ELECTRICAL CONTINUITY BETWEEN SECTIONS OF HAND-RAILS AND METALLIC STAIRS.
18. WHETHER SPECIFICALLY SHOWN OR NOT, ALL METALLIC STRUCTURES, EQUIPMENT, ETC. SHALL BE CONNECTED TO EARTHING CONDUCTORS AT REGULAR INTERVAL.
19. ALL EARTHING CONNECTIONS AND CABLE TRAY SECTIONS FOR CABLE INSTALLATION SHALL BE DONE TO ENSURE ELECTRICAL CONTINUITY AND CONNECTED TO EARTHING CONDUCTORS AT REGULAR INTERVAL. NEAR FROM WORKMANS CONNECTIONS, BEGINNING POINTS SHALL ALSO BE CONNECTED TO EARTHING SYSTEM.
20. METALLIC CONDUITS SHALL NOT BE USED AS EARTH CONTINUITY CONDUCTOR.
21. RAILWAY TRACKS WITHIN SWITCHYARD AREA SHALL BE EARTHED AT A DISTANCE OF 30M AND ALSO AT BOTH ENDS.
22. EARTHING CONDUCTOR SHALL BE BURIED 3000 MM OUTSIDE THE PERIPHERAL FENCE. ALL THE GATES AND EVERY ALTERNATE POST OF THE FENCE SHALL BE EARTHED AT BOTH ENDS.
23. SEAM & BARE MS FLATS SHALL BE PLACED ALL ALONG THE CABLE TRENCHES AND THE SAME SHALL BE WELDED TO EACH OF THE RACKS. TWO COATS OF ZINC CHROME PAINT.
24. EARTHING CONNECTOR SHALL BE BURIED 1500 MM OUTSIDE THE PERIPHERAL FENCE. ALL THE GATES AND EVERY ALTERNATE POST OF THE FENCE SHALL BE EARTHED AT BOTH ENDS AND ALSO AT 30 MTR. INTERVALS.
25. EARTHING CONNECTOR SHALL BE BURIED 1500 MM OUTSIDE THE PERIPHERAL FENCE. ALL THE GATES AND EVERY ALTERNATE POST OF THE FENCE SHALL BE EARTHED AT BOTH ENDS AND ALSO AT 30 MTR. INTERVALS.
26. SEAM & BARE MS FLATS SHALL BE PLACED ALL ALONG THE CABLE TRENCHES AND THE SAME SHALL BE WELDED TO EACH OF THE RACKS. TWO COATS OF ZINC CHROME PAINT.
27. EARTHING CONNECTOR SHALL BE BURIED 1500 MM OUTSIDE THE PERIPHERAL FENCE. ALL THE GATES AND EVERY ALTERNATE POST OF THE FENCE SHALL BE EARTHED AT BOTH ENDS AND ALSO AT 30 MTR. INTERVALS.
28. EARTHING CONNECTOR SHALL BE BURIED 1500 MM OUTSIDE THE PERIPHERAL FENCE. ALL THE GATES AND EVERY ALTERNATE POST OF THE FENCE SHALL BE EARTHED AT BOTH ENDS AND ALSO AT 30 MTR. INTERVALS.
29. EARTHING CONNECTOR SHALL BE BURIED 1500 MM OUTSIDE THE PERIPHERAL FENCE. ALL THE GATES AND EVERY ALTERNATE POST OF THE FENCE SHALL BE EARTHED AT BOTH ENDS AND ALSO AT 30 MTR. INTERVALS.
30. EARTHING CONNECTOR SHALL BE BURIED 1500 MM OUTSIDE THE PERIPHERAL FENCE. ALL THE GATES AND EVERY ALTERNATE POST OF THE FENCE SHALL BE EARTHED AT BOTH ENDS AND ALSO AT 30 MTR. INTERVALS.
31. EARTHING CONNECTOR SHALL BE BURIED 1500 MM OUTSIDE THE PERIPHERAL FENCE. ALL THE GATES AND EVERY ALTERNATE POST OF THE FENCE SHALL BE EARTHED AT BOTH ENDS AND ALSO AT 30 MTR. INTERVALS.
32. EARTHING CONNECTOR SHALL BE BURIED 1500 MM OUTSIDE THE PERIPHERAL FENCE. ALL THE GATES AND EVERY ALTERNATE POST OF THE FENCE SHALL BE EARTHED AT BOTH ENDS AND ALSO AT 30 MTR. INTERVALS.
33. EARTHING CONNECTOR SHALL BE BURIED 1500 MM OUTSIDE THE PERIPHERAL FENCE. ALL THE GATES AND EVERY ALTERNATE POST OF THE FENCE SHALL BE EARTHED AT BOTH ENDS AND ALSO AT 30 MTR. INTERVALS.

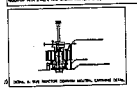
S.NO.	SYMBOL	ITEM DESCRIPTION	ENGGL. QUANTITY	LOA QUANTITY
1		40MM DIA. MS ROD EARTHMAT CONDUCTOR	22000 MTR	27000 MTR
2		PERIPHERAL ROD ELECTRODE WITHOUT PIT (3M LONG)	327 MTR (109 NO.)	
3		ROD EARTH ELECTRODE WITH TEST EARTH PIT (3M LONG)	945 MTR (315 NO.)	
4		40MM DIA. MS ROD FOR AUX. EARTHMAT (1006 NOS)	18105 MTR (APPROX.)	1 LOT.
5		40MM DIA. MS ROD FOR RISERS	75000 MTR	
6		40MM DIA. MS ROD FOR ICT/REACTOR RING	2700 MTR Δ	
7		PIPE ELECTRODE WITH TREATED EARTH PIT (3M LONG)	40 NO. Δ	

Δ TOTAL REQUIRED LENGTH IS MORE THAN ABOVE LENGTH BUT THE ACTUAL LENGTH TO BE PROVIDED WILL BE DECIDED BY THE EARTHING STUDY BASED ON ACTUAL SITE CONDITIONS.

Δ FOR PERIPHERAL ROD ELECTRODE WITHOUT PIT, ALL 315 NOS. ROD ELECTRODES TO BE PROVIDED ON ROAD SIDE AT EQUAL INTERVALS OF 2m.

TYPICAL CONNECTION OF AUXILIARY EARTHMAT WITH ROAD EARTHMAT





REV.	DATE	ALTERED	SY	REV.	DATE	ALTERED	SY	REV.	DATE	ALTERED	SY
		CHECKED	RS			CHECKED	RS			CHECKED	RS
03	17.01.25	APPROVED	SKS	02	08.01.25	APPROVED	SKS	01	22.11.24	APPROVED	SKS
ZONE	REVISED AS PER POWERGRID COMMENTS			ZONE	REVISED AS PER POWERGRID COMMENTS			ZONE	REVISED AS PER POWERGRID COMMENTS		

NOA NO : CC/TW-AIS/OOM/A10/23/01955/NOA-1/24-102643/01

ADDITIONAL INFORMATION
W.O.No.

STATUS OF DRAWING
DISTRIBUTION OF PRINTS

NAME OF CUSTOMER
NAME OF CLIENT
NAME OF PROJECT

BIKANER-III NEEMRANA TRANSMISSION LIMITED
POWERGRID CORPORATION OF INDIA LIMITED
Establishment of 6x500 MVA, 765/400 kV & 5x500 MVA 400/220 kV Bikaner-III Pooling Station (Including 400kV, 6x125MVAR, reactor at Bikaner-III)

भारत हैवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP

	नाम /NAME	हस्ताक्षर /SIGN.	दि./DATE
तैयार किया DRAWN	SY	-SD/-	12.09.24
जाँच CHECKED	RS	-SD/-	12.09.24
स्वीकृत APPROVED	SKS	-SD/-	12.09.24

अनुपात / SCALE
शहरी कोड CARD CODE

POWERGRID DRAWING NO.
TB202359-1002269-BS3480-EMAT-LAYOUT

शीर्षक/TITLE
BIKANER III NEW S/S- EARTHMAT LAYOUT DRGS

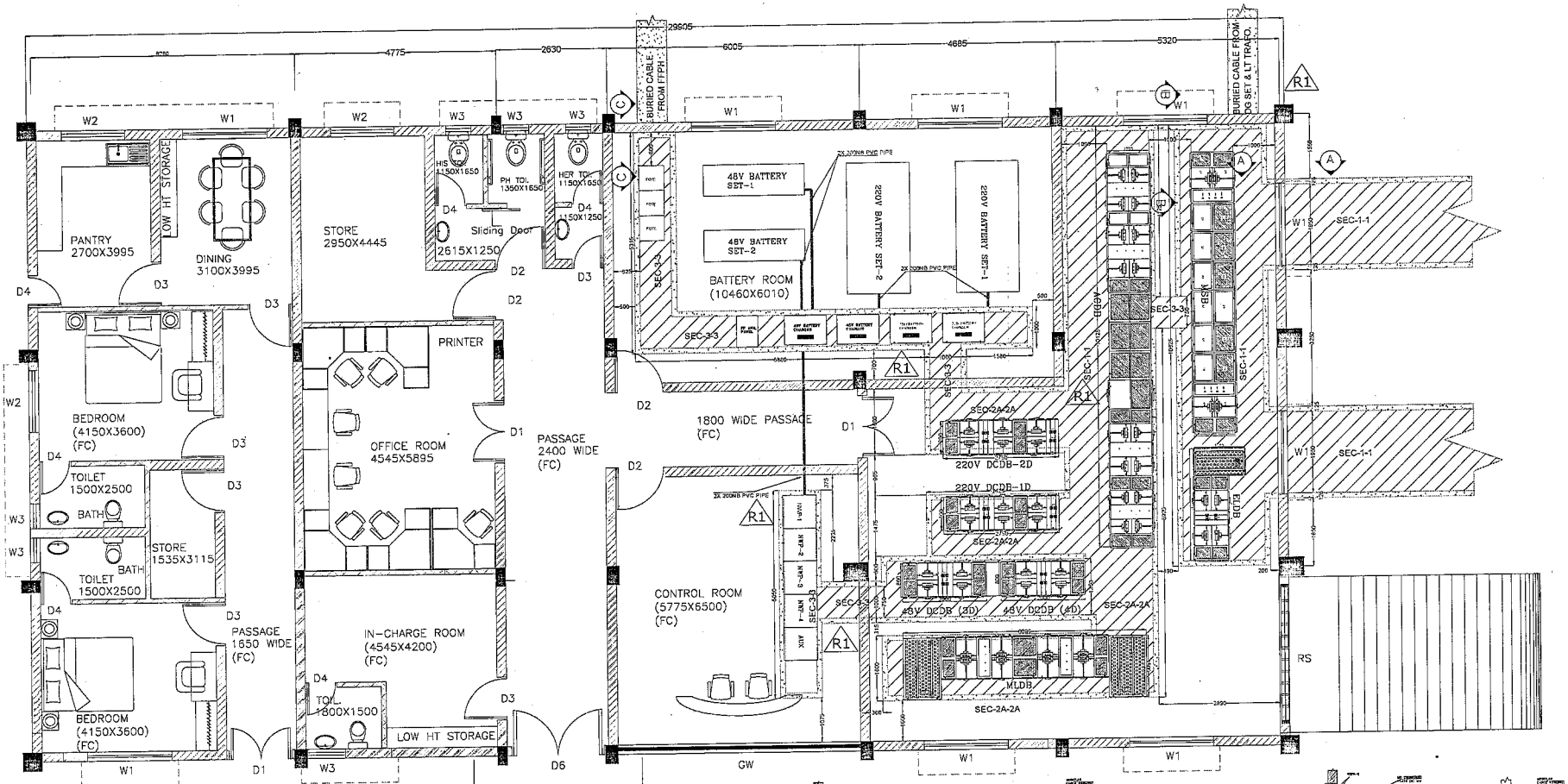
डॉ.सं./DRAWING NO. TB-0-424-316-005
संशो./REV. 03
पृष्ठ सं./SHEET No. 01 अगला पृष्ठ/NEXT SHEET ---

PROJECT TITLE	Establishment of 6X1500 MVA, 765/400 kV & 5X500 MVA 400/220 kV Bikaner-III Pooling Station (including 400kV, 2x125MVAR, reactor at Bikaner-III)
CUSTOMER	BIKANER III NEEMRANA TRANSMISSION LIMITED
CONSULTANT	POWERGRID CORPORATION OF INDIA LIMITED
EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED (BHEL)
REVIEW OF	BIKANER III NEW S/S- CONTROL ROOM BUILDING CABLE TRENCH LAYOUT

Sl. NO.	POWERGRID Comments dated 29/01/2025	BHEL reply dated 14/02/2025
1	This portion to be shifted on edge of wall and space to be kept between two Section for coridor, Section 1-1	incorporated
2	Pipe opening to be shown for buried cable trench	Cable will be crossing through cable transit system as per section-B, hence pipe opening not required.
3	MLDB is kept outside the cable trench, please align the same	incorporated
4	Section 3-3	incorporated
5	200 NB	incorporated

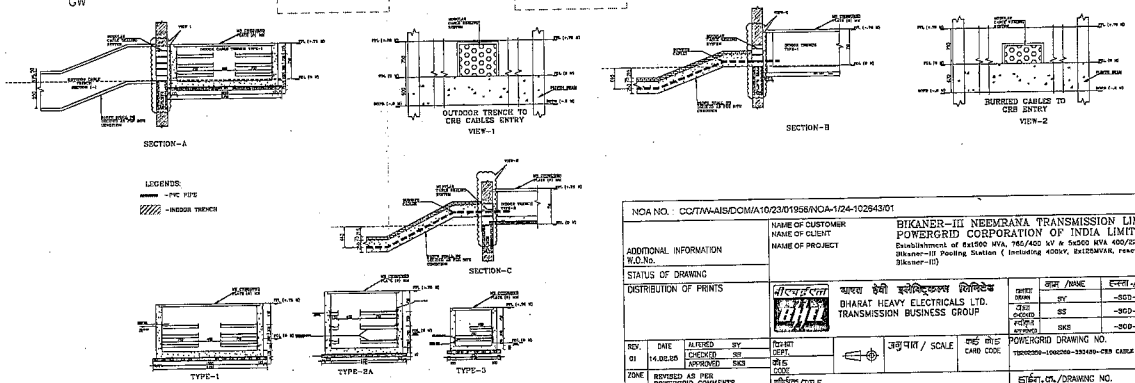
FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRG. NO. TB-2-424-316-009



REFERENCE DRAWINGS:

1. TB-2-424-316-105-CRB Rev.02 :- BIKANER III NEW S/S- CONTROL ROOM BUILDING PANEL ARRANGEMENT LAYOUT.
2. TB-0-424-316-007 Rev.02 :- BIKANER III NEW S/S--CABLE TRENCH LAYOUT



NOA NO. : CO/TW-AIS/DOM/A10/23/01958/NOA-1/24-102643/01

ADDITIONAL INFORMATION W.O.No.	NAME OF CUSTOMER NAME OF CLIENT NAME OF PROJECT	BIKANER-III NEEMRANA TRANSMISSION LIMITED POWERGRID CORPORATION OF INDIA LIMITED Establishment of 6x1500 MVA, 765/400 kV & 5x500 MVA 400/220 kV Bikaner-III Pooling Station (Including 400kV, 6x125MVAR, Reactor at Bikaner-III)
STATUS OF DRAWING		
DISTRIBUTION OF PRINTS	भारत हेवी इलेक्ट्रिकल्स लिमिटेड BHEL BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP	

	नाम /NAME	हस्ता./SIGN.	दि./DATE
तैयार DRAWN	SY	-SD-	16.01.25
जाँचा CHECKED	SS	-SD-	16.01.25
स्वीकृत APPROVED	SKS	-SD-	16.01.25

REV.	DATE	ALTERED	SY.
01	14.02.25	CHECKED	SS
		APPROVED	SKS
ZONE	REVISED AS PER POWERGRID COMMENTS		

टि०-मि० DEPT. | कोड CODE | अनुपात / SCALE | कार्ड कोड CARD CODE

POWERGRID DRAWING NO. TB0000-100000-330480-CRB CABLE TRENCH LAYOUT

शीर्षक/TITLE: BIKANER III NEW S/S- CONTROL ROOM BUILDING CABLE TRENCH LAYOUT

ड्रॉ.सं./DRAWING NO. TB-2-424-316-009 | पुना/REV. 01

पृष्ठ सं./SHEET No. | अगला पृष्ठ/NEXT SHEET

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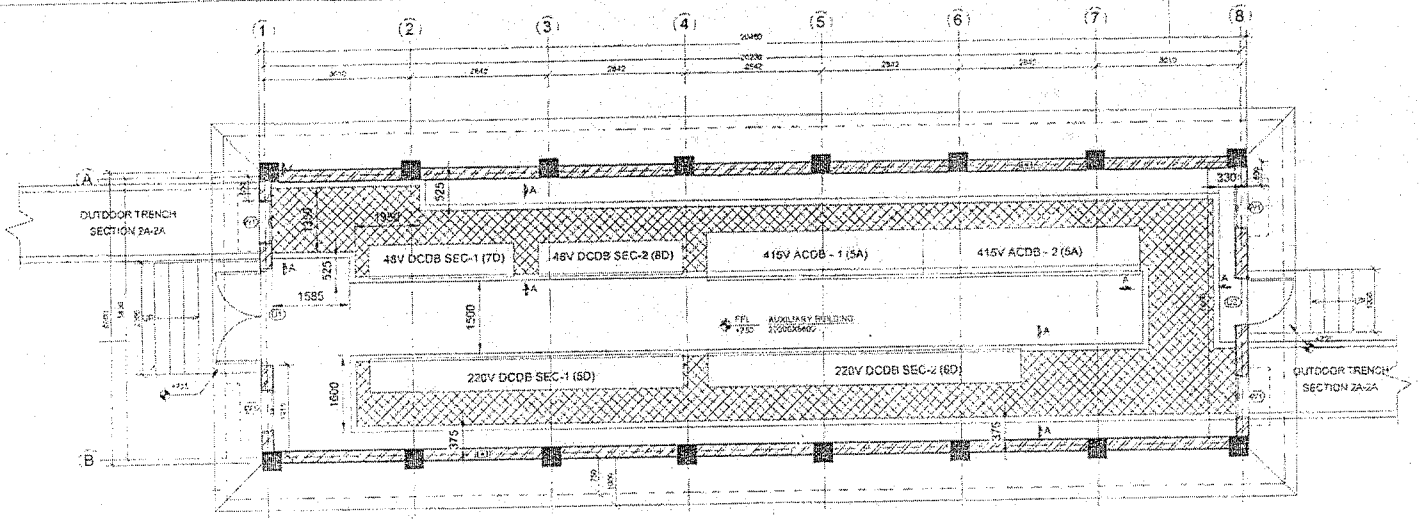
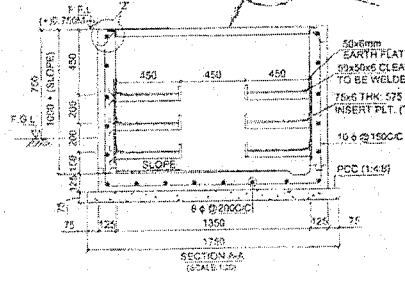
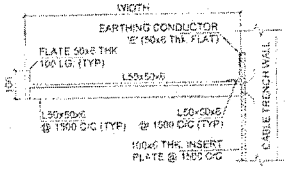
COMPUTER DRG. PATH NAME : | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

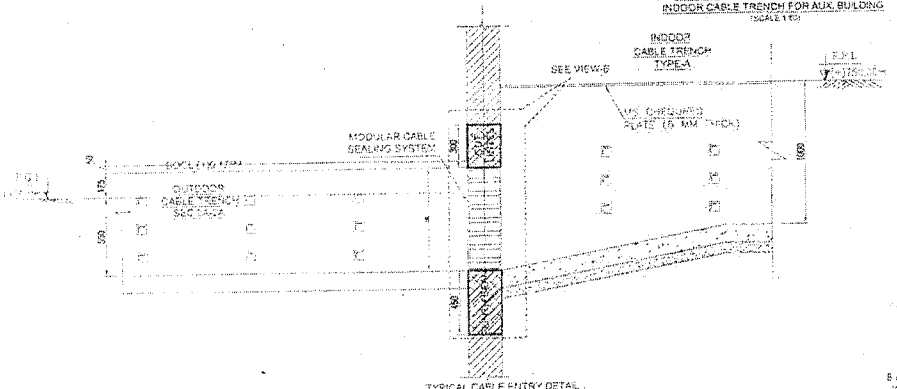


LAYOUT AND DETAILS OF GRADE SLAB INDOOR CABLE TRENCH FOR AUX. BUILDING
(SCALE 1:50)

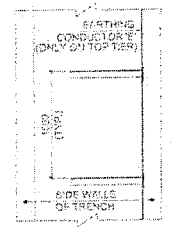




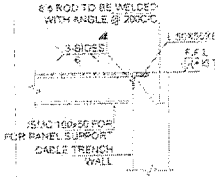
TYPICAL CABLE SUPPORT
(FOR ONE SIDE WALL)
(SCALE 1:10)



TYPICAL CABLE ENTRY DETAIL
(SCALE 1:20)



PLAN OF CABLE TRAY SUPPORT FOR CABLE TRENCH SECTION 2-2 & 3-3
(COVER NOT SHOWN FOR CLARITY)
(SCALE 1:20)

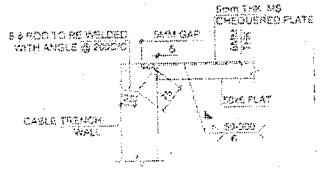


(#) TYPICAL ARRANGEMENT OF TRENCH COVER
(FOR PORTION OF TRENCH COVERED BY PANELS)
(SCALE 1:10)

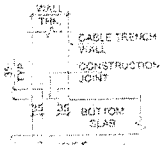
NOTES:-

LEGENDS:-

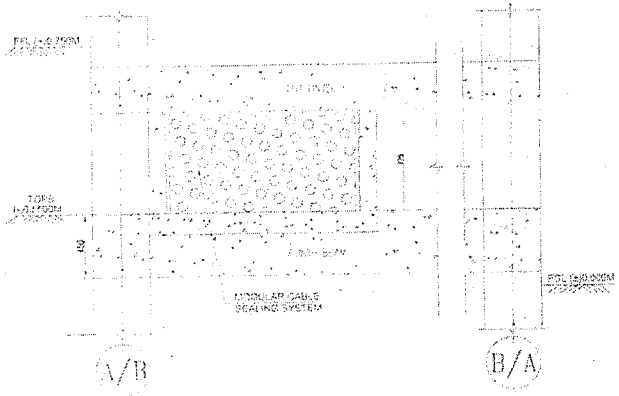
REFERENCE DRAWINGS:-

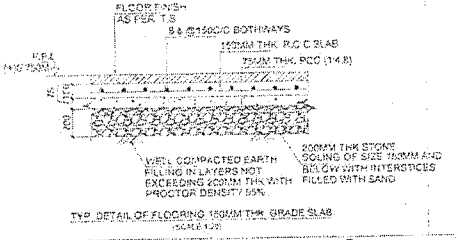


(#) DETAIL-2' TYPICAL DETAIL OF CHEQUERED PLATE SUPPORT NOT COVERED BY PANELS
(SCALE 1:10)



TYPICAL DETAIL OF CONSTRUCTION JOINT
(SCALE 1:10)





TYP. DETAIL OF FLOORING 150MM THK. GRADE SLAB
(SCALE 1:20)

POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

POWERGRID

PROJECT:
SUBSTATION PACKAGE SS-01 FOR (I) ESTABLISHMENT OF 765/400/220KV BIKANER-III (NEW) POOLING STATION INCLUDING 400KV CLASS BUS REACTOR AT BIKANER-III S/S; (II) EXTENSION OF 765KV NEEMBIANA-II S/S FOR TERMINATION OF 765 KV D/C LINE NEEMRANA-II-BIKANER-III T/L AND (III) EXTENSION OF 400KV BIKANER-II S/S FOR TERMINATION OF 400KV BIKANER-II BIKANER-III T/L UNDER "TRANSMISSION SYSTEM FOR EVACUATION OF POWER FROM RAJASTHAN SEZ PH-IV (PART-1) (BIKANER COMPLEX): PART-A"

TITLE:
REF. DETAILS OF GRADE SLAB AND INDOOR CABLE TRENCHES FOR AUXILIARY BUILDING

DRAWING NO.: C/ENG/NRI/BIKANER-III/SS01/BIB CAB TRENCH/01

SCALE	SIZE	REV.
NTS	A1	1

पावरग्रिड
POWERGRID

पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड
(भारत सरकार का उपक्रम)
POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

संदर्भ/Ref : CC-ENGG-TB202359-1002269-SS3480-LTSWR-DRG

Date : 18/02/2025

From : Somiran Das
Senior GM

To : Bharat Heavy Electricals Limited
Plot No.-7, Sector-142 Noida 201305
201305

Cc :

Subject : Substation Package SS-01 for (i) Establishment of 765/400/220kV Bikaner-III (New) Pooling Station including 400kV class Bus Reactor at Bikaner-III S/s; (ii) Extension of 765kV Neemrana-II S/s for termination of 765 kV D/c line Neemrana-II–Bikaner-III T/L and (iii) Extension of 400kV Bikaner-II S/s for termination of 400kV Bikaner-II Bikaner-III T/L under "Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1) (Bikaner Complex): PART-A"

LOA Ref : CC/T/W-AIS/DOM/A10/23/01956/NOA-1/24-102643/01 & 02 Dated 23/02/2024

Please find enclosed following drawings/ documents for necessary action at your end.

Vendor Drg. No.	:	USL/PGCIL/BHEL/2024-2025/1241A
Orgn. Drg. No.	:	TB202359-1002269-SS3480-LTSWR-DRG
Revision No.	:	00
Drg. Title	:	BIKANER III NEW S/S- LT SWITCHGEAR - DRGS
App. Category	:	CAT-I
Release Date	:	18/02/2025

Scan to verify

Comments : Generally in order with minor comments

अनुमोदित श्रेणी/App. Category:

I. फेब्रिकेशन/निर्माण/टाइप टेस्टिंग हेतु जारी।
Approved/released for fabrication/construction.

II. फेब्रिकेशन/निर्माण/टाइप टेस्टिंग हेतु अनुमोदित/जारी बशर्ते दिए गए टिप्पणियों एवं अशोधनों को सम्मिलित किया जाये। कृपया रिवाइज्ड ड्राइंग अनुमोदनार्थ प्रस्तुत करें।
Approved/released for fabrication/ construction subject to incorporation of comments and modification as noted. Revised drawing required for approval.

III. टिप्पणियाँ सम्मिलित करने के उपरांत ड्राइंग को अनुमोदनार्थ प्रस्तुत करें।
To be resubmitted for approval after incorporating the comments.

IV. सूचनार्थ एवं रिकार्ड हेतु।
For information and record.

CATREL/ REL-CON निर्माण हेतु जारी।
Released for construction.

नोट/Note:

1. Approval/Comments conveyed herein neither relieve the contractor of his contractual obligations and his responsibilities, weights, quantities, design details assemble fits, performance particulars and conformity of the supplies with the Indian Statutory Laws as may be applicable, nor does it limits the purchaser's right under the contract.

2. The approval conveyed vide this letter does not cover the approval of make for sub-vendor items.

CLIENT	POWER GRID CORPORATION OF INDIA LIMITED.
CONTRACTOR	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
PROJECT NAME	765/400/220kV BIKANER-III POOLING STATION
CA NO.	CC/T/W-A6/DOM/A10/73/01956/NOA-1/24-102643/01 & 02 DATED 23.02.2024
VENDOR NAME	ULTIMA SWITCHGEARS LTD.
DOC NAME	DRG - ANNEXURE
DOC NO	USL/PGCIL/BHEL/2024-2025/1241A

S.NO.	DRG NO.	ITEM DESCRIPTION	NO. OF SHEET	REV.	PGCIL Approval Reference	REMARKS
		DRAWINGS DETAILS FOR 415V MAIN SWITCH BOARD (1A) (MCRB)				
1	USL/PGCIL/BHEL/2024-2025/1241A-001	COVER SHEET	1	0	PROJECT SPECIFIC	Submitted for Project Specific approval for this Project
2	USL/PGCIL/BHEL/2024-2025/1241A-101	GENERAL ARRANGEMENT DRAWING	3	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-201	SINGLE LINE DIAGRAM	4	0		
4	USL/PGCIL/BHEL/2024-2025/1241A-501	SCHEMATIC DRAWING OF ACB OUTGOING FEEDER	1	0		
5	USL/PGCIL/BHEL/2024-2025/1241A-701	BILL OF MATERIAL	6	0		
6		GENERAL TECHNICAL SPECIFICATIONFOR ALL PANEL	25	3	ALREADY APPROVED VIDE LETTER NO. CC-ENGG-TB202313-1001964-SS3420-LTSWR-DRG DATED 06.05.2024	Submitted for Extension of Approval for this Project
7		ELECTRICAL SYMBOL FOR ALL PANEL				
8		KEY LINE DIAGRAM FOR MSB & ACDB				
9		SCHEMATIC DRAWING FOR 415V MAIN SWITCHBOARD (MSB)				
		DRAWINGS DETAILS FOR 415V AC DISTRIBUTION BOARD (2A) (MCRB)				
1	USL/PGCIL/BHEL/2024-2025/1241A-002	COVER SHEET	1	0	PROJECT SPECIFIC	Submitted for Project Specific approval for this Project
2	USL/PGCIL/BHEL/2024-2025/1241A-102	GENERAL ARRANGEMENT DRAWING	5	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-202	SINGLE LINE DIAGRAM	12	0		
4	USL/PGCIL/BHEL/2024-2025/1241A-702	BILL OF MATERIAL	6	0		
5		GENERAL TECHNICAL SPECIFICATIONFOR ALL PANEL	25	3	ALREADY APPROVED VIDE LETTER NO. CC-ENGG-TB202313-1001964-SS3420-LTSWR-DRG DATED 06.05.2024	Submitted for Extension of Approval for this Project
6		ELECTRICAL SYMBOL FOR ALL PANEL				
7		KEY LINE DIAGRAM FOR MSB & ACDB				
8		SCHEMATIC DRAWING FOR 415V AC DISTRIBUTION BOARD (ACDB)				

S.NO.	DRG NO.	ITEM DESCRIPTION	NO. OF SHEET	REV.	PGCIL Approval Reference	REMARKS
DRAWINGS DETAILS FOR 415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCRB)						
1	USL/PGCIL/BHEL/2024-2025/1241A-003	COVER SHEET	1	0	PROJECT SPECIFIC	Submitted for Project Specific approval for this Project
2	USL/PGCIL/BHEL/2024-2025/1241A-103	GENERAL ARRANGEMENT DRAWING	3	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-203	SINGLE LINE DIAGRAM	7	0		
4	USL/PGCIL/BHEL/2024-2025/1241A-703	BILL OF MATERIAL	3	0		
5		GENERAL TECHNICAL SPECIFICATIONFOR ALL PANEL	12	3	ALREADY APPROVED VIDE LETTER NO. CC-ENGG-TB202313-1001964-SS3420-LTSWR-DRG DATED 05.05.2024	Submitted for Extension of Approval for this Project
6		ELECTRICAL SYMBOL FOR ALL PANEL				
7		SCHEMATIC DRAWING FOR 415V MAIN LIGHTING DISTRIBUTION BOARD				
DRAWINGS DETAILS FOR 415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (MCRB)						
1	USL/PGCIL/BHEL/2024-2025/1241A-004	COVER SHEET	1	0	PROJECT SPECIFIC	Submitted for Project Specific approval for this Project
2	USL/PGCIL/BHEL/2024-2025/1241A-104	GENERAL ARRANGEMENT DRAWING	3	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-204	SINGLE LINE DIAGRAM	3	0		
4	USL/PGCIL/BHEL/2024-2025/1241A-704	BILL OF MATERIAL	2	0		
5		GENERAL TECHNICAL SPECIFICATIONFOR ALL PANEL	11	3	ALREADY APPROVED VIDE LETTER NO. CC-ENGG-TB202313-1001964-SS3420-LTSWR-DRG DATED 05.05.2024	Submitted for Extension of Approval for this Project
6		ELECTRICAL SYMBOL FOR ALL PANEL				
7		SCHEMATIC DRAWING FOR 415V EMERGENCY LIGHTING DISTRIBUTION BOARD				
DRAWINGS DETAILS FOR 220V DC DISTRIBUTION BOARD-1 (1D) (MCRB)						
1	USL/PGCIL/BHEL/2024-2025/1241A-005	COVER SHEET	1	0	PROJECT SPECIFIC	Submitted for Project Specific approval for this Project
2	USL/PGCIL/BHEL/2024-2025/1241A-105	GENERAL ARRANGEMENT DRAWING	2	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-205	SINGLE LINE DIAGRAM	5	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-505	SCHEMATIC DRAWING	3	0		
4	USL/PGCIL/BHEL/2024-2025/1241A-705	BILL OF MATERIAL	2	0		
5		GENERAL TECHNICAL SPECIFICATIONFOR ALL PANEL	5	3	ALREADY APPROVED VIDE LETTER NO. CC-ENGG-TB202313-1001964-SS3420-LTSWR-DRG DATED 05.05.2024	Submitted for Extension of Approval for this Project
6		ELECTRICAL SYMBOL FOR ALL PANEL				

S.NO.	DRG NO.	ITEM DESCRIPTION	NO. OF SHEET	REV.	PGCIL Approval Reference	REMARKS
DRAWINGS DETAILS FOR 220V DC DISTRIBUTION BOARD-2 (2D)(MCRB)						
1	USL/PGCIL/BHEL/2024-2025/1241A-006	COVER SHEET	1	0	PROJECT SPECIFIC	Submitted for Project Specific approval for this Project
2	USL/PGCIL/BHEL/2024-2025/1241A-106	GENERAL ARRANGEMENT DRAWING	2	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-206	SINGLE LINE DIAGRAM	5	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-506	SCHEMATIC DRAWING	3	0		
4	USL/PGCIL/BHEL/2024-2025/1241A-706	BILL OF MATERIAL	2	0		
5		GENERAL TECHNICAL SPECIFICATIONFOR ALL PANEL	5	3	ALREADY APPROVED VIDE LETTER NO. CC-ENGG-TB202313-1001964-SS3420-LTSWR-DRG DATED 06.05.2024	Submitted for Extension of Approval for this Project
6		ELECTRICAL SYMBOL FOR ALL PANEL				
DRAWINGS DETAILS FOR 48V DC DISTRIBUTION BOARD-1 (3D)(MCRB)						
1	USL/PGCIL/BHEL/2024-2025/1241A-007	COVER SHEET	1	0	PROJECT SPECIFIC	Submitted for Project Specific approval for this Project
2	USL/PGCIL/BHEL/2024-2025/1241A-107	GENERAL ARRANGEMENT DRAWING	1	0		
	USL/PGCIL/BHEL/2024-2025/1241A-207	SINGLE LINE DIAGRAM	3	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-507	SCHEMATIC DRAWING	3	0		
4	USL/PGCIL/BHEL/2024-2025/1241A-707	BILL OF MATERIAL	2	0		
5		GENERAL TECHNICAL SPECIFICATIONFOR ALL PANEL	5	3	ALREADY APPROVED VIDE LETTER NO. CC-ENGG-TB202313-1001964-SS3420-LTSWR-DRG DATED 06.05.2024	Submitted for Extension of Approval for this Project
6		ELECTRICAL SYMBOL FOR ALL PANEL				
DRAWINGS DETAILS FOR 48V DC DISTRIBUTION BOARD-2 (4D)(MCRB)						
1	USL/PGCIL/BHEL/2024-2025/1241A-008	COVER SHEET	1	0	PROJECT SPECIFIC	Submitted for Project Specific approval for this Project
2	USL/PGCIL/BHEL/2024-2025/1241A-108	GENERAL ARRANGEMENT DRAWING	1	0		
	USL/PGCIL/BHEL/2024-2025/1241A-208	SINGLE LINE DIAGRAM	3	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-508	SCHEMATIC DRAWING	3	0		
4	USL/PGCIL/BHEL/2024-2025/1241A-708	BILL OF MATERIAL	2	0		
5		GENERAL TECHNICAL SPECIFICATIONFOR ALL PANEL	5	3	ALREADY APPROVED VIDE LETTER NO. CC-ENGG-TB202313-1001964-SS3420-LTSWR-DRG DATED 06.05.2024	Submitted for Extension of Approval for this Project
6		ELECTRICAL SYMBOL FOR ALL PANEL				

S.NO.	DRG NO.	ITEM DESCRIPTION	NO. OF SHEET	REV.	PGCIL Approved Reference	REMARKS
DRAWINGS DETAILS FOR 415V AC DISTRIBUTION BOARD (5A) (AB)						
1	USL/PGCIL/BHEL/2024-2025/1241A-009	COVER SHEET	1	0	PROJECT SPECIFIC	Submitted for Project Specific approval for this Project
2	USL/PGCIL/BHEL/2024-2025/1241A-900	GENERAL TECHNICAL SPECIFICATION	1	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-000-09	ELECTRICAL SYMBOL FOR ALL PANEL	1	0		
4	USL/PGCIL/BHEL/2024-2025/1241A-109	GENERAL ARRANGEMENT DRAWING	3	0		
5	USL/PGCIL/BHEL/2024-2025/1241A-209	SINGLE LINE DIAGRAM	13	0		
6	USL/PGCIL/BHEL/2024-2025/1241A-509-00	KEY LINE DIAGRAM	1	0		
7	USL/PGCIL/BHEL/2024-2025/1241A-509	SCHEMATIC DIAGRAM	3	0		
8	USL/PGCIL/BHEL/2024-2025/1241A-709	BILL OF MATERIAL	1	0		
DRAWINGS DETAILS FOR 220V DC DISTRIBUTION BOARD-1 (5D) & 2(6D) (AB)						
1	USL/PGCIL/BHEL/2024-2025/1241A-010	COVER SHEET	1	0	PROJECT SPECIFIC	Submitted for Project Specific approval for this Project
2	USL/PGCIL/BHEL/2024-2025/1241A-1000	GENERAL TECHNICAL SPECIFICATION	1	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-000-10	ELECTRICAL SYMBOL FOR ALL PANEL	1	0		
4	USL/PGCIL/BHEL/2024-2025/1241A-110	GENERAL ARRANGEMENT DRAWING	2	0		
5	USL/PGCIL/BHEL/2024-2025/1241A-210	SINGLE LINE DIAGRAM	10	0		
6	USL/PGCIL/BHEL/2024-2025/1241A-510	SCHEMATIC DIAGRAM	1	0		
7	USL/PGCIL/BHEL/2024-2025/1241A-710	BILL OF MATERIAL	1	0		
DRAWINGS DETAILS FOR 48V DC DISTRIBUTION BOARD-1(7D) & 2(8D) (AB)						
1	USL/PGCIL/BHEL/2024-2025/1241A-011	COVER SHEET	1	0	PROJECT SPECIFIC	Submitted for Project Specific approval for this Project
2	USL/PGCIL/BHEL/2024-2025/1241A-1100	GENERAL TECHNICAL SPECIFICATION	1	0		
3	USL/PGCIL/BHEL/2024-2025/1241A-000-11	ELECTRICAL SYMBOL FOR ALL PANEL	1	0		
4	USL/PGCIL/BHEL/2024-2025/1241A-111	GENERAL ARRANGEMENT DRAWING	2	0		
5	USL/PGCIL/BHEL/2024-2025/1241A-211	SINGLE LINE DIAGRAM	4	0		
6	USL/PGCIL/BHEL/2024-2025/1241A-511	SCHEMATIC DIAGRAM	1	0		
7	USL/PGCIL/BHEL/2024-2025/1241A-711	BILL OF MATERIAL	1	0		

This Drawing & information or descriptive matter set out herein are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing,rendering or for any other purpose without their permission.

ENGINEERING DRAWING DETAILS FOR

415V MAIN SWITCH BOARD (1A) (MCRB)

PROJECT :- 765/400/220kV BIKANER-III POOLING STATION

CLIENT :- POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR :- BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP
CHKD.	VDP
APPD.	--
ALL DIMENSIONS IN mm.	SIGN.
TOLERANCE 5%	
REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-68 & F-69, IPHB-C, LUKSAR, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	COVER PAGE
TITLE	415V MAIN SWITCH BOARD (1A) (MCRB)
CA NO.	CC/T/W-HD/DOM/016/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BIKANER-III POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DWG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-001
JOB NO.	1241A
SH. NO.	01 OF 01

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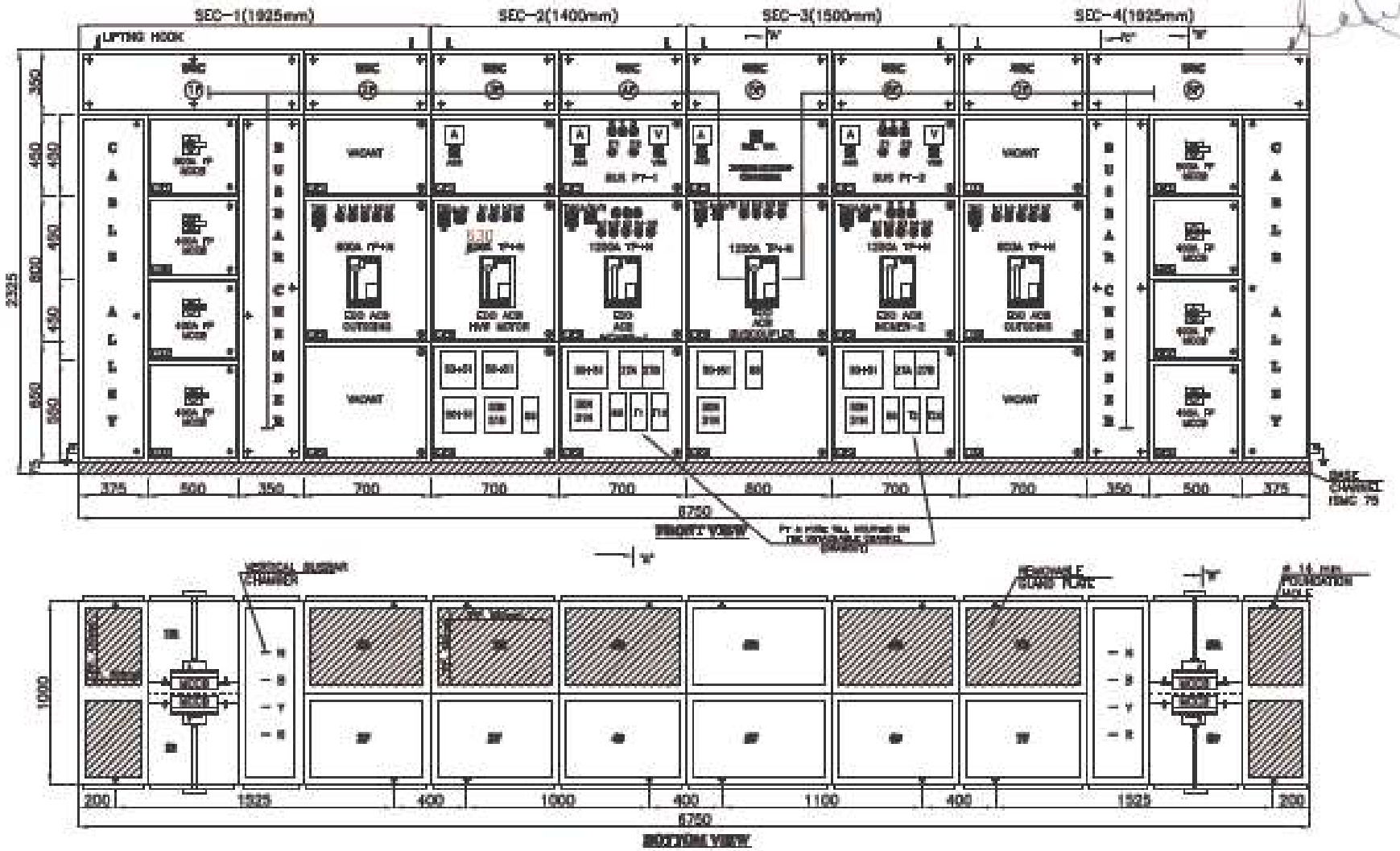

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BHD. AMBA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-8 & F-9, IPHB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V MAIN SWITCH BOARD (1A) (MCSB)
CA NO.	CC/T/W-HS/DOM/318/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DWG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-101

JOB NO. 1241A

SH. NO. 01 OF 03

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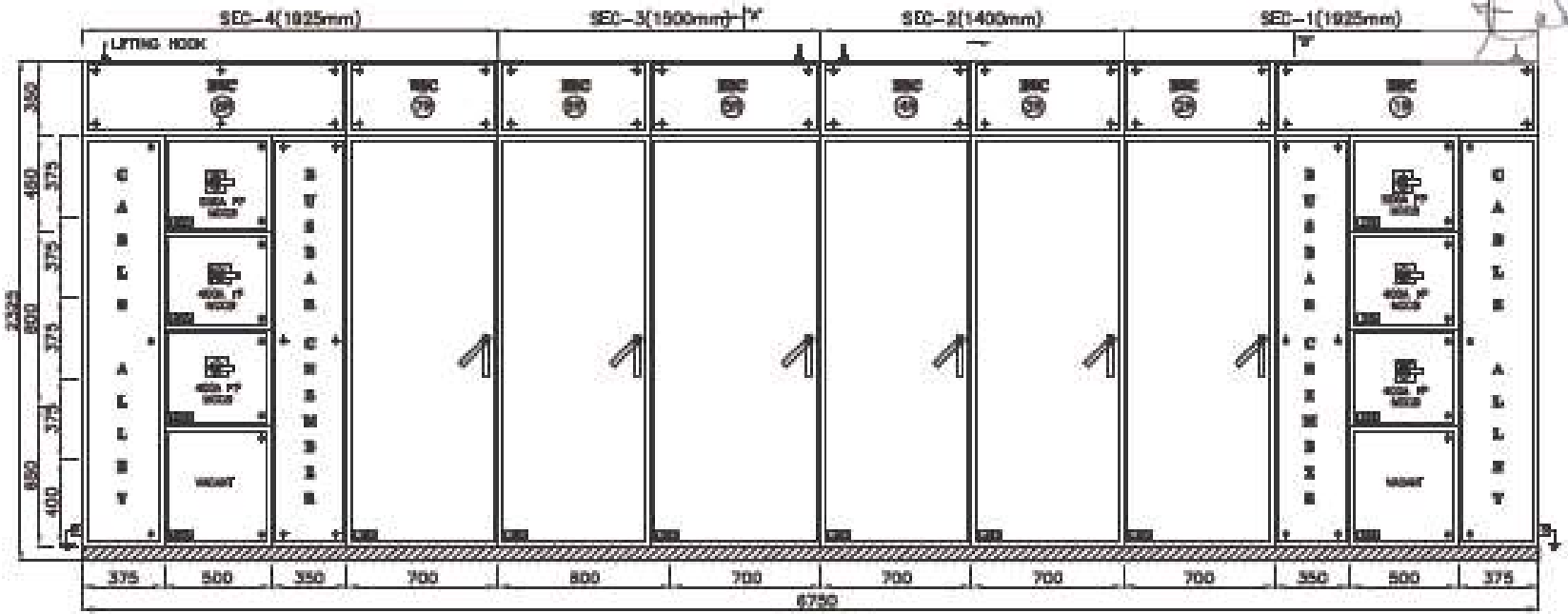

LEGEND DETAILS

R	=	'R' PHASE
Y	=	'Y' PHASE
B	=	'B' PHASE
M1	=	ACB ON INDICATION RED
M2	=	ACB OFF INDICATION GREEN
M3	=	ACB TRIP INDICATION AMBER
M4	=	TRANSFORMER FAULT INDICATION WHITE
M5	=	ACB SPRING CHARGE INDICATION BLUE
M6	=	DC HEALTHY INDICATION BLUE
M7	=	ILLUMINATION PUSH BUTTON FOR TCS WHITE
P1	=	TRF TRIP FAULT RESET PUSH BUTTON SPRING RETURN TYPE BLACK
P2	=	TRF H-TRIP FAULT RESET PUSH BUTTON SPRING RETURN TYPE BLACK
A	=	ANALOG AMMETER
V	=	ANALOG VOLT METER
ASS	=	AMPERE SELECTOR SWITCH
VSS	=	VOLTMETER SELECTOR SWITCH
BCS/TNC	=	BREAKER CONTROL SWITCH
27A&27B	=	UNDER VOLTAGE RELAY
86	=	MASTER TRIP RELAY (HAND RESET)
50+51	=	3POLE CURRENT EARTH FAULT RELAY
50N+51N	=	EARTH FAULT RELAY
VMR	=	VOLTAGE MONITORING RELAY
A/M	=	AUTO/MANUAL SELECTOR SWITCH

HORIZONTAL BUS BAR SIZE:-

PHASE : 1x150X10 Sq. mm AL OR Eqv.
NEUTRAL : 1x150X05 Sq. mm AL OR Eqv.
EARTH : 1X50X05 Sq. mm CU. OR Eqv.

VERTICAL BUS BAR SIZE:-

PHASE : 2X75X10 SQ. MM AL. OR Eqv.
NEUTRAL : 1X75X10 SQ. MM AL. OR Eqv.

PANEL DIMENSIONS

HEIGHT : 2325 mm.
WIDTH : 6750 mm.
DEPTH : 1000 mm.

CABLE ENTRY

BOTTOM ENTRY

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP
	04.	-	CHKD.	VDP
	03.	-	APPD.	--
	02.	-	ALL DIMENSIONS IN mm.	SIGN.
	01.		TOLERANCE 5%	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V MAIN SWITCH BOARD (1A) (MCRB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/WOA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIANDI-II POLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
HEMANT KUMAR ELECTRICAL CAREER (HEKA)
TRANSMISSION PROJECTS DIVISION

DWG. NO. USL/PGCIL/GHEL/2024-2025/1241A-101

SH. NO. 02 OF 03

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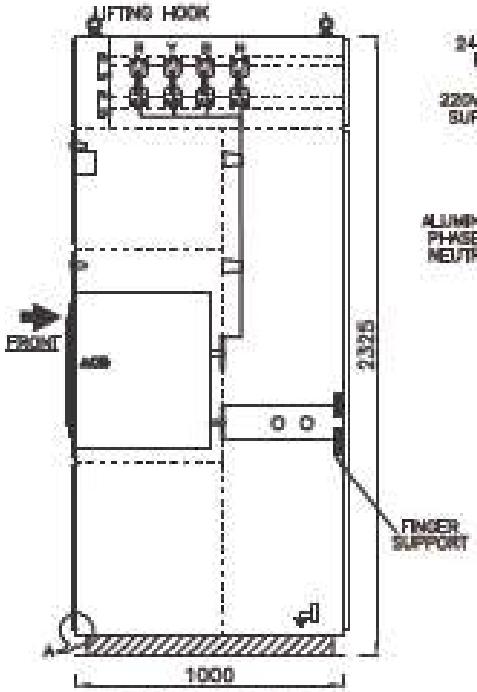
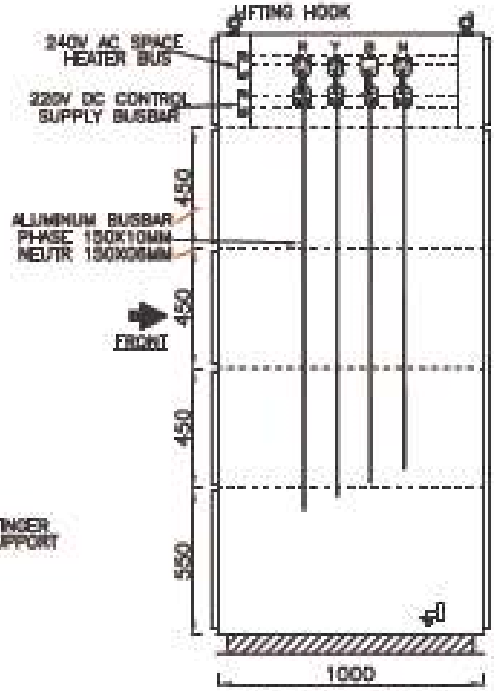
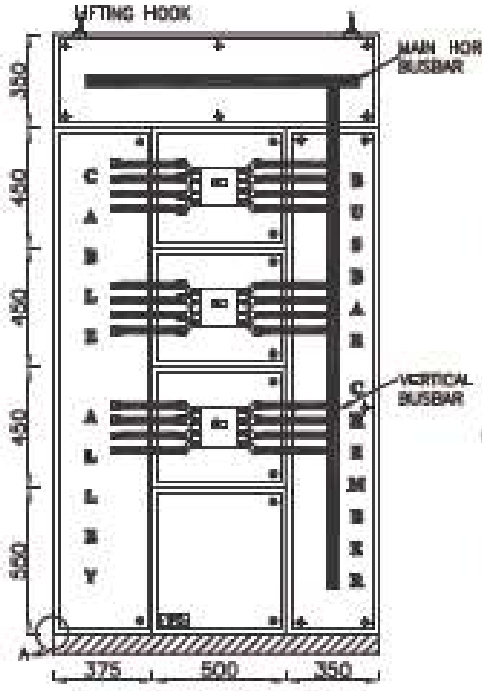


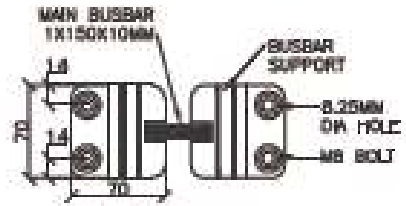
SECTIONAL VIEW AT "A"-"A"



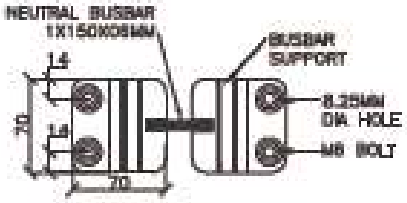
SECTIONAL VIEW AT "B"-"B"



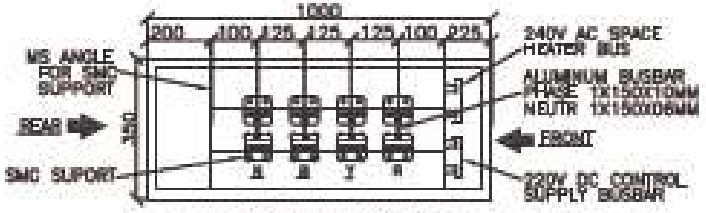
TYP. DETAIL OF PANEL NO-1
(FRONT VIEW W/O DOOR & COVER)



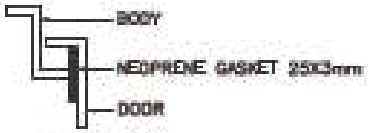
DETAIL OF PHASE BUSBAR SUPPORT



DETAIL OF NEUTRAL BUSBAR SUPPORT



SECTIONAL VIEW AT "C"-"C"
FOR HORIZONTAL BUSBAR
TYPICAL PANEL NO-1



DETAIL "A"

DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00
	04.	–	DRAWN: MP
	03.	–	CHKD.: VDP
	02.	–	APPD.: --
	01.		ALL DIMENSIONS IN mm. SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 218, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - BOGNOOL, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V MAIN SWITCH BOARD (1A) (MCBB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/NOA-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIANDI-II POLING STATION
CLIENT	TOWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HIGHT TEMPT ELECTRICAL CHECK (INDIA) TRANSMISSION PROJECTS DIVISION
DWG. NO.	USL/PGCIL/SHEL/2024-2025/1241A-101

JOB NO. 1241A

SH. NO. 03 OF 03

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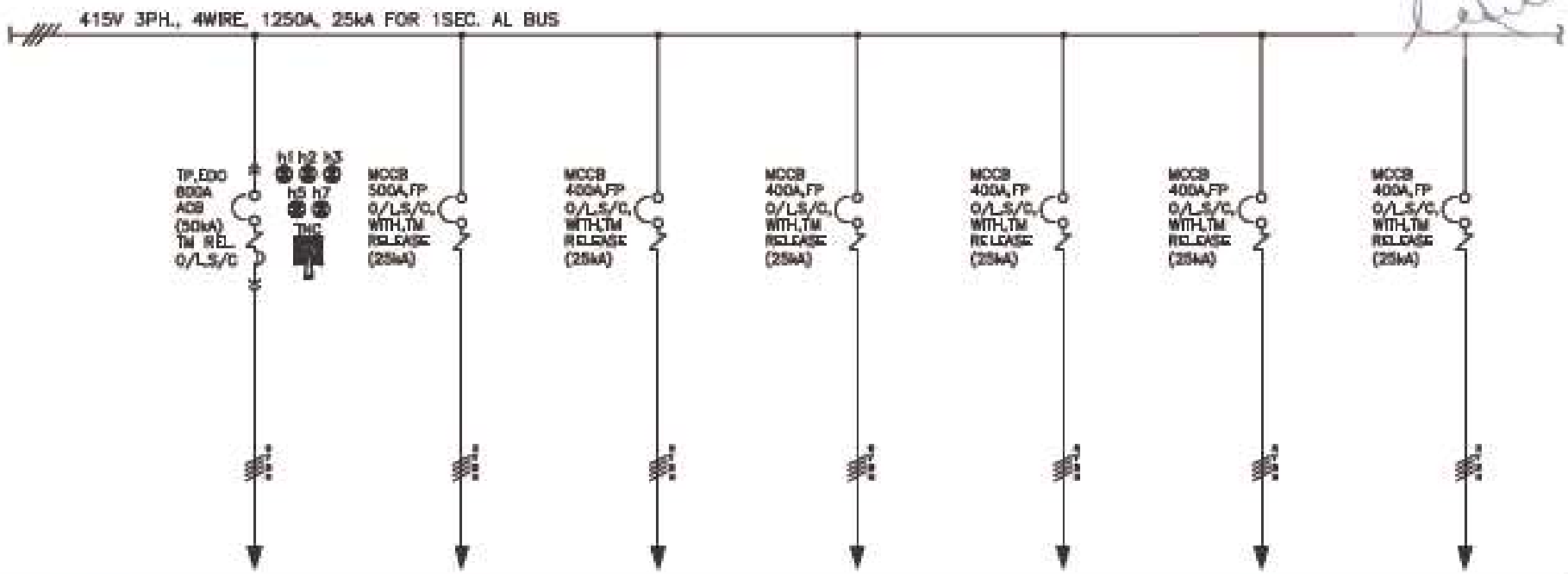

FEEDER NUMBER	2F2	1R1	1F2	1F3	1F4	1R2	1R3
MODULE TYEP	AE	E	E	E	E	E	E
FEEDER RATING	800A	500A	400A	400A	400A	400A	400A
FEEDER TYPE	ACB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
FEEDER DESCRIPTION	TO ACDB-2A/ (ACDB INCOMER-1)	SPARE-1	OUTDOOR RECEPTACLES OIL FILTRATION UNIT-1 765/400kV ICT	OUTDOOR RECEPTACLES OIL FILTRATION UNIT-2 765/400kV ICT	OUTDOOR RECEPTACLES OIL FILTRATION UNIT-3 765/400kV ICT	OUTDOOR RECEPTACLES OIL FILTRATION UNIT-4 765/400kV ICT	COLONY LIGHTING
CABLE SIZE	2RX3.5CX300Sqmm AL. XLPE CABLE	--	1RX3.5CX300Sqmm AL. XLPE CABLE	1RX3.5CX300Sqmm AL. XLPE CABLE	1RX3.5CX300Sqmm AL. XLPE CABLE	1RX3.5CX300Sqmm AL. XLPE CABLE	1RX3.5CX300Sqmm AL. XLPE CABLE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWARIPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-II & F-V, IITD-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V MAIN SWITCH BOARD (1A) (MCCB)
CA NO.	CC/T/W-HD/DOM/318/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS/HS-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DWG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-201

JOB NO. 1241A

SH. NO. 01 OF 04

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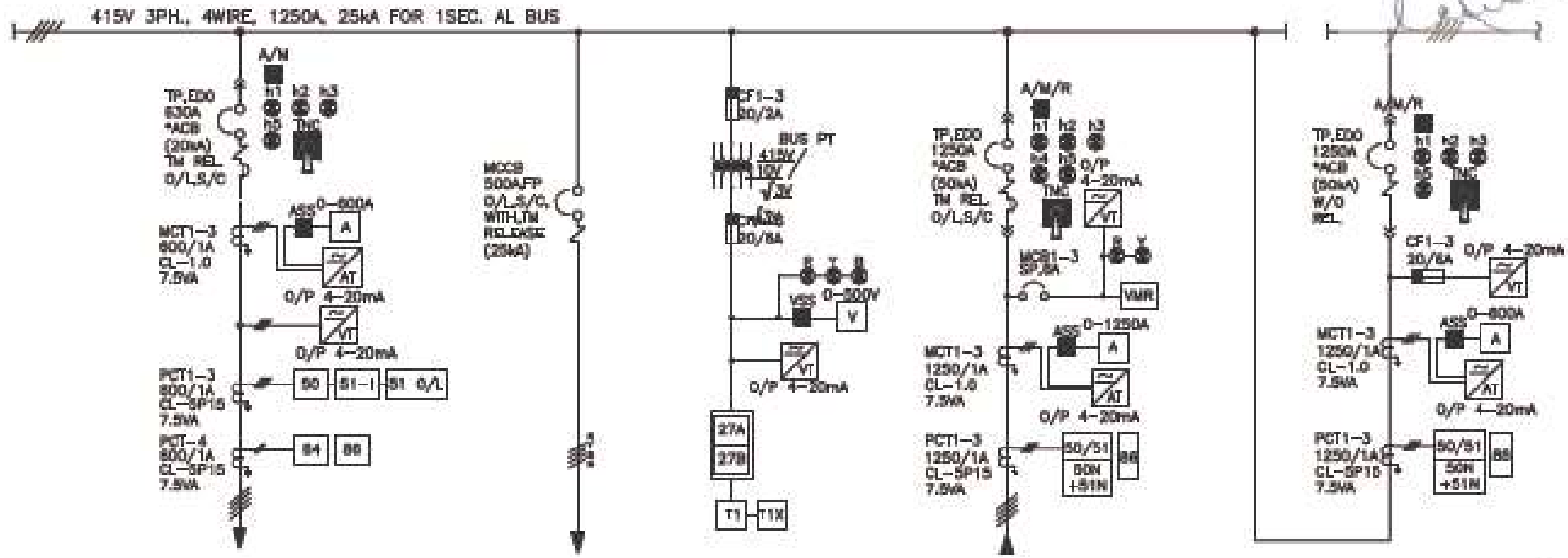

FEEDER NUMBER	3F1+3F2+3F3	1F1	4F1+4F3	4F1+4F2+4F3	5F1+5F2+5F3
MODULE TYEP	M	E	G1	AE	AE
FEEDER RATING	630A	500A	---	1250A	1250A
FEEDER TYPE	ACB	MCCB	BUS PT	ACB	ACB
FEEDER DESCRIPTION	HVW MOTOR	300KVA, LIGHTING TRANSFORMER-1	VT MODULE-1	INCOMER-1 FROM LT TRANSFORMER-1	BUSCOUPLER
CABLE SIZE	1RX3.5CX300Sqmm AL. XLPE CABLE	2RX3.5CX300Sqmm AL. XLPE CABLE	---	2Rx1Cx630Sqmm. AL XLPE FOR PHASE 1Rx1Cx630Sqmm. AL XLPE FOR NEUTRAL	---

DATE	No.	REVISIONS DESCRIPTION			
	04.	-	DRAWN	MP	
	03.	-	CHKD.	VDP	
	02.	-	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 218, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II: F-8 & F-9, IPSEC, LOHARI, SIDHAPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V MAIN SWITCH BOARD (1A) (MCB)
CA NO.	CC/T/W-HS/DOM/015/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEMANT KHAYE ELECTRICAL CONTRACTOR (HEKA) TRANSMISSION PROJECTS DIVISION
DWG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-201
JOB NO.	1241A
SH. NO.	02 OF 04

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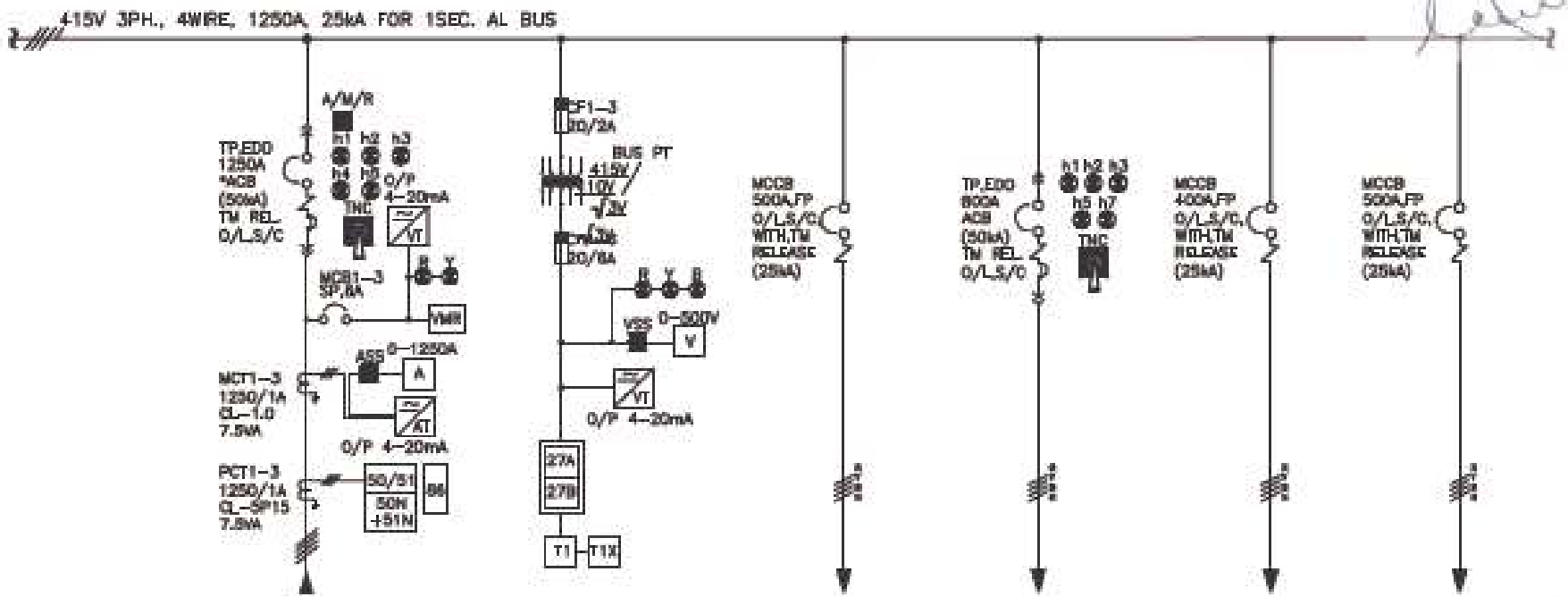

FEEDER NUMBER	6F1+6F2+6F3	6F1+6F3	8F1	7F2	8F2	8R1
MODULE TYEP	AE	G1	E	AE	E	E
FEEDER RATING	1250A	--	500A	800A	400A	500A
FEEDER TYPE	ACB	BUS PT	MCCB	ACB	MCCB	MCCB
FEEDER DESCRIPTION	INCOMER-2 FROM LT TRANSFORMER-2	VT MODULE-2	300KVA, LIGHTING TRANSFORMER-2	TO ACDB-2A (ACDB INCOMER-2)	COLONY LIGHTING	SPARE-2
CABLE SIZE	2Rx1Cx630Sqmm. AL XLPE FOR PHASE 1Rx1Cx630Sqmm. AL XLPE FOR NEUTRAL	--	2RX3.5CX300Sqmm AL. XLPE CABLE	2RX3.5CX300Sqmm AL. XLPE CABLE	1RX3.5CX300Sqmm AL. XLPE CABLE	--

DATE	No.	REVISIONS DESCRIPTION			
	04.	-	DRAWN	MP	
	03.	-	CHKD.	VDP	
	02.	-	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V MAIN SWITCH BOARD (1A) (MCMB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/00A-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EMPTY ELECTRICAL CHAIRMAN (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-201
JOB NO.	1241A
SH. NO.	03 OF 04

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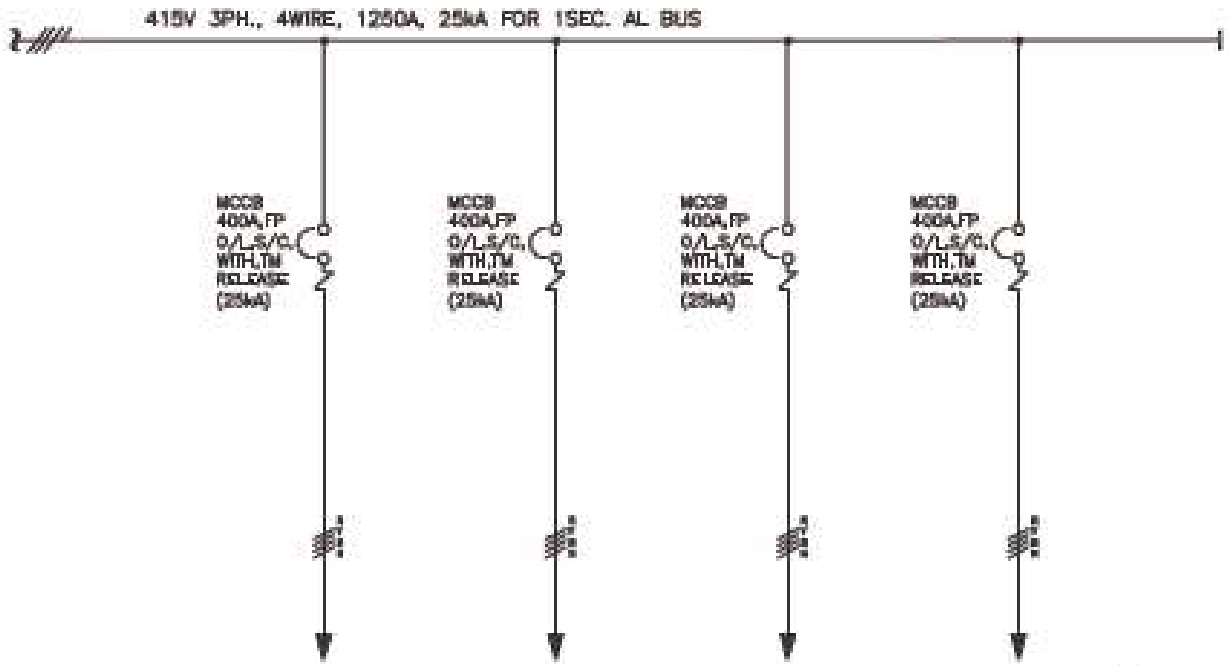

FEEDER NUMBER	8F3	8F4	8R2	8R3
MODULE TYEP	E	E	E	E
FEEDER RATING	400A	400A	400A	400A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB
FEEDER DESCRIPTION	OUTDOOR RECEPTACLES OIL FILTRATION UNIT-5 765/400kV ICT	OUTDOOR RECEPTACLES OIL FILTRATION UNIT-6 765/400kV ICT	OUTDOOR RECEPTACLES OIL FILTRATION UNIT-7 765/400kV ICT	OUTDOOR RECEPTACLES OIL FILTRATION UNIT-8 765/400kV ICT
CABLE SIZE	1RX3.5CX300Sqmm AL. XLPE CABLE	1RX3.5CX300Sqmm AL. XLPE CABLE	1RX3.5CX300Sqmm AL. XLPE CABLE	1RX3.5CX300Sqmm AL. XLPE CABLE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II F-II & F-V, IPHB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V MAIN SWITCH BOARD (1A) (MCCB)
CA NO.	CC/T/W-HD/DOM/019/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-201

JOB NO. 1241A

SH. NO. 04 OF 04

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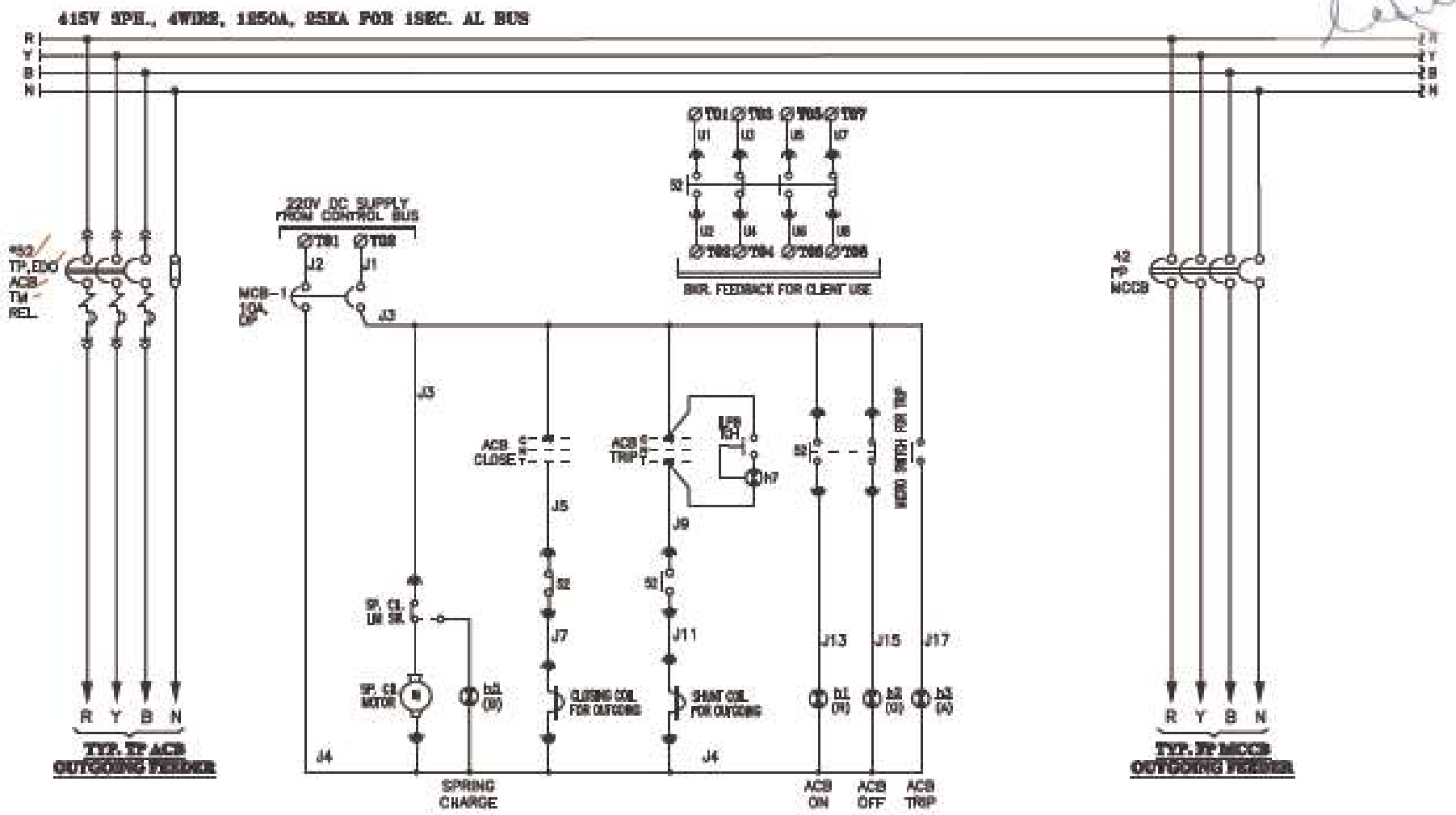

SCHEMATIC DRAWING FOR ACB OUTGOING FEEDER (AE) CIRCUIT BREAKER

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP	SIGN.
	04.	–	CHKD.	VDP	
	03.	–	APPD.	--	
	02.	–	ALL DIMENSIONS IN mm.		
	01.				
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 218, BRD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-8 & F-9, IPHB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAMPUR ROORKEE - 247667 (U. K.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DRAWING
TITLE	415V MAIN SWITCH BOARD (1A) (MCRB)
CA NO.	CC/T/W-HD/DOM/015/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-501
JOB NO.	1241A
SH. NO.	01 OF 01

This Drawing & Information or descriptive matter set out herein are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing, tendering or for any other purpose without their permission.

BILL OF MATERIAL FOR 415V MAIN SWITCH BOARD (1A) (MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A		BILL OF MATERIAL FOR MODULE - (A8) INCOMER 1&2			2NOs
1	89A & 89B	TP ACB, EDO, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION, 1. SPRING CHARGE MOTOR 220V DC WITH SPRING CHARGE SWITCH 2. CLOSING COIL 220V DC 3. SHUNT COIL 220V DC 4. LIMIT SWITCH FOR TEST/ISOLATE/SERVICE POSITION 5. 4NO + 4NC POTENTIAL FREE CONTACT	L&T/C&S/HAVELLS	1250A, 50kA	01
2	CF7-13	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	07
3	CF7-13	HRC FUSE LINK	L&T/C&S/HAVELLS	6A	07
4	94,X,Y,Z,AX	AUX. CONTACTOR RELAY, COIL VOLTAGE 220V DC WITH 2NO+2NC AUX. CONTACT	L&T/C&S/HAVELLS	--	04
5	TCX	AUX. CONTACTOR RELAY, COIL VOLTAGE 220V DC WITH 3NO+1NC AUX. CONTACT	L&T/C&S/HAVELLS		01
6	BX,BY,BZ	AUX. CONTACTOR RELAY, COIL VOLTAGE 220V DC WITH 4NO AUX. CONTACT	L&T/C&S/HAVELLS	--	06
7	89AX	2NO+2NC ADD ON BLOCK	L&T/C&S/HAVELLS	--	01
8	MCB	DP MINIATURE CIRCUIT BREAKER, DC TYPE	L&T/C&S/HAVELLS	10A, DP	01
9	MCB	DP MINIATURE CIRCUIT BREAKER, DC TYPE	L&T/C&S/HAVELLS	6A, DP	01
10	MCB	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, SP	03
11	MCTs	CURRENT TRANSFORMER, RESIN CAST TYPE	NEWTEK/AE/PRECISE/ PROCOM/ASHMOR	1250/1A, CL-1, 7.5VA	03
12	PCTs	CURRENT TRANSFORMER, RESIN CAST TYPE		1250/1A, CL-5P15, 7.5VA	04
13	A	ANALOG AMMETER, SINGLE PHASE, SIZE-96X96 Sq. mm, CL-1.0, CTR-/1A	AE/RISHAB/NEWTEK/SECURE	0-1250A	01
14	AS	AMMETER SELECTOR SWITCH, ROTARY TYPE	SALZER/KAYCEE/TELERGON	6A	01
15	A/M/R	AUTO/MANUAL/REMOTE SELECTOR SWITCH WITH OFF, 3POLE 3WAY, ROTARY TYPE	SALZER/KAYCEE/TELERGON	6A	01
16	TNC	BREAKER CONTROL SWITCH, ROTARY TYPE	SALZER/KAYCEE/TELERGON	16A	01
17	86	HIGH SPEED TRIPPING RELAY (AUTO RESET)	L&T/JVS/C&S	NOMINAL VOLTAGE 220V DC	01
18	50+51	TRIPLE POLE INSTANTANEOUS OVER-CURRENT RELAY HAVING THE SETTING RANGE OF 200-800% OR 500-2000% OF CT SECONDARY AND ADJUSTABLE DEFINITE MINIMUM TIME, AUX. SUPPLY 220V DC .	L&T/JVS/C&S	-/1A	01
19	50N+51N	INSTANTANEOUS EARTH FAULT RELAY HAVING AN ADJUSTABLE SETTING RANGE OF 10-40% OR 20 - 80% OF CT SECONDARY CURRENT AND ADJUSTABLE DEFINITE MINIMUM TIME. THE EARTH FAULT RELAY SHALL BE PROVIDED WITH A STABILISING RESISTOR, AUX. SUPPLY 220V DC.	L&T/JVS/C&S	-/1A	01

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-8 & F-9, IPHB-C, LOHARI, SIDCUL INDUSTRIAL AREA, HARIDWAR - 249403 U. S. NAGAR (U.K.) INDIA
E-mail : [illegible]

DRWG: BILL OF MATERIAL
TITLE: 415V MAIN SWITCH BOARD (1A) (MCRB)
CA NO.: CC/T/N-MS/DDN/010/23/01005/NOA-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT: 765/400/220kV BHADLA-II POOLING STATION
JOB NO.: 1241A

CLIENT: POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:- NIRANT XIANY ELECTRICAL CHENNAI (NCEL) TRANSMISSION PROJECTS DIVISION

DRG. NO.: USL/PGCIL/BHEL/2024-2025/1241A-701
SH. NO. 01 OF 06

This Drawing & Information or description mother set out hereon are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing, tendering or for any other purpose without their permission.

BILL OF MATERIAL FOR 415V MAIN SWITCH BOARD (1A) (MCCB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A		**BILL OF MATERIAL FOR MODULE - (A2) INCOMER 1&2**			2NOs
20	VMN-4, VMN-5	415V AC, THREE PHASE, 3WIRE, VOLTAGE MONITORING RELAY	MINLEC/PGCIL APPROVED MAKE	---	01
21	Ct	AC CURRENT TRANSDUCER, SINGLE OUTPUT- 4-20mA, CT RATIO-1250/1A, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE/PGCIL APPROVED	---	03
22	Vt	AC VOLTAGE TRANSDUCER, SINGLE OUTPUT- 4-20mA, PIN-415V AC, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	---	03
23	R-PHASE	'R' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	240V AC	01
24	Y-PHASE	'Y' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, YELLOW	ESBEE/VAISHNO/C&S	240V AC	01
25	B-PHASE	'B' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VAISHNO/C&S	240V AC	01
26	M	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	220V DC	01
27	M	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESBEE/VAISHNO/C&S	220V DC	01
28	M	'TRIP' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, AMBER	ESBEE/VAISHNO/C&S	220V DC	01
29	M	TRANSFORMER FAULT INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, WHITE	ESBEE/VAISHNO/C&S	220V DC	01
30	M	'SPRING CHARGE' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VAISHNO/C&S	220V DC	01
31	PB, PB	TRIP & NON-TRIP FAULT RESET PUSH BUTTON, 22.5 Sq. mm. DIA, SPRING RETURN TYPE, BLACK WITH 4NC CONTACT	ESBEE/VAISHNO/C&S	---	02
32	TR, TR	ON DELAY TIMER WITH 1C/O AUXILIARY SWITCH, 0-60 SEC.	GIC/PGCIL APPROVED MAKE	220V DC	01
33	TIA, TIA	ON DELAY TIMER WITH 1C/O AUXILIARY SWITCH, 0-60 SEC.	GIC/PGCIL APPROVED MAKE	220V DC	01
C					
B		**BILL OF MATERIAL FOR MODULE - (B) FOR OUTGOINGS**			
1	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH SPREADER LINK & EXTENDED ROM, Ics = 100% Icu	L&T/C&S/HAVELLS	500A, 25kA	04
2	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH SPREADER LINK & EXTENDED ROM, Ics = 100% Icu	L&T/C&S/HAVELLS	400A, 25kA	10

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
28.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: —
ALL DIMENSIONS IN mm. SCN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: SUMMA NO. 235, NO. 446A, VILLAGE RAIPUR (SHAHBERIPUR), TEHSIL - BISHRAKH, DISTRICT HAMIRPUR (UTTARAKHAND) - 247661, INDIA, TEL: [illegible]
UNIT-II: F-2 & F-3, SIDC, UNIDC, SIDCUL INDUSTRIAL AREA, SEKTOR KOTRA - 263153 U.S. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING: BILL OF MATERIAL
TITLE: 415V MAIN SWITCH BOARD (1A) (MCCB)
JOB NO. 1241A
CA NO.: CC/T/N-AE/DOM/A10/23/01664/NDA-1/24-10843/01 & 02 DATED 23.01.2024
PROJECT: 765/400/220kV BHOEL-II POOLING STATION
CLIENT: POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:- BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.: USL/PGCIL/BHEL/2024-2025/1241A-701
SH. NO. 02 OF 06

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BILL OF MATERIAL FOR 415V MAIN SWITCH BOARD (1A) (MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
C		BILL OF MATERIAL FOR MODULE - (NO) CIRCUIT BREAKER CONTROLLED MOTOR FEEDER			1NO
1	[illegible]	TP ACB, EDO, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION, 1. SPRING CHARGE MOTOR 220V DC WITH SPRING CHARGE SWITCH 2. CLOSING COIL 220V DC 3. SHUNT COIL 220V DC 4. LIMIT SWITCH FOR TEST/ISOLATE/SERVICE POSITION 5. AND + 4NC POSITION FREE CONTACT.	L&T/C&S/HAVELLS	63GA, 20kA	01
2	[illegible]	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	7
3	[illegible]	HRC FUSE LINK	L&T/C&S/HAVELLS	6A	7
4	[illegible]	DP MINIATURE CIRCUIT BREAKER. DC TYPE	L&T/C&S/HAVELLS	10A, DP	01
5	[illegible]	DP MINIATURE CIRCUIT BREAKER. DC TYPE	L&T/C&S/HAVELLS	6A, DP	01
6	[illegible]	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, SP	03
7	[illegible]	AUX. CONTACTOR RELAY, COIL VOLTAGE 220V DC WITH 2NO+2NC AUX. CONTACT	L&T/C&S/HAVELLS	2NO+2NC, 220V DC	02
8		2NO+2NC ADD ON BLOCK	L&T/C&S/HAVELLS	2NO+2NC	01
9	[illegible]	CURRENT TRANSFORMER, RESIN CAST TYPE	NEWTEK/AE/PRECISE/ PROCOM/KSHMOR	600/1A, CL-1, 7.5VA	03
10	[illegible]	CURRENT TRANSFORMER, RESIN CAST TYPE		600/1A, CL-5P15, 7.5VA	04
11	[illegible]	ANALOG AMMETER, SINGLE PHASE, SIZE-96X96 Sq. mm, CL-1.0, CTR-/1A	AE/RISHAB/NEWTEK/SECURE	0-600A	01
12	[illegible]	AMMETER SELECTOR SWITCH, ROTARY TYPE	SALZER/KAYCEE/TELEROON	6A	01
13	[illegible]	AUTO/MANUAL SELECTOR SWITCH WITH OFF, 6POLE 3WAY, ROTARY TYPE	SALZER/KAYCEE/TELEROON	6A	01
14	[illegible]	BREAKER CONTROL SWITCH, ROTARY TYPE	SALZER/KAYCEE/TELEROON	16A	01
15	[illegible]	HIGH SPEED TRIPPING RELAY (AUTO RESET)	L&T/JVS/C&S	NOMINAL VOLTAGE-220V DC	01
16	[illegible]	TRIPLE POLE INSTANTANEOUS OVER-CURRENT RELAY FOR PROVIDING POSITIVE SEQUENCE CURRENT PROTECTION IN ALL THE THREE PHASES. THE RELAY SETTING RANGE SHALL BE CONTINUOUSLY ADJUSTABLE BETWEEN 200-800% OR 400-1600% OF CT SECONDARY RATED CURRENT AS REQUIRED., AUX. SUPPLY 220V DC .	L&T/JVS/C&S	600/1A	01
17	[illegible]	DOUBLE POLE INVERSE DEFINITE MINIMUM TIME OVER CURRENT RELAYS CONNECTED IN R & B PHASES FOR OVER CURRENT PROTECTION OF MOTOR RATED 110 KW - 200 KW. THE RELAY SHALL HAVE AN ADJUSTABLE SETTING RANGE OF 50% - 200% OF CT SECONDARY CURRENT AND TIME SETTING RANGE OF 0-30 SECOND, THE RELAY SHALL BE CDGM-22 OF EE OR EQUIVALENT. AUX. SUPPLY 220V DC .	L&T/JVS/C&S	600/1A	01
18	[illegible]	SINGLE POLE ADJUSTABLE DEFINITE TIME DELAY RELAY FOR MOTOR OVERLOAD ALARM CONNECTED IN Y-PHASE ONLY. THE RELAY SHALL HAVE RESETTING RATIO OF NOT LESS THAN 90%. THE RELAY SHALL HAVE CONTINUOUSLY ADJUSTABLE TIME DELAY RANGE OF 2.5 TO 25 SEC., AUX. SUPPLY 220V DC .	L&T/JVS/C&S	600/1A	01
19	[illegible]	INSTANTANEOUS EARTH FAULT RELAY HAVING AN ADJUSTABLE SETTING RANGE OF 10-40% OR 20 - 80% OF CT SECONDARY CURRENT. THE EARTH FAULT RELAY SHALL BE PROVIDED WITH A STABILISING RESISTOR, AUX. SUPPLY 220V DC.	L&T/JVS/C&S	600/1A	01
20	[illegible]	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESSBEE/VAISHNO/C&S	220V DC	01
21	[illegible]	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESSBEE/VAISHNO/C&S	220V DC	01
22	[illegible]	'TRIP' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, AMBER	ESSBEE/VAISHNO/C&S	220V DC	01
23	[illegible]	'SPRING CHARGE' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESSBEE/VAISHNO/C&S	220V DC	01
24	[illegible]	AC VOLTAGE TRANSDUCER, SINGLE OUTPUT- 4-20mA, PT RATIO-415V, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	—	03
25	[illegible]	AC CURRENT TRANSDUCER, SINGLE OUTPUT- 4-20mA, CT RATIO-600/1A, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	—	03

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAMPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - [illegible]
UNIT-II: F-II & F-V, IITB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203205 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V MAIN SWITCH BOARD (1A) (MCRB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS/HVDC-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EARTH ELECTRICAL CARRIER (INDIA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-701

JOB NO. 1241A

SH. NO. 03 OF 06

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BILL OF MATERIAL FOR 415V MAIN SWITCH BOARD (1A) (MCCB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
D		BILL OF MATERIAL FOR MODULE - (A2) BUS-COUPLER			ONO
1	ACB	TP ACB 415V,EDO, WITH OUT RELEASE , 1. SPRING CHARGE MOTOR 220V DC WITH SPRING CHARGE SWITCH 2. CLOSING RELEASE 220V DC 3. SHUNT RELEASE 220V DC 4. UNDER VOLTAGE RELEASE 415V AC 5. LIMIT SWITCH FOR TEST/ISOLATE/SERVICE POSITION 6. 4NO + 4NC POTENTIAL FREE CONTACT.	L&T/C&S/HAVELLS	1250A, 50kA	01
2	CFU-02	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	12
3	CFU-02	HRC FUSE LINK	L&T/C&S/HAVELLS	8A	12
4	MCB	DP MINIATURE CIRCUIT BREAKER, DC TYPE	L&T/C&S/HAVELLS	10A	01
5	94, CO, BCK, BK,	AUX. CONTACTOR RELAY, COIL VOLTAGE 220V DC WITH 2NO+2NC AUX. CONTACT	L&T/C&S/HAVELLS	---	04
6	33X	AUX. CONTACTOR RELAY, COIL VOLTAGE 220V DC WITH 3NO+1NC AUX. CONTACT	L&T/C&S/HAVELLS	--	01
7	BCK	2NO+2NC ADD ON BLOCK	L&T/C&S/HAVELLS	--	01
8	MCTs	CURRENT TRANSFORMER, RESIN CAST TYPE	NEWTEK/AE/PRECISE/PROCOM/AS HMOR	1250/1A, CL-1, 7.5VA	03
9	PCTs	CURRENT TRANSFORMER, RESIN CAST TYPE	NEWTEK/AE/PRECISE/PROCOM/AS HMOR	1250/1A, CL-5P15, 7.5VA	04
10	A	ANALOG AMMETER, SINGLE PHASE, SIZE-96X96 Sq. mm, CL-1.0, CTR-/1A	AE/RISHAB/NEWTEK/SECURE	0-1250A	01
11	ASS	AMMETER SELECTOR SWITCH, ROTARY TYPE	SALZER/KAYCEE/TELERGON	6A	01
12	A/M/R	AUTO/MANUAL/REMOTE SELECTOR SWITCH WITH OFF, 3POLE 3WAY, ROTARY TYPE	SALZER/KAYCEE/TELERGON	6A	01
13	CBC	BREAKER CONTROL SWITCH, ROTARY TYPE	SALZER/KAYCEE/TELERGON	16A	01
14	86	HIGH SPEED TRIPPING RELAY (AUTO RESET)	L&T/JVS/C&S	NOMINAL VOLTAGE 220V DC	01
15	50+51	TRIPLE POLE INSTANTANEOUS OVER-CURRENT RELAY HAVING THE SETTING RANGE OF 200-600% OR 500-2000% OF CT SECONDARY AND ADJUSTABLE DEFINITE MINIMUM TIME, AUX. SUPPLY 220V DC .	L&T/JVS/C&S	-/1A	01
16	50N+51N	INSTANTANEOUS EARTH FAULT RELAY HAVING AN ADJUSTABLE SETTING RANGE OF 10-40% OR 20 - 80% OF CT SECONDARY CURRENT AND ADJUSTABLE DEFINITE MINIMUM TIME. THE EARTH FAULT RELAY SHALL BE PROVIDED WITH A STABILISING RESISTOR, AUX. SUPPLY 220V DC.	L&T/JVS/C&S	-/1A	01
17	W1	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VASHNO/C&S	220V DC	01
18	W2	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESBEE/VASHNO/C&S	220V DC	01
19	W3	'TRIP' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, AMBER	ESBEE/VASHNO/C&S	220V DC	01
20	W4	'SPRING CHARGE' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VASHNO/C&S	220V DC	01
21	TD	ON DELAY TIMER WITH 1C/O AUXILIARY SWITCH, 0-60 SEC.	GIC/PGCIL APPROVED MAKE	220V DC	01
22	VT	AC VOLTAGE TRANSDUCER, SINGLE OUTPUT- 4-20mA, FTR-415V AC, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	--	03
23	CT	AC CURRENT TRANSDUCER, OUTPUT- 4-20mA, WITH SINGLE OUTPUT, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	1250/1A	03

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-8 & F-9, IPHB-C, LANDCO, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V MAIN SWITCH BOARD (1A) (MCCB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/00A-1/24-02043/01 & 02 DKED 23.02.2024
PROJECT	765/400/220kV GWEB-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-701
SH. NO. 04 OF 06

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PT & FUSE WILL MOUNTED ON THE DETACHABLE CHANNEL (DRAWOUT)

BILL OF MATERIAL FOR 415V MAIN SWITCH BOARD (1A) (MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
E	BILL OF MATERIAL FOR MODULE - (G1) (BUS PT MODULE)				2NOs
1	CF1-6	HRC FUSE BASE (MOUNTED ON CHASSIS OF VOLTAGE TRANSFORMER)	L&T/C&S/HAVELLS	20A	06
2	CF1-3	HRC FUSE LINK	L&T/C&S/HAVELLS	2A	03
3	CF4-6	HRC FUSE LINK	L&T/C&S/HAVELLS	6A	03
4	BUS-PT	(415/√3V)/(110/√3V)VOLTS SINGLE PHASE VOLTAGE TRANSFORMER STAR/STAR CONNECT WITH STAR POINT SOLIDLY EARTHED MOUNTED ON COMMON DRAW OUT CHASSIS. ACCURACY CLASS 0.5 FOR PROTECTION AND METERING WITH 50VA BURDEN.	NEWTEK/AE/PRECISE/PROCOM/ ASHMOR	--	03
5	V1	AC VOLTAGE TRANSDUCER, SINGLE OUTPUT (4–20mA), PT RATIO–PTR–(415/√3V)/(110/√3V) AC, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	—	03
6	V	ANALOG VOLTMETER, SINGLE PHASE, SIZE–96X96 Sq. mm, CL–1.0, PTR–(415/√3 V)/(110/√3V) AC	AE/RISHAB/NEWTEK/SECURE	0–500V	01
7	VSS	FOUR POSITION VOLTMETER SELECTOR SWITCH, ROTARY TYPE	SALZER/KAYCEE/TELERGON	—	01
8	27A&27B	DOUBLE POLE INSTANTANEOUS UNDER VOLTAGE RELAYS WITH CONTINUOUS VARIABLE SETTING RANGE OF 40–80% OF 110 VOLTS, PT RATIO, (415/√3 V)/(110/√3V) AUX. SUPPLY 220V DC	L&T/JVS/C&S	—	01
9	T1, T2	TIME DELAY PICK UP RELAY HAVING A TIME SETTING RANGE OF 0.5 TO 3 SECS. WITH 3 'NO', SELF RESET CONTACTS, SUITABLE FOR 220V	L&T/JVS/C&S	—	01
10	T1X, T2X	AUXILIARY RELAY 220V DC WITH 2 NO. SELF RESET CONTACTS.	L&T/JVS/C&S	—	01
11	R-PHASE	'R' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VINSHNO/C&S	63.5V AC	01
12	Y-PHASE	'Y' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, YELLOW	ESBEE/VINSHNO/C&S	63.5V AC	01
13	B-PHASE	'B' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VINSHNO/C&S	63.5V AC	01
F	BILL OF MATERIAL FOR MISC.				
1	MCB	DP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	25A, 10kA	01
2	MCB	DP MINIATURE CIRCUIT BREAKER, DC TYPE	L&T/C&S/HAVELLS	25A	02
3	MCB	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	16A, 10kA	08
4	SW-SOCKET	SWITCH WITH SOCKET	ANCHOR/RePUTED	5/15A	02
5	SS	SELECTOR SWITCH, 2P, 2W WITH OFF	SALZER/KAYCEE	32A	01
6	DS	DOOR SWITCH	SURAJ/PGCIL APPROVED MAKE	1 C/O	08
7	PL	PANEL ILLUMINATION LIGHT, 230V AC	HAVELLS//PGCIL APPROVED MAKE	5W	08
8	SH	SPACE HEATER, 230V AC	HOTWEL/PGCIL APPROVED MAKE	60W	08
9	TH	THERMOSTATE	ELCON/PGCIL APPROVED MAKE	30 – 65°C	08
10	TS	TOGGLE SWITCH	FTC/PGCIL APPROVED MAKE	6A	08

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP
	04.	–	CHKD.	VDP
	03.	–	APPD.	--
	02.	–	ALL DIMENSIONS IN mm.	SIGN.
	01.		TOLERANCE 5%	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IITBI-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V MAIN SWITCH BOARD (1A) (MCRB)
CA NO.	CC/T/W-HD/DOM/015/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
HIGHT TEMPT ELECTRICAL CHECK (HETC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024–2025/1241A–701 | SH. NO. 05 OF 06

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BILL OF MATERIAL FOR 415V MAIN SWITCH BOARD (1A) (MCCB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
C		BILL OF MATERIAL FOR MODULE – (AE) FOR ACB OUTGOINGS			2NOs
1	[illegible]	TP ACB, EDO, WITH TM BASED RELEASE FOR O/L,S/C PROTECTION, 1. SPRING CHARGE MOTOR 220V DC WITH SPRING CHARGE SWITCH 2. CLOSING COIL 220V DC 3. SHUNT COIL 220V DC 4. LIMIT SWITCH FOR TRIP POSITION 5. 4NO + 4NC POTENTIAL FREE CONTACT.	L&T/C&S/HAVELLS	800A, 50kA	01
2	TNC	BREAKER CONTROL SWITCH, ROTARY TYPE	SALZER/KAYCEE/TELERGON	16A	01
3	MCB	DP MINIATURE CIRCUIT BREAKER, DC TYPE	L&T/C&S/HAVELLS	10A, DP	01
4	M	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	220V DC	01
5	M	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESBEE/VAISHNO/C&S	220V DC	01
6	M	'TRIP' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, AMBER	ESBEE/VAISHNO/C&S	220V DC	01
7	M	'SPRING CHARGE' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VAISHNO/C&S	220V DC	01
8	M	ILLUMINATION PUSH BUTTON, 22.5 Sq. mm. DIA ,LED TYPE, WHITE	ESBEE/VAISHNO/C&S	220V DC	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, VILL. AMBA, VILLAGE RAMPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-68 & F-70, RIICO-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V MAIN SWITCH BOARD (1A) (MCCB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS/AIS-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	MEGHAT JOINT VENTURE (MOU) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/GIS/2024-2025/1241A-701
JOB NO.	1241A
SH. NO.	06 OF 06

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ENGINEERING DRAWING DETAILS FOR

415V AC DISTRIBUTION BOARD (2A) (MCRB)

PROJECT :- 765/400/220kV BIKANER-III POOLING STATION

CLIENT :- POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR :- BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP
	04.	-	CHKD.	VDP
	03.	-	APPD.	--
	02.	-	ALL DIMENSIONS IN mm.	SIGN.
	01.		TOLERANCE 5%	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-68 & F-70, IPHB-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	COVER PAGE
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BIKANER-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-002

JOB NO. 1241A

SH. NO. 01 OF 01

1 2 3 4 5 6 7 8 9

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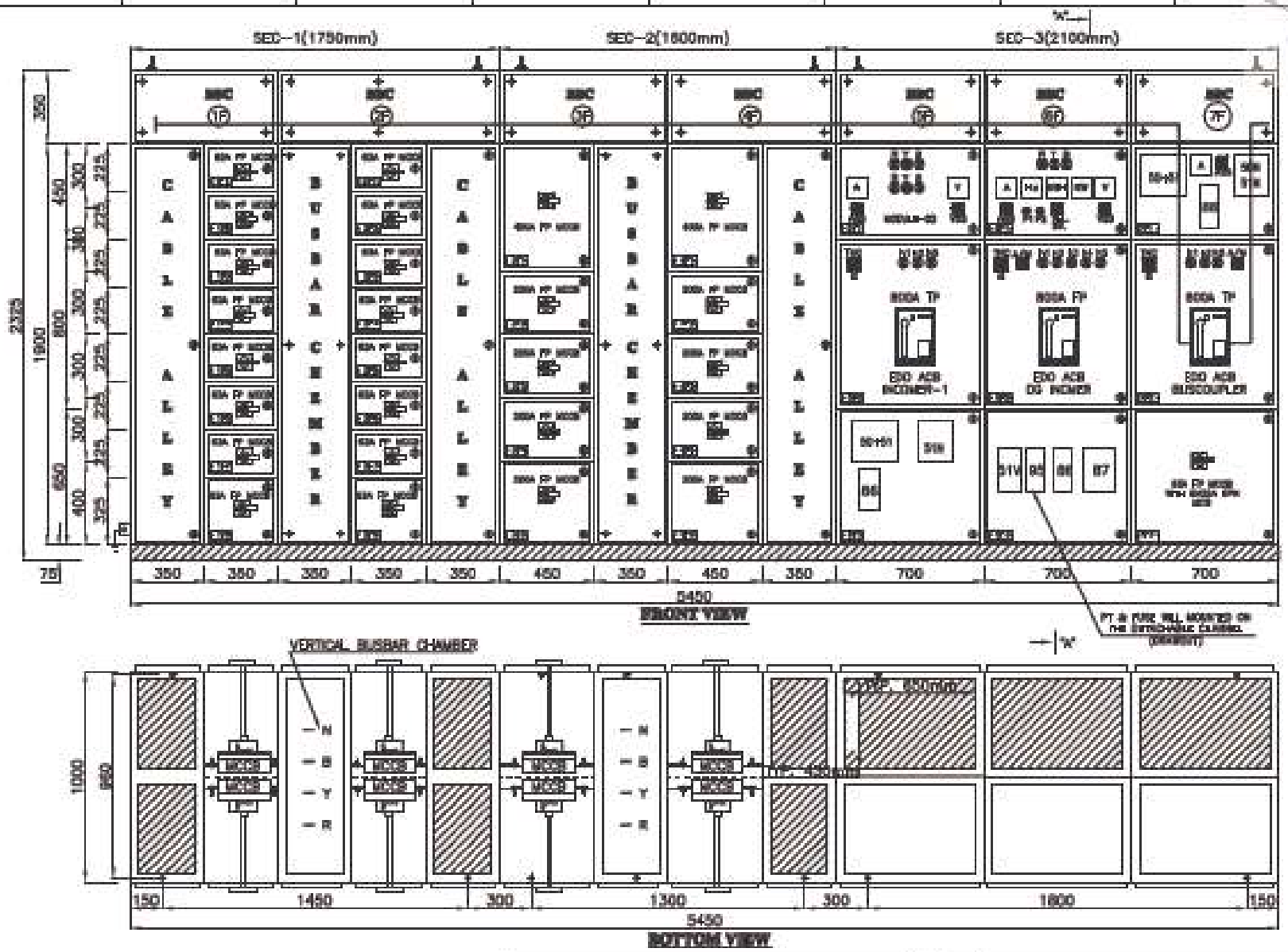

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-8 & F-9, IPHB-C, UPSIDC, SIDKUL INDUSTRIAL AREA, GRAUTER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCCB)
CA NO.	CC/T/W-MS/DDN/515/23/01656/WA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
BHARAT HEAVY ELECTRICALS LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-102 | SH. NO. 01 OF 05

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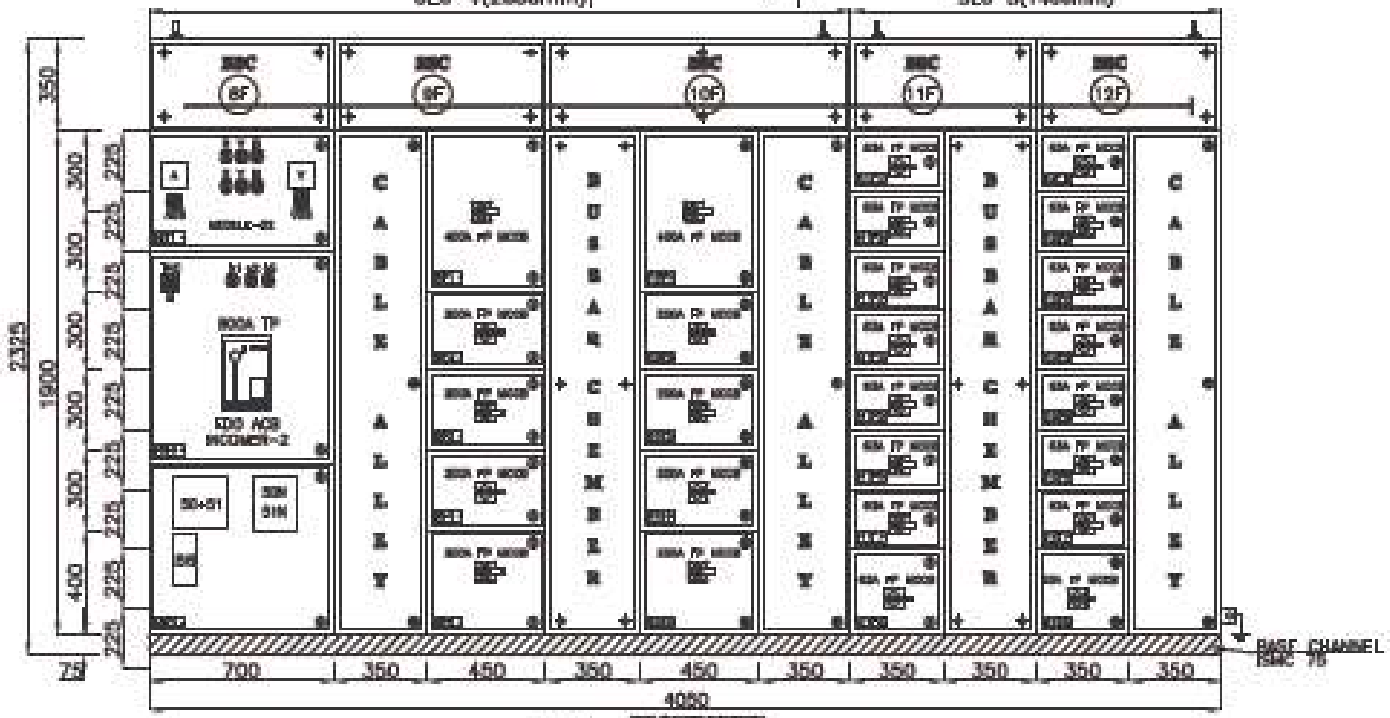

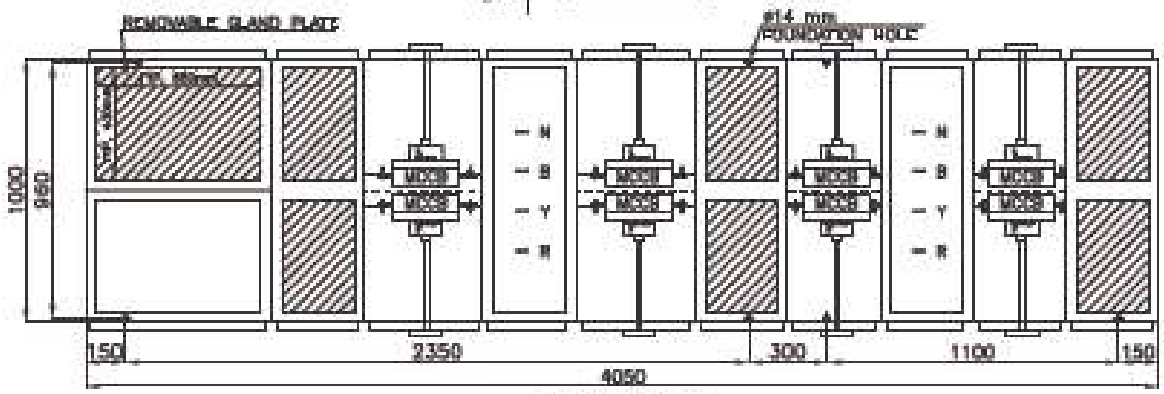

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHARWAPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-8 & F-9, IPHB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203205 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCCB)
CA NO.	CC/T/N-MS/DDA/515/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHABA-II POLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-102 | SH. NO. 02 OF 05

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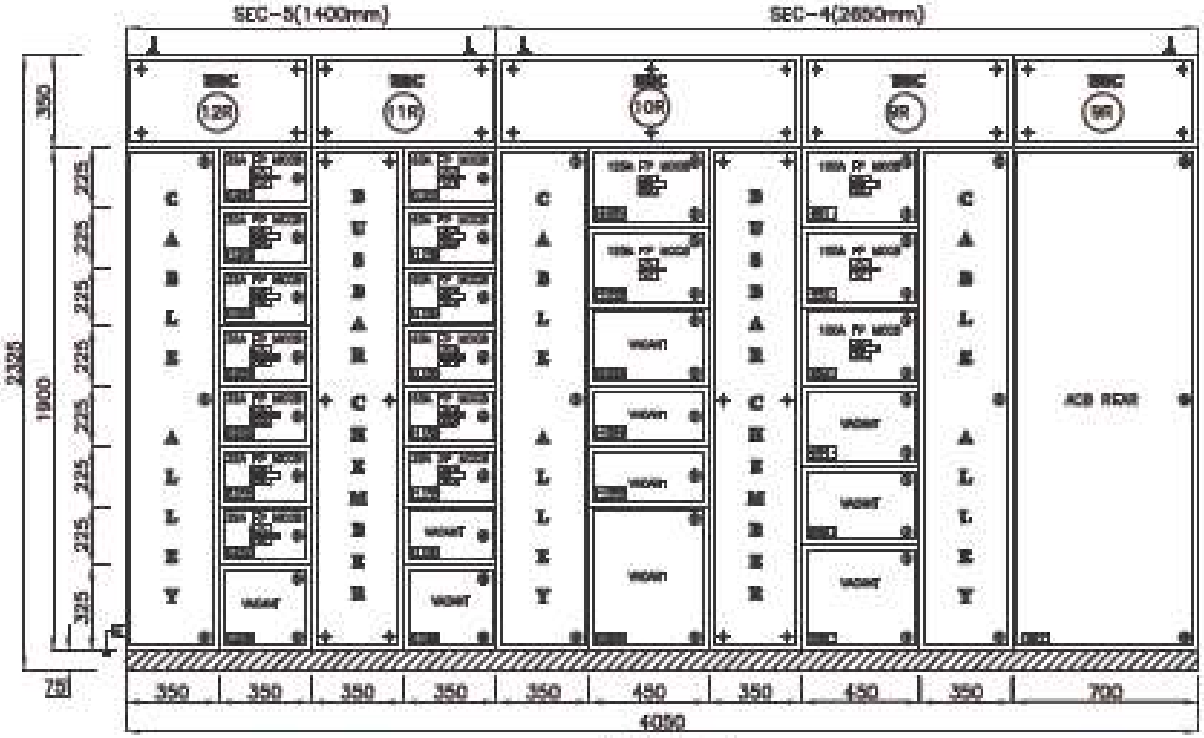


REAR VIEW

LEGEND DETAILS

R = 'R' PHASE
Y = 'Y' PHASE
B = 'B' PHASE
h1 = ACB/MCCB OFF INDICATION GREEN
h2 = ACB/MCCB ON INDICATION RED
h3 = ACB TRIP INDICATION AMBER
h5 = ACB SPRING CHARGE INDICATION BLUE
V = ANALOG VOLTMETER
A = ANALOG AMMETER
Hz = FREQUENCY METER
KW = KILOWATT METER
KWH = KILOWATT HOUR METER
P1 = MCCB OFF PUSH BUTTON (RED)
P2 = MCCB ON PUSH BUTTON (GREEN)
87 = DEFERENTIAL PROTECTION RELAY
51V = VOLTAGE CONTROLLED DEFINITE DELAY RELAY
95 = SINGLE POLE DEFINITE TIME OVER CURRENT RELAY
VMR = VOLTAGE MONITORING RELAY
86 = MASTER TRIP RELAY (HAND RESET)
VSS = VOLTMETER SELECTOR SWITCH
ASS = AMMETER SELECTOR SWITCH
A/M = AUTO/MANUAL SELECTOR SWITCH

PANEL DIMENSIONS

HEIGHT : 2325 mm.
WIDTH : 9500 mm. (5450+4050)
DEPTH : 1000 mm.

HORIZONTAL MAIN BUS BAR SIZE

PHASE : 1x80X10 Sq. mm AL
NEUTRAL : 1x80X06 Sq. mm AL
EARTH : 1X50X06 Sq. mm AL.

VERTICAL MAIN BUS BAR SIZE FOR BAY1A1, BAY1A4, BAY1A10 AND BAY1A12

PHASE : 1X80X10 SQ. MM AL.
NEUTRAL : 1X80X06 SQ. MM AL.

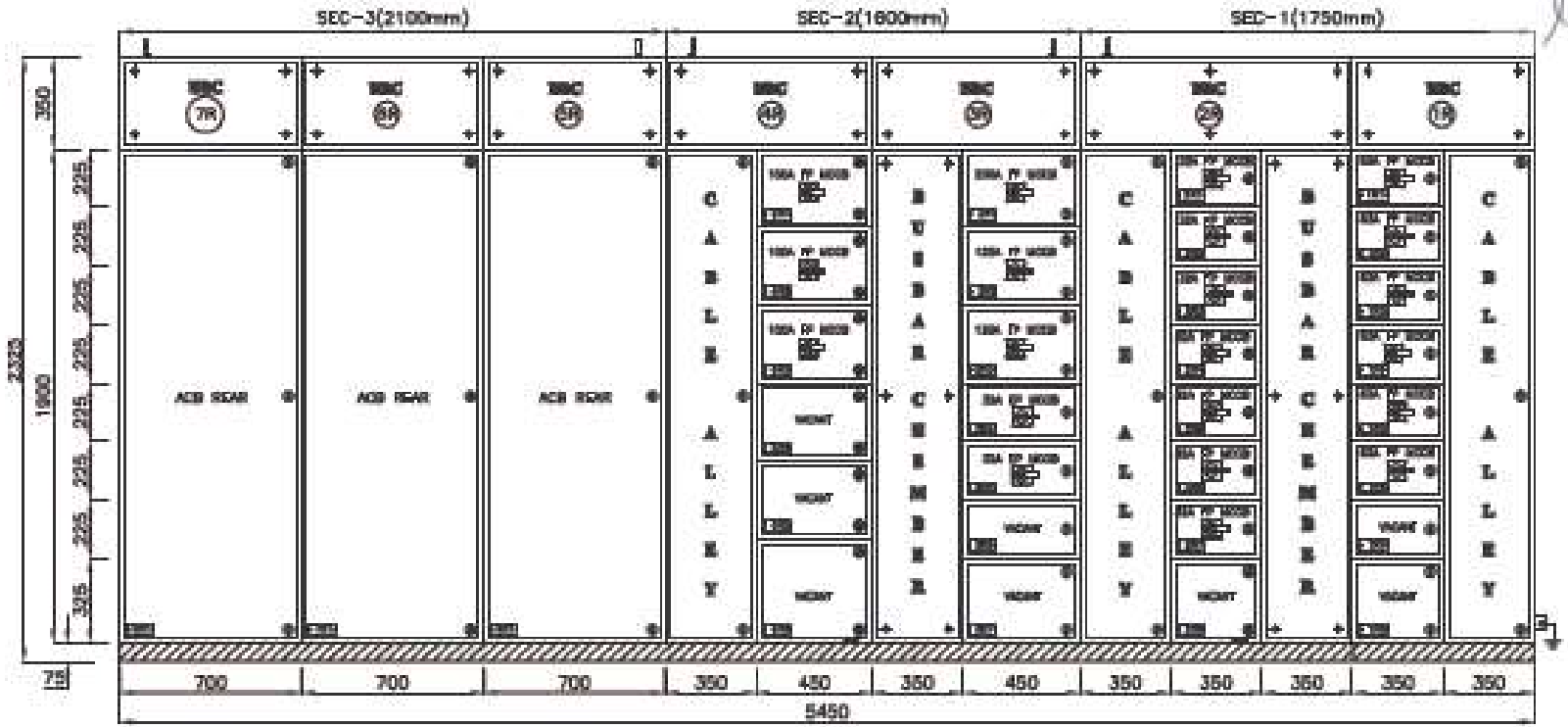
DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: —
ALL DIMENSIONS IN mm. SCAL.
TOLERANCE: ±X
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: SHARDA NO. 208, IND. AREA, VILLAGE RAIPUR (SHAHWANPUR), TEHSIL - [illegible], DISTRICT SAHARANPUR (UTTRAKHAND) - [illegible]
UNIT-II: P-8 & P-7, SEZ-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - [illegible] & NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCCB)
OA NO.	CC/T/N-46/SOM/616/23/01956/SOM-1/24-10943/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHOJA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	SHANT KANTI ELECTRICAL UNION (SKEU) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/SHEL/2024-2025/1241A-102

JOB NO. 1241A
SH. NO. 03 OF 05



REAR VIEW

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-8 & F-9, IPHB-C, LPHSIC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCMS)
CA NO.	CC/T/W-MS/DOM/515/23/01656/WA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
BHARAT HEAVY ELECTRICALS LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-102

SH. NO. 04 OF 05

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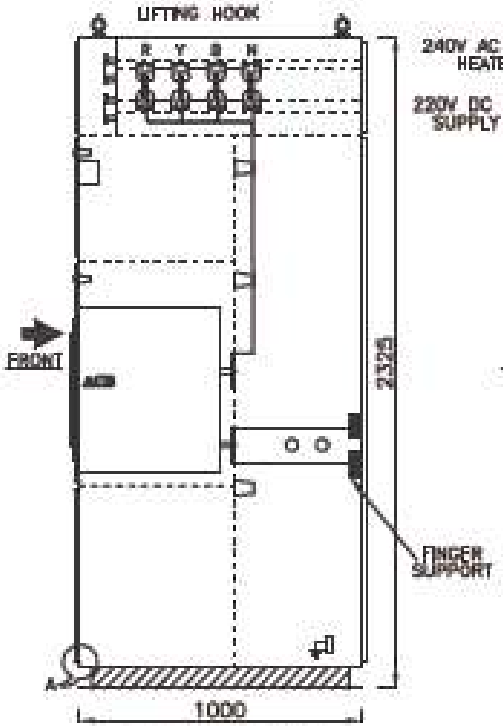
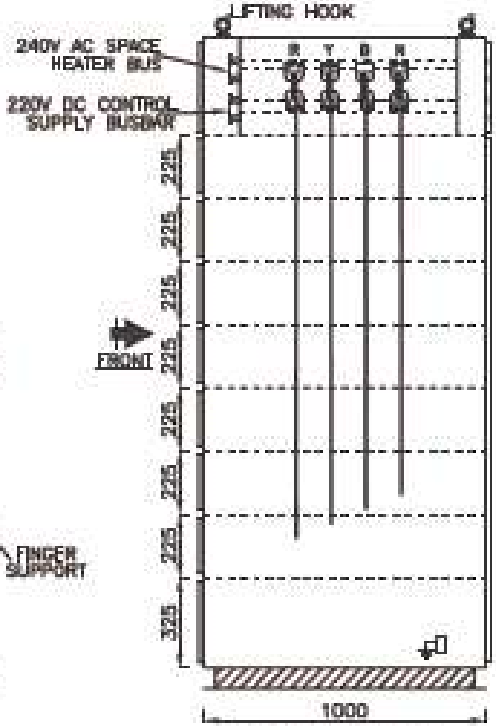
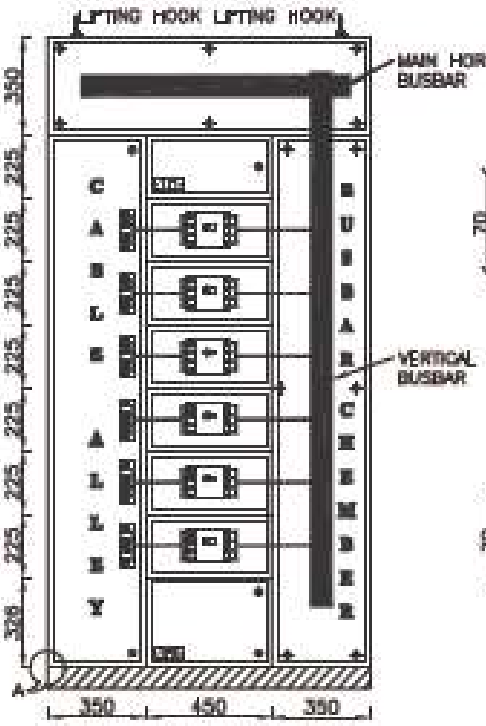


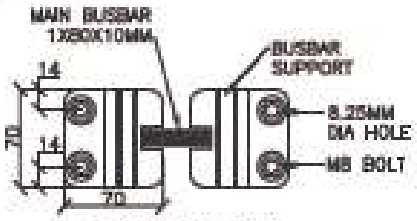
SECTIONAL VIEW AT "A"-"A"



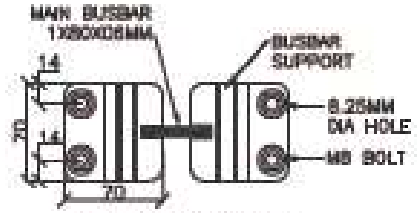
SECTIONAL VIEW AT "B"-"B"



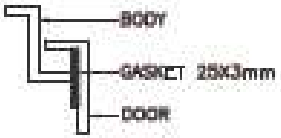
TYP. DETAIL OF PANEL NO-1
(FRONT VIEW W/O DOOR & COVER)



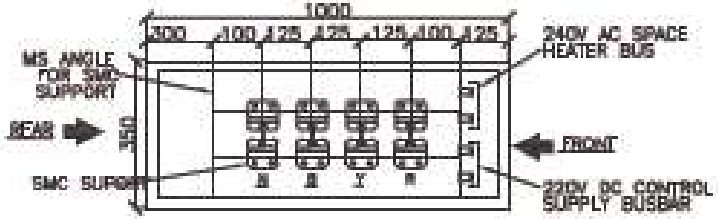
DETAIL OF PHASE BUSBAR SUPPORT



DETAIL OF NEUTRAL BUSBAR SUPPORT



DETAIL-'A'



SECTIONAL VIEW AT "C"-"C"
FOR HORIZONTAL BUSBAR
TOLERANCE ±0.5%

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-8 & F-9, IPHB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAUTAM BUDDHA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V AC DISTRIBUTION BOARD (DA) (MORB)
CA NO.	CC/T/W-MS/DDN/515/23/01896/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	[illegible]
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-102

JOB NO. 1241A

SH. NO. 05 OF 05

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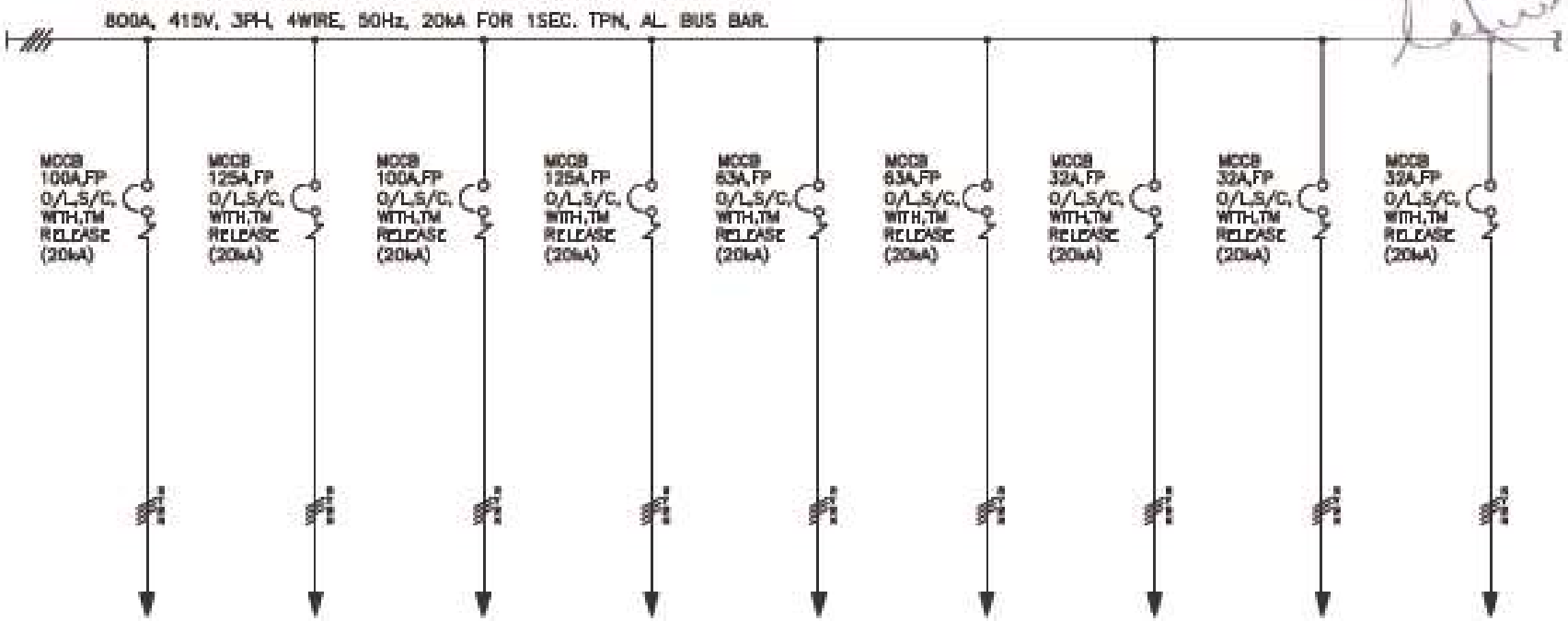

FEEDER NUMBER	4R1	3R2	4R2	3R3	1F1	1F2	2R1	2R2	2R3
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	100A	125A	100A	125A	63A	63A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	48V BATTERY CHARGER-1, SOURCE - 1	220V BATTERY CHARGER-1, SOURCE - 1	48V BATTERY CHARGER-2, SOURCE - 1	220V BATTERY CHARGER-2, SOURCE - 1	AIR CONDITIONING DB BATTERY ROOM	AIR CONDITIONING DB SAS ROOM	SUMP PUMP-1	JOCKEY PUMP (LCP)	SUPPLY POWER TO FF ACDB
POWER CABLE SIZE	1x3.5Cx70 Sqmm.	1x3.5Cx70 Sqmm.	1x3.5Cx70 Sqmm.	1x3.5Cx70 Sqmm.	1X3.5CX35 Sqmm.	1X3.5CX35 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, 319, AMBA, VILLAGE RAMPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II: F-65 & F-67, RIICO-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (DA) (MCRB)
CA NO.	CC/T/W-MS/DDN/318/23/01806/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS/HS-II POLING STATION

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

JOB NO. 1241A

DRG. NO. LSL/PGCIL/SHCL/2024-2025/1241A-202

SH. NO.:- 01 OF 12

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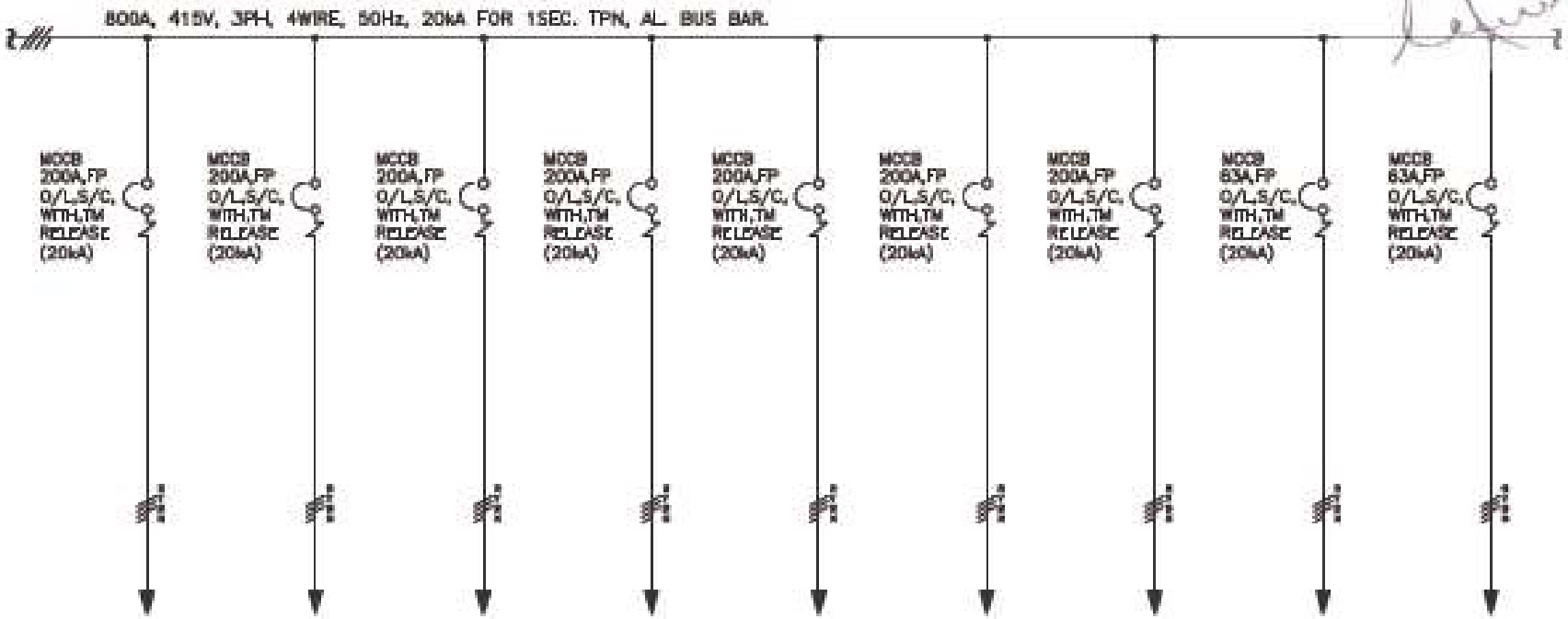

FEEDER NUMBER	3F2	3F3	3F4	3F5	4F2	4F3	4F4	1F3	1F4
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	200A	200A	200A	200A	200A	200A	200A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	765/400KV AUTO TRANSFORMER BANK-1 COMMON MB	765/400KV AUTO TRANSFORMER BANK-2 COMMON MB	765/400KV AUTO TRANSFORMER BANK-3 COMMON MB	765/400KV AUTO TRANSFORMER BANK-4 COMMON MB	765/400KV AUTO TRANSFORMER BANK-5 COMMON MB	765/400KV AUTO TRANSFORMER BANK-6 COMMON MB	765/400KV AUTO TRANSFORMER BANK-7 COMMON MB(F)	765KV LINE REACTOR 703 LR MB (F)	765KV LINE REACTOR 709 LR MB
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - BOCHOCH, DISTRICT HARDWAR (UTTRAKHAND) - [illegible], INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-II & F-V, IPIB-C, UPSIDC, SIKANDRA INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (DA) (MCBB)
CA NO.	CC/T/W-MS/DDN/318/23/01806/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXAVY ELECTRICAL CHENNAI (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-202
JOB NO.	1241A
SH. NO.:-	02 OF 12

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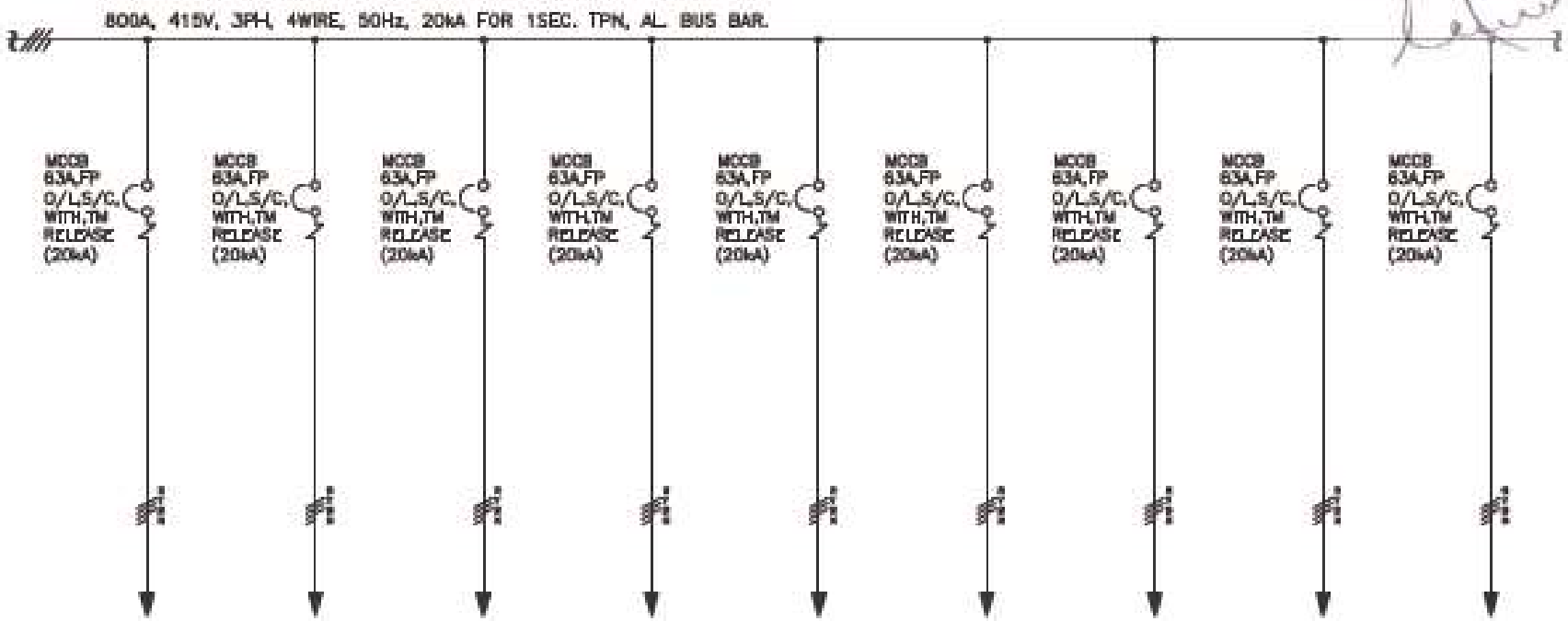

FEEDER NUMBER	1F5	1F6	1F7	1F8	2F1	2F2	2F3	2F4	2F5
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	765kV BUS REACTOR-1 715 LR MB	765kV LINE REACTOR 721 LR MB (F)	765kV LINE REACTOR 727 LR MB (F)	765kV BUS REACTOR 722 LR MB (F)	BMK-701	BMK-704	BMK-707	BMK-710	BMK-713
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, 319, AMBA, VILLAGE RAMPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-II & F-V, IITBI-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCBB)
CA NO.	CC/T/W-MS/DDN/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPRT ELECTRICAL CHECK (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-202

JOB NO. 1241A

SH. NO.:- 03 OF 12

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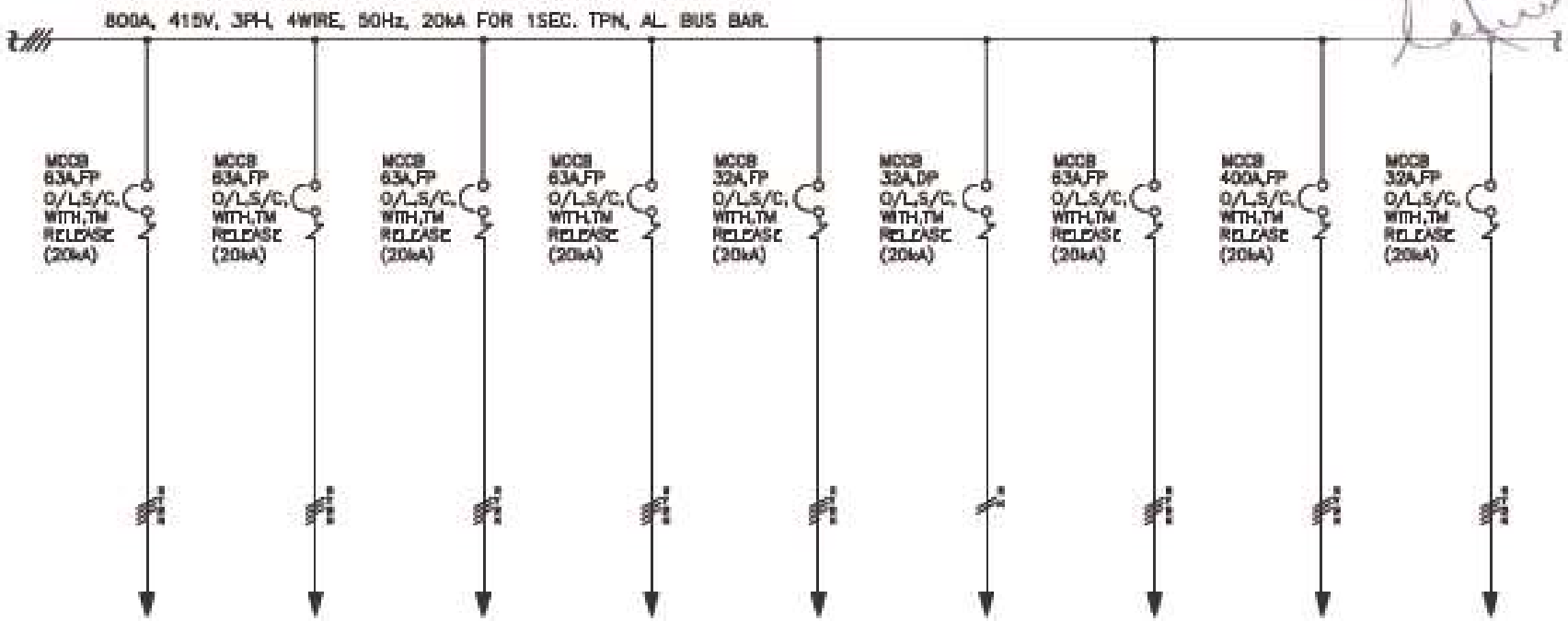

FEEDER NUMBER	2F6	2F7	2F8	1R1	2R4	3R4	1R2	3F1	2R5
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	32A	32A	63A	400A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BMK-716	BMK-719 (F)	BMK-722 (F)	BMK-725 (F)	SUPPLY TO FF ANN. PANEL	VISUAL MONITORING SYSTEM	LT TRANSFORMER MB	400kV & 220kV ACDB (AUX. BUILDING)	SAS PANEL
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X3.5CX70 Sqmm.	2X3.5CX300Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, 319, AMBA, VILLAGE RAMPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II: F-8 & F-9, IITBI-C, UPSIDC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/WA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EARTH ELECTRICAL CHENNAI (HEEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-202

JOB NO. 1241A

SH. NO.:- 04 OF 12

1 2 3 4 5 6 7 8 9

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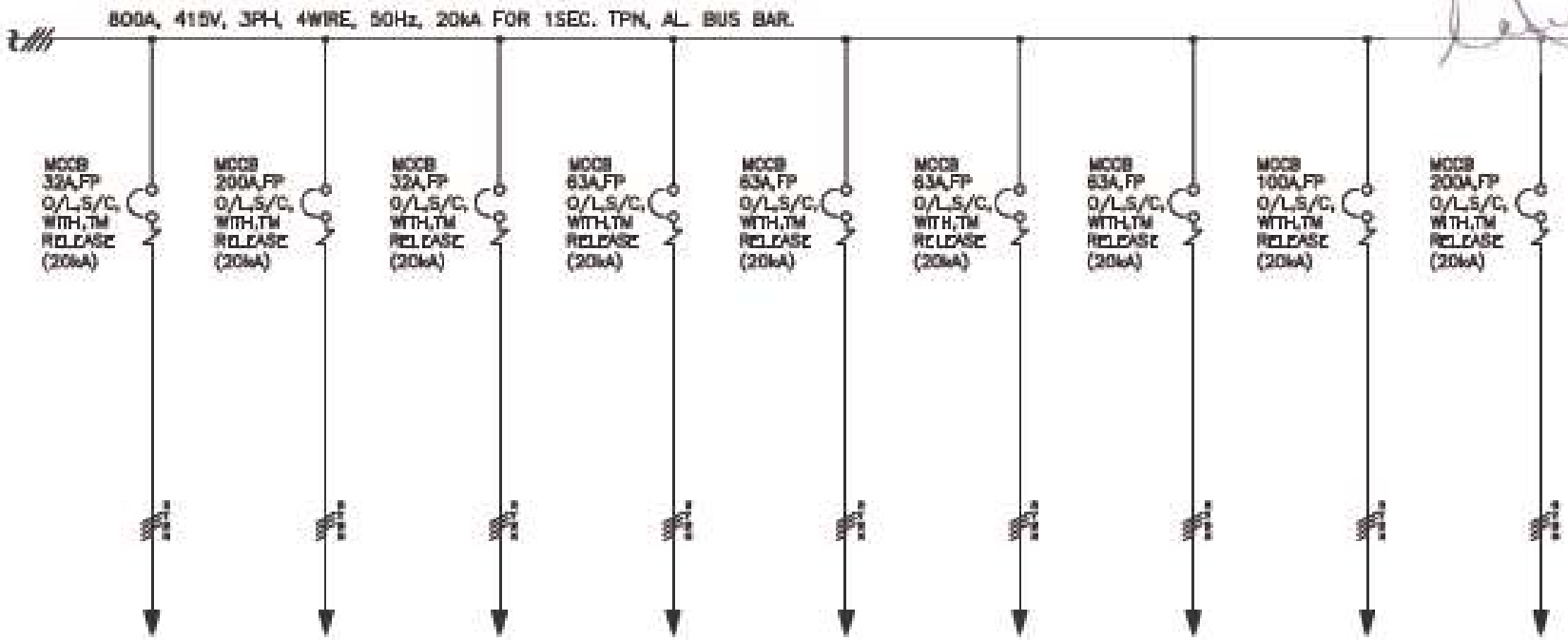

FEEDER NUMBER	2R6	4F5	2R7	1R3	1R4	1R5	1R6	4R3	3R1
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	32A	200A	32A	63A	63A	63A	63A	100A	200A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	765kV CRP PANEL	415V ELDB	SPARE-1	SPARE-2	SPARE-3	SPARE-4	SPARE-5	SPARE-6	SPARE-7
POWER CABLE SIZE	1X4CX16 Sqmm.	1X3.5CX70 Sqmm.	--	--	—	--	--	—	—

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, 319, AMBA, VILLAGE RAMPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II: F-48 & F-47, IITBI-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GHAZIABAD, INDIA - 201009 U. P. INDIA (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (DA) (MCBB)
CA NO.	CC/T/W-MS/DDM/515/23/01656/WA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EMPLOYEES ELECTRICAL CHAIRS (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-202
JOB NO.	1241A
SH. NO.:-	06 OF 12

1 2 3 4 5 6 7 8 9

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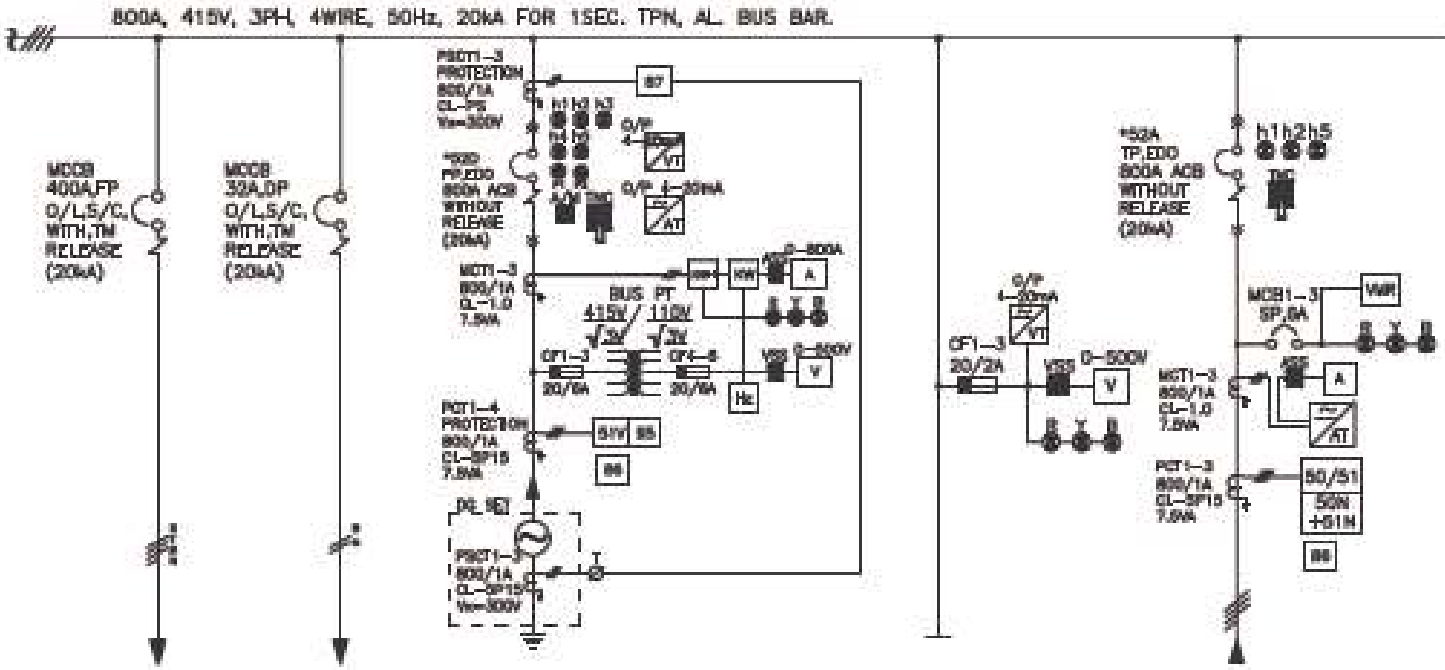

FEEDER NUMBER	4F1	3R5	6F1+6F2+6F3	5F1+5F2+5F3	
MODULE TYEP	E	E	DG	G2	AE
FEEDER RATING	400A	32A	800A	—	800A
FEEDER TYPE	MCCB	MCCB	ACB	METERING	ACB
DESCRIPTION	SPARE-8	SPARE-9	415V AC SUPPLY FROM 415V 500kVA DG SET	—	415V AC SUPPLY FROM 415V MAIN SWITCH BOARD (INCOMER-1)
POWER CABLE SIZE	--	—	2X3.5CX300 Sqmm.		2X3.5CX300 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II: F-8 & F-9, IPSEC, LOHGAD, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCRB)
CA NO.	CC/T/W-MS/DOM/015/23/01006/NOA-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS/HS-II POOLING STATION

JOB NO. 1241A

CLIENT: POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:- [illegible] ELECTRICAL CHENNAI (INDIA) TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/SHED/2024-2025/1241A-202

SH. NO.:- 06 OF 12

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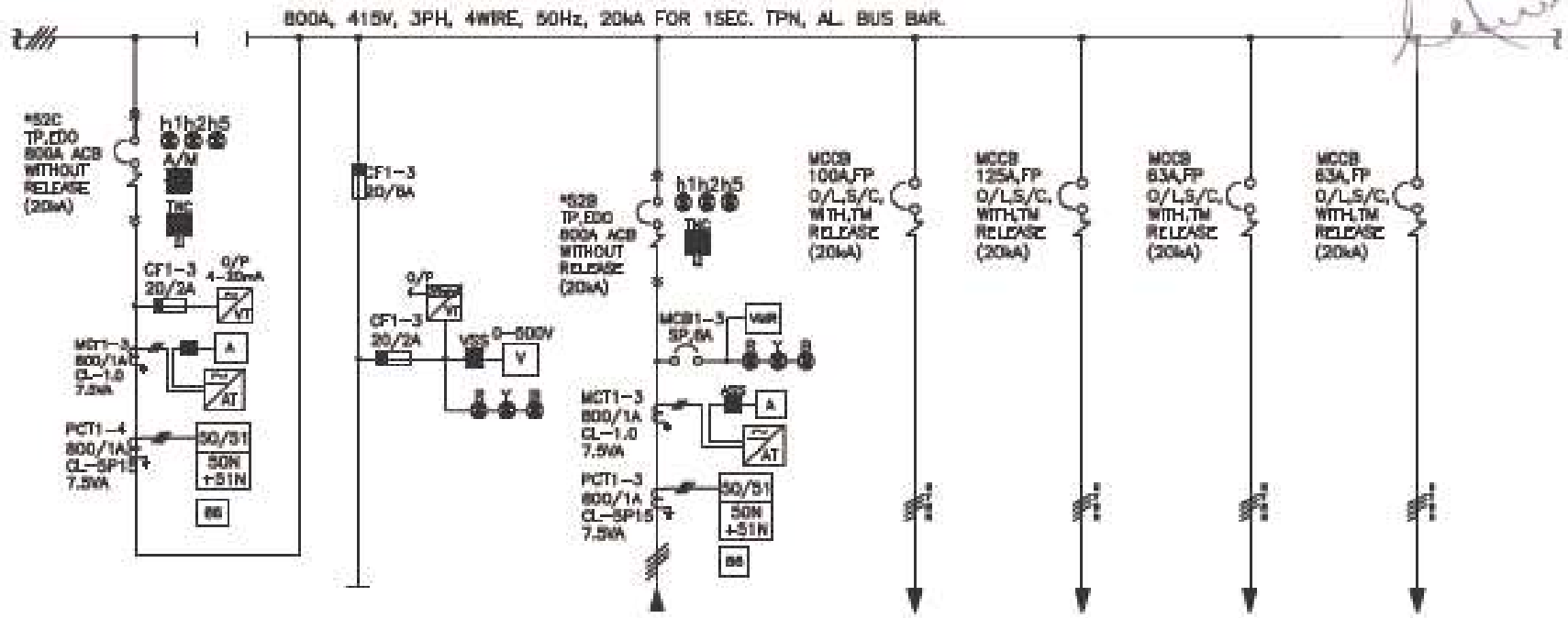

FEEDER NUMBER	7F1+7F2+7F3	8F1+8F3	8F1+8F2+8F3	9R1	10R1	11F1	11F2
MODULE TYEP	AE	G2	AE	E	E	E	E
FEEDER RATING	800A	--	800A	100A	125A	63A	63A
FEEDER TYPE	ACB	METERING	ACB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BUS COUPLER	--	415V AC SUPPLY FROM 415V MAIN SWITCH BOARD (INCOMER-2)	48V BATTERY CHARGER-1, SOURCE - 2	220V BATTERY CHARGER-1, SOURCE - 2	AIR CONDITIONING DB INCHARGE OFFICE	AIR CONDITIONING DB TRASIT GUEST ROOM
POWER CABLE SIZE			2X3.5CX300 Sqmm.	1x3.5Cx70 Sqmm.	1x3.5Cx70 Sqmm.	1X3.5CX35 Sqmm.	1X3.5CX35 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 218, BHD. AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IITBI-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCRB)
CA NO.	CC/T/W-MS/DDN/515/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS/HS-II POLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/SHED/2024-2025/1241A-202
SH. NO.:- 07 OF 12

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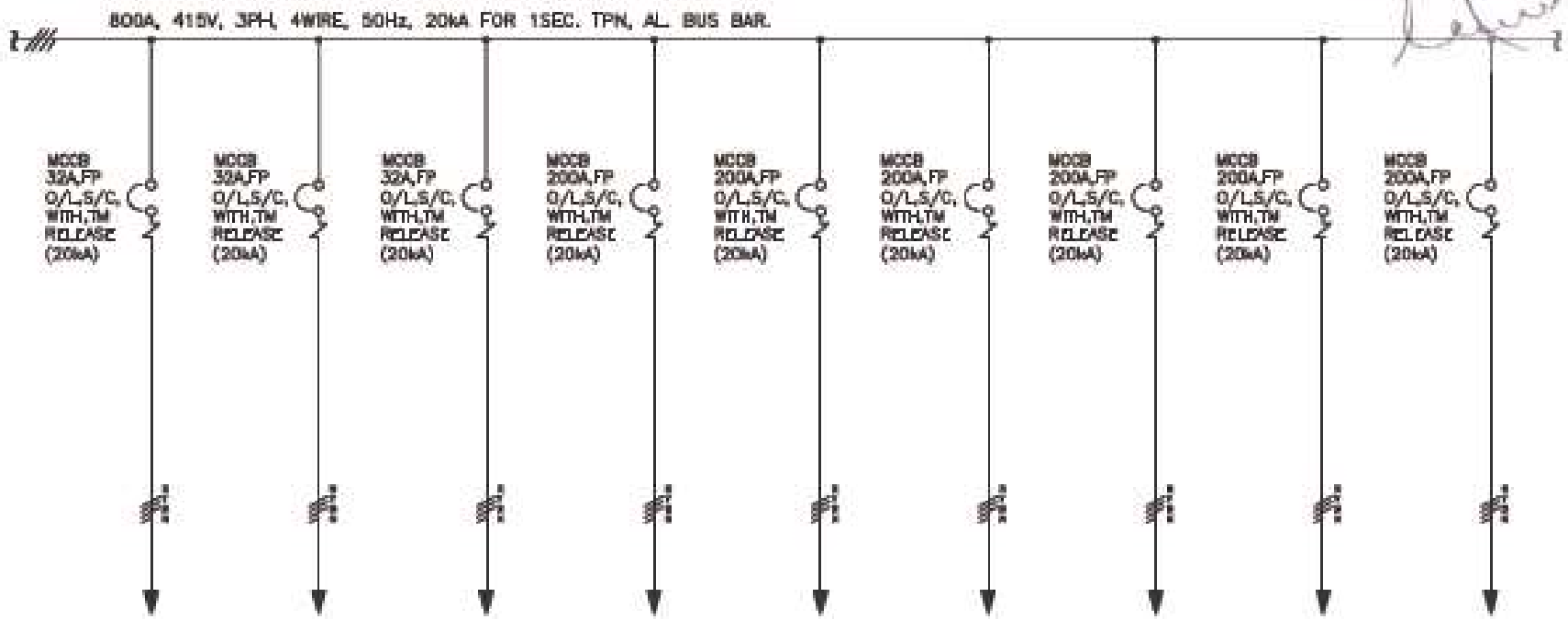

FEEDER NUMBER	12R1	12R2	12R3	9F2	9F3	9F4	9F5	10F2	10F3
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	32A	32A	32A	200A	200A	200A	200A	200A	200A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	SUMP PUMP-2	JOCKEY PUMP (LCP)	SUPPLY POWER TO FF ACDB	765/400KV AUTO TRANSFORMER BANK-1 COMMON MB	765/400KV AUTO TRANSFORMER BANK-2 COMMON MB	765/400KV AUTO TRANSFORMER BANK-3 COMMON MB	765/400KV AUTO TRANSFORMER BANK-4 COMMON MB	765/400KV AUTO TRANSFORMER BANK-5 COMMON MB	765/400KV AUTO TRANSFORMER BANK-6 COMMON MB
POWER CABLE SIZE	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAMPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (DA) (MCBB)
CA NO.	CC/T/W-MS/DDN/318/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPRT ELECTRICAL CHECK (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	LSL/PGCIL/BHCL/2024-2025/1241A-202

JOB NO. 1241A

SH. NO.:- 08 OF 12

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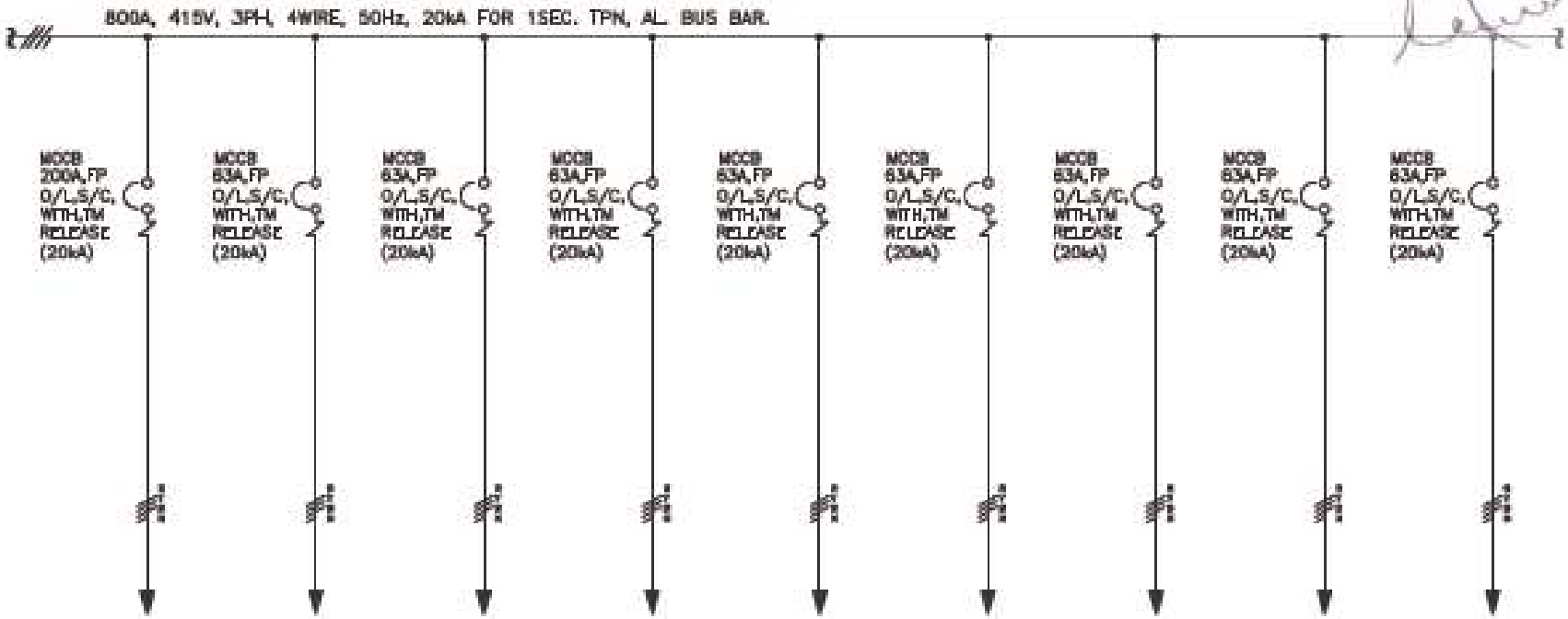

FEEDER NUMBER	10F4	11F3	11F4	11F5	11F6	11F7	11F8	12F1	12F2
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	200A	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	765/400KV AUTO TRANSFORMER BANK-7 COMMON MB(F)	765kV LINE REACTOR 706 LR MB (F)	765kV LINE REACTOR 712 LR MB	765kV LINE REACTOR 724 LR MB (F)	765kV LINE REACTOR 725 LR MB (F)	765kV BUS REACTOR-2 727 BR MB	BMK-703(F)	BMK-706(F)	BMK-709
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, 319, AMBA, VILLAGE RAMPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IITB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCBS)
CA NO.	CC/T/W-MS/DDN/010/23/01006/WA-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BANDA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DWG. NO. USL/PGCIL/BHEL/2024-2025/1241A-202 | SH. NO.:- 09 OF 12

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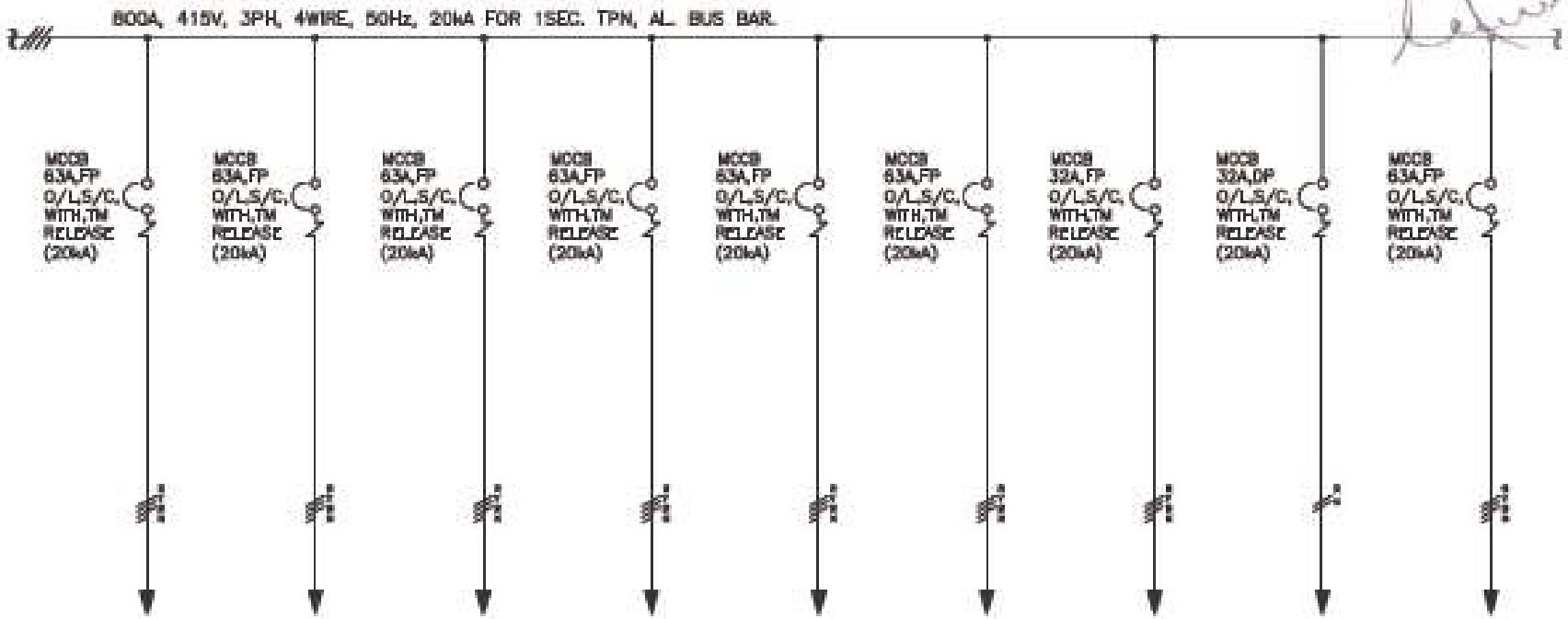


FEEDER NUMBER	12F3	12F4	12F5	12F6	12F7	12F8	12R4	11R6	11R1
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	32A	32A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BMK-712	BMK-715	BMK-718	BMK-721(F)	BMK-724(F)	BMK-727(F)	SUPPLY TO FF ANN. PANEL	VISUAL MONITORING SYSTEM	LT TRANSFORMER MB
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

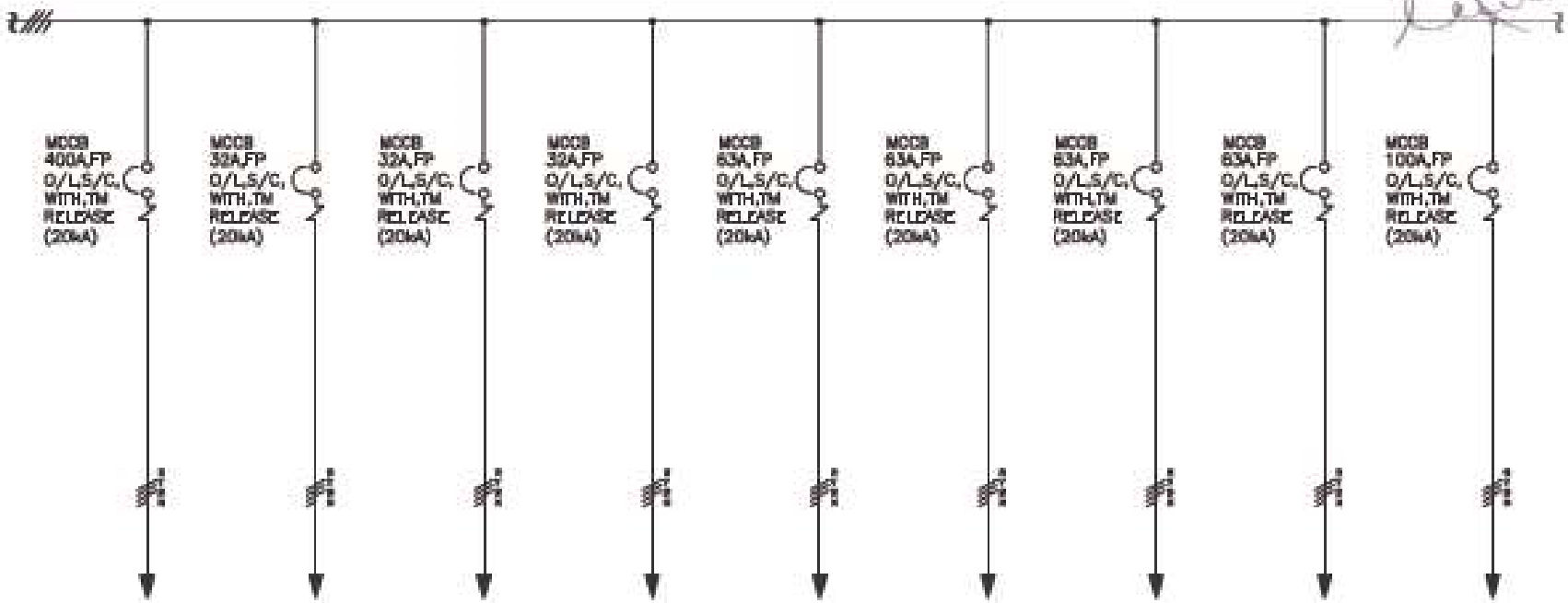
MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-II & F-V, IPIB-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCRB)
CA NO.	CC/T/W-MS/DDN/318/23/01656/WA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HIGHT TEMPT ELECTRICAL CHECK (INDIA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-202

JOB NO. 1241A

SH. NO.:- 10 OF 12

This Drawing & Information or descriptive matter set out herein are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing, rendering or for any other purpose without their permission.



FEEDER NUMBER	9F1	12R5	12R6	12R7	11R2	11R3	11R4	11R5	9R2
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	400A	32A	32A	32A	63A	63A	63A	63A	100A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	400kV & 220kV ACDB (AUX. BUILDING)	SAS PANEL	765kV CRP PANEL	SPARE–10	SPARE–11	SPARE–12	SPARE–13	SPARE–14	SPARE–15
POWER CABLE SIZE	2X3.5CX300Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	—	—	--	--	—	--

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, 319, AMBA, VILLAGE RAMPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IITB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (DA) (MCBS)
CA NO.	CC/T/W-MS/DDN/515/23/01656/WA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPORT ELECTRICAL CHINA (HEC) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-202

JOB NO. 1241A

SH. NO.:- 11 OF 12

1 2 3 4 5 6 7 8 9

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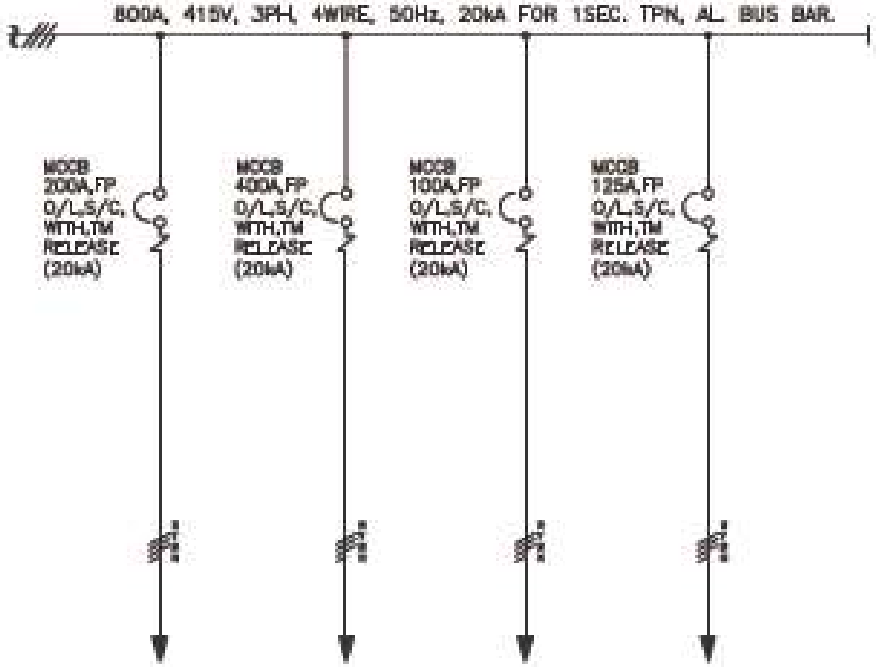

FEEDER NUMBER	10F5	10F1	9R3	10R2
MODULE TYEP	E	E	E	E
FEEDER RATING	200A	400A	100A	125A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	SPARE-16	SPARE-17	48V BATTERY CHARGER-2, SOURCE - 2	220V BATTERY CHARGER-2, SOURCE - 2
POWER CABLE SIZE	--	--	1x3.5Cx70 Sqmm.	1x3.5Cx70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAMPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-68 & F-69, IITBI-C, UPSIDC, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (DA) (MCRB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIANDI-II POLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHECK (NCEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO. LSL/PGCIL/SHCL/2024-2025/1241A-202
SH. NO.:- 12 OF 12

This Drawing & Information or descriptive matter set out herein are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing, rendering or for any other purpose without their permission.

BILL OF MATERIAL FOR 415V AC DISTRIBUTION BOARD (2A) (MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A		BILL OF MATERIAL FOR MODULE - (AB) INCOMER 1&2			2 Nos.
1	52A & 52B	TP ACB 415V,EDO, WITHOUT RELEASE, 1. SPRING CHARGE MOTOR 220V DC WITH SPRING CHARGE SWITCH 2. CLOSING RELEASE 220V DC 3. SHUNT RELEASE 220V DC 4. LIMIT SWITCH FOR TEST/ISOLATE/SERVICE POSITION 5. 4NO + 4NC POTENTIAL FREE CONTACT.	L&T/C&S/HAVELLS	800A, 50kA	01
2	CN-18	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	07
3	CN-20	HRC FUSE LINK	L&T/C&S/HAVELLS	6A	07
4		AUX. CONTACTOR RELAY, COIL VOLTAGE 220V DC WITH 2NO+2NC AUX. CONTACT	L&T/C&S/HAVELLS	---	03
5		AUX. CONTACTOR RELAY, COIL VOLTAGE 220V DC WITH 3NO+1NC AUX. CONTACT	L&T/C&S/HAVELLS	---	02
6		2NO+2NC ADD ON BLOCK	L&T/C&S/HAVELLS	---	01
7	MCB	DP MINIATURE CIRCUIT BREAKER, DC TYPE	L&T/C&S/HAVELLS	10A, 4kA	02
8	MCB	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, 10kA	03
9	VMR-1, VMR-2	415V AC, THREE PHASE, 3WIRE, VOLTAGE MONITORING RELAY	MINILEC/PGCIL APPROVED MAKE	---	01
10	BNC	BREAKER CONTROL SWITCH	SALZER/KAYCEE	16A	01
11	R-PHASE	'R' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	240V AC	01
12	Y-PHASE	'Y' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, YELLOW	ESBEE/VAISHNO/C&S	240V AC	01
13	B-PHASE	'B' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VAISHNO/C&S	240V AC	01
14	M	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	220V DC	01
15	M	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESBEE/VAISHNO/C&S	220V DC	01
16	M	'SPRING CHARGE' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VAISHNO/C&S	220V DC	01
17	2T, 3T	ON DELAY TIMER WITH 1C/O AUXILIARY SWITCH, 0-60 SEC.	GIC/PGCIL APPROVED MAKE	220V DC	01
18	T1A, T2A	ON DELAY TIMER WITH 1C/O AUXILIARY SWITCH, 0-60 SEC.	GIC/PGCIL APPROVED MAKE	220V DC	01
19	MCTs	CURRENT TRANSFORMER, RESIN CAST TYPE	REWTEK/AE/PRECISE/PROCOM/ASHWOR	800/1A, CL-1.0, 7.5VA	03
20	PCTs	CURRENT TRANSFORMER, RESIN CAST TYPE	REWTEK/AE/PRECISE/PROCOM/ASHWOR	800/1A, CL-5P15, 7.5VA	04
21	A	ANALOG AMMETER, SINGLE PHASE, SIZE-96X96 Sq. mm, CL-1.0, CTR-/1A	AE/RISHAB/NEWTEK/SECURE/PGCIL APPROVED MAKE	0-800A	01
22	AS	AMMETER SELECTOR SWITCH, ROTARY TYPE	SALZER/KAYCEE	6A	01

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP; CHKD.: VDP; APPD.: --; ALL DIMENSIONS IN mm. SIGN.; TOLERANCE 5%; REVISIONS : 00

MANUFACTURER: ULTIMA SWITCHGEARS LTD.

DRAWING	BILL OF MATERIAL
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCRB)
CA NO.	CC/T/W-MS/DOM/015/23/01005/00A-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	MEGHAT KHAIT ELECTRICAL CHECK (MEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-702

JOB NO. 1241A; SH. NO. 01 OF 06

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BILL OF MATERIAL FOR 415V AC DISTRIBUTION BOARD (2A) (MCCB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A		**BILL OF MATERIAL FOR MODULE - (A2) INCOMER 1&2**			**2 Nos.**
23	VI	AC VOLTAGE TRANSDUCER, SINGLE OUTPUT- 4-20mA, PTR-415V AC, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	—	03
24	CI	AC CURRENT TRANSDUCER, OUTPUT- 4-20mA, WITH SINGLE OUTPUT, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	800/1A	03
25	M	HIGH SPEED TRIPING RELAY WITH 3NO+1NC CONTACT (AUTO RESET HIGH SPEED), AUX. SUPPLY 220V DC	L&T/JVS/C&S	—	01
26	50+51	TRIPLE POLE INSTANTANEOUS OVER-CURRENT RELAY HAVING THE SETTING RANGE OF 200-800% OR 500-2000% OF CT SECONDARY AND ADJUSTABLE DEFINITE MINIMUM TIME, AUX. SUPPLY 220V DC .	L&T/JVS/C&S	-/1A	01
27	50N+51N	INSTANTANEOUS EARTH FAULT RELAY HAVING AN ADJUSTABLE SETTING RANGE OF 10-40% OR 20 - 80% OF CT SECONDARY CURRENT AND ADJUSTABLE DEFINITE MINIMUM TIME. THE EARTH FAULT RELAY SHALL BE PROVIDED WITH A STABILISING RESISTOR, AUX. SUPPLY 220V DC.	L&T/JVS/C&S	-/1A	01

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

	04.	-	DRAWN	MP	
	03.	-	CHKD.	VDP	
	02.	-	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-68 & F-70, RIICO-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCCB)
CA NO.	CC/T/W-HS/DOM/318/23/01656/WA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPRT ELECTRICAL CHECK (HEEC) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-702

JOB NO. 1241A

SH. NO. 02 OF 06

This Drawing & information or descriptive matter set out herein are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing, rendering or for any other purpose without their permission.

BILL OF MATERIAL FOR 415V AC DISTRIBUTION BOARD (2A) (MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
B	**BILL OF MATERIAL FOR MODULE - (A3-BC) BUS-COUPLER**				1 No.
1	ACB	"TP" ACB 415V,COD, WITHOUT RELEASE, 1. SPRING CHARGE MOTOR 220V DC WITH SPRING CHARGE SWITCH 2. CLOSING RELEASE 220V DC 3. SHUNT RELEASE 220V DC 4. LIMIT SWITCH FOR TEST/ISOLATE/SERVICE POSITION 5. 4NO + 4NC POTENTIAL FREE CONTACT.	L&T/C&S/HAVELLS	800A, 50kA	01
2	CFU-20	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	10
3	CFU-20	HRC FUSE LINK	L&T/C&S/HAVELLS	6A	10
4		AUX. CONTACTOR RELAY, COIL VOLTAGE 220V DC WITH 2NO+2NC AUX. CONTACT	L&T/C&S/HAVELLS	--	04
5		AUX. CONTACTOR RELAY, COIL VOLTAGE 220V DC WITH 4NO AUX. CONTACT	L&T/C&S/HAVELLS	--	02
6		2NO+2NC ADD ON BLOCK	L&T/C&S/HAVELLS	--	01
7		4NO ADD ON BLOCK	L&T/C&S/HAVELLS	--	01
8	MCB	DP MINIATURE CIRCUIT BREAKER, DC TYPE	L&T/C&S/HAVELLS	10A, 4kA	01
9	MCTs	CURRENT TRANSFORMER, RESIN CAST TYPE	NEWTEK/AE/PRECISE/PROCOM/ASHMOR	800/1A, CL-1.0, 7.5VA	03
10	PCTs	CURRENT TRANSFORMER, RESIN CAST TYPE	NEWTEK/AE/PRECISE/PROCOM/ASHMOR	800/1A, CL-5P15, 7.5VA	04
11	A	ANALOG AMMETER, SINGLE PHASE, SIZE-96X96 Sq. mm, CL-1.0, CTR-/1A	AE/RISHAB/NEWTEK/SECURE	0-800A	01
12	ASS	AMMETER SELECTOR SWITCH, ROTARY TYPE	SALZER/KAYCEE	6A	01
13	Vt	AC VOLTAGE TRANSDUCER, SINGLE OUTPUT- 4-20mA, PTR-415V AC, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	--	03
14	Ct	AC CURRENT TRANSDUCER, OUTPUT- 4-20mA, WITH SINGLE OUTPUT, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	800/1A	03
15	TNC	BREAKER CONTROL SWITCH	SALZER/KAYCEE	16A	01
16	ASS	AUTO/MANUAL SELECTOR SWITCH WITH OFF, 3POLE 2WAY, ROTARY TYPE	SALZER/KAYCEE	6A	01
17	M	"ON" INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VASHNO/C&S	220V DC	01
18	M	"OFF" INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESBEE/VASHNO/C&S	220V DC	01
19	M	"SPRING CHARGE" INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VASHNO/C&S	220V DC	01
20	TS	"ON" INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	GIC/PGCIL APPROVED MAKE	220V DC	01
21	86	HIGH SPEED TRIPING RELAY WITH 3NO+1NC CONTACT (AUTO RESET HIGH SPEED), AUX. SUPPLY 220V DC.	L&T/JVS/C&S	--	01
22	50-1-51	TRIPLE POLE INSTANTANEOUS OVER-CURRENT RELAY HAVING THE SETTING RANGE OF 200-800% OR 500-2000% OF CT SECONDARY AND ADJUSTABLE DEFINITE MINIMUM TIME. AUX. SUPPLY 220V DC .	L&T/JVS/C&S	-/1A	01
23	50N-1-51N	INSTANTANEOUS EARTH FAULT RELAY HAVING AN ADJUSTABLE SETTING RANGE OF 10-40% OR 20 - 80% OF CT SECONDARY CURRENT AND ADJUSTABLE DEFINITE MINIMUM TIME. THE EARTH FAULT RELAY SHALL BE PROVIDED WITH A STABILISING RESISTOR, AUX. SUPPLY 220V DC.	L&T/JVS/C&S	-/1A	01
C	**BILL OF MATERIAL FOR MODULE - (C3)**				2 Nos.
1	CFU-2	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	03
2	CFU-2	HRC FUSE LINK	L&T/C&S/HAVELLS	2A	03
3	V	ANALOG VOLTMETER, SINGLE PHASE, SIZE-96X96 Sq. mm, CL-1.0, PTR-415AC	AE/RISHAB/NEWTEK/SECURE	0-500V	01
4	VSS	FOUR POSITION VOLTMETER SELECTOR SWITCH, ROTARY TYPE	SALZER/KAYCEE	6A	01
5	R-PHASE	"R" INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VASHNO/C&S	240V AC	01
6	Y-PHASE	"Y" INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, YELLOW	ESBEE/VASHNO/C&S	240V AC	01
7	B-PHASE	"B" INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VASHNO/C&S	240V AC	01

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP; CHKD.: VDP; APPD.: --; ALL DIMENSIONS IN mm. SIGN.; TOLERANCE 5%; REVISIONS : 00

MANUFACTURER: ULTIMA SWITCHGEARS LTD.

DRAWING	BILL OF MATERIAL
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCRB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HIGHWAY ENERGY ELECTRICAL CHENNAI (HEEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-702

JOB NO. 1241A

SH. NO. 03 OF 06

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BILL OF MATERIAL FOR 415V AC DISTRIBUTION BOARD (2A) (MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
0		BILL OF MATERIAL FOR MODULE -(MCB)			1 No.
1	ACB	HP ACB 415V AC, EDO, WITHOUT RELEASE, 1. SPRING CHARGE MOTOR 220V DC WITH SPRING CHARGE SWITCH 2. CLOSING RELEASE 220V DC 3. SHUNT RELEASE 220V DC 4. LIMIT SWITCH FOR TEST/ISOLATE/SERVICE POSITION 5. 4NO + 4NC POTENTIAL FREE CONTACT.	L&T/C&S/HAVELLS	800A, 50kA	01
2	CFI-II	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	13
3	CFI-II	HRC FUSE LINK	L&T/C&S/HAVELLS	6A	13
4		AUX. CONTACTOR RELAY, COIL VOLTAGE 220V DC WITH 3NO+2NC AUX. CONTACT	L&T/C&S/HAVELLS	--	03
5		2NO+2NC ADD ON BLOCK	L&T/C&S/HAVELLS	--	01
6	MCB	DP MINIATURE CIRCUIT BREAKER, DC TYPE	L&T/C&S/HAVELLS	10A	02
7	MCTs	CURRENT TRANSFORMER, RESIN CAST TYPE	NEWTEK/AE/PRECISE/PROCOM/ASHMOR	800/1A, CL-1, 7.5VA	03
8	PCTs	CURRENT TRANSFORMER, RESIN CAST TYPE	NEWTEK/AE/PRECISE/PROCOM/ASHMOR	800/1A, CL-5P15, 7.5VA	03
9	PMCTs	CURRENT TRANSFORMER, RESIN CAST TYPE	NEWTEK/AE/PRECISE/PROCOM/ASHMOR	800/1A, CL-PS, 7.5VA, Vx=300V	06*
10	Hz	FREQUENCY METER (Hz), 110V AC	NEWTEK/AE/PRECISE/PROCOM/ASHMOR	45Hz-55Hz	01
11	KWH	DIGITAL KILO WATT HOUR METER WITH SIX DIGITS AND MINIMUM COUNT OF ONE KWH,110V AC 3Ph 4 WIRE, SIZE – 96 X 96 Sq.mm., AUX. SUPPLY 240V AC	AE/RISHAB/NEWTEK/SECURE	800/1A	01
12	KW	DIGITAL KILO WATT METER, 110V AC 3Ph 4 WIRE, 0-300KW RANGE, AUX. SUPPLY 240V AC	AE/RISHAB/NEWTEK/SECURE	800/1A	01
13	A	ANALOG AMMETER, SINGLE PHASE, SIZE-96X96 Sq. mm, CL-1.0, CTR-/1A	AE/RISHAB/NEWTEK/SECURE /PGCIL APPROVED MAKE	0-800A	01
14	V	ANALOG VOLTMETER, SINGLE PHASE, SIZE-96X96 Sq. mm, CL-1.0, PTR-(415/√3 V)/(110/√3V) AC		0-500V	01
15	A/M	AUTO/MANUAL SELECTOR SWITCH, 3POLE 2WAY WITH OFF, ROTARY TYPE	SALZER/KAYCEE	6A	01
16	AS	AMMETER SELECTOR SWITCH, ROTARY TYPE	SALZER/KAYCEE	6A	01
17	VS	FOUR POSITION VOLTMETER SELECTOR SWITCH, ROTARY TYPE	SALZER/KAYCEE	6A	01
18	BNC	BREAKER CONTROL SWITCH, ROTARY TYPE	SALZER/KAYCEE	16A	01
19	OLV	THREE POLE VOLTAGE CONTROLLED DEFINITE TIME OVER CURRENT RELAY, SETTING 50-200% OF CT SECONDARY CURRENT, A TIME DELAY 2.5-35SEC. CONNECTED IN CT OF Y PHASE FOR OVERLOAD ALARM, AUX. SUPPLY 220V DC, PTR-(415/√3 V)/(110/√3V) AC	L&T/JVS/C&S	800/1A	01
20	50	SINGLE POLE NON DIRECTIONAL DEFINITE TIME OVER CURRENT RELAY WITH INBUILT TIMER SETTING RANGE 50-200% IN STEP OF 10% TIME DELAY RANGE 0-25 SEC IN STEP OF 0.1 SEC. AUX. SUPPLY 220V DC. SETTING RATIO OF NOT LESS THAN 90%	L&T/JVS/C&S	800/1A	01

*PROTECTION CT 3 NOS. WILL BE SUPPLIED LOOSE FOR MOUNTING IN DG SET PANEL

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP; CHKD.: VDP; APPD.: --; ALL DIMENSIONS IN mm. SIGN.; TOLERANCE 5%; REVISIONS : 00

MANUFACTURER: ULTIMA SWITCHGEARS LTD.

DRAWING	BILL OF MATERIAL
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCRB)
CA NO.	CC/T/W-MS/DOM/015/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	MEGHAT KHAYY ELECTRICAL CHENNAI (MEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-702
SH. NO.	04 OF 06

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BILL OF MATERIAL FOR 415V AC DISTRIBUTION BOARD (3A) (MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
D		**BILL OF MATERIAL FOR MODULE-(DCU)**			1 No.
21	[illegible]	HIGH SPEED TRIPING RELAY WITH 3NO+1NC CONTACT (AUTO RESET HIGH SPEED). AUX. SUPPLY 220V DC	L&T/JVS/C&S	--	01
22	[illegible]	THREE POLE DIFFERENTIAL PROTECTION RELAY HAVING AN OPERATING CURRENT SETTING RANGE OF 10–40% OF GENERATOR FULL LOAD CURRENT, THE RELAY SHALL BE OF HIGH IMPEDANCE TYPE, WITH NECESSARY STABILIZING RESISTORS., AUX. SUPPLY 220V DC	L&T/JVS/C&S	800/1A	01
23	[illegible]	AC VOLTAGE TRANSDUCER, SINGLE OUTPUT– 4–20mA, PTR–(415/√3 V)/(110/√3V) AC, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	--	03
24	[illegible]	AC CURRENT TRANSDUCER, OUTPUT – 4–20mA, WITH SINGLE OUTPUT, AUX. SUPPLY 220V DC	AE/RISHAB/SECURE	800/1A	03
25	[illegible]	'R' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	63.5V AC	01
26	[illegible]	'Y' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, YELLOW	ESBEE/VAISHNO/C&S	63.5V AC	01
27	[illegible]	'B' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VAISHNO/C&S	63.5V AC	01
28	[illegible]	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	220V DC	01
29	[illegible]	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESBEE/VAISHNO/C&S	220V DC	01
30	[illegible]	'TRIP' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, AMBER	ESBEE/VAISHNO/C&S	220V DC	01
31	[illegible]	'SPRING CHARGE' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VAISHNO/C&S	220V DC	01
32	[illegible]	'STOP' PUSH BUTTON, SPRING RETURN TYPE, 22.5 Sq. mm. DIA WITH 2NC CONTACT, RED	ESBEE/VAISHNO/C&S	220V DC	01
33	[illegible]	'START' PUSH BUTTON, SPRING RETURN TYPE, 22.5 Sq. mm. DIA WITH 2NO CONTACT, GREEN	ESBEE/VAISHNO/C&S	220V DC	01
34	[illegible]	(415/√3V)/(110/√3V)VOLTS SINGLE PHASE VOLTAGE TRANSFORMER STAR/STAR CONNECT WITH STAR POINT SOLIDLY EARTHED MOUNTED ON COMMON DRAW OUT CHASSIS. ACCURACY CLASS 0.5 FOR PROTECTION AND METERING WITH 50VA BURDEN.	NEWTEK/AE/PRECISE/PROCOM /ASHNOR	--	03
E	**BILL OF MATERIAL FOR MISC.**				
1	MCB	DP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	25A, 10kA	01
2	MCB	DP MINIATURE CIRCUIT BREAKER, DC TYPE	L&T/C&S/HAVELLS	25A	02
3	MCB	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	16A, 10kA	11
4	SW-SOCKET	SWITCH WITH SOCKET	ANCHOR/REPUTED	5/15A	03
5	SS	SELECTOR SWITCH, 2P, 2W WITH OFF	SALZER/KAYCEE	32A	01
6	DS	DOOR SWITCH	SURAJ/REPUTED	1 C/O	11
7	PL	PANEL ILLUMINATION LIGHT, 240V AC	COMPACT/REPUTED	5W	11
8	SH	SPACE HEATER, 240V AC	HOTWEL/REPUTED	60W	11
9	TH	THERMOSTATE	ELCOM/REPUTED	30 – 85°C	11
10	TS	TOGGLE SWITCH	FTC/REPUTED	6A	11

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 218, BTD. AREA, VILLAGE RAIPUR (BHAGWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - [illegible], INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDCUL PURAPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V AC DISTRIBUTION BOARD (3A) (MCRB)
CA NO.	CC/T/W-HS/DOM/015/23/01656/WA-1/24-02943/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPORT ELECTRICAL CHENNAI (HEEC) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-702

JOB NO. 1241A

SH. NO. 05 OF 06

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BILL OF MATERIAL FOR 415V AC DISTRIBUTION BOARD (QA) (MCCB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
F		**BILL OF MATERIAL FOR MODULE - (B) FOR OUTGOINGS**			
1	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH SPREADER & EXTENDED ROM, Ics = 100% Icu	L&T/C&S/HAVELLS	400A, 20kA	02
2	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH SPREADER & EXTENDED ROM, Ics = 100% Icu	L&T/C&S/HAVELLS	200A, 20kA	03
3	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH SPREADER & EXTENDED ROM, Ics = 100% Icu	L&T/C&S/HAVELLS	100A, 20kA	35
4	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH EXTENDED ROM, Ics = 100% Icu	L&T/C&S/HAVELLS	63A, 20kA	91
5	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH EXTENDED ROM, Ics = 100% Icu	L&T/C&S/HAVELLS	32A, 20kA	13
6	MCB	SPN MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	32A, 10kA	18

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BRD. AREA, VILLAGE RAMPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-68 & F-70, RIICO-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V AC DISTRIBUTION BOARD (2A) (MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-702
SH. NO.	05 OF 06

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ENGINEERING DRAWING DETAILS FOR

415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCRB)

PROJECT :- 765/400/220kV BIKANER-III POOLING STATION

CLIENT :- POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR :- BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-48 & F-47, IPHB-C, LOHARI, SIDHAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	COVER PAGE
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BIKANER-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/POOL/BHEL/2024-2025/1241A-003

JOB NO. 1241A

SH. NO. 01 OF 01

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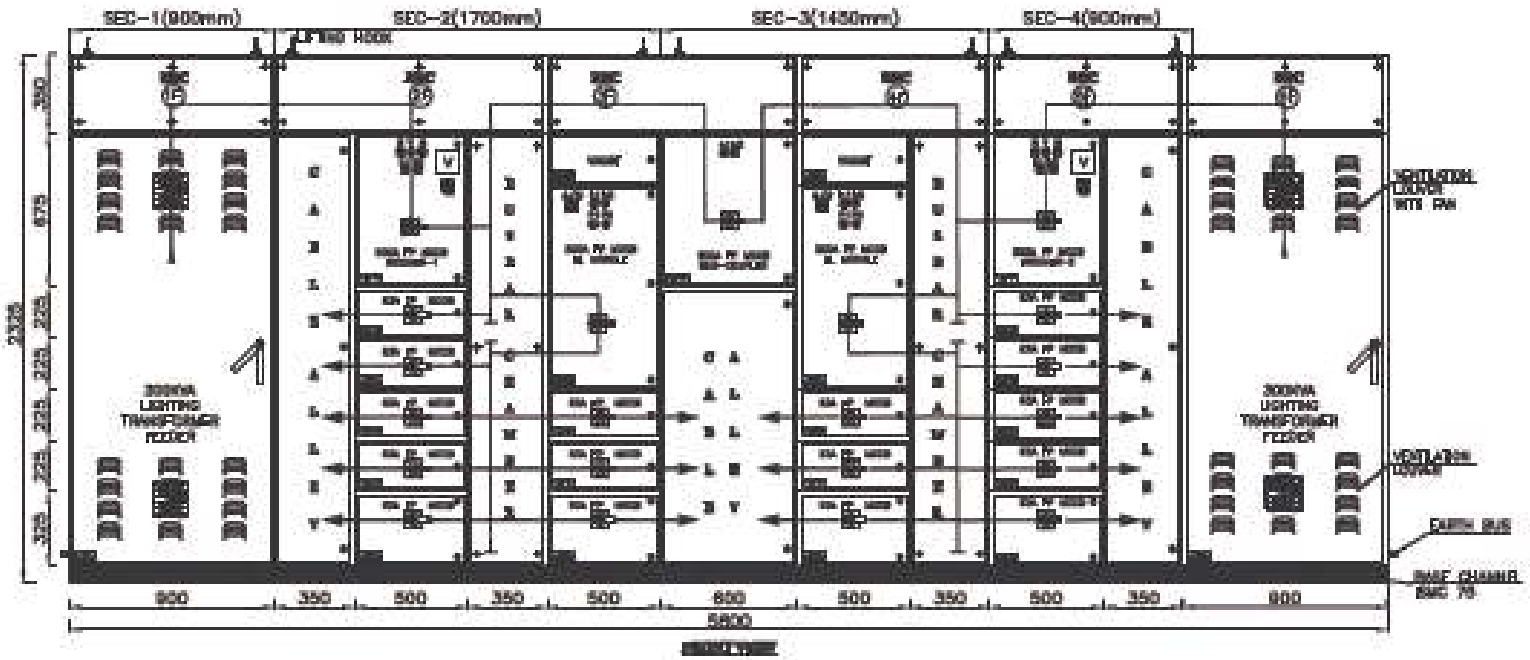

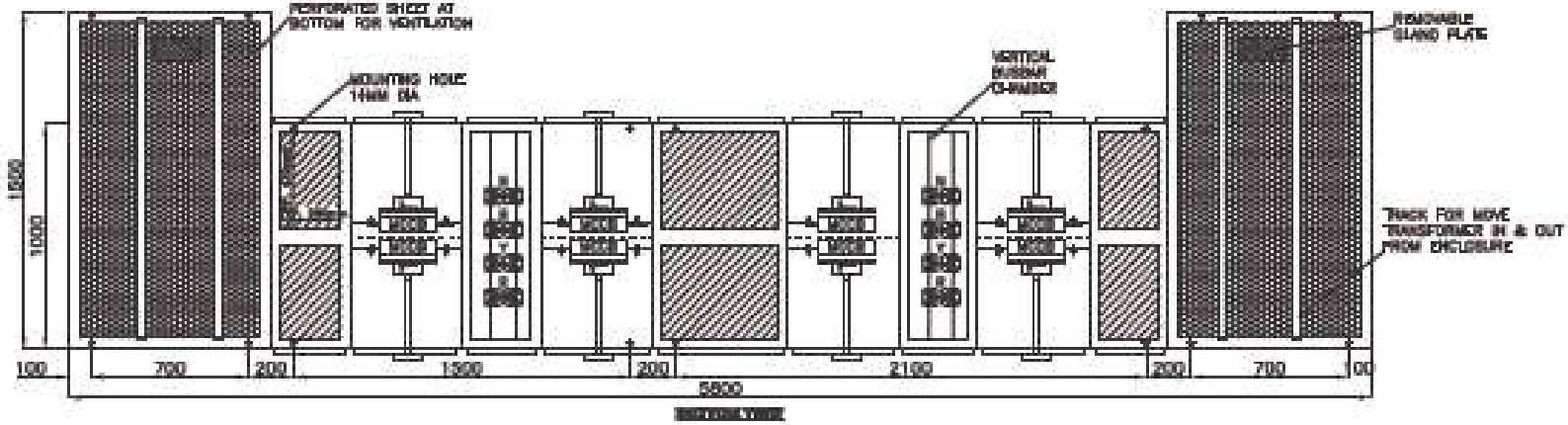

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP
	04.	–	CHKD.	VDP
	03.	–	APPD.	--
	02.	–	ALL DIMENSIONS IN mm.	SIGN.
	01.		TOLERANCE 5%	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMIN, VILLAGE RAIPUR, BHAGWANPURI, TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL : 01332-285262 FAX : 01332-285262
UNIT-II F-8 & F-9, IPHB-C, LANDCO, SIDCUL, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : info@ultimaswitchgear.com

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCRB)
CA NO.	CC/T/W-HD/DOM/015/23/01656/WA-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EQUIPT ELECTRICAL CHENNAI (HEQ) TRANSMISSION PROJECTS DIVISION
DWG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-103
JOB NO.	1241A
SH. NO.	01 OF 03

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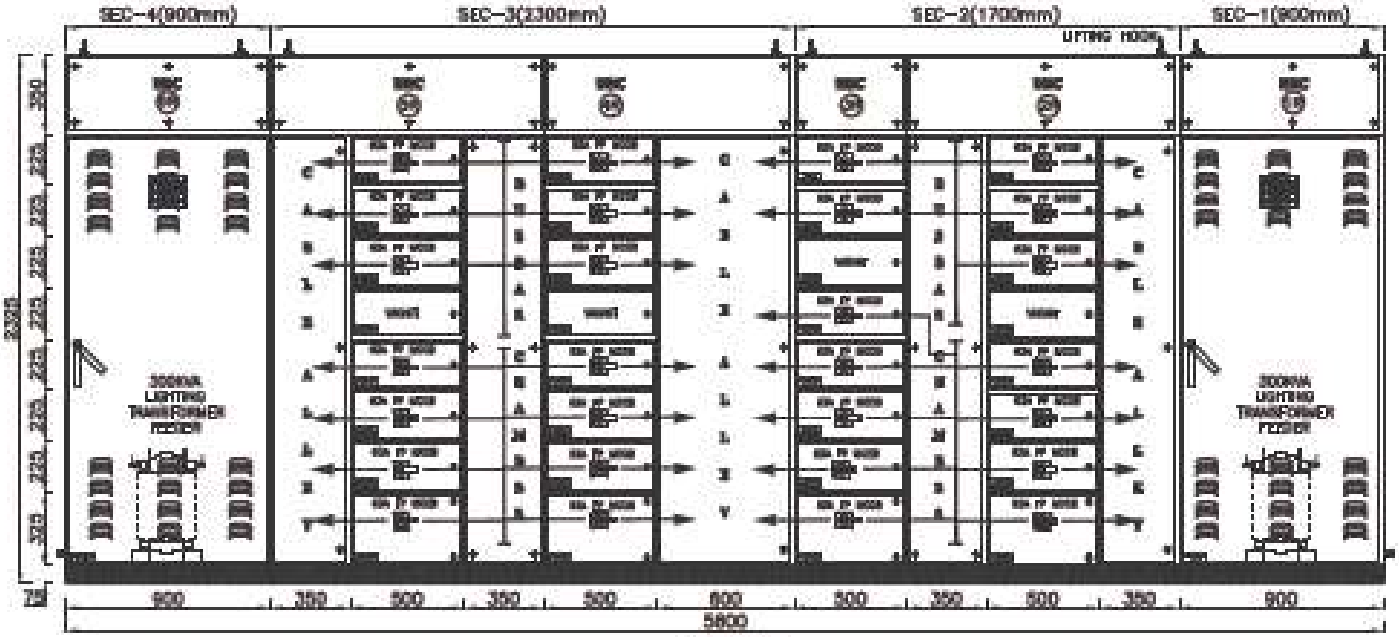

FRONT VIEW

PANEL DIMENSIONS

HEIGHT 2325 mm.
WIDTH 5600 mm.
DEPTH 1500/1000 mm.

CABLE ENTRY

BOTTOM ENTRY

HORIZONTAL BUS BAR SIZE :-

PHASE : 1x50x10 Sq.mm AL.
NEUTRAL : 1x50x06 Sq.mm AL.
EARTH : 1x50x06 Sq.mm. GS.

VERTICAL BUS BAR SIZE :-

PHASE : 1X50X10 SQ.MM AL.
NEUTRAL : 1X50X06 SQ.MM AL.

LEGEND DESCRIPTION

R = R-PHASE INDICATION (RED)
Y = Y-PHASE INDICATION (YELLOW)
B = B-PHASE INDICATION (BLUE)
H1 = ON INDICATION RED
H2 = OFF INDICATION GREEN
A = DIGITAL AMMETER
V = DIGITAL VOLT METER
ASS = AMMETER SELECTOR SWITCH
VSS = VOLTAGE SELECTOR SWITCH
P1 = CONTACTOR OFF PUSH BUTTON
P2 = CONTACTOR ON PUSH BUTTON
A/M = AUTO/MANUAL SELECTOR SWITCH

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP	SIGN.
	04.	–	CHKD.	VDP	
	03.	–	APPD.	--	
	02.	–	ALL DIMENSIONS IN mm.		
	01.		TOLERANCE 5%		
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL : 01332-285260 FAX : 01332-285262
UNIT-II: F-8 & F-9, IPHB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : info@ultimaswitchgear.com

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCHB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NOA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHABA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	MEGHAT KHAYY ELECTRICAL CHENNAI (MCEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-103
JOB NO.	1241A
SH. NO.	02 OF 03

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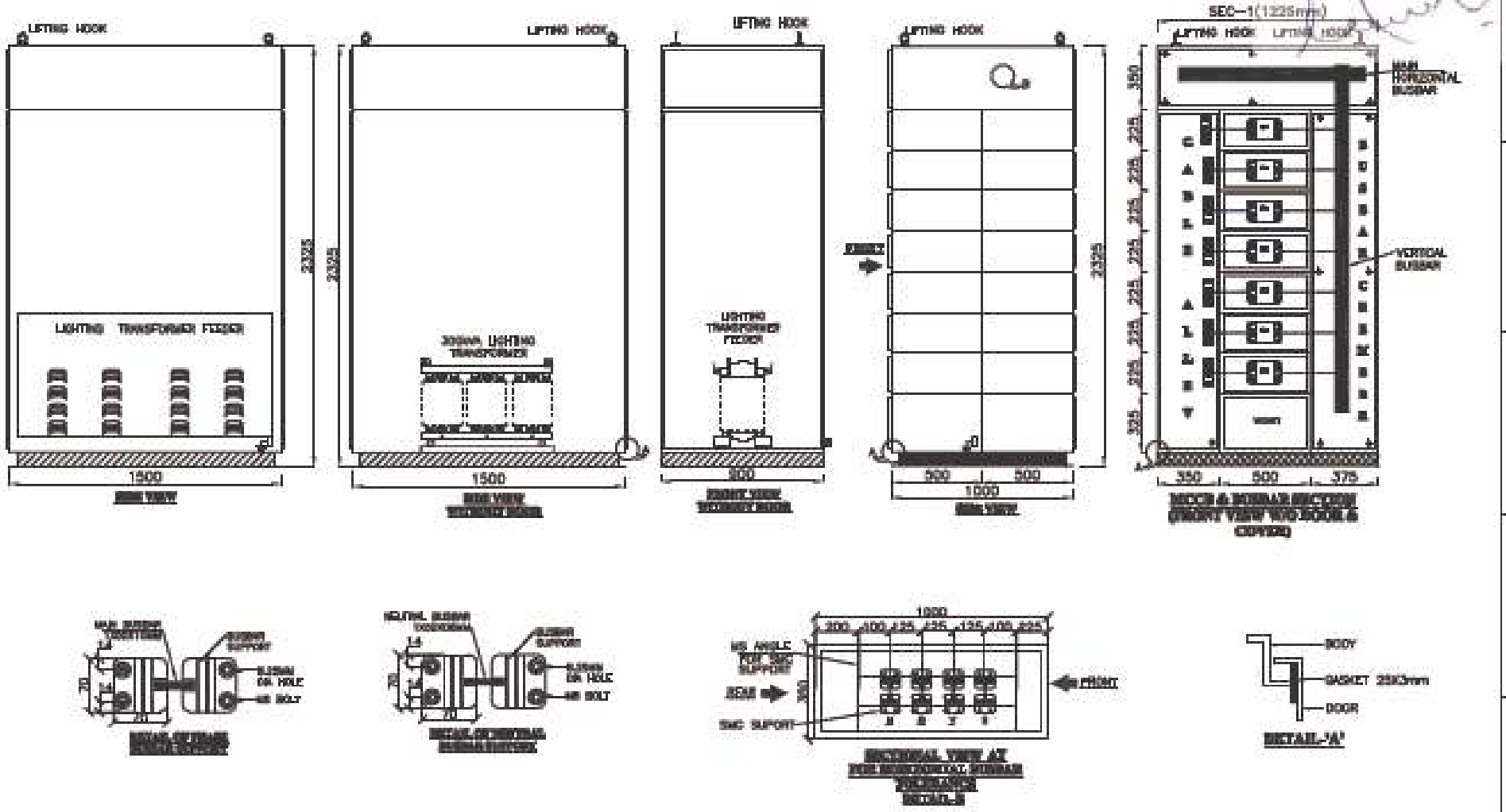

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP	SIGN.
	04.	–	CHKD.	VDP	
	03.	–	APPD.	--	
	02.	–	ALL DIMENSIONS IN mm.		
	01.		TOLERANCE 5%		
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDCUL INDUSTRIAL AREA, GRAMPUR ROORKEE - 247667 (U. K.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCRS)
CA NO.	CC/T/W-MS/DOM/515/23/01656/WA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-103

JOB NO. 1241A

SH. NO. 03 OF 03

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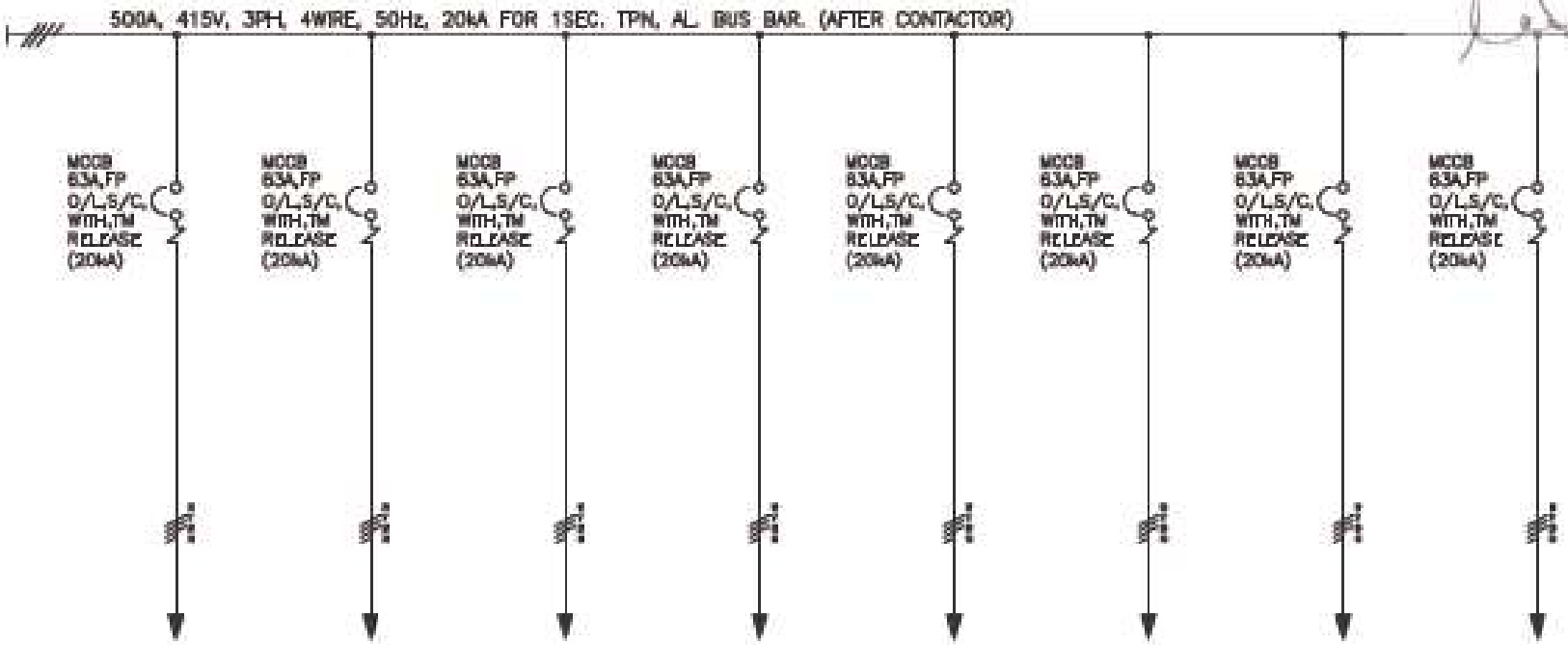

FEEDER NUMBER	2F3	2F4	2F5	2F6	3F3	3F4	3F5	2R5
MODULE TYEP	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	765kV SWITCHYARD LIGHTING PANEL (1) ACP-2	765kV SWITCHYARD LIGHTING PANEL (2) ACP-2	765kV SWITCHYARD LIGHTING PANEL (3) ACP-2	765kV SWITCHYARD LIGHTING PANEL (4) ACP-2	765kV SWITCHYARD LIGHTING PANEL (5) ACP-2	765kV SWITCHYARD LIGHTING PANEL (6) ACP-2	400kV SWITCHYARD LIGHTING PANEL (7) ACP-2	400kV SWITCHYARD LIGHTING PANEL (8) ACP-2
POWER CABLE SIZE	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-8 & F-9, RIICO-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCMB)
CA NO.	CC/T/W-MS/DOA/318/23/01656/MOA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EQUIPT ELECTRICAL CHENNAI (MEEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	LSL/PGCIL/BHCL/2024-2025/1241A-203
JOB NO.	1241A
SH. NO.:-	01 OF 07

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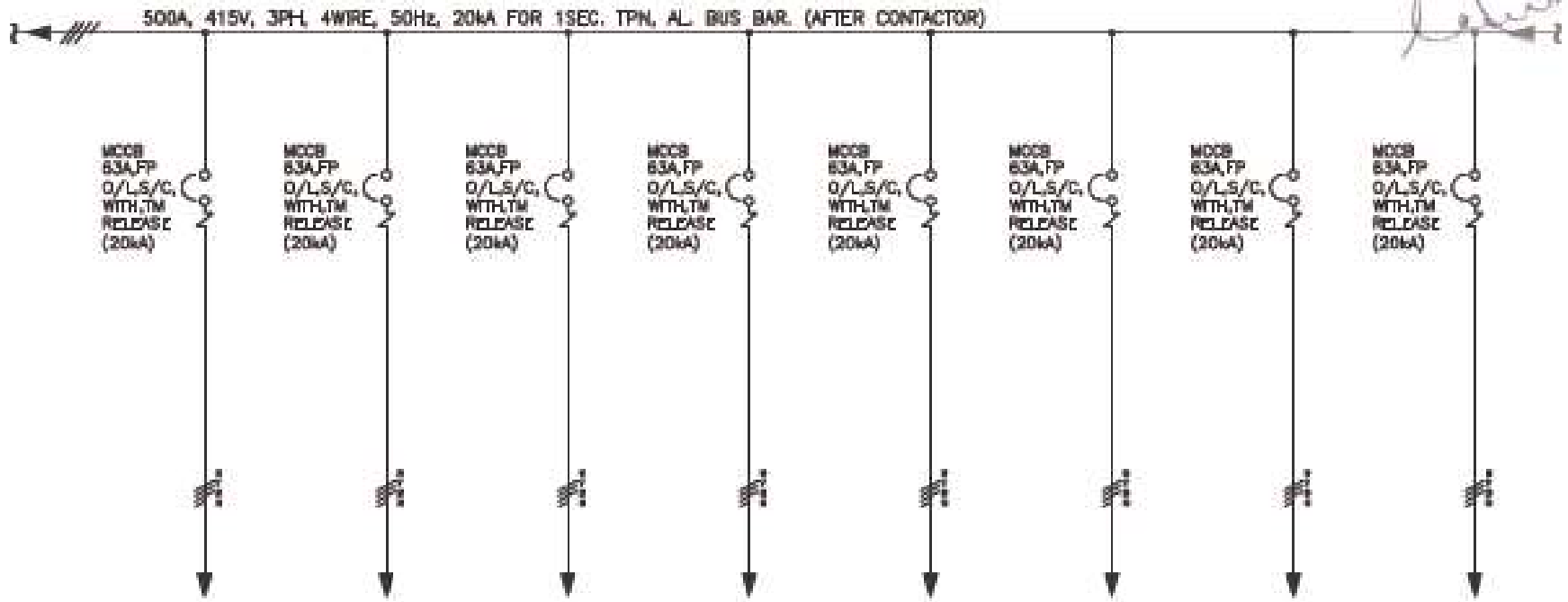

FEEDER NUMBER	2R6	2R7	2R8	3R4	3R5	3R6	3R7	3R8
MODULE TYEP	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	SWITCHYARD STREET LIGHTING PANEL ACP-3	SPARE 1	SPARE 2	FUTURE SWITCHYARD	FUTURE SWITCHYARD	FUTURE SWITCHYARD	FUTURE SWITCHYARD	FUTURE SWITCHYARD
POWER CABLE SIZE	3.5CX70 Sqmm.	--	—	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX35 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAMPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITBI-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAMTIKI ROORKEE - 247667 (U. K. HARDWAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCMB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/WA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHCL/2024-2025/1241A-203
SH. NO.:- 02 OF 07

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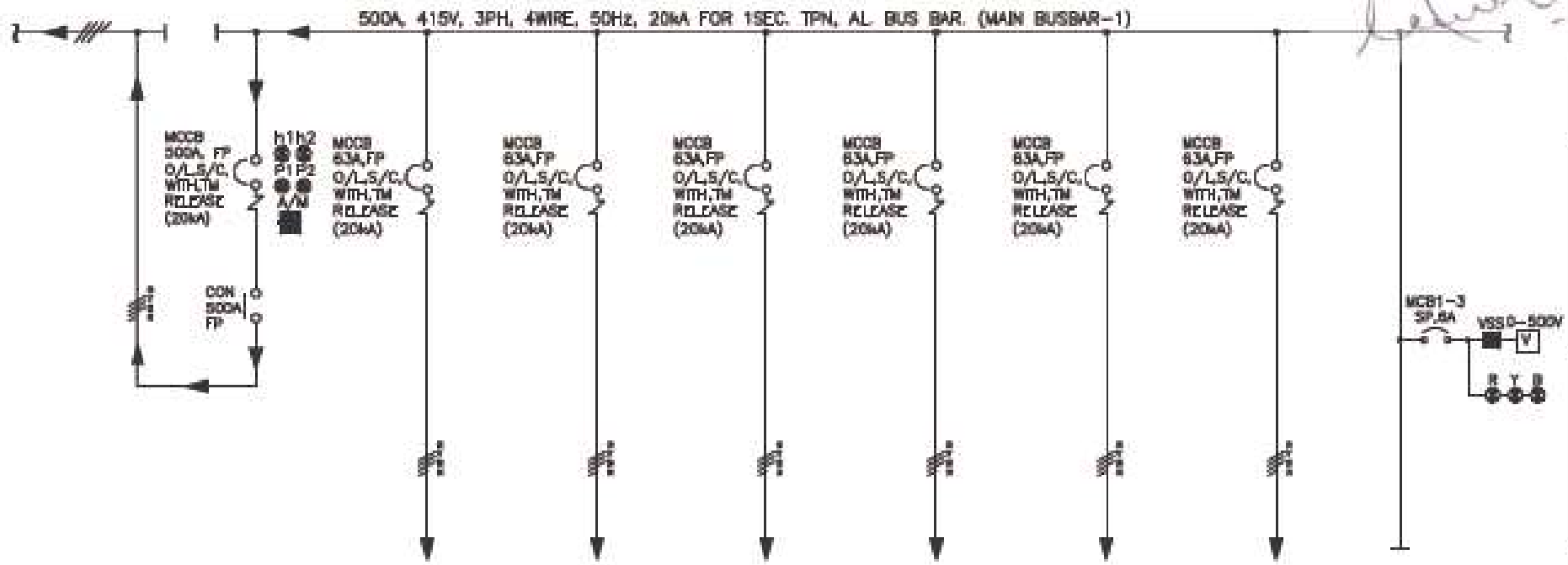

FEEDER NUMBER	3F2	2F2	2R1	2R2	2R3	3R1	3R2	2F1
MODULE TYEP	EL	E	E	E	E	E	E	G2
FEEDER RATING	500A	63A	63A	63A	63A	63A	63A	---
FEEDER TYPE	MCCB+CONT.	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	METERING
DESCRIPTION	MODULE EL	INDOOR LIGHTING PANEL (1) CRB	INDOOR LIGHTING PANEL (2) AUX BUILDING	INDOOR LIGHTING PANEL (3) FFPH	RECEPTACLE-1	RECEPTACLE-2	RECEPTACLE-3	---
POWER CABLE SIZE	--	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX35 Sqmm.	---

	04.	-	DRAWN	MP	
	03.	-	CHKD.	VDP	
	02.	-	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-8 & F-9, IPHB-C, LUKSAR, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCHB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/MOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. LSL/PGCIL/BHCL/2024-2025/1241A-203 | SH. NO.:- 03 OF 07

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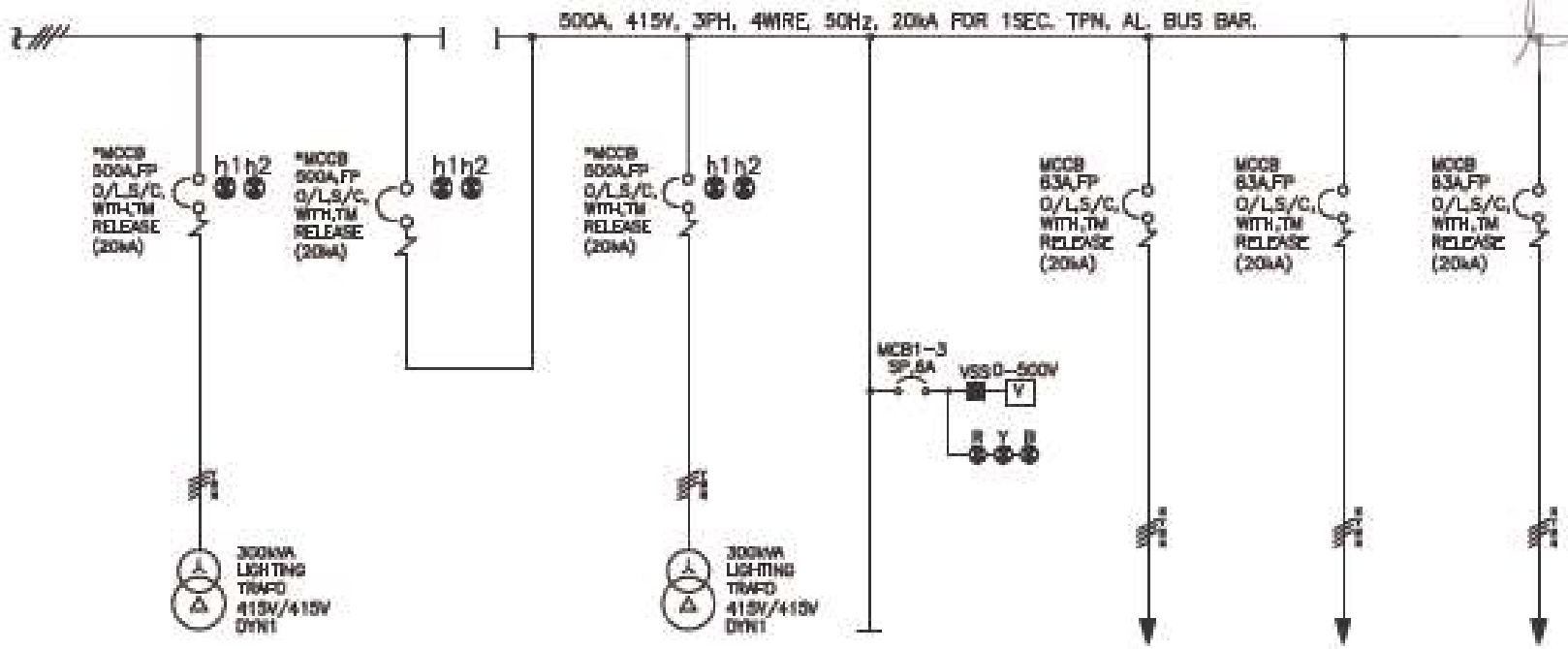


FEEDER NUMBER	1F1+2F1	4FA	5F1+6F1	5F1	5F2	4R1	4R2
MODULE TYEP	H	H (BC)	H	G2	E	E	E
FEEDER RATING	500A	500A	500A	---	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	METERING	MCCB	MCCB	MCCB
DESCRIPTION	415V AC SUPPLY INCOMER -1 FROM 300kVA TRANSFORMER	BUSCOUPLER	415V AC SUPPLY INCOMER -2 FROM 300kVA TRANSFORMER	---	RECEPTACLE-4	RECEPTACLE-5	RECEPTACLE-6
POWER CABLE SIZE	2RX3.5CX300 Sqmm. AL XLPE CABLE	---	2RX3.5CX300 Sqmm. AL XLPE CABLE	---	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX35 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BHD. AREA, VILLAGE RAIPUR (BHARWAPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCBB)
CA NO.	CC/T/N-MS/DDA/010/23/01006/NOA-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION

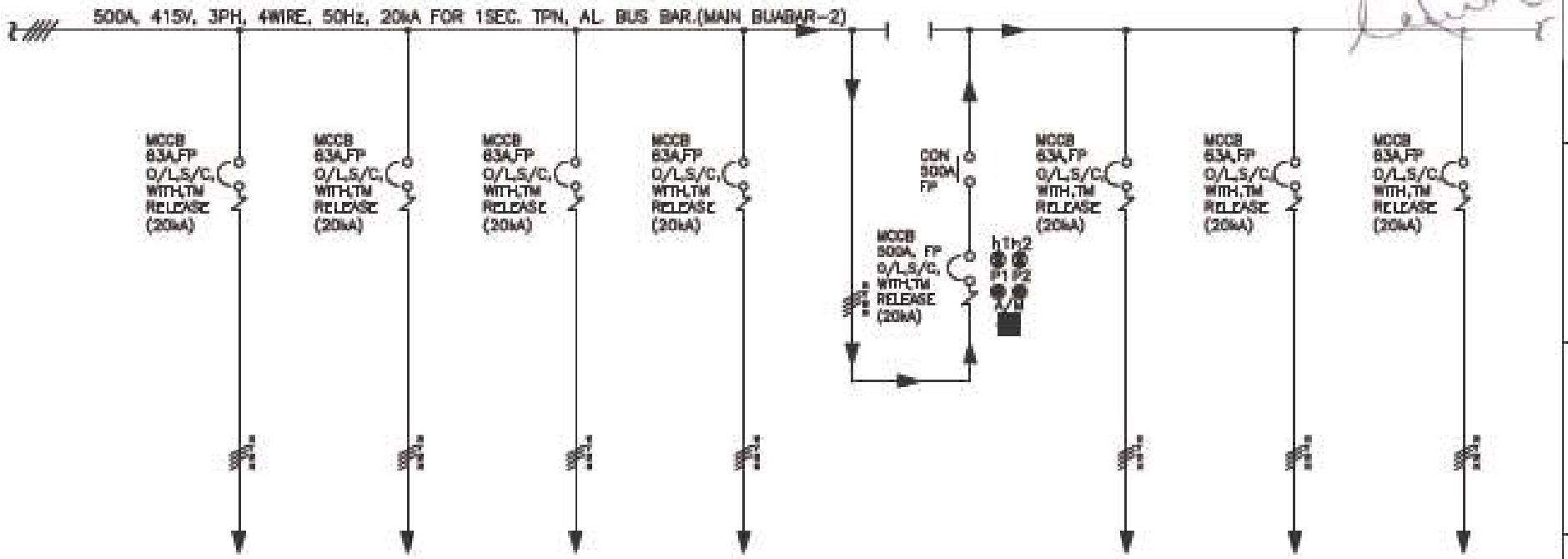
JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHCL/2024-2025/1241A-203

SH. NO.:- 04 OF 07



FEEDER NUMBER	4R3	5R1	5R2	5R3	4F2	4F3	4F4	4F5
MODULE TYEP	E	E	E	E	EL	E	E	E
FEEDER RATING	63A	63A	63A	63A	500A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB+CONT.	MCCB	MCCB	MCCB
DESCRIPTION	RECEPTACLE-7	RECEPTACLE-8	RECEPTACLE-9	RECEPTACLE-10	MODULE EL	FUTURE SWITCHYARD	FUTURE SWITCHYARD	FUTURE SWITCHYARD
POWER CABLE SIZE	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX35 Sqmm.	--	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX35 Sqmm.

DATE	No.	REVISIONS DESCRIPTION			
	04.	-	DRAWN	MP	
	03.	-	CHKD.	VDP	
	02.	-	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-8 & F-9, IPHB-C, LANDCO, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCHB)
CA NO.	CC/T/W-MS/DOM/015/23/01006/00A-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-203 | SH. NO.:- 06 OF 07

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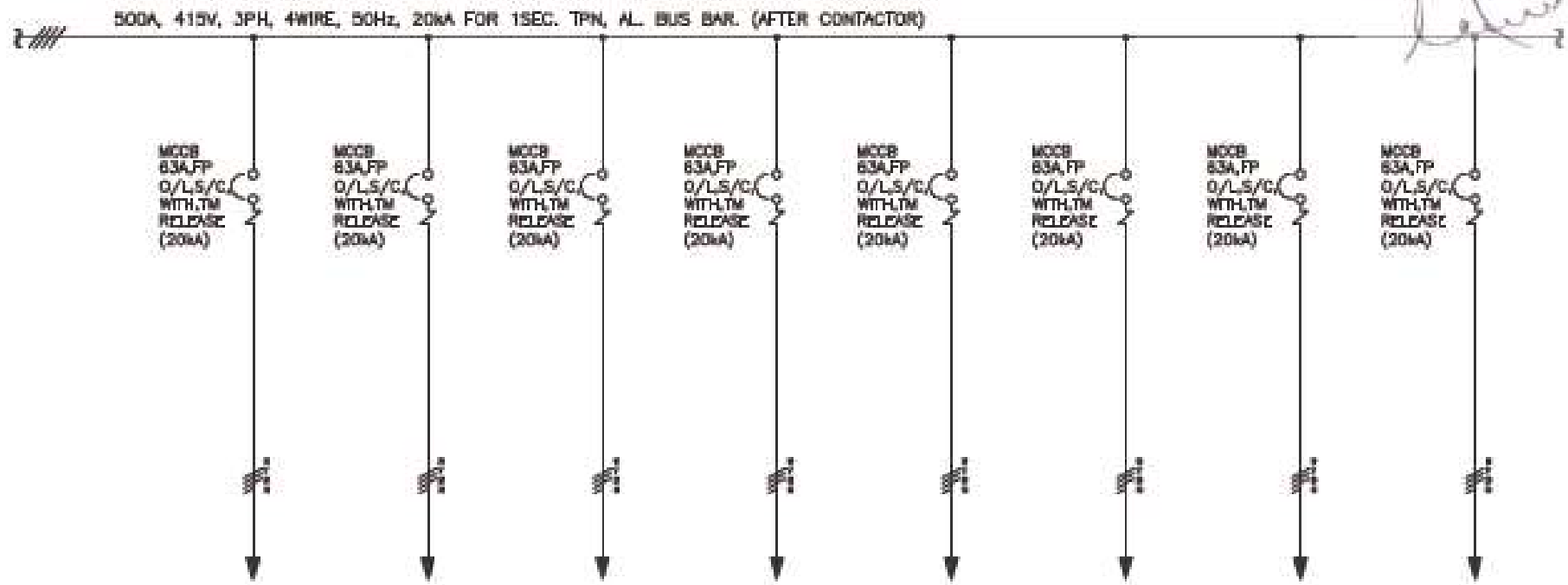

FEEDER NUMBER	5F3	5F4	5F5	5F6	4R5	4R6	4R7	4R8
MODULE TYEP	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	FUTURE SWITCHYARD	FUTURE SWITCHYARD	400kV SWITCHYARD LIGHTING PANEL (9) ACP-2	400kV SWITCHYARD LIGHTING PANEL (10) ACP-2	400kV SWITCHYARD LIGHTING PANEL (11) ACP-2	400kV SWITCHYARD LIGHTING PANEL (12) ACP-2	220kV SWITCHYARD LIGHTING PANEL (13) ACP-2	200kV SWITCHYARD LIGHTING PANEL (14) ACP-2
POWER CABLE SIZE	3.5CX35 Sqmm.	3.5CX35 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWAPPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IITIE-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCBB)
CA NO.	CC/T/W-HS/DOM/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EQUIPT ELECTRICAL CHENNAI (HEQ) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-203
SH. NO.:-	06 OF 07

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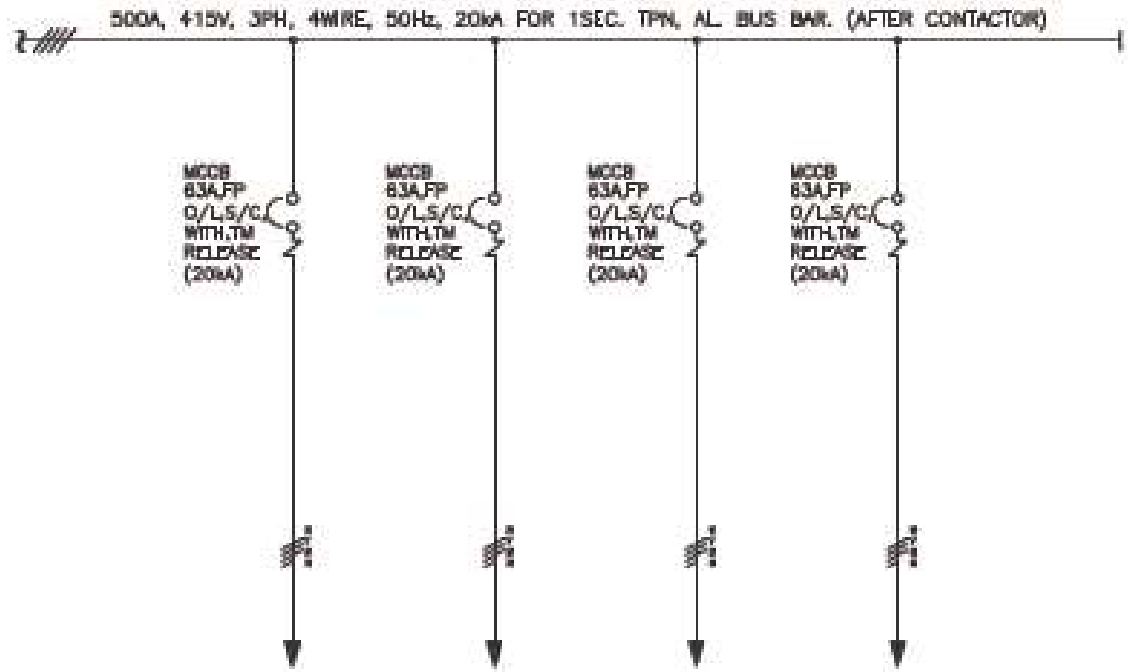

FEEDER NUMBER	5R5	5R6	5R7	5R8
MODULE TYEP	E	E	E	E
FEEDER RATING	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	200kV SWITCHYARD LIGHTING PANEL (15) ACP-2	200kV SWITCHYARD LIGHTING PANEL (16) ACP-2	SPARE	SPARE
POWER CABLE SIZE	3.5CX70 Sqmm.	3.5CX70 Sqmm.	--	--

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHARTWAIPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IPIB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCRB)
CA NO.	CC/T/W-MS/DDN/515/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (NCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-203

SH. NO.:- 07 OF 07

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BILL OF MATERIAL FOR 415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A	**BILL OF MATERIAL FOR MODULE - (II)**				02 Nos.
1	**MCCB**	FP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80-100 % O/L, S/C PROTECTION WITH SPREADER LINK, ROTARY OPERATING MECHANISM (ROM) & 1C/O AUX. CONTACT, Ics=100% Icu	L&T/C&S/HAVELLS	500A, 20kA	01
2	**MCB**	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, 10kA	01
3	**LIGHTING TRF**	LIGHTING TRANSFORMER 415/415 Dyn1	PGCIL APPROVED	300kVA	01
4	**M1**	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	240V AC	01
5	**M2**	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESBEE/VAISHNO/C&S	240V AC	01
B	**BILL OF MATERIAL FOR MODULE - (III)**				02 Nos.
1	**MCCB**	FP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80-100 % O/L, S/C PROTECTION WITH SPREADER LINK & ROTARY OPERATING MECHANISM (ROM), Ics=100% Icu	L&T/C&S/HAVELLS	500A, 20kA	01
2	**CM**	FP POWER CONTACTOR, COIL VOLTAGE 240V AC, WITH 2NO+2NC AUX. CONTACT, AC-1 DUTY	L&T/C&S/HAVELLS	500A	01
3	**MCB**	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, 10kA	01
4	**M1**	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	240V AC	01
5	**M2**	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESBEE/VAISHNO/C&S	240V AC	01
6	**PS**	'STOP' PUSH BUTTON, SPRING RETURN TYPE, 22.5 Sq. mm. DIA WITH 2NC CONTACT, RED	ESBEE/VAISHNO/C&S	240VAC	01
7	**PS**	'START' PUSH BUTTON, SPRING RETURN TYPE, 22.5 Sq. mm. DIA WITH 2NO CONTACT, GREEN	ESBEE/VAISHNO/C&S	240V AC	01
8	**T**	24 HOURS TIMER SWITCH DIN RAIL MOUNTED , 1C/O AUX. CONTACT	GIC/EAPL	240V AC	01
9	**A/M**	AUTO/MANUAL SELECTOR SWITCH WITH OFF, 2POLE 2WAY, ROTARY TYPE	SALZER/KAYCEE	6A	01

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 218, BTD. AREA, VILLAGE RAIPUR (BHARTWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IITB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203205 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING: BILL OF MATERIAL
TITLE: 415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCRB)
CA NO.: CC/T/W-MS/DOM/215/23/01656/MOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT: 765/400/220kV BHADLA-II POOLING STATION
JOB NO.: 1241A

CLIENT: POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:- [illegible] ELECTRICAL CHECK (INDIA) TRANSMISSION PROJECTS DIVISION

DRG. NO.: USL/PGCIL/BHEL/2024-2025/1241A-703
SH. NO.:- 01 OF 03

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BILL OF MATERIAL FOR 415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
C	**BILL OF MATERIAL FOR MODULE - (02)**				02 Nos.
1	**MCB3-B**	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, 10kA	03
2	**V**	AC ANALOG VOLTMETER, SINGLE PHASE, SIZE-96X96 Sq. mm, CL-1, PTR-415V	AE/RISHAB/NEWTEK/SECURE	0-500V	01
3	**VSS**	VOLTMETER SELECTOR SWITCH, ROTARY TYPE, 4 POSITION	SALZER/KAYCEE	6A	01
4	**R-PHASE**	'R' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	240V AC	01
5	**Y-PHASE**	'Y' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, YELLOW	ESBEE/VAISHNO/C&S	240V AC	01
6	**B-PHASE**	'B' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VAISHNO/C&S	240V AC	01
D	**BILL OF MATERIAL FOR MODULE - (S-BC) SUB-COUPLER**				01 No.
1	**MCCB**	FP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80-100 % O/L, S/C PROTECTION WITH SPREADER LINK, ROTARY OPERATING MECHANISM (ROM) & 1C/O AUX. CONTACT, Ics=100% Icu	L&T/C&S/HAVELLS	500A FP, 20kA	01
2	**MCB**	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, 10kA	01
3	--	MECHANICAL LOCK 3 LOCK 2-KEY FOR 100A FP MCCB	PGCIL APPROVED	--	1-SET
4	**M**	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	240V AC	01
5	**M**	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESBEE/VAISHNO/C&S	240V AC	01
E	**BILL OF MATERIAL FOR MODULE (S)**				
1	**MCCB**	FP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80-100 % O/L, S/C PROTECTION WITH ROTARY OPERATING MECHANISM (ROM), Ics=100% Icu	L&T/C&S/HAVELLS	63A, 20kA	44

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-8 & F-9, IPHB-C, LUKSAR, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHENNAI (MCEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-703
SH. NO.:- 02 OF 03

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BILL OF MATERIAL FOR 415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
F	**BILL OF MATERIAL FOR MISC.**				
1	**MCB**	SP MINIATURE CIRCUIT BREAKER, "C" CURVE	L&T/C&S/HAVELLS	6A, 10kA	05
2	**R-SW**	ON/OFF ROTARY SWITCH	PGCIL APPROVED	6A	02
3	**SW - SOCKET**	5/15A SWITCH SOCKET	ANCHOR//PGCIL APPROVED MAKE	—	02
4	**DS**	DOOR SWITCH, 1C/O	KAYCEE/PGCIL APPROVED MAKE	—	03
5	**PL**	PANEL ILLUMINATION LIGHT, 240V AC	COMPACT/PGCIL APPROVED MAKE	5W	03
6	**SH**	SPACE HEATER, 240V AC	HOTWEL/PGCIL APPROVED MAKE	60W	03
7	**TH**	THERMOSTATE, 240V AC	ELCON/PGCIL APPROVED MAKE	30 – 85°C	05
8	**TI**	ON DELAY TIMER WITH 1C/O AUXILIARY SWITCH, 0–60 SEC., 240V AC	GIC/PGCIL APPROVED MAKE	—	02
9	**TIX**	AUX. CONTACTOR RELAY, COIL VOLTAGE 240V DC WITH 2NO+2NC AUX. CONTACT	L&T/C&S/HAVELLS	—	02
10	**FAN 1-3**	VANTILATION FAN (150MM), 240V AC	HIGH COOL/PGCIL APPROVED MAKE	—	06

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, VILL. AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IPHB-C, LSMSEZ, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V MAIN LIGHTING DISTRIBUTION BOARD (3A) (MCB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/MCA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	NIRMAT KRAFT ELECTRICAL CHENNAI (NKEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/RHEL/2024–2025/1241A–703
JOB NO.	1241A
SH. NO.:-	03 OF 03

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ENGINEERING DRAWING DETAILS FOR

415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (MCRB)

PROJECT :- 765/400/220kV BIKANER–III POOLING STATION

CLIENT :- POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR :- BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHAGWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II: F-II & F-V, IPIB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	COVER PAGE
TITLE	415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NON-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BIKANER-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024–2025/1241A–004

SH. NO. 01 OF 01

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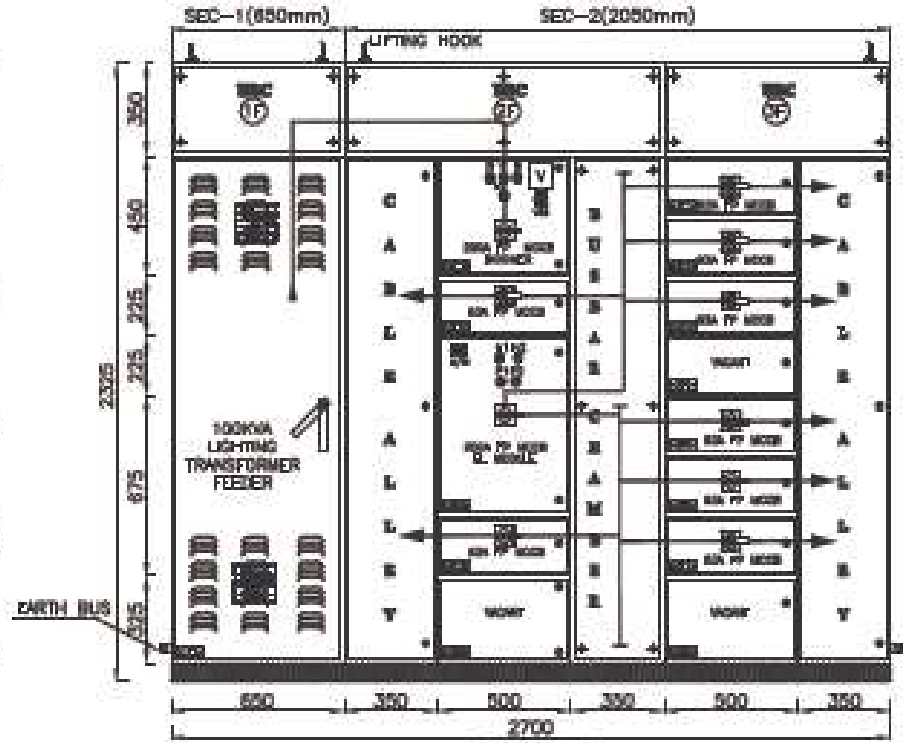
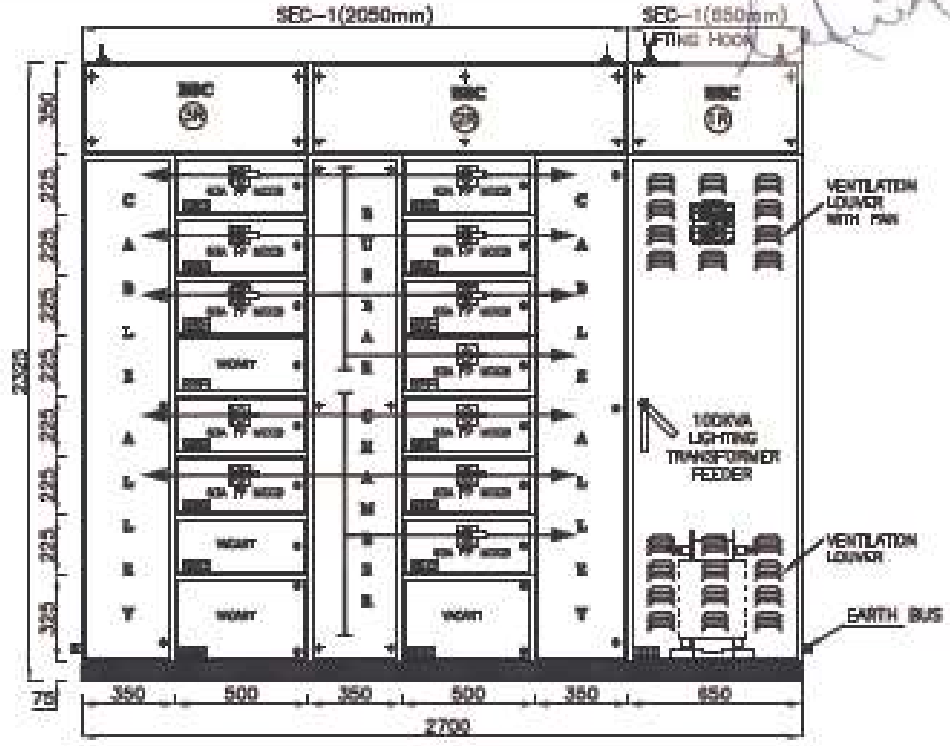
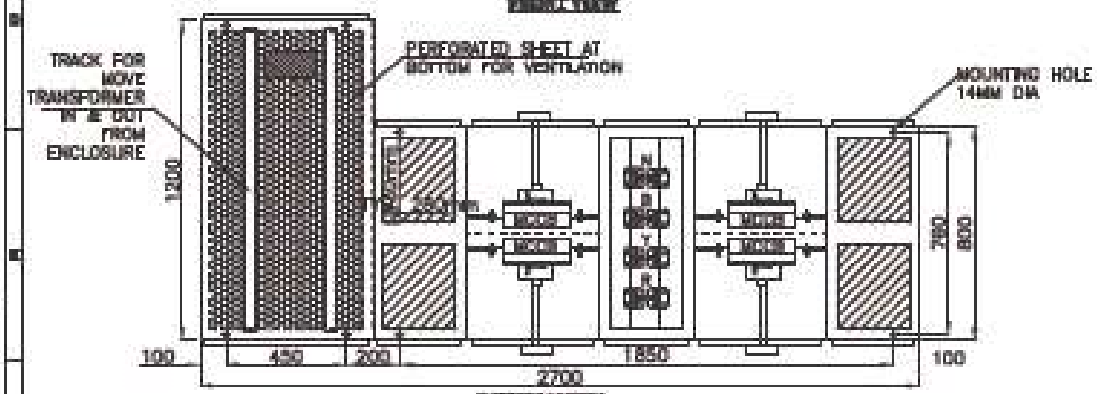


FRONT VIEW



REAR VIEW



BOTTOM VIEW

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER

ULTIMA SWITCHGEARS LTD.

UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]

UNIT-II F-II & F-V, IPIB-C, LANDCO, SIDCUL INDUSTRIAL AREA, SIDCUL - 263139 G. B. NAGAR (U.P.) INDIA

E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (WCRB)
CA NO.	CC/T/N-MS/DOM/515/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
HEMANT KUMAR ELECTRICAL CAMPBELL (MCEL)
TRANSMISSION PROJECTS DIVISION

DWG. NO. USL/PGCIL/BHEL/2024-2025/1241A-104

SH. NO. 01 OF 03

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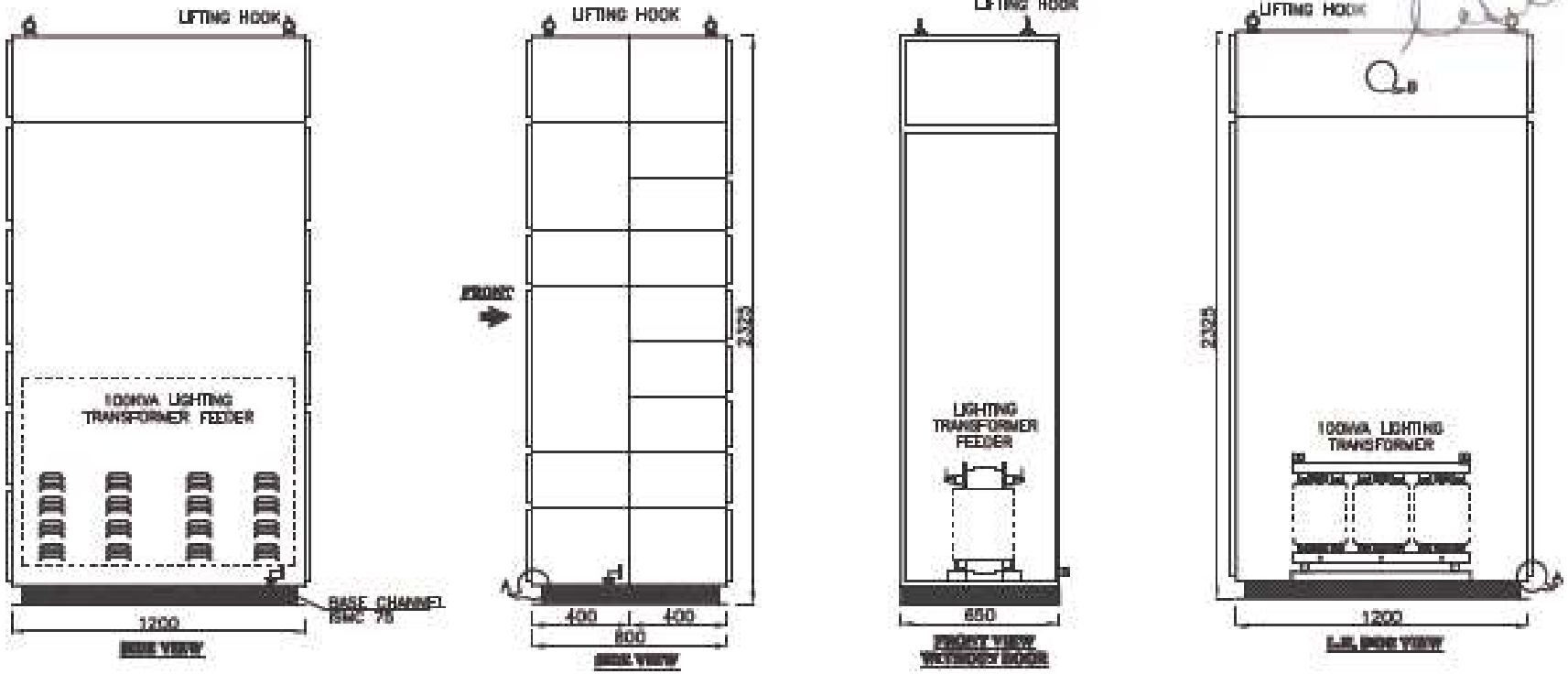


PANEL DIMENSIONS

HEIGHT 2325 mm.
WIDTH 2700 mm.
DEPTH 1200/800 mm.

CABLE ENTRY

BOTTOM ENTRY

HORIZONTAL BUS BAR SIZE:-

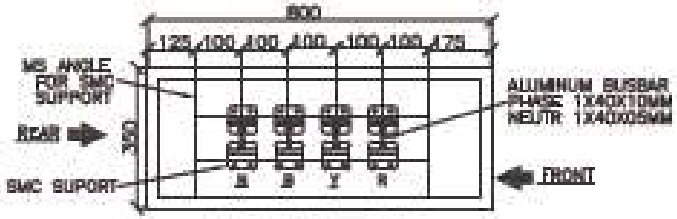
PHASE : 1x40x10 Sq.mm Al.
NEUTRAL : 1x40x05 Sq.mm Al.
EARTH : 1x40x05 Sq.mm. GS.

VERTICAL BUS BAR SIZE:-

PHASE :1X40X10 SQ.MM AL.
NEUTRAL :1X40X05 SQ.MM AL.

LEGEND DESCRIPTION

R	=	R-PHASE INDICATION (RED)
Y	=	Y-PHASE INDICATION (YELLOW)
B	=	B-PHASE INDICATION (BLUE)
h1	=	ON INDICATION RED
h2	=	OFF INDICATION GREEN
A	=	DIGITAL AMMETER
V	=	DIGITAL VOLT METER
ASS	=	AMMETER SELECTOR SWITCH
VSS	=	VOLTAGE SELECTOR SWITCH
P1	=	CONTACTOR OFF PUSH BUTTON
P2	=	CONTACTOR ON PUSH BUTTON
A/M	=	AUTO/MANUAL SELECTOR SWITCH



SECTIONAL VIEW AT FOR HORIZONTAL BUSBAR TOLERANCE DETAIL-B

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER

ULTIMA SWITCHGEARS LTD.

UNIT-I: KHASRA NO. 318, BHD. AMBA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (WCRS)
CA NO.	CC/T/W-MS/DOM/515/23/01656/WCR-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION

DWG. NO. USL/PGCIL/BHEL/2024-2025/1241A-104

SH. NO. 02 OF 03

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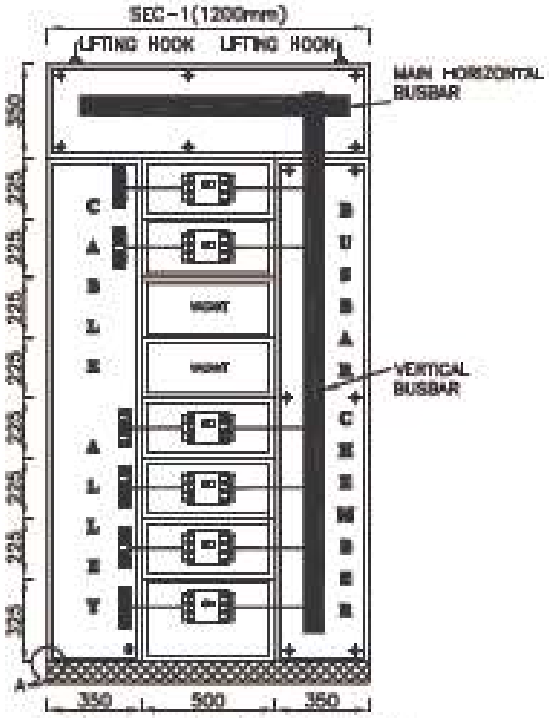
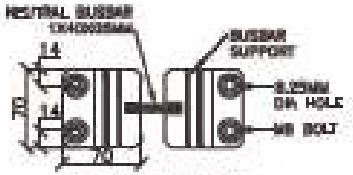
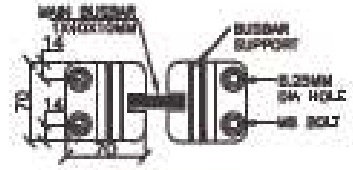


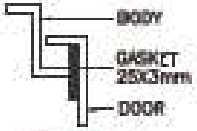
MCCB & BUSBAR SECTION (FRONT VIEW W/O DOOR & COVER)



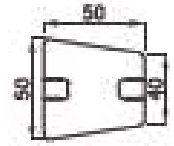
DETAIL OF NEUTRAL BUSBAR SUPPORT



DETAIL OF PHASE BUSBAR SUPPORT



DETAIL 'A'



"DETAIL-B"
CONICAL SUPPORT

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - [illegible], INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPHB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (MCCB)
CA NO.	CC/T/W-HS/DOM/318/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] KHAN ELECTRICAL CHECK (INDIA) TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-104

SH. NO. 03 OF 03

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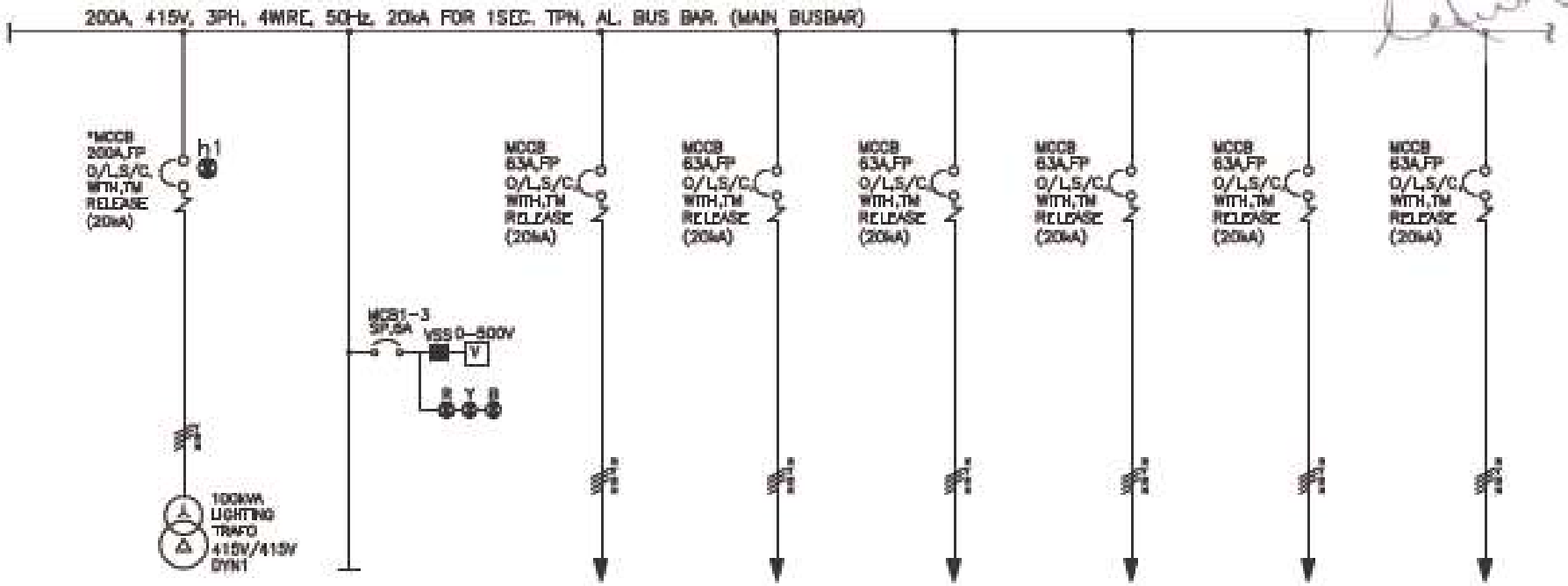

FEEDER NUMBER	1F1+2F1	2F1	2F2	3F1	3F2	3F3	2R1	2R2
MODULE TYEP	H	G2	E	E	E	E	E	E
FEEDER RATING	200A	--	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	METERING	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	415V AC SUPPLY INCOMER FROM 100KVA TRANSFORMER	--	INDOOR EMERGENCY LIGHTING PANEL-1 (CRB)	INDOOR EMERGENCY LIGHTING PANEL-2(AUX. BUILDING)	INDOOR EMERGENCY LIGHTING PANEL-3(FFPH)	SPARE	SPARE	765kV SWITCHYARD LP
POWER CABLE SIZE	3.5CX70 Sqmm.	--	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	--	--	3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWAPPUR), TEHSIL - BOCHOCH, DISTRICT HARDWAR (UTTRAKHAND) - [illegible], INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IITB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (MCRB)
CA NO.	CC/T/N-MS/DDM/515/23/01656/NOA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EMPTY ELECTRICAL CHECK (HEEC) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-204

JOB NO. 1241A

SH. NO.:- 01 OF 03

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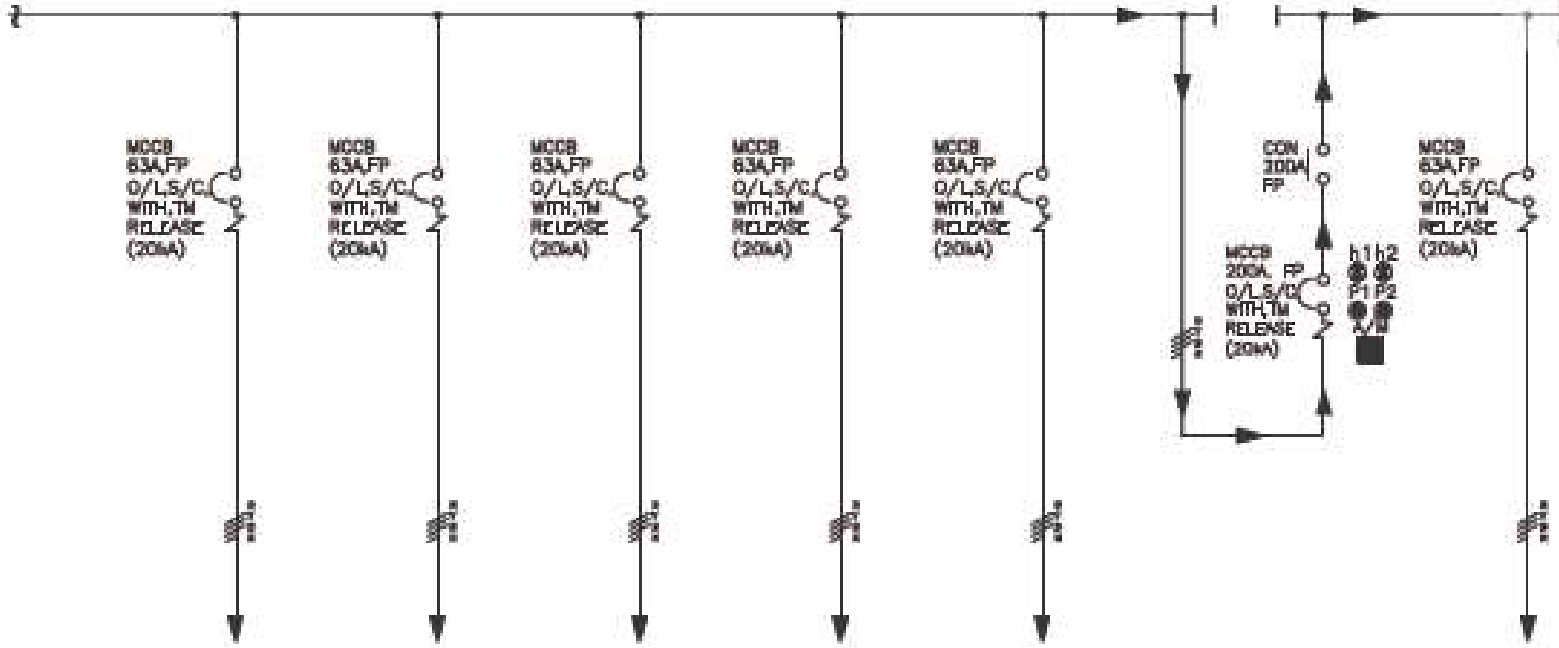

FEEDER NUMBER	2R3	2R4	3R1	3R2	3R3	2F3	2F4
MODULE TYEP	E	E	E	E	E	EL	E
FEEDER RATING	63A	63A	63A	63A	63A	200A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB+CONT.	MCCB
DESCRIPTION	765kV SWITCHYARD LP	400kV SWITCHYARD LP	400kV SWITCHYARD LP	220kV SWITCHYARD LP	220kV SWITCHYARD LP	MODULE EL	SWITCHYARD EMERGENCY LIGHTING PANEL-1(ACP2)
POWER CABLE SIZE	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	—	3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - [illegible], INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (MCRB)
CA NO.	CC/T/W-MS/DDM/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-204
SH. NO.:- 02 OF 03

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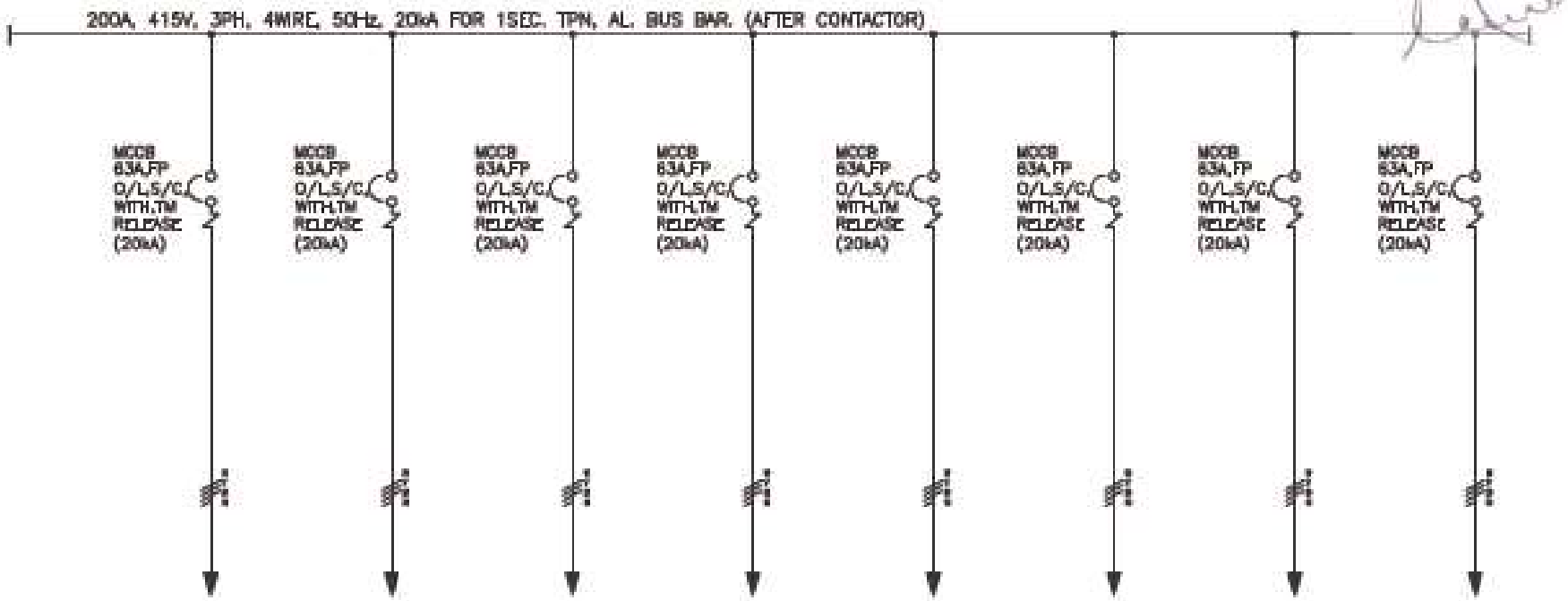

FEEDER NUMBER	3F5	3F6	3F7	2R5	2R6	2R7	3R5	3R6
MODULE TYEP	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	SWITCHYARD EMERGENCY LIGHTING PANEL-2(ACP2)	SWITCHYARD EMERGENCY LIGHTING PANEL-3(ACP2)	SWITCHYARD EMERGENCY LIGHTING PANEL-4(ACP2)	SPARE	FUTURE SWITCHYARD LP	FUTURE SWITCHYARD LP	FUTURE SWITCHYARD LP	FUTURE SWITCHYARD LP
POWER CABLE SIZE	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	—	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.	3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISION : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAMPURI ROORKEE - 247667 (U. K.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (MCRB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/WOA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
HIGHAT KHAYY ELECTRICAL CHAKIN (INDIA) TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-204

SH. NO.:- 03 OF 03

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BILL OF MATERIAL FOR 415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A	BILL OF MATERIAL FOR MODULE -(II)				1 No.
1	MCCB	FP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER LINK, ROTARY OPERATING MECHANISM (ROM) & 1C/O AUX. CONTACT, Ics=100% Icu	L&T/C&S/HAVELLS	200A, 20kA	01
2	MCB	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, 10kA	01
3	LIGHTING TRF	LIGHTING TRANSFORMER 415/415 Dyn1	PGCIL APPROVED	100kVA	01
4	M	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED, 240V AC	ESBEE/VAISHNO/C&S	—	01
B	BILL OF MATERIAL FOR MODULE-(III)				1 No.
1	MCCB	FP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER LINK & ROTARY OPERATING MECHANISM (ROM), Ics = 100% Icu	L&T/C&S/HAVELLS	200A, 20kA	01
2	CM	FP POWER CONTACTOR, COIL VOLTAGE 240V AC, WITH 2NO+2NC AUX. CONTACT, AC–1 DUTY	L&T/C&S/HAVELLS	200A	01
3	MCB	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, 10kA	01
4	M	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED, 240V AC	ESBEE/VAISHNO/C&S	—	01
5	M	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN, 240V AC	ESBEE/VAISHNO/C&S	—	01
6	PB	'STOP' PUSH BUTTON, SPRING RETURN TYPE, 22.5 Sq. mm. DIA WITH 2NC CONTACT, RED	ESBEE/VAISHNO/C&S	—	01
7	PB	'START' PUSH BUTTON, SPRING RETURN TYPE, 22.5 Sq. mm. DIA WITH 2NO CONTACT, GREEN	ESBEE/VAISHNO/C&S	—	01
8	T	24 HOURS TIMER SWITCH DIN RAIL MOUNTED , 1C/O AUX. CONTACT	GIC/EAPL	—	01
9	A/M	AUTO/MANUAL SELECTOR SWITCH WITH OFF, 3POLE 3WAY, ROTARY TYPE	SALZER/KAYCEE	—	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IPIB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHECK (NCR)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024–2025/1241A–704
SH. NO.:- 01 OF 02

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BILL OF MATERIAL FOR 415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (MCRS)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
C	BILL OF MATERIAL FOR MODULE - (C2)				2 No.
1	MCB1-3	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, 10kA	03
2	V	ANALOG VOLTMETER, SINGLE PHASE, SIZE-96X96 Sq. mm, CL-1.0, PTR-415V	AE/RISHAB/NEWTEK/SECURE	0-500V	01
3	VSS	VOLTMETER SELECTOR SWITCH, ROTARY TYPE, 4 POSITION	SALZER/KAYCEE	6A	01
4	R-PHASE	'R' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED, 240V AC	ESBEE/VAISHNO/C&S	—	01
5	Y-PHASE	'Y' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, YELLOW	ESBEE/VAISHNO/C&S	—	01
6	B-PHASE	'B' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VAISHNO/C&S	—	01
D	BILL OF MATERIAL FOR MODULE (D)				
1	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH EXTENDED ROM, Ics = 100% Icu	L&T/C&S/HAVELLS	63A, 20kA	20
E	BILL OF MATERIAL FOR MISC.				
1	MCB	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, 10kA	03
2	S-SW	ON/OFF ROTARY SWITCH	PGCIL APPROVED MAKE	6A	01
3	SW-SOCKET	5/15A SWITCH SOCKET	ANCHOR	—	01
4	DS	DOOR SWITCH, 1C/O	SURAJ/PGCIL APPROVED MAKE	—	02
5	PL	PANEL ILLUMINATION LIGHT, 240V AC	HAVELLS/PGCIL APPROVED MAKE	5W	02
6	SH	SPACE HEATER, 240V AC	HOTWEL/PGCIL APPROVED MAKE	60W	02
7	TH	THERMOSTATE, 240V AC	ELCON/PGCIL APPROVED MAKE	30 - 85°C	03
8	T1	ON DELAY TIMER WITH 1C/O AUXILARY SWITCH, 0-60 SEC., 240V AC	GIC/EAPL/PGCIL APPROVED MAKE	—	01
9	TX	AUX. CONTACTOR RELAY, COIL VOLTAGE 240V DC WITH 2NO+2NC AUX. CONTACT	L&T/C&S/HAVELLS	—	01
10	FAN 1-3	VANTILATION FAN (150MM), 240V AC	HIGH COOL/PGCIL APPROVED MAKE	—	03

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP
	04.	-	CHKD.	VDP
	03.	-	APPD.	--
	02.	-	ALL DIMENSIONS IN mm.	SIGN.
	01.		TOLERANCE 5%	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IITBI-C, UPSIDC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V EMERGENCY LIGHTING DISTRIBUTION BOARD (4A) (MCRS)
CA NO.	CC/T/W-MS/DOM/318/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
JOB NO.	1241A
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-704
SH. NO.:-	02 OF 02

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ENGINEERING DRAWING DETAILS FOR

220V DC DISTRIBUTION BOARD-1(1D)(MCRB)

PROJECT :- 765/400/220kV BIKANER-III POOLING STATION

CLIENT :- POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR :- BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHAGWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-68 & F-70, IPHB-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	COVER PAGE
TITLE	220V DC DISTRIBUTION BOARD-1(1D)(MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01806/NON-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BIKANER-III POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DWG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-005

JOB NO. 1241A

SH. NO. 01 OF 01

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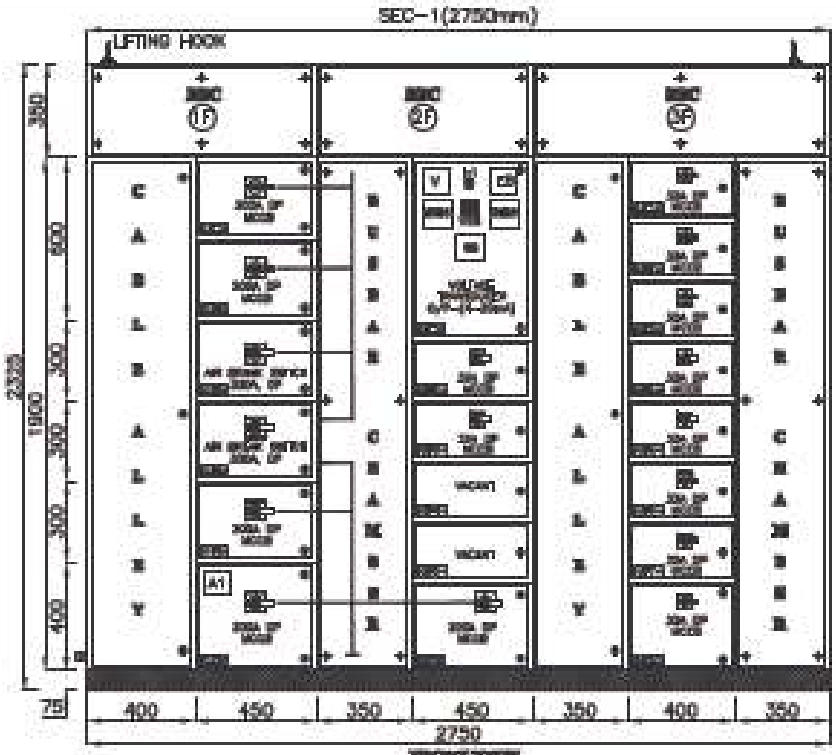
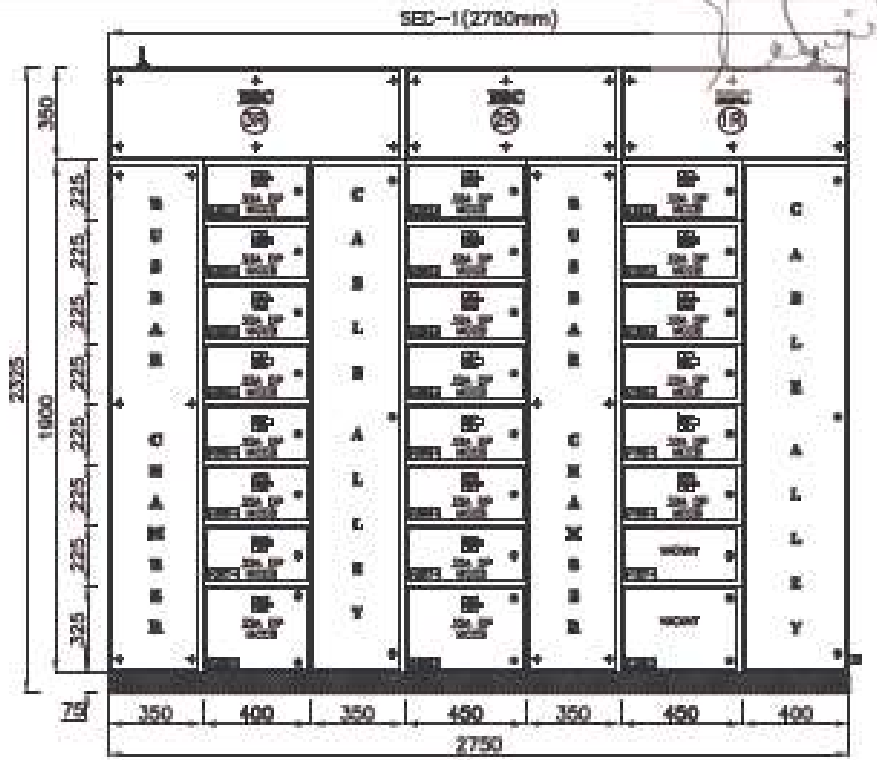
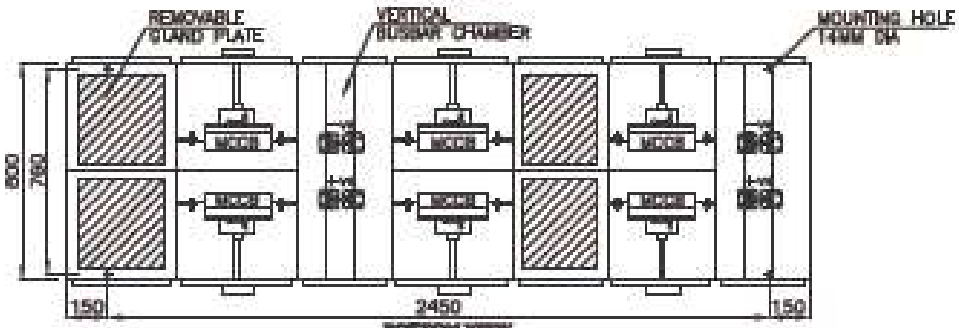


FRONT VIEW



REAR VIEW



BOTTOM VIEW

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP
	04.	–	CHKD.	VDP
	03.	–	APPD.	--
	02.	–	ALL DIMENSIONS IN mm.	SIGN.
	01.		TOLERANCE 5%	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00	

MANUFACTURER

ULTIMA SWITCHGEARS LTD.

UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-8 & F-9, IPHB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	220V DC DISTRIBUTION BOARD-1(10)(MCCB)
CA NO.	CC/T/W-MS/DOM/015/23/01006/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS-II POLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCC) TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-105

SH. NO. 01 OF 02

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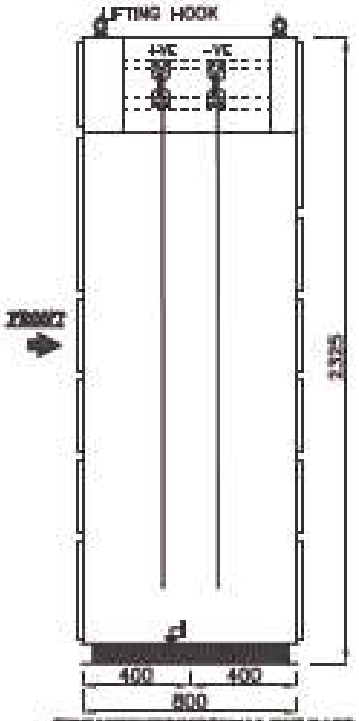


SIDE VIEW(HORIZONTAL BUS BARS ARRANGED VERTICALLY OF BUS BAR SECTION)

PANEL DIMENSIONS

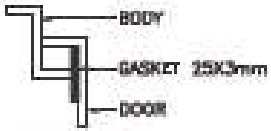
HEIGHT : 2325 mm.
WIDTH : 2250 mm.
DEPTH : 800 mm.

BUS BAR SIZE :-

POSITIVE : 1x40x10 Sq.mm Al.
NEGATIVE : 1x40x10 Sq.mm Al.
EARTH : 1x40X10 Sq.mm CU.

LEGEND DETAILS

AI = ANALOG DC AMMETER
VI = ANALOG DC VOLT METER
BE = BATTERY EARTH FAULT RELAY
27DC = DC UNDER VOLTAGE RELAY
59DC = DC OVER VOLTAGE RELAY
BB = ELECTRONIC BUZZER



DETAIL-'A'

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP	SIGN.
	04.	–	CHKD.	VDP	
	03.	–	APPD.	--	
	02.	–	ALL DIMENSIONS IN mm.		
	01.		TOLERANCE 5%		
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BHD. AREA, VILLAGE RAIPUR (BHARWAIPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-68 & F-69, IPHB-C, LOHARI, SIDCUL INDUSTRIAL AREA, GRAUTAM BUDDHA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	220V DC DISTRIBUTION BOARD-1(10)(MCCB)
CA NO.	CC/T/W-MS/DOM/010/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEMANT KHAYE ELECTRICAL CHECKER (MCCL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-105
JOB NO.	1241A
SH. NO.	02 OF 02

1 2 3 4 5 6 7 8 9

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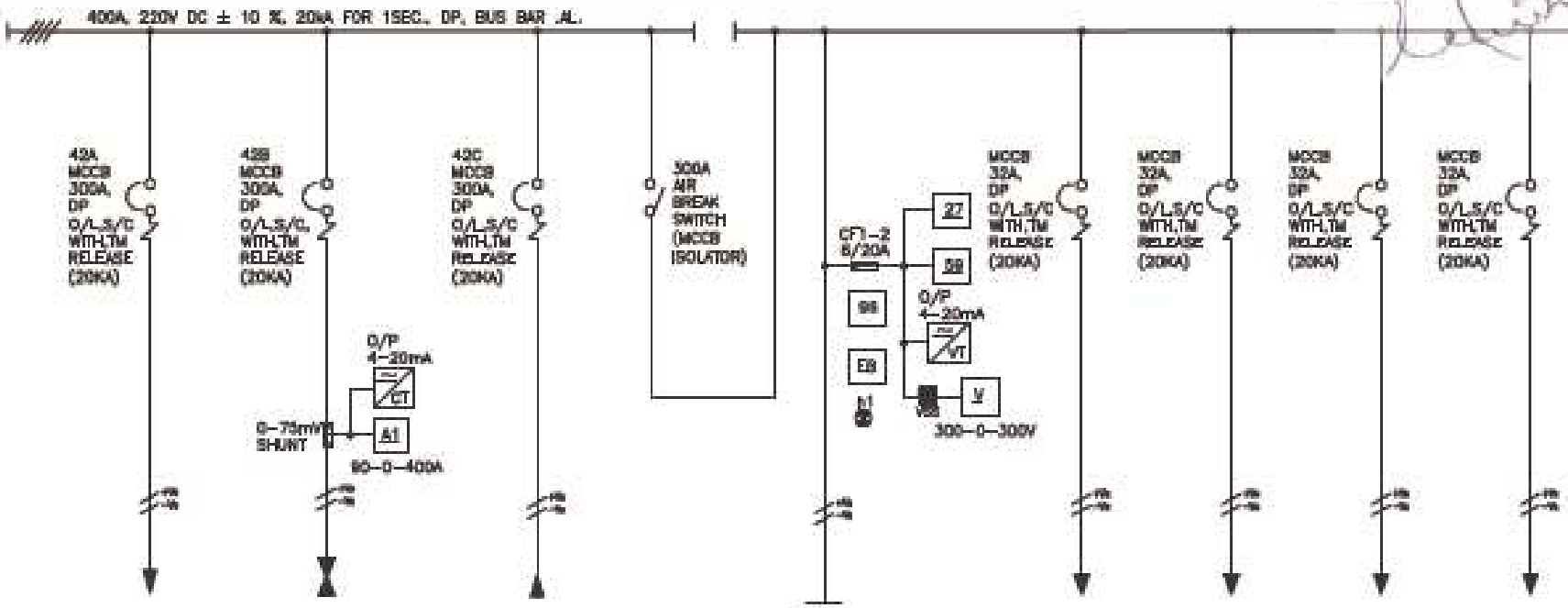

FEEDER NUMBER	2F6	1F6	1F5	1F4	2F1	2F2	2F3	3F1	3F2
MODULE TYEP	DC	DC	DC	H1	S1	X	X	X	X
FEEDER RATING	300A	300A	300A	300A	—	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	ISOLATOR	METERING	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BATTERY CURATIVE DISCHARGE FEEDER	220V DC BATTERY BANK-1	220V DC INCOMER FROM BATTERY CHARGER-1	MAIN BUSBAR CONTROL FEEDER 220V DCDB-1	--	765kV RELAY PANEL 701	765kV RELAY PANEL 703	765kV RELAY PANEL 704	765kV RELAY PANEL 706
POWER CABLE SIZE (AL PVC)	2X1CX150 Sqmm.	2X1CX150 Sqmm.	2X1CX150 Sqmm.	—	--	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IITBI-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(1D)(MCRB)
CA NO.	CC/T/W-HS/DDN/318/23/01956/NOA-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EARTH ELECTRICAL CHENNAI (HEEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-205

JOB NO. 1241A

SH. NO.:- 01 OF 05

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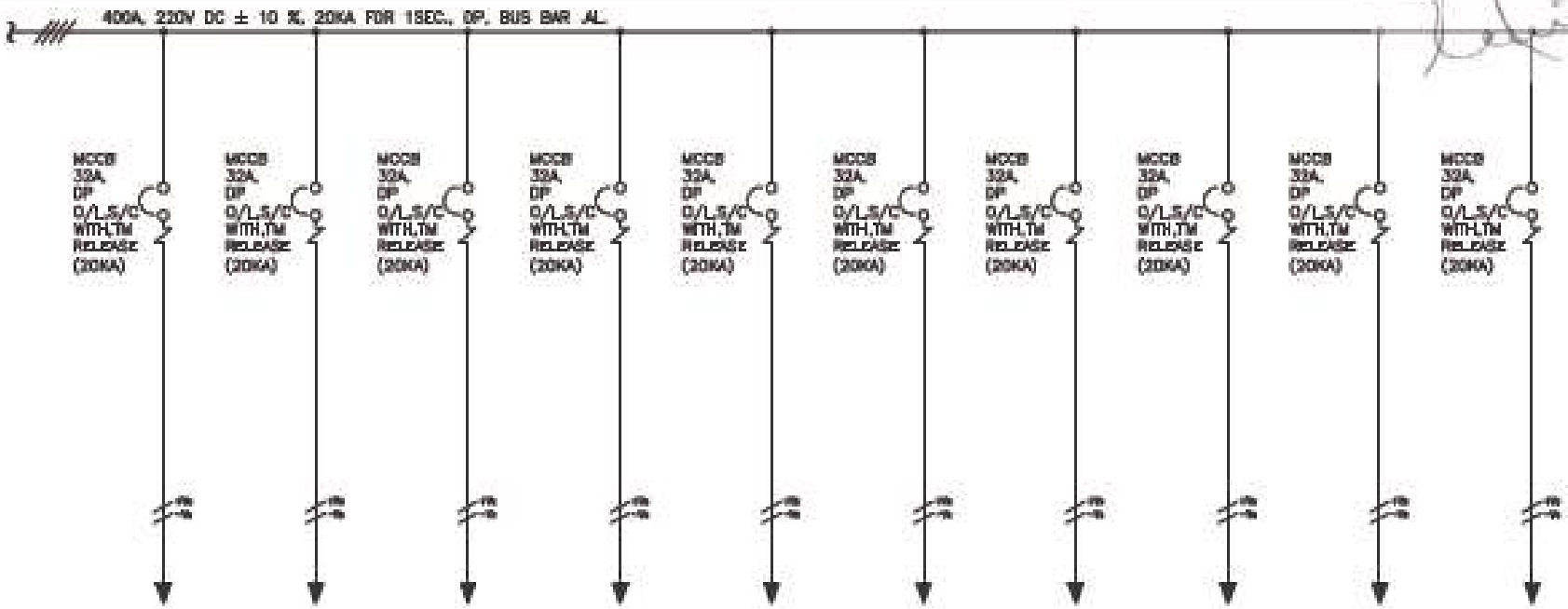

FEEDER NUMBER	3F3	3F4	3F5	3F6	3F7	3F8	1R1	1R2	1R3	1R4
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	765kV RELAY PANEL 707	765kV RELAY PANEL 709	765kV RELAY PANEL 710	765kV RELAY PANEL 712	765kV RELAY PANEL 713	765kV RELAY PANEL 715	765kV RELAY PANEL 716	765kV RELAY PANEL 718	765kV RELAY PANEL 719 (F)	765kV RELAY PANEL 721 (F)
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITBI-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(1D)(MCRB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (NCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-205

SH. NO.:- 02 OF 05

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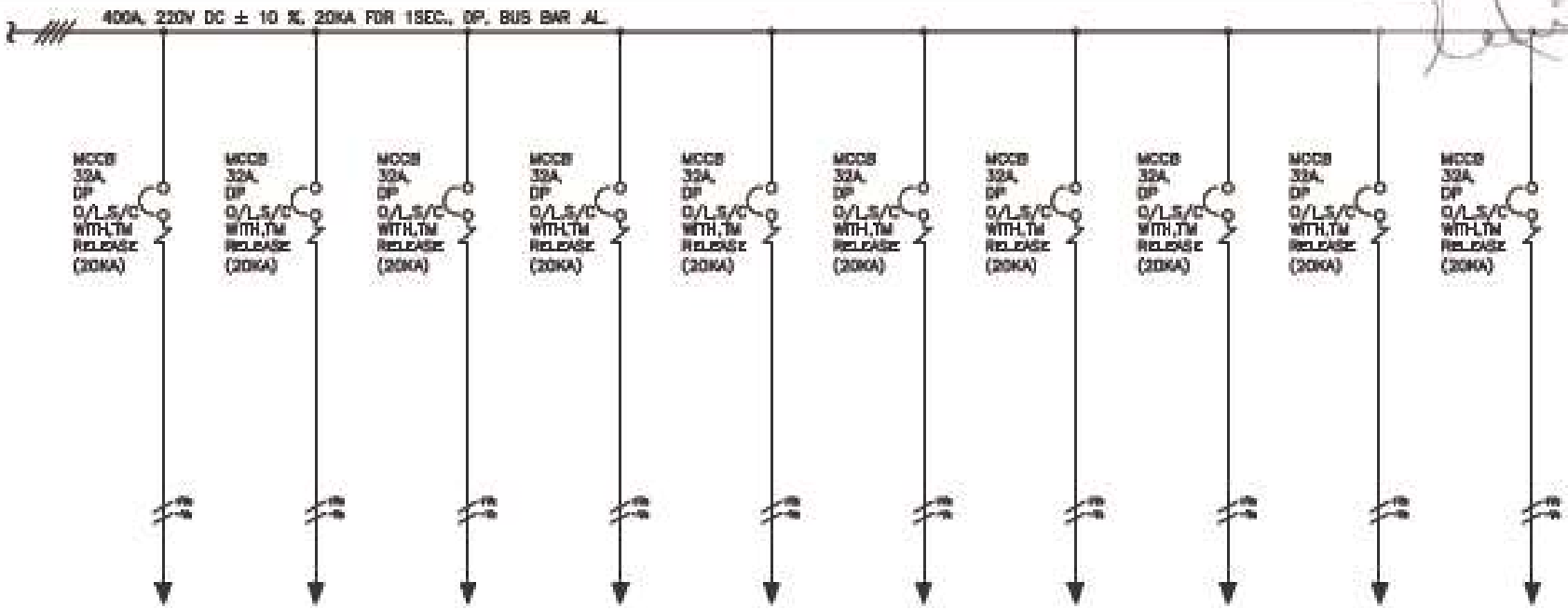

FEEDER NUMBER	1R5	1R6	2R1	2R2	2R3	2R4	2R5	2R6	2R7	2R8
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	765kV RELAY PANEL 722 (F)	765kV RELAY PANEL 724 (F)	765kV RELAY PANEL 725 (F)	765kV RELAY PANEL 727 (F)	765kV RELAY PANEL BUSBAR	NETWORK PANEL	DC SUPPLY FOR FF DCDB	DC SUPPLY FOR DC LIGHTING PANEL	DC SUPPLY FOR MSB-1A	DC SUPPLY FOR MSB-2A
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IITBI-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAUTER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(1D)(MCRB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPRT ELECTRICAL CHECK (HECA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-205
JOB NO.	1241A
SH. NO.:-	03 OF 05

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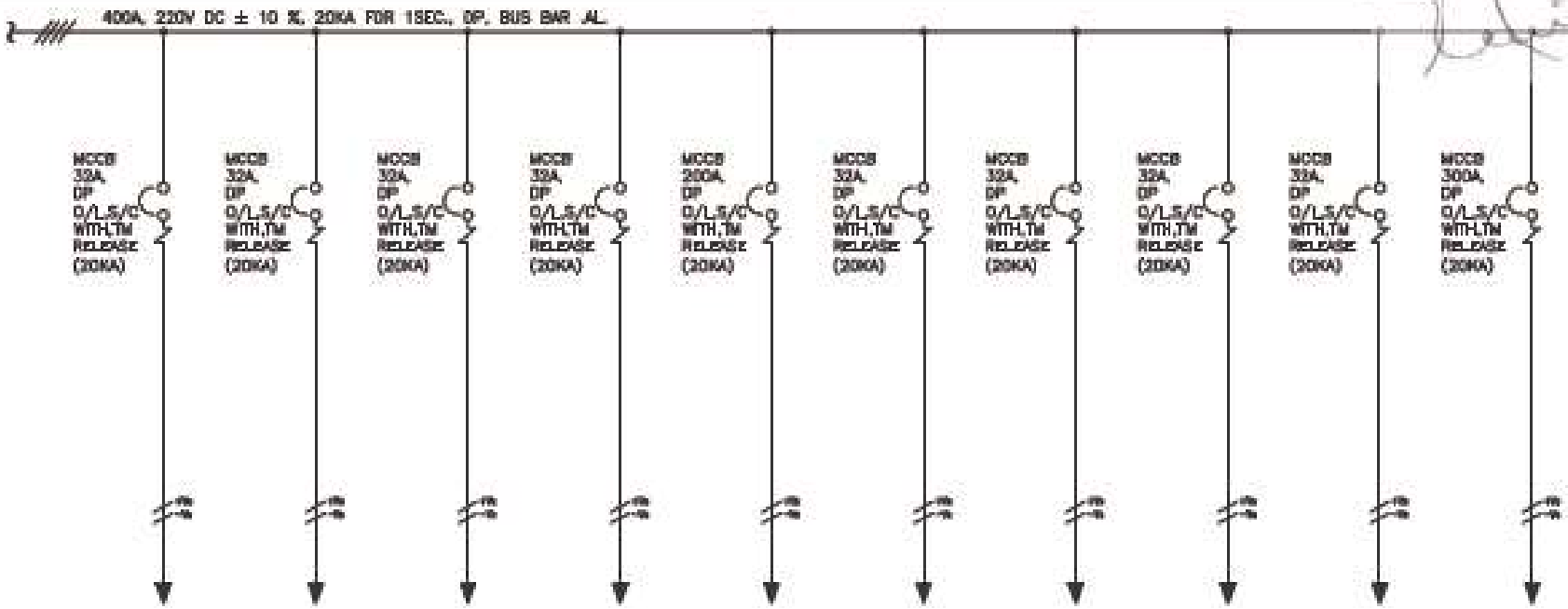

FEEDER NUMBER	3R1	3R2	3R3	3R4	1F2	3R5	3R6	3R7	3R8	1F1
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	200A	32A	32A	32A	32A	300A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	DC SUPPLY FOR INVERTER-1	DC SUPPLY FOR ELECTRONIC TEST LAB	DC SUPPLY FOR AUX. BCU PANEL	DC SUPPLY FOR MLDB	OUTGOING FEEDER TO 400&220KV DCDB	STATION HMI	SPARE-1	SPARE-2	SPARE-3	SPARE-4
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	2X1CX150Sqmm.	1X4CX16 Sqmm.	---	---	---	---

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAMPURI ROORKEE - 247667 U. K. INDIA (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(1D)(MCRB)
CA NO.	CC/T/W-HS/DOM/318/23/01656/WA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220KV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
BHARAT HEAVY ELECTRICALS LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-205

SH. NO.:- 04 OF 05

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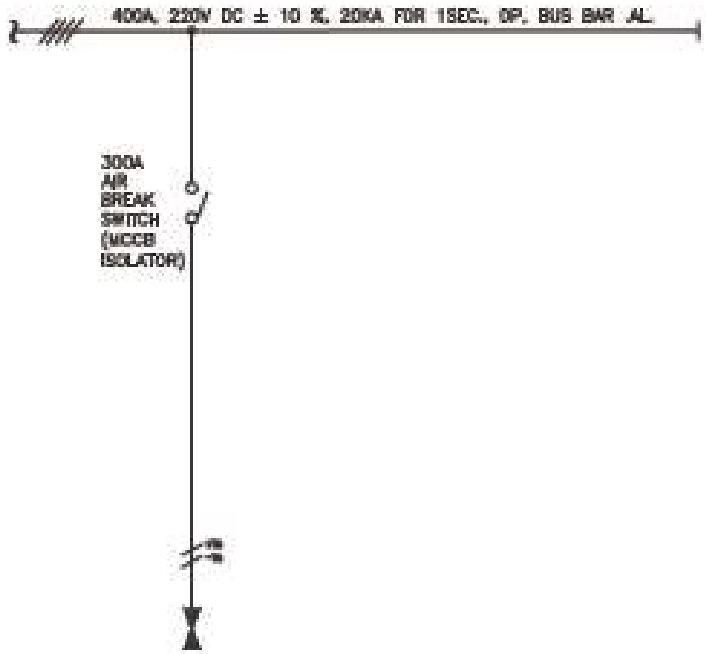

FEEDER NUMBER	1F3
MODULE TYEP	H1
FEEDER RATING	300A
FEEDER TYPE	ISOLATOR
DESCRIPTION	TO 220V DCDB-2
POWER CABLE SIZE (AL PVC)	2X1CX150 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II F-68 & F-97, RIICO-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(1D)(MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NOA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (INDIA) TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-205

SH. NO.:- 05 OF 05

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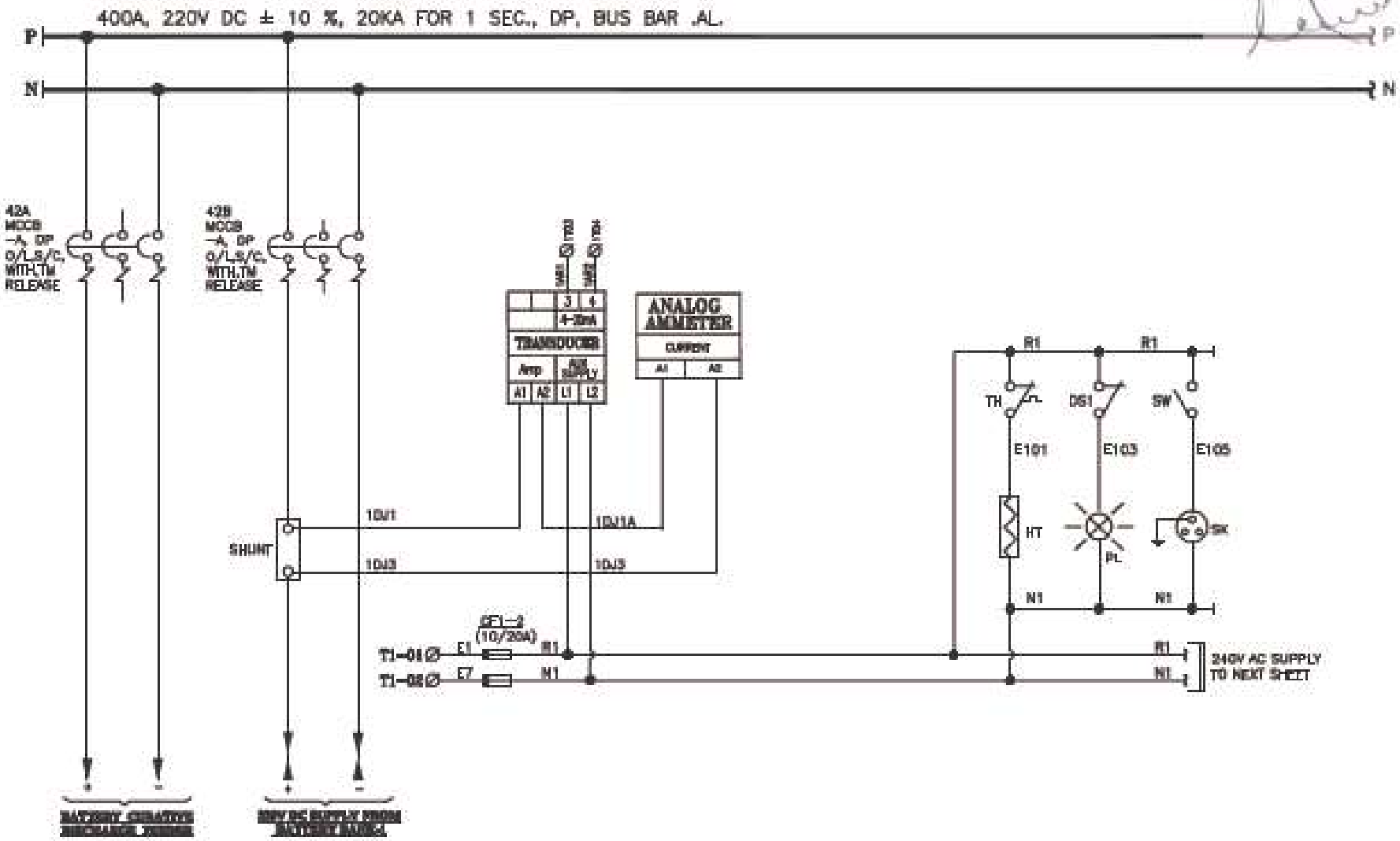

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-8,9,F-7, IPHB-C, LANDCO, SIDCUL INDUSTRIAL AREA, GRAUTER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(1D)(MCRB)
CA NO.	CC/T/W-HD/DOM/318/23/01806/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DWG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-505	SH. NO.:- 01 OF 03

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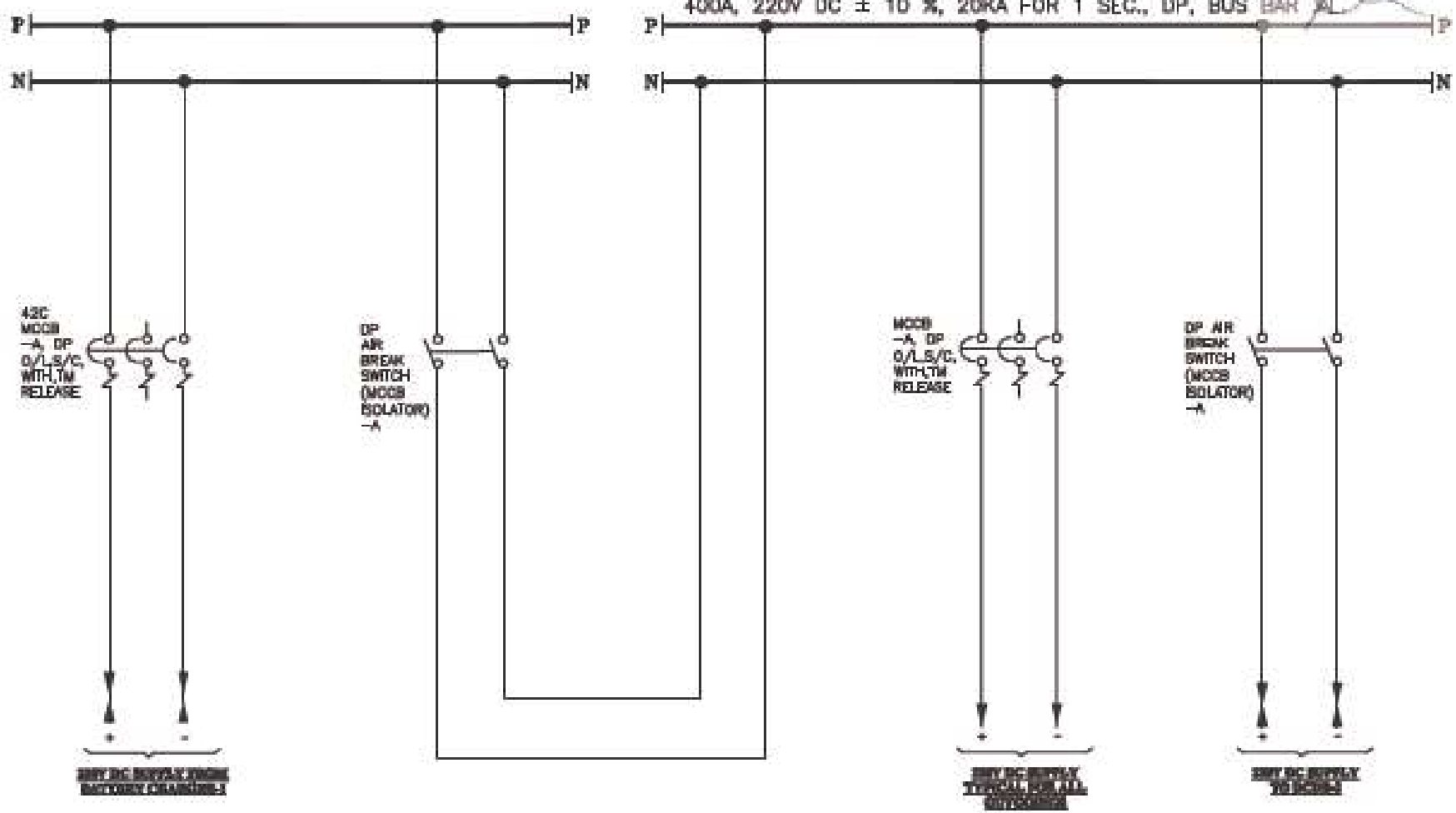

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II F-68 & F-97, IPHB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(1D)(MCRB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/WA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EARTH ELECTRICAL CHECK (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-505
JOB NO.	1241A
SH. NO.:-	02 OF 03

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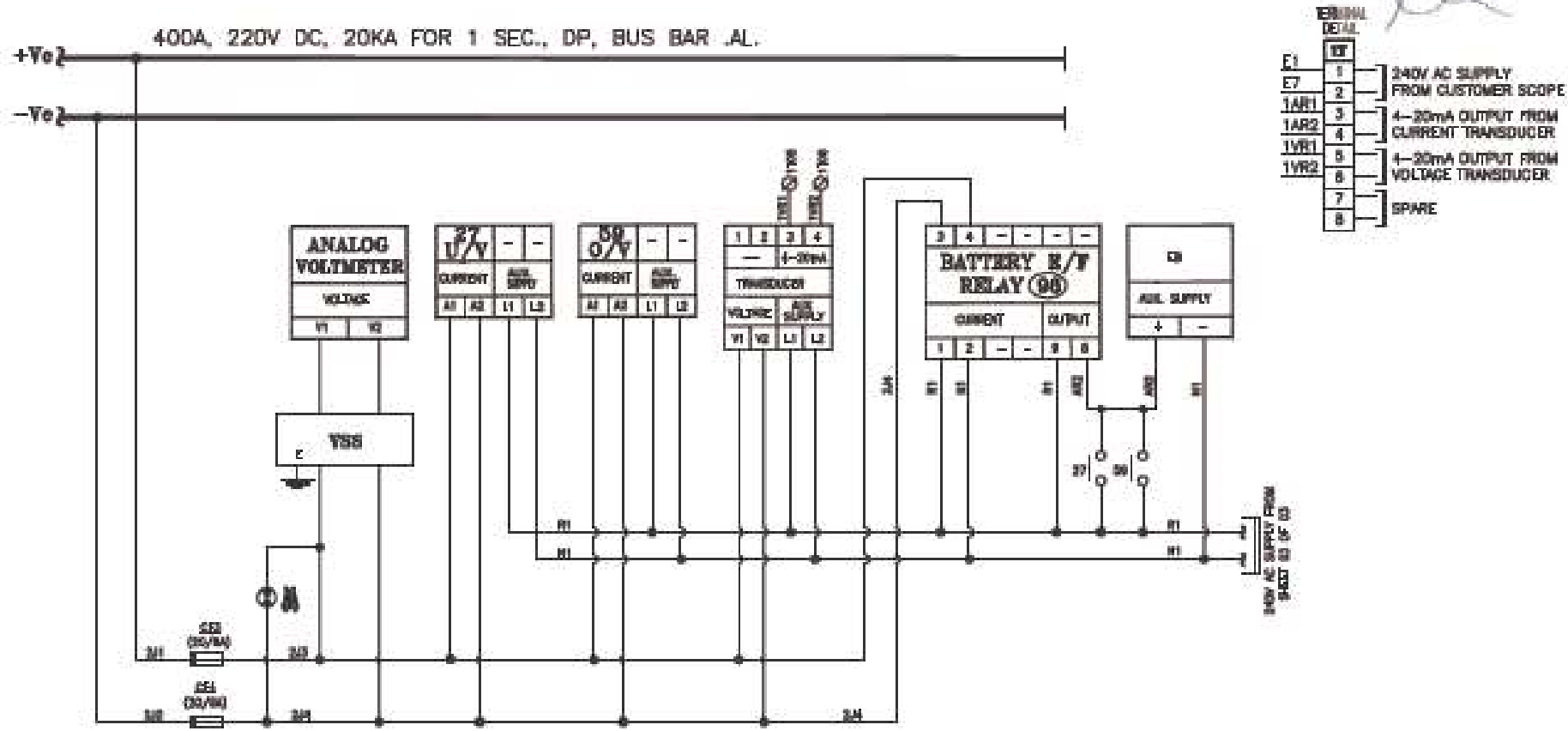

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-48 & F-49, IITBI-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(1D)(MORB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-505
SH. NO:-	03 OF 03

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BILL OF MATERIAL FOR 220V DC DISTRIBUTION BOARD-1(10)(MORB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A	BILL OF MATERIAL FOR MODULE - (DC)				1 No.
1	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER LINK, ROTARY OPERATING MECHANISM (ROM), ICS = 100% ICU	L&T/C&S/HAVELLS	300A, 20kA, 220V DC	03
2	AI	DC ANALOG AMMETER, 96 X 96 Sq MM, WITH 0–75mV SHUNT	AE/RISHAB/NEWTEK/SECURE	90–0–400A	01
3	CT	DC CURRENT TRANSDUCER , SINGLE OUTPUT–4–20mA, WITH 0–75mV SHUNT, AUX. SUPPLY 240V AC	AE/RISHAB/SECURE	0–400A	01
B	BILL OF MATERIAL FOR MODULE (BI)				2 Nos.
1	MCCB ISOLATOR	DOUBLE POLE SINGLE THROUGH TYPE ON/OFF AIR BREAK SWITCH (MCCB ISOLATOR), WITH DOOR INTERLOCKING AND PAD LOCKING FACILITY	L&T/C&S/HAVELLS	300A, 220V DC	01
0	—	MECHANICAL LOCK 2 LOCK 1–KEY FOR 300A AIR BREAK SWITCH	PGCIL APPROVED	—	1–SET
C	BILL OF MATERIAL FOR MODULE (D)				
1	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER & ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	300A, 20kA, 220V DC	01
2	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER & ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	200A, 20kA, 220V DC	01
3	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	32A, 20kA, 220V DC	32
D	BILL OF MATERIAL FOR MODULE - (BI)				1 No.
1	27	DC INSTANTANEOUS UNDER VOLTAGE RELAY WITH 95% OF 220V DC. THE RESETTING RATIO OF RELAY OF RELAY SHOULD NOT BE MORE THAN 1.25. THE RELAY SHALL BE PROVIDED WITH A SERIES RESISTOR AND A PUSH BUTTON ACROSS IF FOR RESETTING (PICK UP) THE RELAY AT ABOUT 105% OF THE DROP OUT VOLTAGE. FLUSH MOUNTED. AUX. SUPPLY 240V AC	C&S/JVS/ASHIDHA/PROCOM	NOMINAL VOLTAGE–220V DC	01
2	59	DC INSTANTANEOUS OVER VOLTAGE RELAY WITH SETTING RANGE OF 110% OF 220V DC. THE RESETTING RATIO OF RELAY SHOULD NOT BE LESS THAN 0.8. THE RELAY SHALL HAVE A PUSH BUTTON IN SERIES OF RESETTING THE RELAY AT ABOUT 95% OF THE OPERATING VOLTAGE. FLUSH MOUNTED. AUX. SUPPLY 240V AC	C&S/JVS/ASHIDHA/PROCOM	NOMINAL VOLTAGE–220V DC	01
3	86	DC EARTH LEAKAGE RELAY ONLY FOR 220V DC SYSTEM HAVING ADJUSTABLE PICK UP RANGE BETWEEN 3 TO 7 MILLIAMPS. FLUSH MOUNTED. AUX. SUPPLY 240V AC	C&S/JVS/ASHIDHA/PROCOM	NOMINAL VOLTAGE–220V DC	01
4	V	DC ANALOG VOLTMETER 96 X 96 Sq MM	AE/RISHAB/NEWTEK/SECURE	300–0–300V	01
5	VSS	VOLTAGE SELECTOR SWITCH,3POSITION (+VE/–VE, +VE/EARTH, –VE/EARTH), CAM TYPE, 2POLE, THREE WAY WITH OFF,	SALZER/KAYCEE	6A	01
6	M	'DC SUPPLY ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	220V DC	01
7	BZ	ELECTRONIC BUZZER, 220V DC	SECO	—	01
8	CFS-4	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	02
9	CFS-4	HRC FUSE LINK	L&T/C&S/HAVELLS	6A	02
10	VT	DC VOLTAGE TRANSDUCER, SINGLE OUTPUT–4–20mA,CL–1.0, AUX. SUPPLY 240V AC	AE/RISHAB/SECURE	220V DC	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP; CHKD.: VDP; APPD.: –– ; ALL DIMENSIONS IN mm. SIGN.; TOLERANCE 5%; REVISIONS : 00

MANUFACTURER: ULTIMA SWITCHGEARS LTD.

DRAWING	BILL OF MATERIAL
TITLE	220V DC DISTRIBUTION BOARD–1(10)(MORB)
CA NO.	CC/T/W-MS/DOM/015/23/01006/00A–1/24–02043/01 & 02 DATED 23.02.2024
PROJECT	TIS/400/220kV BHADLA-II POLING STATION
JOB NO.	1241A
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:–	HEAVY EARTH ELECTRICAL CHECK (HEEC) TRANSMISSION PROJECTS DIVISION
DWG. NO.	USL/PGCIL/BHEL/2024–2025/1241A–705
SH. NO.:–	01 OF 02

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BILL OF MATERIAL FOR 220V DC DISTRIBUTION BOARD-4(100/MCCB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
E	BILL OF MATERIAL FOR MISC.				
1	CFI-2	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	02
2	CFI-2	HRC FUSE LINK	L&T/C&S/HAVELLS	10A	02
3	DS	DOOR SWITCH, 1C/O	SURAJ	--	02
4	PL	PANEL ILLUMINATION LIGHT, 240V AC	HAVELLS	5W	02
5	SH	SPACE HEATER, 240V AC	HOTWEL	60W	02
6	TH	THERMOSTATE, 240V AC	ELCON	30 – 85°C	02
7	SW-SOCKET	5/15A SWITCH SOCKET	ANCHOR	--	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-68 & F-97, IPHB-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	220V DC DISTRIBUTION BOARD-1(10)(MCCB)
CA NO.	CC/T/W-MS/DOM/015/23/01656/WA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	MEGHAT KHAKI ELECTRICAL CHECK (MEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-705
SH. NO.:-	02 OF 02

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ENGINEERING DRAWING DETAILS FOR

220V DC DISTRIBUTION BOARD–2(2D)(MCRB)

PROJECT :– 765/400/220kV BIKANER–III POOLING STATION

CLIENT :– POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR :– BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHAGWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-68 & F-70, IPHB-C, LOHARI, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	COVER PAGE
TITLE	220V DC DISTRIBUTION BOARD–2(2D)(MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01806/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BIKANER-III POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:–	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024–2025/1241A–006

JOB NO. 1241A

SH. NO. 01 OF 01

1 2 3 4 5 6 7 8 9

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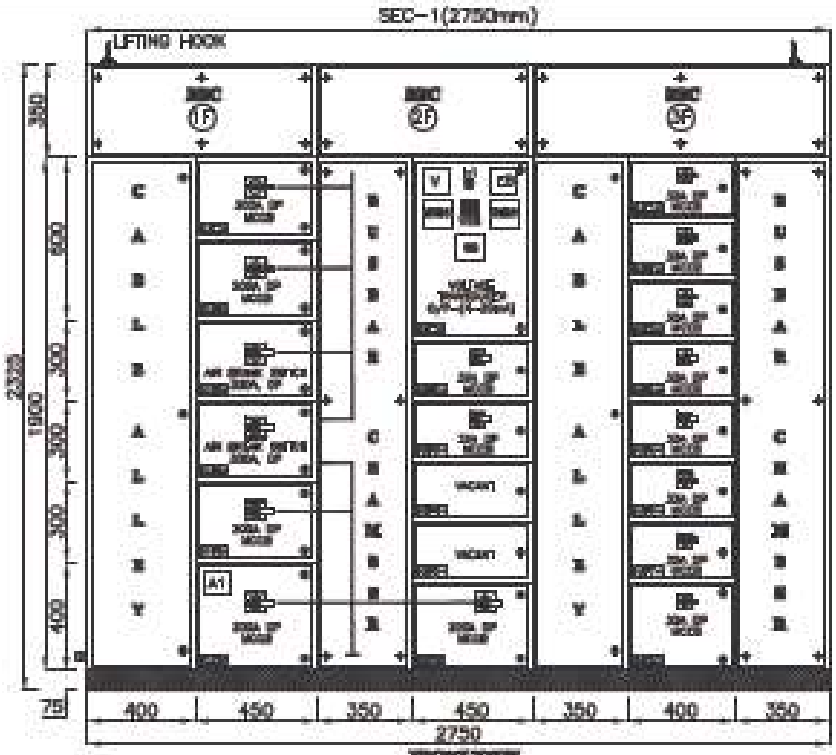
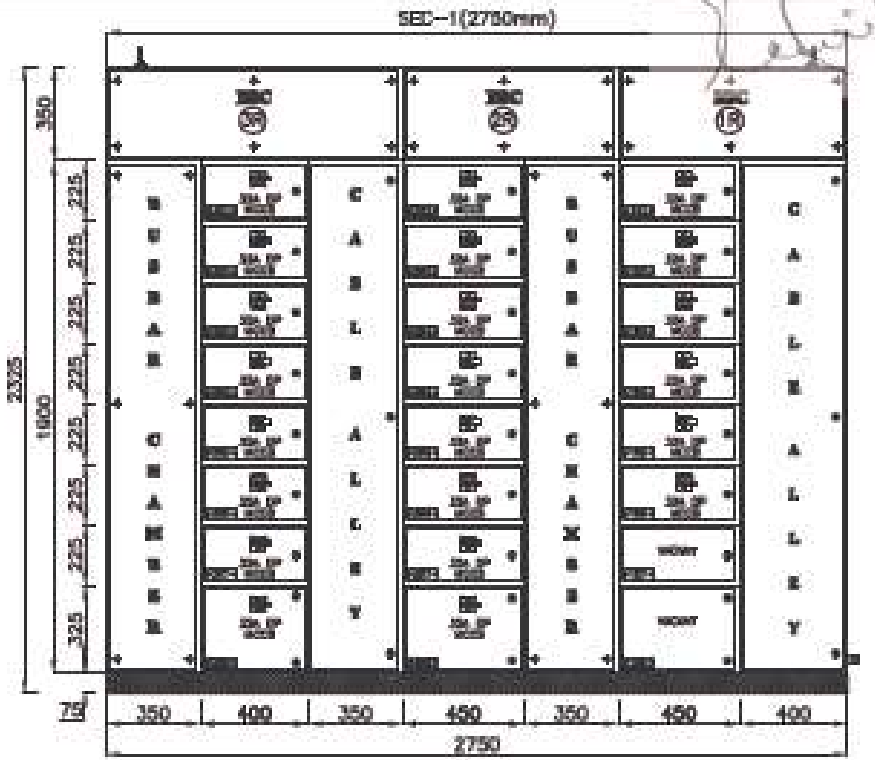
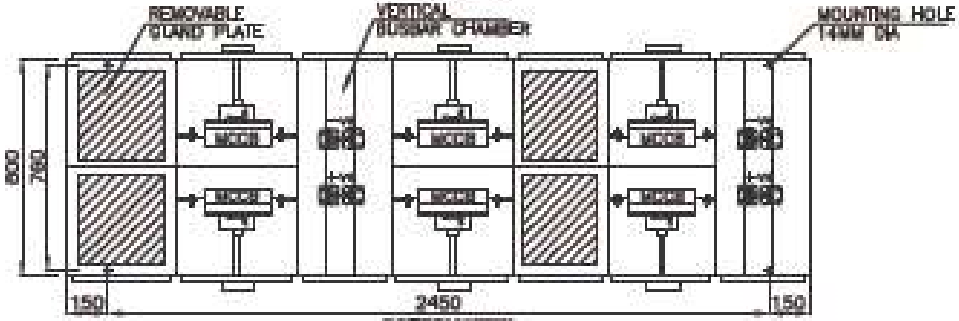


FRONT VIEW



REAR VIEW



BOTTOM VIEW

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-8 & F-9, IPHB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	220V DC DISTRIBUTION BOARD-2(2D)(MCCB)
CA NO.	CC/T/W-MS/DOM/015/23/01006/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
BHARAT HEAVY ELECTRICALS LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-106

SH. NO. 01 OF 02

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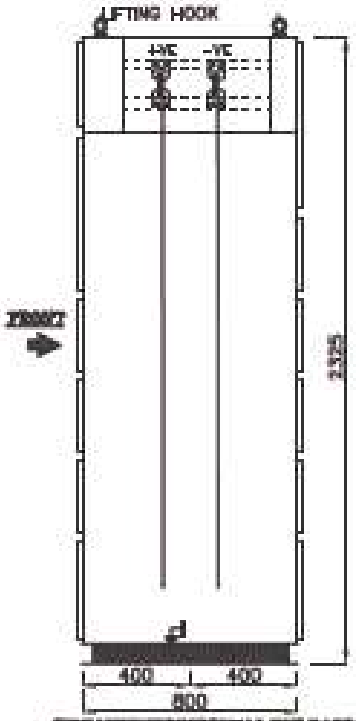


SIDE VIEW(HORIZONTAL BUS BARS ARRANGEMENT)(VERTICAL BUS BAR ARRANGEMENT)

PANEL DIMENSIONS

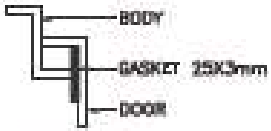
HEIGHT : 2325 mm.
WIDTH : 2250 mm.
DEPTH : 800 mm.

BUS BAR SIZE :-

POSITIVE : 1x40x10 Sq.mm Al.
NEGATIVE : 1x40x10 Sq.mm Al.
EARTH : 1x40X10 Sq.mm CU.

LEGEND DETAILS

AI = ANALOG DC AMMETER
VI = ANALOG DC VOLT METER
BE = BATTERY EARTH FAULT RELAY
27DC = DC UNDER VOLTAGE RELAY
59DC = DC OVER VOLTAGE RELAY
BB = ELECTRONIC BUZZER



DETAIL-'A'

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP	SIGN.
	04.	–	CHKD.	VDP	
	03.	–	APPD.	--	
	02.	–	ALL DIMENSIONS IN mm.		
	01.		TOLERANCE 5%		
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BHD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : 01332-290360 FAX : 01332-290362
UNIT-II F-68 & F-69, IITBI-C, UPSIDC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : info@ultimaswitchgear.com

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	220V DC DISTRIBUTION BOARD-2(2D)(MCCB)
CA NO.	CC/T/W-MS/DOM/010/23/01006/NOA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPRT ELECTRICAL CHINA (HEEC) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-106
JOB NO.	1241A
SH. NO.	02 OF 02

1 2 3 4 5 6 7 8 9

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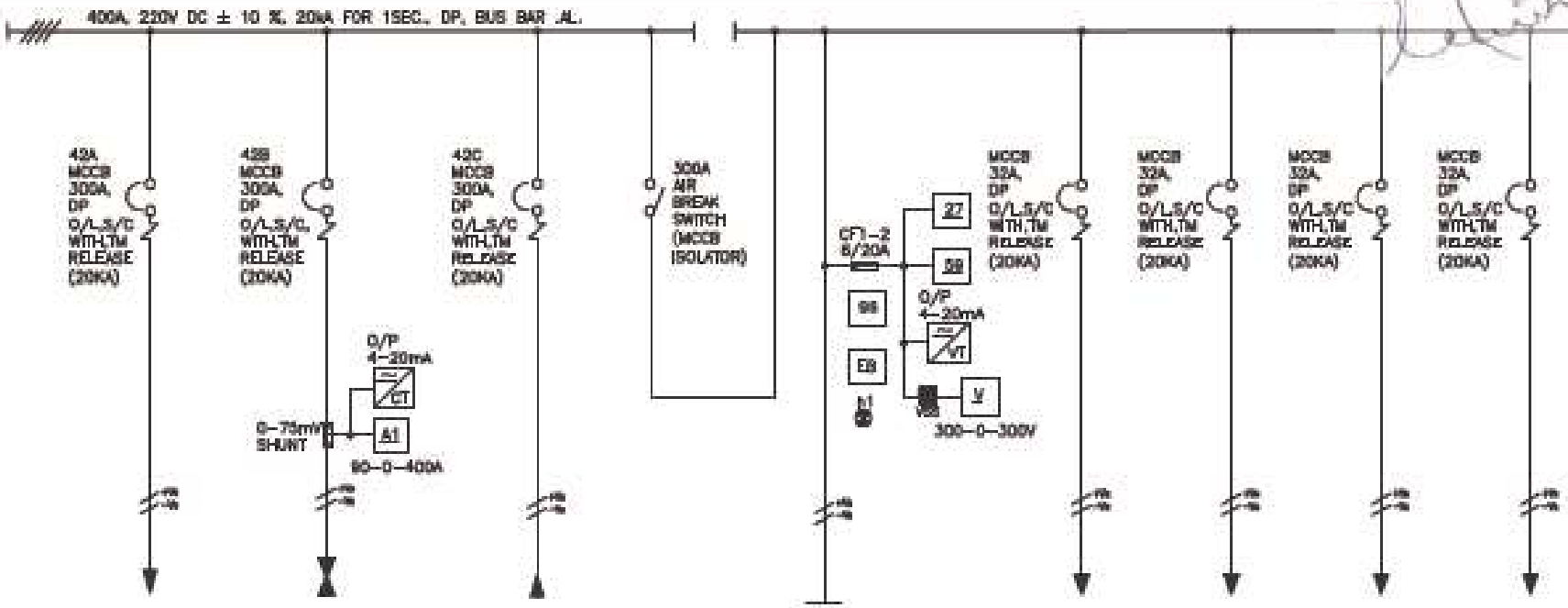

FEEDER NUMBER	2F6	1F6	1F5	1F4	2F1	2F2	2F3	3F1	3F2
MODULE TYEP	DC	DC	DC	H1	S1	X	X	X	X
FEEDER RATING	300A	300A	300A	300A	—	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	ISOLATOR	METERING	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BATTERY CURATIVE DISCHARGE FEEDER	220V DC BATTERY BANK-2	220V DC INCOMER FROM BATTERY CHARGER-2	MAIN BUSBAR CONTROL FEEDER 220V DCDB-2	--	765kV RELAY PANEL 701	765kV RELAY PANEL 703 (F)	765kV RELAY PANEL 704	765kV RELAY PANEL 706 (F)
POWER CABLE SIZE (AL PVC)	2X1CX150 Sqmm.	2X1CX150 Sqmm.	2X1CX150 Sqmm.	—	--	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURA), TEHSIL - BOCHOCH, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IITBI-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-2(2D)(MORB)
CA NO.	CC/T/W-HD/DDN/318/23/01956/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EARTH ELECTRICAL CHENNAI (HEEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-206
JOB NO.	1241A
SH. NO.:-	01 OF 05

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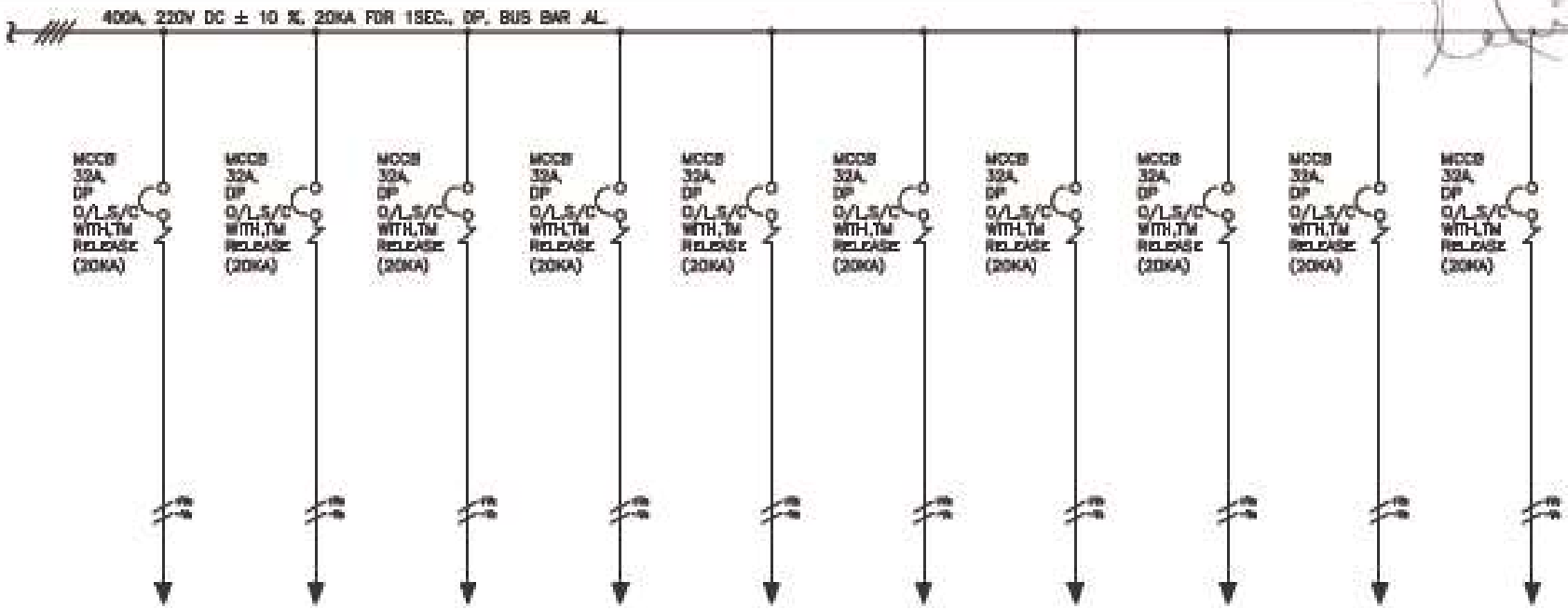

FEEDER NUMBER	3F3	3F4	3F5	3F6	3F7	3F8	1R1	1R2	1R3	1R4
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	765kV RELAY PANEL 707	765kV RELAY PANEL 709	765kV RELAY PANEL 710	765kV RELAY PANEL 712	765kV RELAY PANEL 713	765kV RELAY PANEL 715	765kV RELAY PANEL 716	765kV RELAY PANEL 718	765kV RELAY PANEL 719 (F)	765kV RELAY PANEL 721 (F)
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IITBI-C, UPSIDC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-2(2D)(MORB)
CA NO.	CC/T/W-HD/DOM/D18/23/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-206
JOB NO.	1241A
SH. NO.:-	02 OF 05

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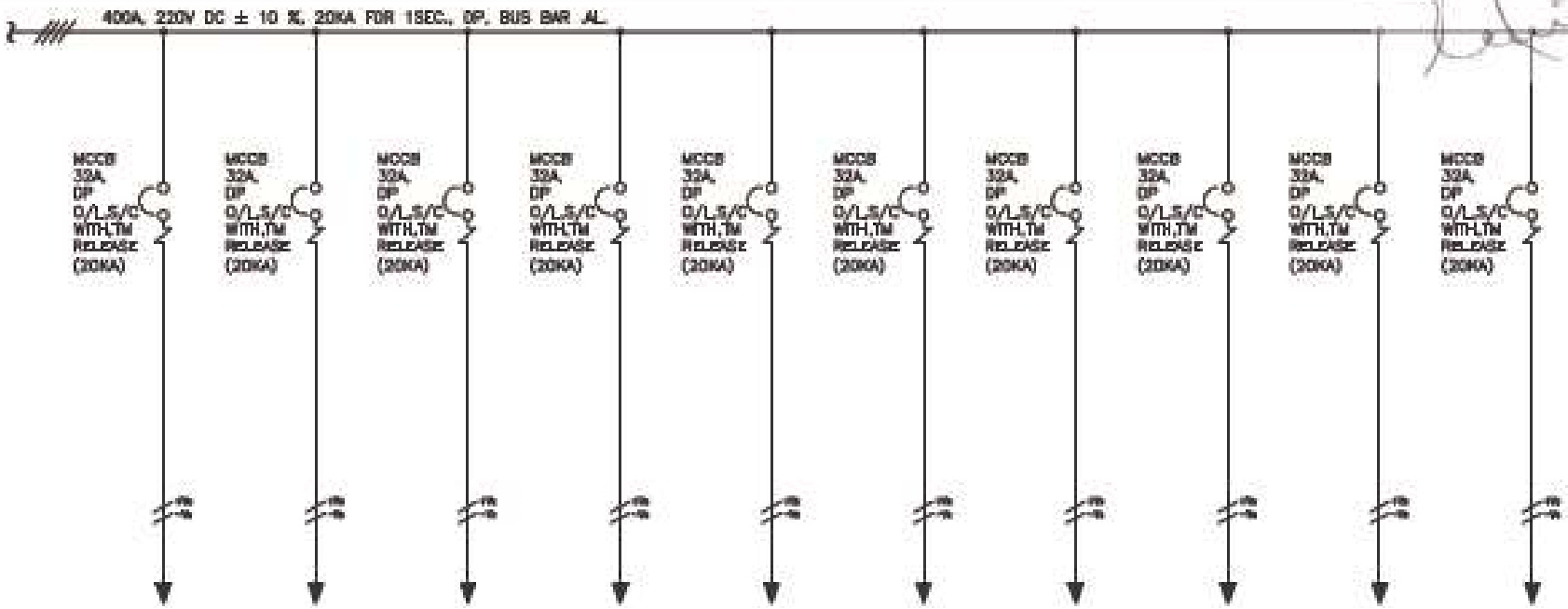

FEEDER NUMBER	1R5	1R6	2R1	2R2	2R3	2R4	2R5	2R6	2R7	2R8
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	765kV RELAY PANEL 722 (F)	765kV RELAY PANEL 724 (F)	765kV RELAY PANEL 725 (F)	765kV RELAY PANEL 727 (F)	765kV RELAY PANEL BUSBAR	NETWORK PANEL	DC SUPPLY FOR FF DCDB	DC SUPPLY FOR DC LIGHTING PANEL	DC SUPPLY FOR MSB-1A	DC SUPPLY FOR MSB-2A
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITBI-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAUTER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-2(2D)(MCRB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (NCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-206

SH. NO.:- 03 OF 05

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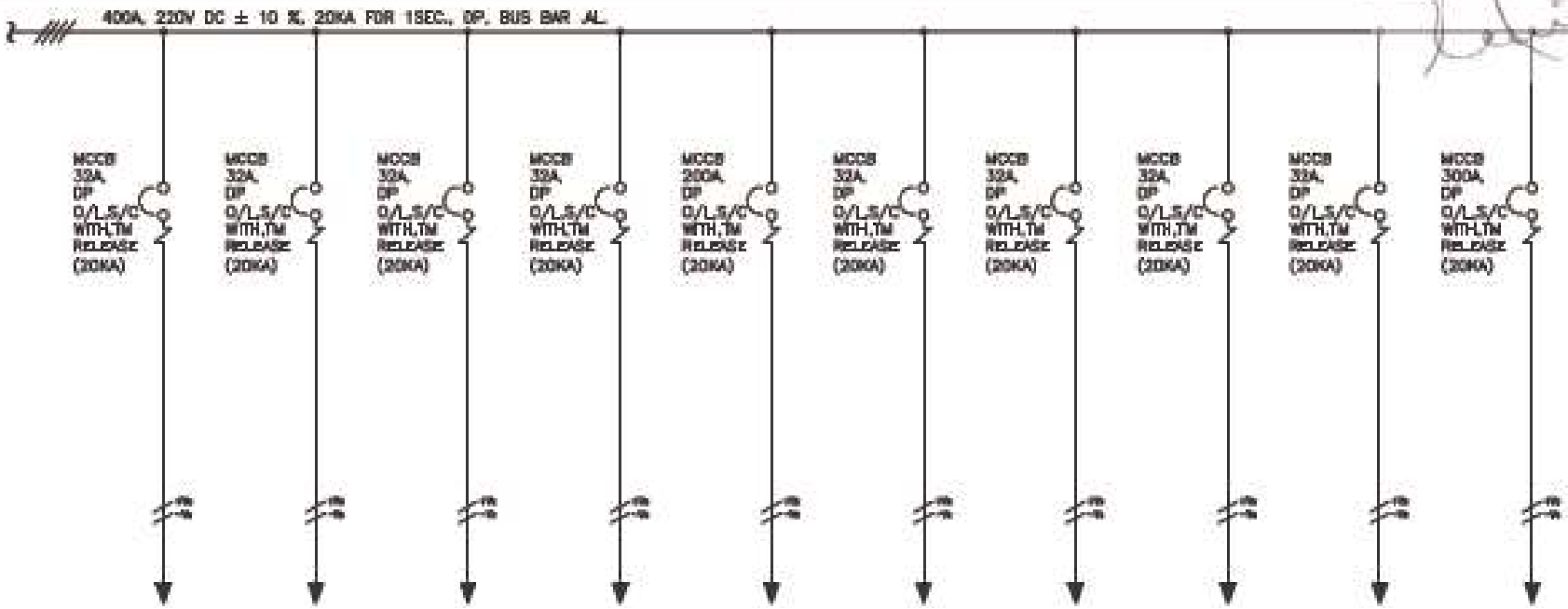

FEEDER NUMBER	3R1	3R2	3R3	3R4	1F2	3R5	3R6	3R7	3R8	1F1
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	200A	32A	32A	32A	32A	300A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	DC SUPPLY FOR INVERTER-1	DC SUPPLY FOR ELECTRONIC TEST LAB	DC SUPPLY FOR AUX. BCU PANEL	DC SUPPLY FOR MLDB	OUTGOING FEEDER TO 400&220KV DCDB	STATION HMI	SPARE-5	SPARE-6	SPARE-7	SPARE-8
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	2X1CX150Sqmm.	1X4CX16 Sqmm.	---	---	---	---

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP	SIGN.
	04.	–	CHKD.	VDP	
	03.	–	APPD.	--	
	02.	–	ALL DIMENSIONS IN mm.		
	01.		TOLERANCE 5%		
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-2(2D)(MORB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIANDI-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXAVY ELECTRICAL CHEMICAL (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-206

JOB NO. 1241A

SH. NO.:- 04 OF 05

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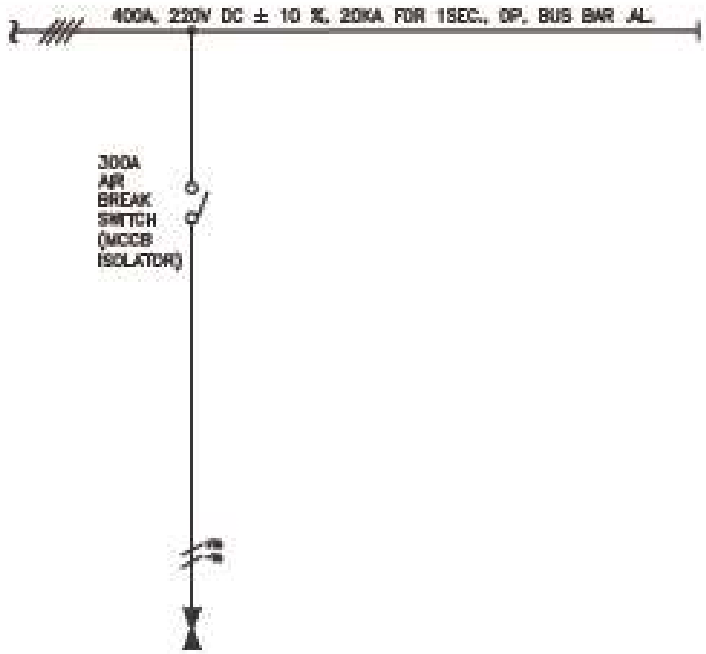

FEEDER NUMBER	1F3
MODULE TYEP	H1
FEEDER RATING	300A
FEEDER TYPE	ISOLATOR
DESCRIPTION	TO 220V DCDB-1
POWER CABLE SIZE (AL PVC)	2X1CX150 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP
CHKD.	VDP
APPD.	--
ALL DIMENSIONS IN mm.	SIGN.
TOLERANCE 5%	
REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II F-68 & F-97, RIICO-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-2(2D)(MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NOA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (INDIA) TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-206

SH. NO.:- 05 OF 05

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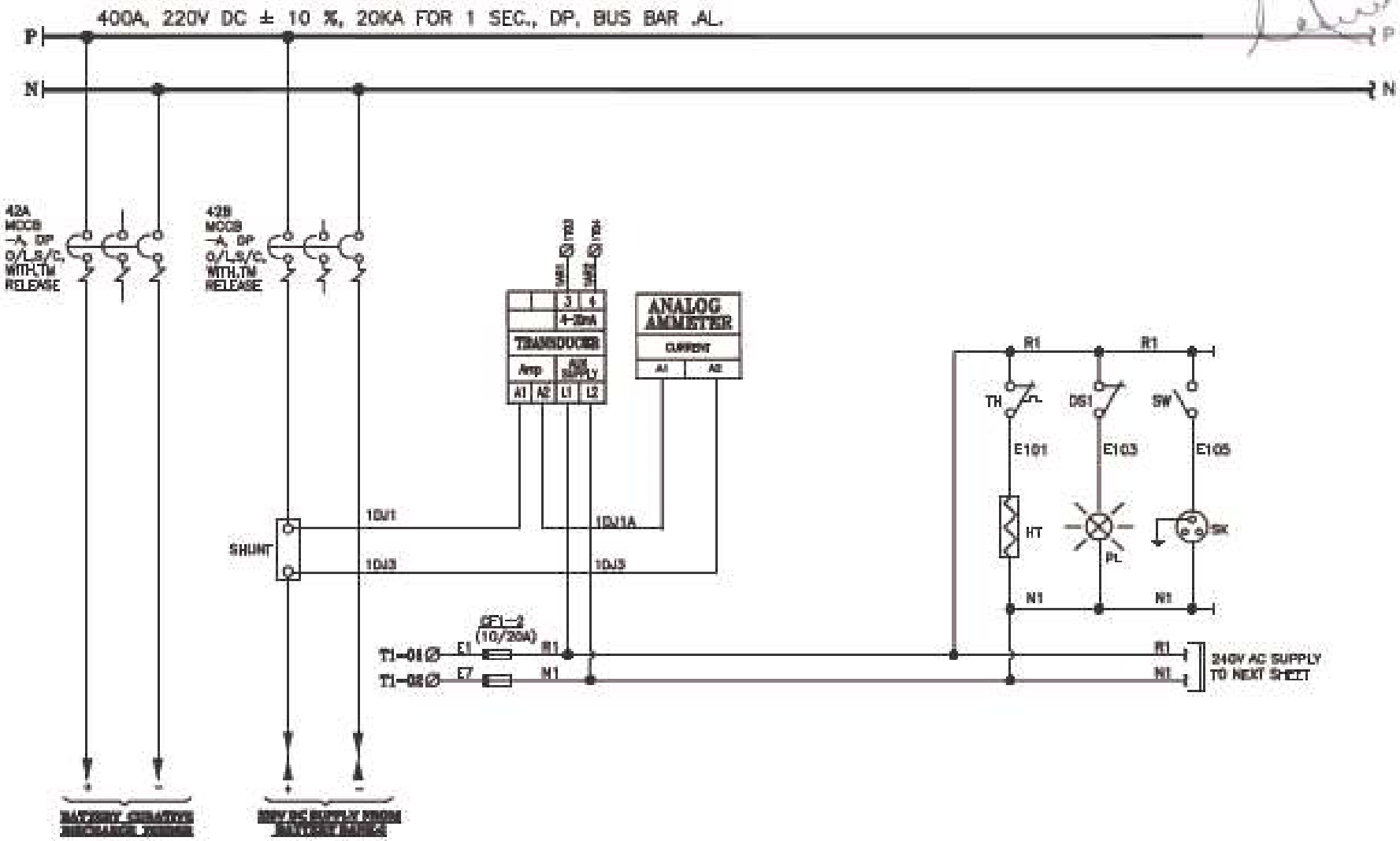

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-2(2D)(MCRB)
CA NO.	CC/T/W-MS/DDN/010/23/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DWG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-506	SH. NO.:- 01 OF 03

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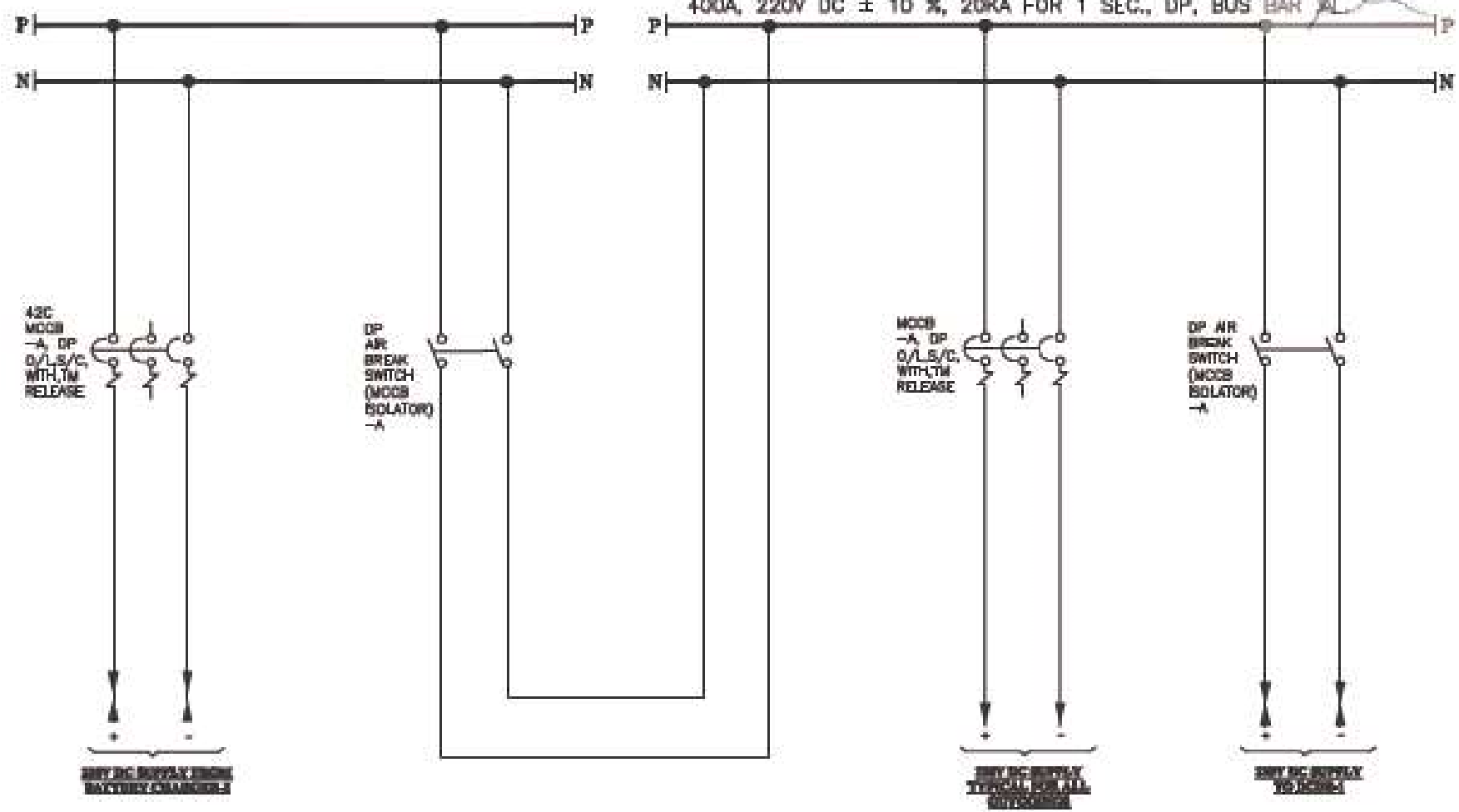

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-48 & F-47, IPHB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-2(2D)(MCRB)
CA NO.	CC/T/W-HD/DOM/318/23/01656/WA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-506

JOB NO. 1241A

SH. NO.:- 02 OF 03

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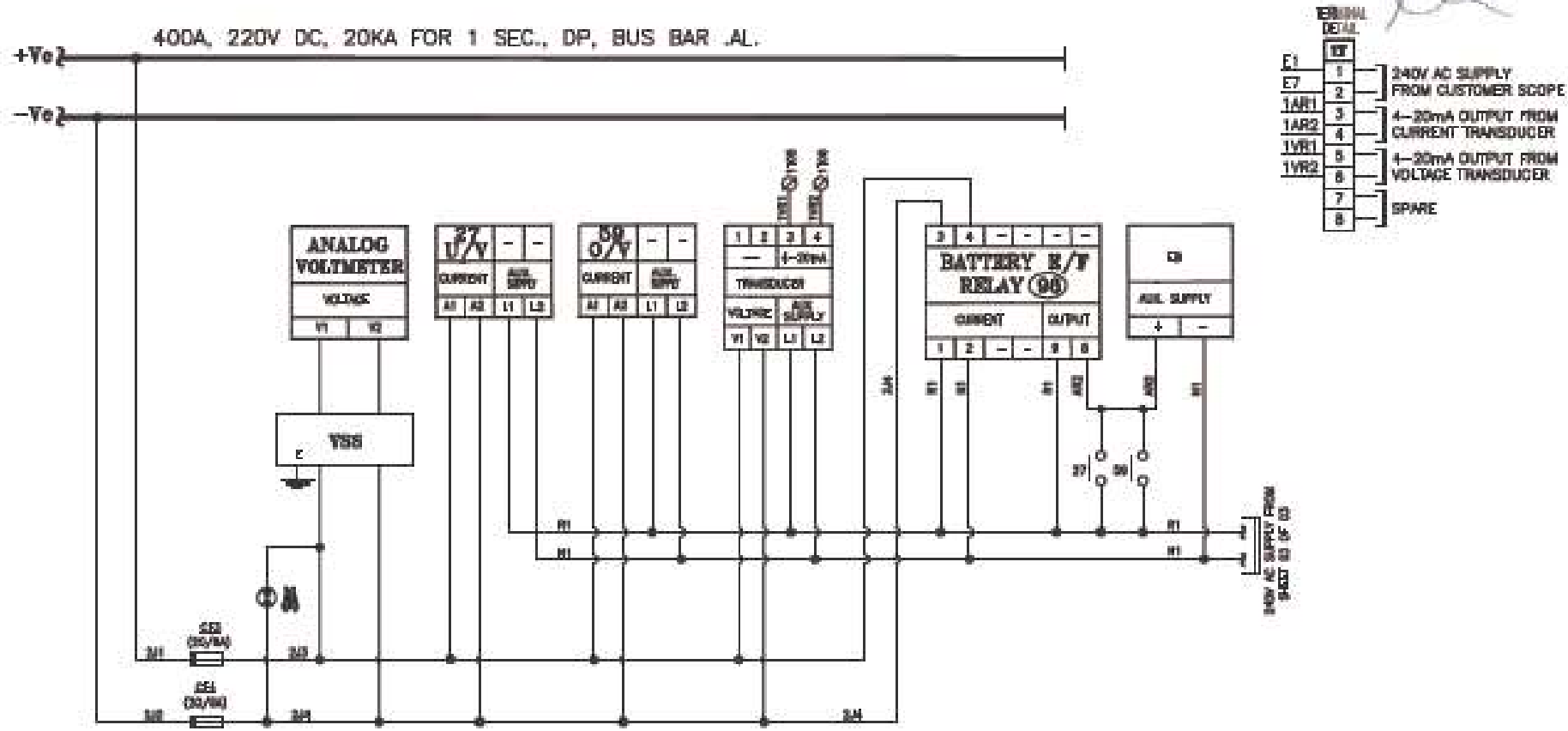

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER

ULTIMA SWITCHGEARS LTD.

UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-61 & F-67, IPHB-C, LOHARI, SIDCUL INDUSTRIAL AREA, HARIDWAR-249403 U. K. INDIA (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-2(2D)(MORB)
CA NO.	CC/T/W-MS/DOM/D15/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-506
SH. NO.:-	03 OF 03

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BILL OF MATERIAL FOR 220V DC DISTRIBUTION BOARD-2(20)(MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A	BILL OF MATERIAL FOR MODULE - (DC)				1 No.
1	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER LINK, ROTARY OPERATING MECHANISM (ROM), ICS = 100% ICU	L&T/C&S/HAVELLS	300A, 20kA, 220V DC	03
2	AI	DC ANALOG AMMETER, 96 X 96 Sq MM, WITH 0–75mV SHUNT	AE/RISHAB/NEWTEK/SECURE	90–0–400A	01
3	CT	DC CURRENT TRANSDUCER , SINGLE OUTPUT–4–20mA, WITH 0–75mV SHUNT, AUX. SUPPLY 240V AC	AE/RISHAB/SECURE	0–400A	01
B	BILL OF MATERIAL FOR MODULE (BI)				2 Nos.
1	MCCB ISOLATOR	DOUBLE POLE SINGLE THROUGH TYPE ON/OFF AIR BREAK SWITCH (MCCB ISOLATOR), WITH DOOR INTERLOCKING AND PAD LOCKING FACILITY	L&T/C&S/HAVELLS	300A, 220V DC	01
0	—	MECHANICAL LOCK 2 LOCK 1–KEY FOR 300A AIR BREAK SWITCH	PGCIL APPROVED	—	1–SET
C	BILL OF MATERIAL FOR MODULE (D)				
1	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER & ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	300A, 20kA, 220V DC	01
2	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER & ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	200A, 20kA, 220V DC	01
3	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	32A, 20kA, 220V DC	32
D	BILL OF MATERIAL FOR MODULE - (BI)				1 No.
1	27	DC INSTANTANEOUS UNDER VOLTAGE RELAY WITH 95% OF 220V DC. THE RESETTING RATIO OF RELAY OF RELAY SHOULD NOT BE MORE THAN 1.25. THE RELAY SHALL BE PROVIDED WITH A SERIES RESISTOR AND A PUSH BUTTON ACROSS IF FOR RESETTING (PICK UP) THE RELAY AT ABOUT 105% OF THE DROP OUT VOLTAGE. FLUSH MOUNTED, AUX. SUPPLY 240V AC	C&S/JVS/ASHIDHA/PROCOM	NOMINAL VOLTAGE–220V DC	01
2	59	DC INSTANTANEOUS OVER VOLTAGE RELAY WITH SETTING RANGE OF 110% OF 220V DC. THE RESETTING RATIO OF RELAY SHOULD NOT BE LESS THAN 0.8. THE RELAY SHALL HAVE A PUSH BUTTON IN SERIES OF RESETTING THE RELAY AT ABOUT 95% OF THE OPERATING VOLTAGE. FLUSH MOUNTED, AUX. SUPPLY 240V AC	C&S/JVS/ASHIDHA/PROCOM	NOMINAL VOLTAGE–220V DC	01
3	96	DC EARTH LEAKAGE RELAY ONLY FOR 220V DC SYSTEM HAVING ADJUSTABLE PICK UP RANGE BETWEEN 3 TO 7 MILLIAMPS. FLUSH MOUNTED, AUX. SUPPLY 240V AC	C&S/JVS/ASHIDHA/PROCOM	NOMINAL VOLTAGE–220V DC	01
4	V	DC ANALOG VOLTMETER 96 X 96 Sq MM	AE/RISHAB/NEWTEK/SECURE	300–0–300V	01
5	VSS	VOLTAGE SELECTOR SWITCH,3POSITION (+VE/–VE, +VE/EARTH, –VE/EARTH), CAM TYPE, 2POLE, THREE WAY WITH OFF,	SALZER/KAYCEE	6A	01
6	M	'DC SUPPLY ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	220V DC	01
7	BZ	ELECTRONIC BUZZER, 220V DC	SECO	—	01
8	CFS-4	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	02
9	CFS-4	HRC FUSE LINK	L&T/C&S/HAVELLS	6A	02
10	VT	DC VOLTAGE TRANSDUCER, SINGLE OUTPUT–4–20mA,CL–1.0, AUX. SUPPLY 240V AC	AE/RISHAB/SECURE	220V DC	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP; CHKD.: VDP; APPD.: –– ; ALL DIMENSIONS IN mm. SIGN.; TOLERANCE 5%; REVISIONS : 00

MANUFACTURER: ULTIMA SWITCHGEARS LTD.

DRAWING	BILL OF MATERIAL
TITLE	220V DC DISTRIBUTION BOARD–2(20)(MCRB)
CA NO.	CC/T/W-MS/DOM/015/23/01956/WA–1/24–02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:–	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024–2025/1241A–706

JOB NO. 1241A

SH. NO.:– 01 OF 02

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BILL OF MATERIAL FOR 220V DC DISTRIBUTION BOARD-2(20)(MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
E	BILL OF MATERIAL FOR MISC.				
1	CFI-2	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	02
2	CFI-2	HRC FUSE LINK	L&T/C&S/HAVELLS	10A	02
3	DS	DOOR SWITCH, 1C/O	SURAJ	--	02
4	PL	PANEL ILLUMINATION LIGHT, 240V AC	HAVELLS	5W	02
5	SH	SPACE HEATER, 240V AC	HOTWEL	60W	02
6	TH	THERMOSTATE, 240V AC	ELCON	30 – 85°C	02
7	SW-SOCKET	5/15A SWITCH SOCKET	ANCHOR	--	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING: BILL OF MATERIAL
TITLE: 220V DC DISTRIBUTION BOARD-2(20)(MCRB)
CA NO.: CC/T/W-MS/DOM/D15/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT: 765/400/220kV BHADLA-II POOLING STATION
JOB NO. 1241A
CLIENT: POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:- [illegible] ELECTRICAL CHINA (NCEC) TRANSMISSION PROJECTS DIVISION
DRG. NO.: USL/PGCIL/BHEL/2024-2025/1241A-706
SH. NO.:- 02 OF 02

This Drawing & information or descriptive matter set out herein are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing, rendering or for any other purpose without their permission.

ENGINEERING DRAWING DETAILS FOR

48V DC DISTRIBUTION BOARD-1(3D)(MCRB)

PROJECT :- 765/400/220kV BIKANER-III POOLING STATION

CLIENT :- POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR :- BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DATE	No.	REVISIONS DESCRIPTION			
	04.	-	DRAWN	MP	
	03.	-	CHKD.	VDP	
	02.	-	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BRD. AREA, VILLAGE RAMPUR (BHAGWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-68 & F-70, IPHB-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	COVER PAGE
TITLE	48V DC DISTRIBUTION BOARD-1(3D)(MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NON-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BIKANER-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-007
JOB NO.	1241A
SH. NO.	01 OF 01

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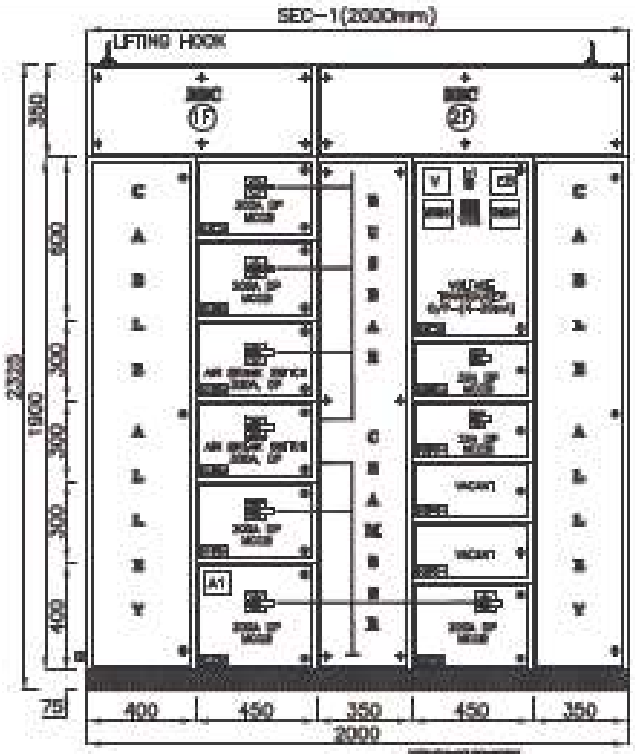
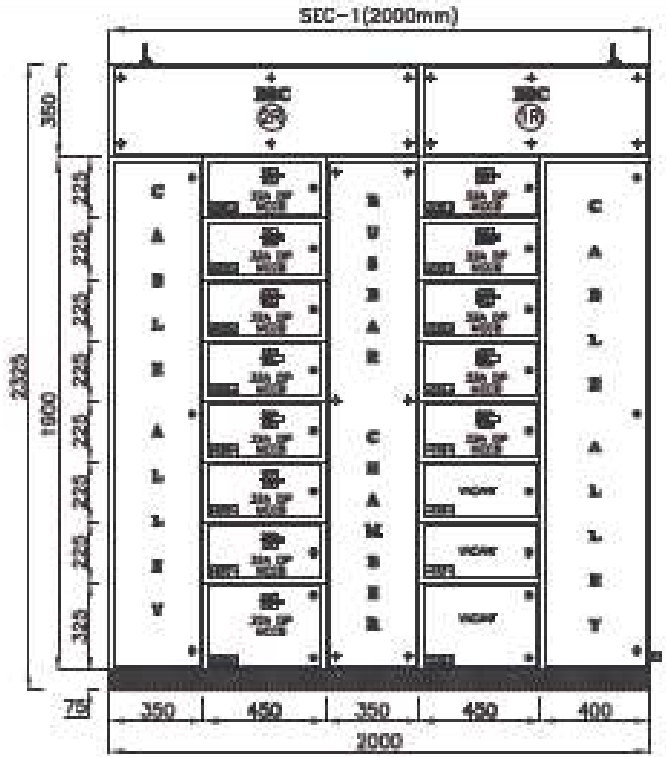
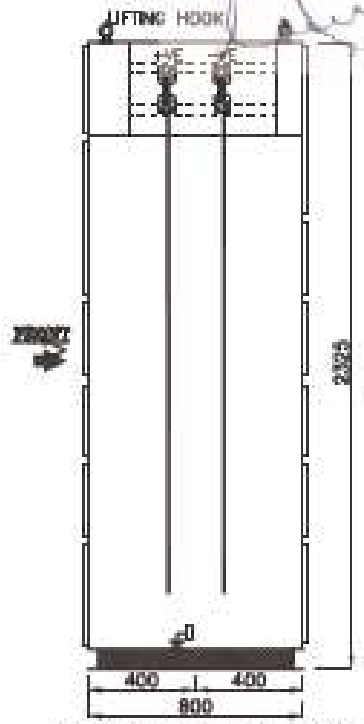


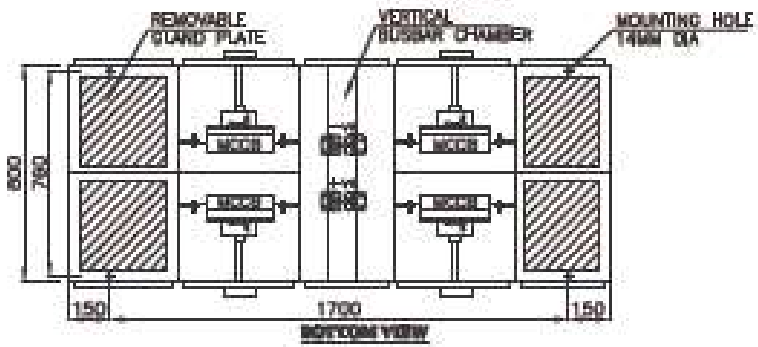
FRONT VIEW



REAR VIEW



SIDE VIEW(HORIZONTAL BUS BARS ALONG WITH INSTALLATION BUS BAR SUPPORTS)



BOTTOM VIEW

PANEL DIMENSION

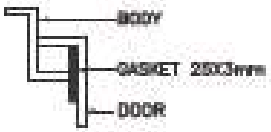
HEIGHT : 2325 mm.
WIDTH : 2000 mm.
DEPTH : 800 mm.

BUS BAR SIZE :-

POSITIVE : 1x40x10 Sq.mm Alu.
NEGATIVE : 1x40x10 Sq.mm Alu.
EARTH : 1x40X05 Sq.mm CU.

LEGEND DETAILS

A1 - ANALOG DC AMMETER
V - ANALOG DC VOLT METER
UVDC - DC UNDER VOLTAGE RELAY
OVDC - DC OVER VOLTAGE RELAY
BB - ELECTRONIC BUZZER



DETAIL-'A'

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP	
	04.	-	CHKD.	VDP	
	03.	-	APPD.	--	
	02.	-	ALL DIMENSIONS IN mm.		SIGN.
	01.		TOLERANCE 5%		
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : 01332-285262 FAX : 01332-285262
UNIT-II F-61,F-67, IITDI-C, LANDCO, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : info@ultimaswitchgear.com

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	48V DC DISTRIBUTION BOARD-1(30)(MCBS)
CA NO.	CC/T/W-HS/DOM/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-107

JOB NO. 1241A

SH. NO. 01 OF 01

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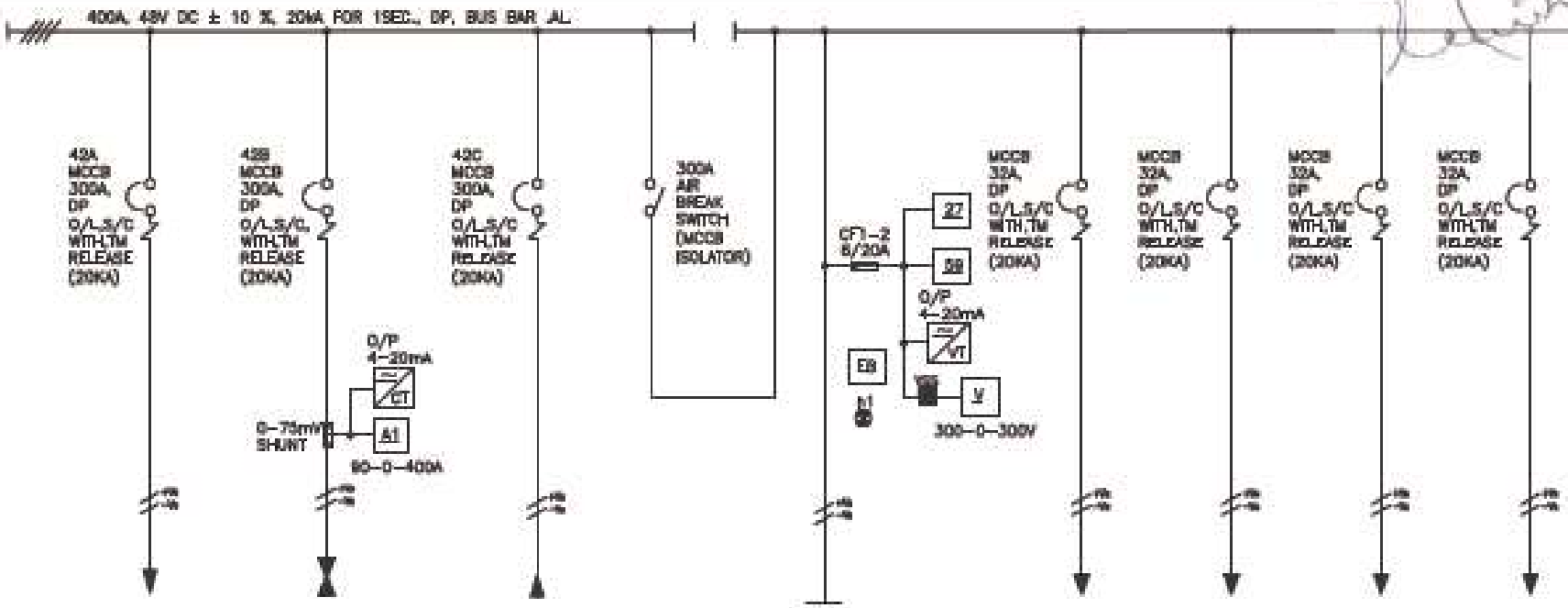

FEEDER NUMBER	2F6	1F6	1F5	1F4	2F1	2F2	2F3	1R1	1R2
MODULE TYEP	DC	DC	DC	H1	S1	X	X	X	X
FEEDER RATING	300A	300A	300A	300A	—	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	ISOLATOR	METERING	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BATTERY CURATIVE DISCHARGE FEEDER	48V DC BATTERY BANK-1	48V DC INCOMER FROM BATTERY CHARGER-1	MAIN BUSBAR CONTROL FEEDER 48V DCDB-1	--	EPAX PANEL	765kV PLCC PANEL 703 (F)	765kV PLCC PANEL 708 (F)	765kV PLCC PANEL 709
POWER CABLE SIZE (AL PVC)	2X1CX150 Sqmm.	2X1CX150 Sqmm.	2X1CX150 Sqmm.	—	--	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURA), TEHSIL - BOCHOCH, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-8 & F-9, IPHB-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-1(30)(MCCB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/00A-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS/HS-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXAVY ELECTRICAL CHENNAI (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-207

JOB NO. 1241A

SH. NO.:- 01 OF 03

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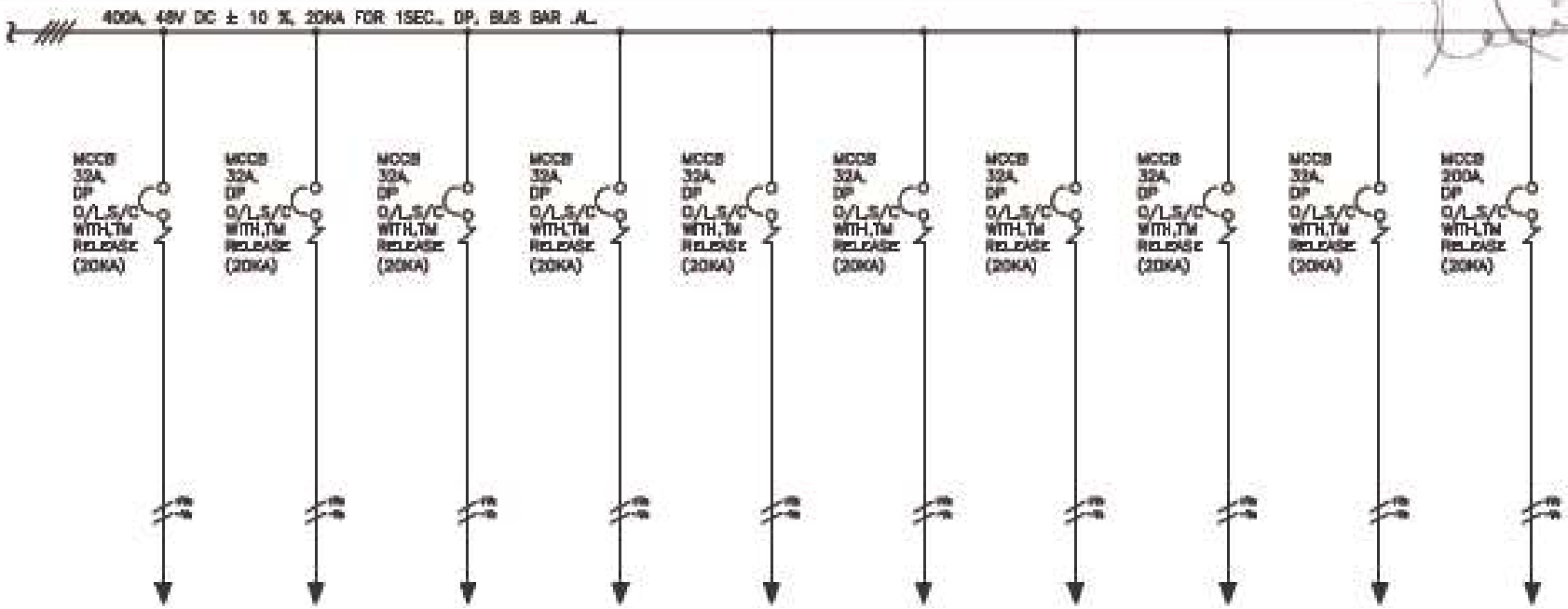

FEEDER NUMBER	1R3	1R4	1R5	2R1	2R2	2R3	2R4	2R5	2R6	1F2
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	200A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	765kV PLCC PANEL 712	765kV PLCC PANEL 721 (F)	765kV PLCC PANEL 724(F)	765kV PLCC PANEL 725 (F)	765kV PLCC PANEL 727 (F)	FOTE-1	FOTE-2	FOTE-3	FOTE-4	OUTGOING FEEDER TO AUX. BUILDING
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	2X1CX150Sqmm.

DATE	No.	REVISIONS DESCRIPTION		
	04.	–	DRAWN	MP
	03.	–	CHKD.	VDP
	02.	–	APPD.	--
	01.		ALL DIMENSIONS IN mm.	SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%	
			REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-1(32)(MCCB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/00A-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS/HS-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXAVY ELECTRICAL CHENNAI (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-207

JOB NO. 1241A

SH. NO.:- 02 OF 03

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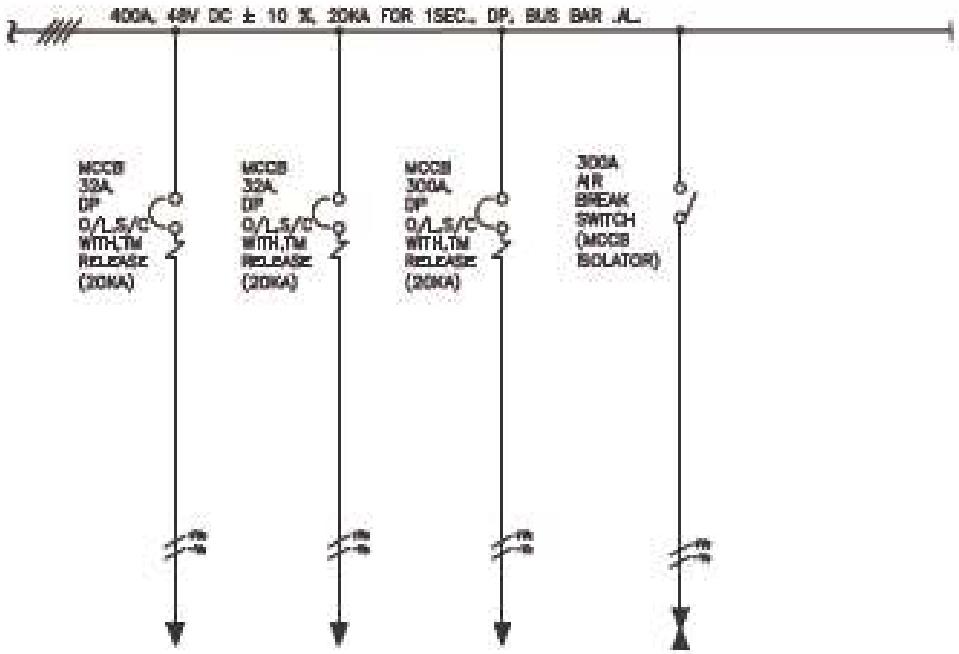

FEEDER NUMBER	2R7	2R8	1F1	1F3
MODULE TYEP	X	X	X	H1
FEEDER RATING	32A	32A	300A	300A
FEEDER TYPE	MCCB	MCCB	MCCB	ISOLATOR
DESCRIPTION	SPARE–1	SPARE–2	SPARE–3	TO 48V DCDB–2
POWER CABLE SIZE (AL PVC)	—	—	—	2X1CX150 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWAIPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II F-II & F-V, IITB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD–1(30)(MCRB)
CA NO.	CC/T/W-HD/DOM/318/23/01696/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEMANT KHAYE ELECTRICAL CHARGE (HEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024–2025/1241A–207

JOB NO. 1241A

SH. NO.:- 03 OF 03

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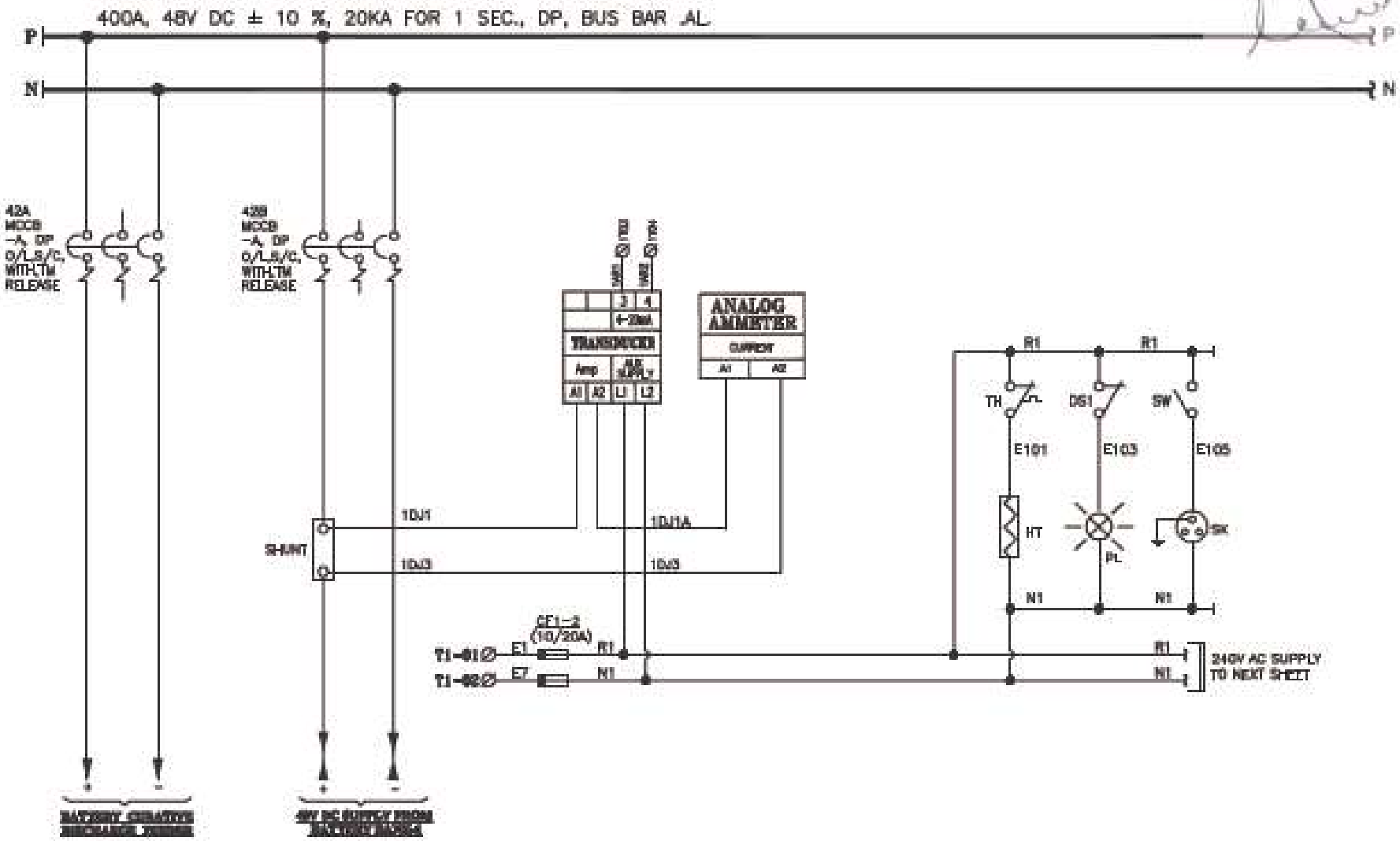

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 218, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIC-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-1(30)(MCCB)
CA NO.	CC/T/W-HD/DOM/010/23/01006/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPRT ELECTRICAL CHECK (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-507
JOB NO.	1241A
SH. NO.:-	01 OF 03

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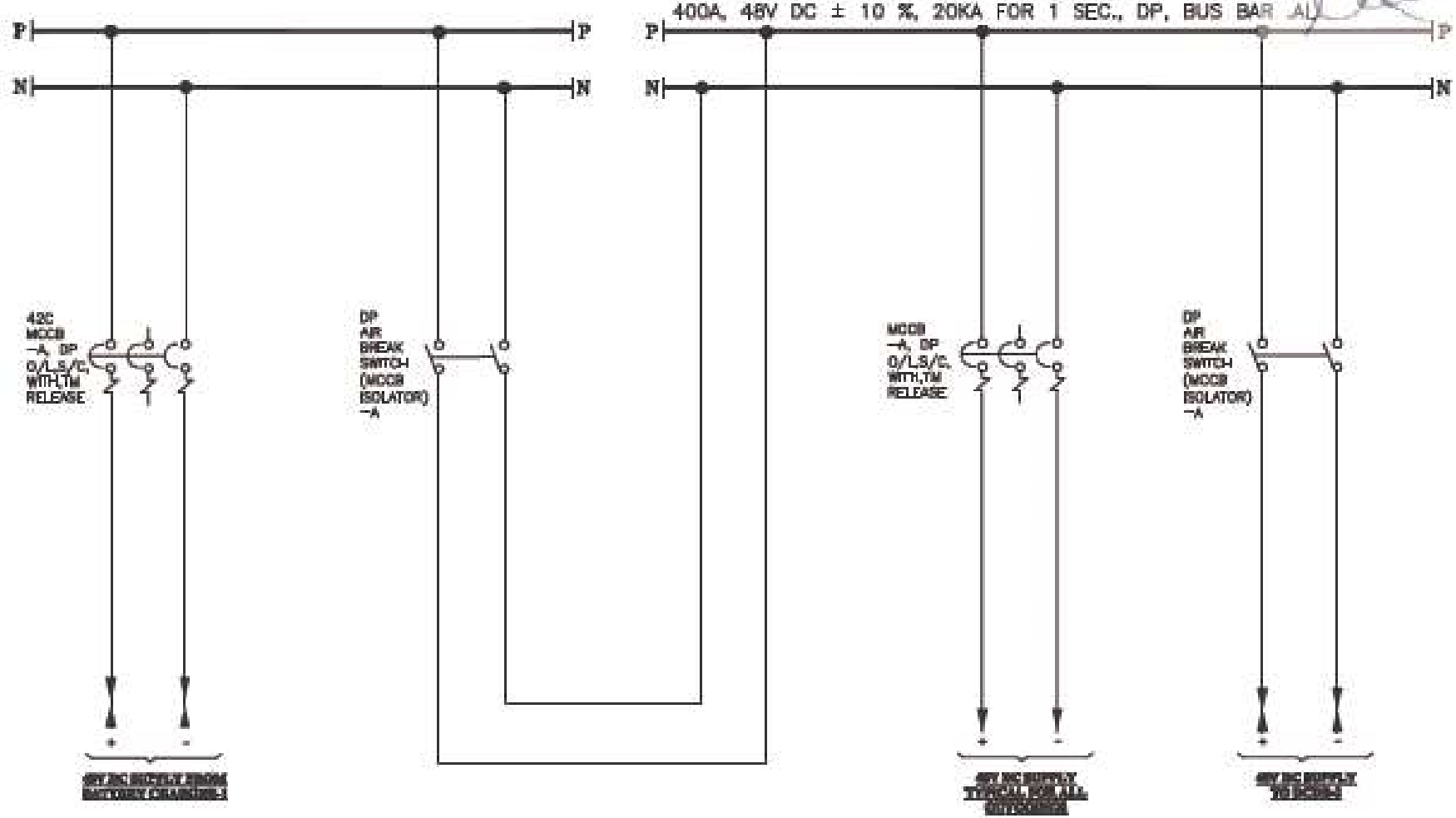

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-68 & F-77, RIICO-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD–1(30)(MCCB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NOA–1/24–02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIANDI-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:–	HEAVY EARTH ELECTRICAL CHECK (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024–2025/1241A–507
JOB NO.	1241A
SH. NO.:–	02 OF 03

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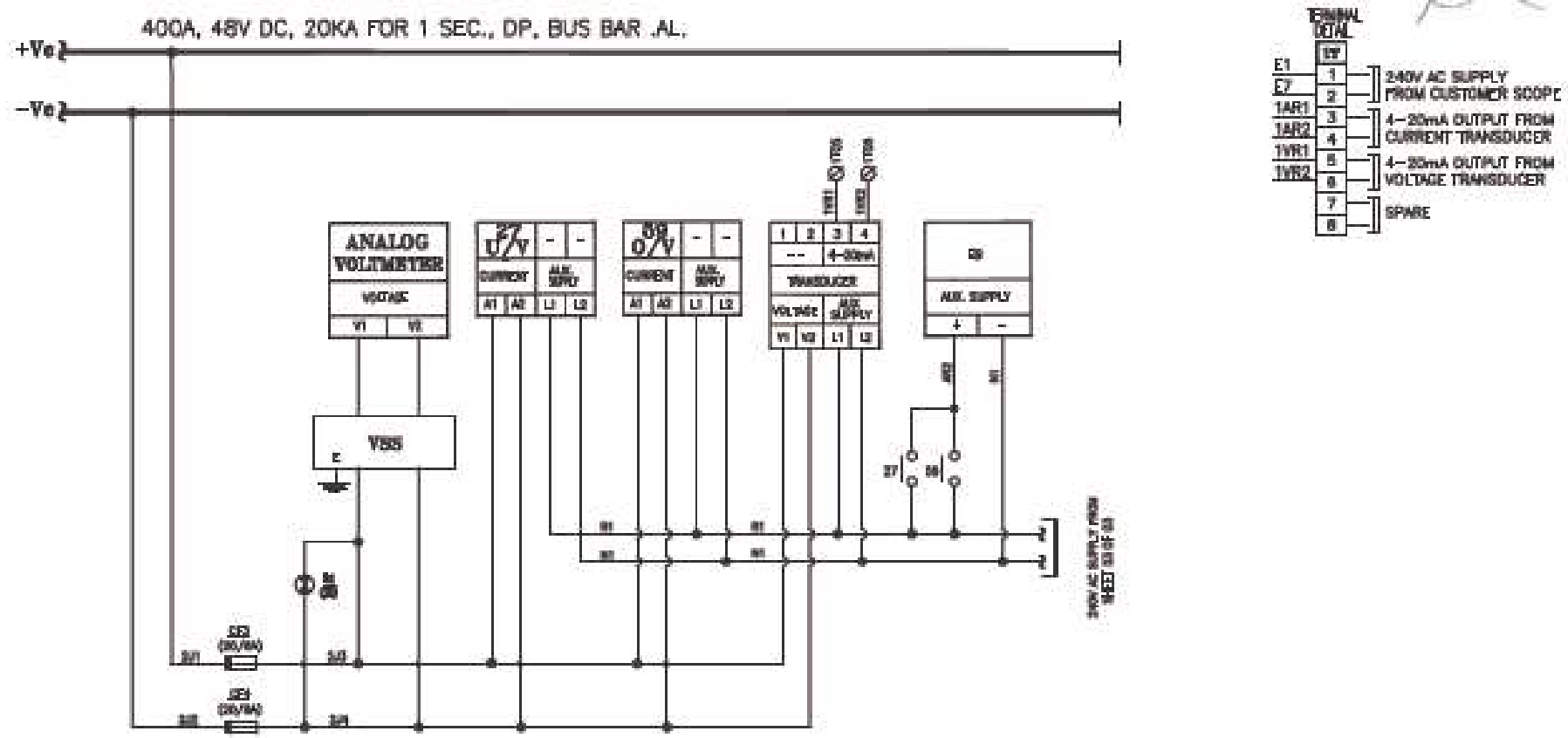

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-II & F-V, IITBI-C, UPSIDC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-1(30)(MCRB)
CA NO.	CC/T/W-HD/DDN/010/23/01006/00A-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (HEC) TRANSMISSION PROJECTS DIVISION

DRG. NO.	USL/POCL/BHEL/2024-2025/1241A-507	SH. NO.:- 03 OF 03

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BILL OF MATERIAL FOR 48V DC DISTRIBUTION BOARD-1(30)(MCBB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A	BILL OF MATERIAL FOR MODULE - (DC)				1 No.
1	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER LINK, ROTARY OPERATING MECHANISM (ROM), ICS = 100% ICU	L&T/C&S/HAVELLS	300A, 20kA, 48V DC	03
2	AI	DC ANALOG AMMETER, 96 X 96 Sq MM, WITH 0–75mV SHUNT	AE/RISHAB/NEWTEK/SECURE	90–0–400A	01
3	CT	DC CURRENT TRANSDUCER , SINGLE OUTPUT–4–20mA, WITH 0–75mV SHUNT, AUX. SUPPLY 240V AC	AE/RISHAB/SECURE	0–400A	01
B	BILL OF MATERIAL FOR MODULE (BI)				2 Nos.
1	MCCB ISOLATOR	DOUBLE POLE SINGLE THROUGH TYPE ON/OFF AIR BREAK SWITCH (MCCB ISOLATOR), WITH DOOR INTERLOCKING AND PAD LOCKING FACILITY	L&T/C&S/HAVELLS	300A, 48V DC	01
0	—	MECHANICAL LOCK 2 LOCK 1–KEY FOR 300A AIR BREAK SWITCH	PGCIL APPROVED	—	1–SET
C	BILL OF MATERIAL FOR MODULE (D)				
1	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER & ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	300A, 20kA, 48V DC	01
2	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER & ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	200A, 20kA, 48V DC	01
3	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	32A, 20kA, 48V DC	15
D	BILL OF MATERIAL FOR MODULE - (BI)				1 No.
1	27	DC INSTANTANEOUS UNDER VOLTAGE RELAY WITH 95% OF 48V DC. THE RESETTING RATIO OF RELAY OF RELAY SHOULD NOT BE MORE THAN 1.25. THE RELAY SHALL BE PROVIDED WITH A SERIES RESISTOR AND A PUSH BUTTON ACROSS IF FOR RESETTING (PICK UP) THE RELAY AT ABOUT 105% OF THE DROP OUT VOLTAGE. FLUSH MOUNTED, AUX. SUPPLY 240V AC	C&S/JVS/ASHIDHA/PROCOM	NOMINAL VOLTAGE–48V DC	01
2	59	DC INSTANTANEOUS OVER VOLTAGE RELAY WITH SETTING RANGE OF 110% OF 48V DC. THE RESETTING RATIO OF RELAY SHOULD NOT BE LESS THAN 0.8. THE RELAY SHALL HAVE A PUSH BUTTON IN SERIES OF RESETTING THE RELAY AT ABOUT 95% OF THE OPERATING VOLTAGE. FLUSH MOUNTED, AUX. SUPPLY 240V AC	C&S/JVS/ASHIDHA/PROCOM	NOMINAL VOLTAGE–48V DC	01
3	V	DC ANALOG VOLTMETER 96 X 96 Sq MM	AE/RISHAB/NEWTEK/SECURE	300–0–300V	01
4	VSS	VOLTAGE SELECTOR SWITCH,3POSITION (+VE/–VE, +VE/EARTH, –VE/EARTH), CAM TYPE, 2POLE, THREE WAY WITH OFF.	SALZER/KAYCEE	6A	01
5	DI	'DC SUPPLY ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	48V DC	01
6	BB	ELECTRONIC BUZZER, 48V DC	SECO	—	01
7	CB-4	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	02
8	CB-4	HRC FUSE LINK	L&T/C&S/HAVELLS	6A	02
9	VT	DC VOLTAGE TRANSDUCER, SINGLE OUTPUT–4–20mA,CL–1.0, AUX. SUPPLY 240V AC	AE/RISHAB/SECURE	48V DC	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP; CHKD.: VDP; APPD.: –– ; ALL DIMENSIONS IN mm. SIGN.; TOLERANCE 5%; REVISIONS : 00

MANUFACTURER: ULTIMA SWITCHGEARS LTD.

DRAWING	BILL OF MATERIAL
TITLE	48V DC DISTRIBUTION BOARD–1(30)(MCBB)
CA NO.	CC/T/N-MS/DOM/010/23/01006/NOA-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HIGHMAST ENERGY ELECTRICAL CHENNAI (HEEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024–2025/1241A–707
JOB NO.	1241A
SH. NO.:-	01 OF 02

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BILL OF MATERIAL FOR 48V DC DISTRIBUTION BOARD-1(OD)(MCRB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
E	**BILL OF MATERIAL FOR MISC.**				
1	**CFI-2**	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	02
2	**CFI-2**	HRC FUSE LINK	L&T/C&S/HAVELLS	10A	02
3	**DS**	DOOR SWITCH, 1C/O	SURAJ	--	02
4	**PL**	PANEL ILLUMINATION LIGHT, 240V AC	HAVELLS	5W	02
5	**SH**	SPACE HEATER, 240V AC	HOTWEL	60W	02
6	**TH**	THERMOSTATE, 240V AC	ELCON	30 – 85°C	02
7	**SW-SOCKET**	5/15A SWITCH SOCKET	ANCHOR	--	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAUTAM BUDDHA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	48V DC DISTRIBUTION BOARD–1(OD)(MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	NIRANT KHAYY ELECTRICAL CHENNAI (INDIA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024–2025/1241A–707
SH. NO.:-	02 OF 02

1 2 3 4 5 6 7 8 9

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ENGINEERING DRAWING DETAILS FOR

48V DC DISTRIBUTION BOARD-2(4D)(MCRB)

PROJECT :- 765/400/220kV BIKANER-III POOLING STATION

CLIENT :- POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR :- BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-48 & F-47, IPHB-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	COVER PAGE
TITLE	48V DC DISTRIBUTION BOARD-2(4D)(MCRB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NON-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BIKANER-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-008

JOB NO. 1241A

SH. NO. 01 OF 01

1 2 3 4 5 6 7 8 9

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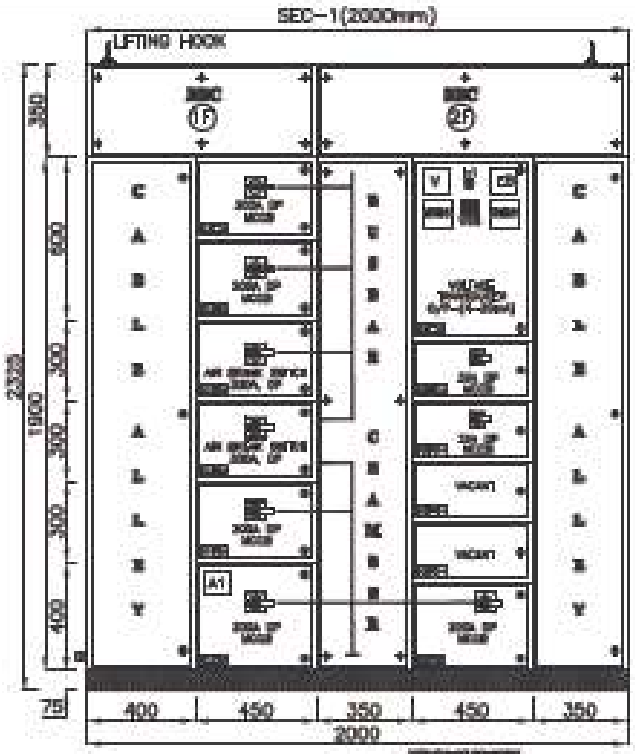
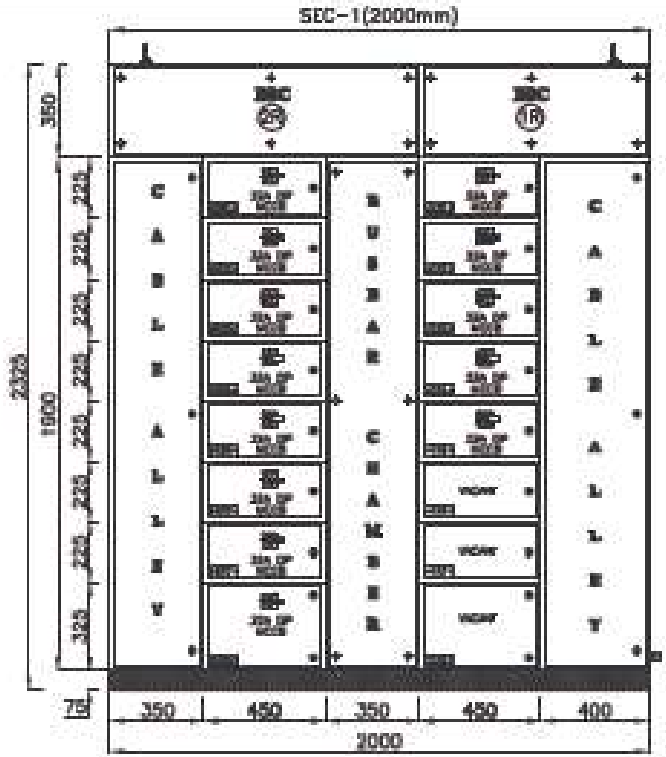
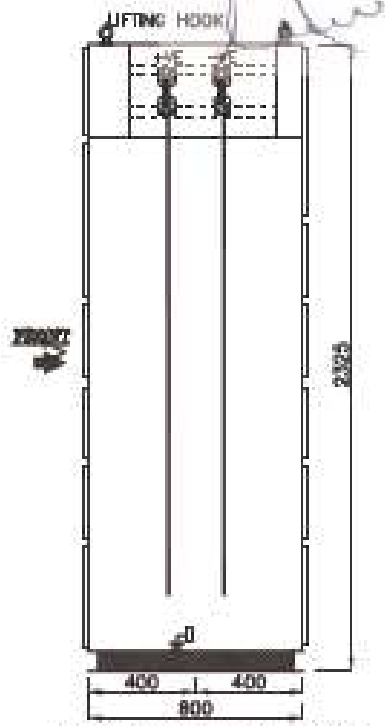


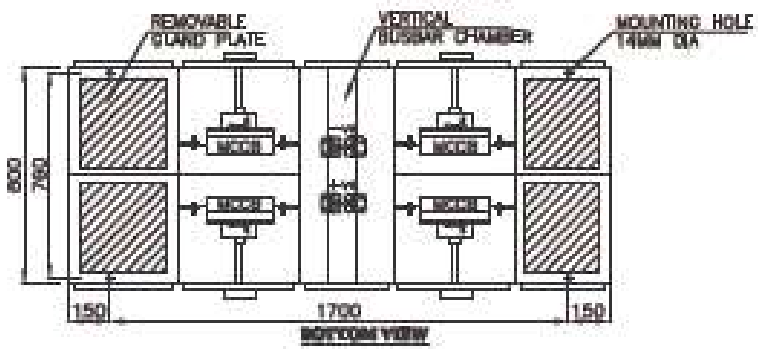
FRONT VIEW



REAR VIEW



SIDE VIEW(HORIZONTAL BUS BARS ALONG WITH INCLINATION OF BUS BAR SUPPORTS)



BOTTOM VIEW

PANEL DIMENSION

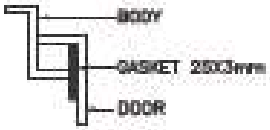
HEIGHT : 2325 mm.
WIDTH : 2000 mm.
DEPTH : 800 mm.

BUS BAR SIZE :-

POSITIVE : 1x40x10 Sq.mm Alu.
NEGATIVE : 1x40x10 Sq.mm Alu.
EARTH : 1x40X05 Sq.mm CU.

LEGEND DETAILS

A1 - ANALOG DC AMMETER
V - ANALOG DC VOLT METER
27DC - DC UNDER VOLTAGE RELAY
59DC - DC OVER VOLTAGE RELAY
BB - ELECTRONIC BUZZER



DETAIL-'A'

	04.	-	DRAWN	MP	
	03.	-	CHKD.	VDP	
	02.	-	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER

ULTIMA SWITCHGEARS LTD.

UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-48,F-47, IPHB-C, UPSIDC, SIDCUL PURAPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	48V DC DISTRIBUTION BOARD-2(40)(WC150)
CA NO.	CC/T/N-MS/DDM/318/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCC) TRANSMISSION PROJECTS [illegible]

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-108

SH. NO. 01 OF 01

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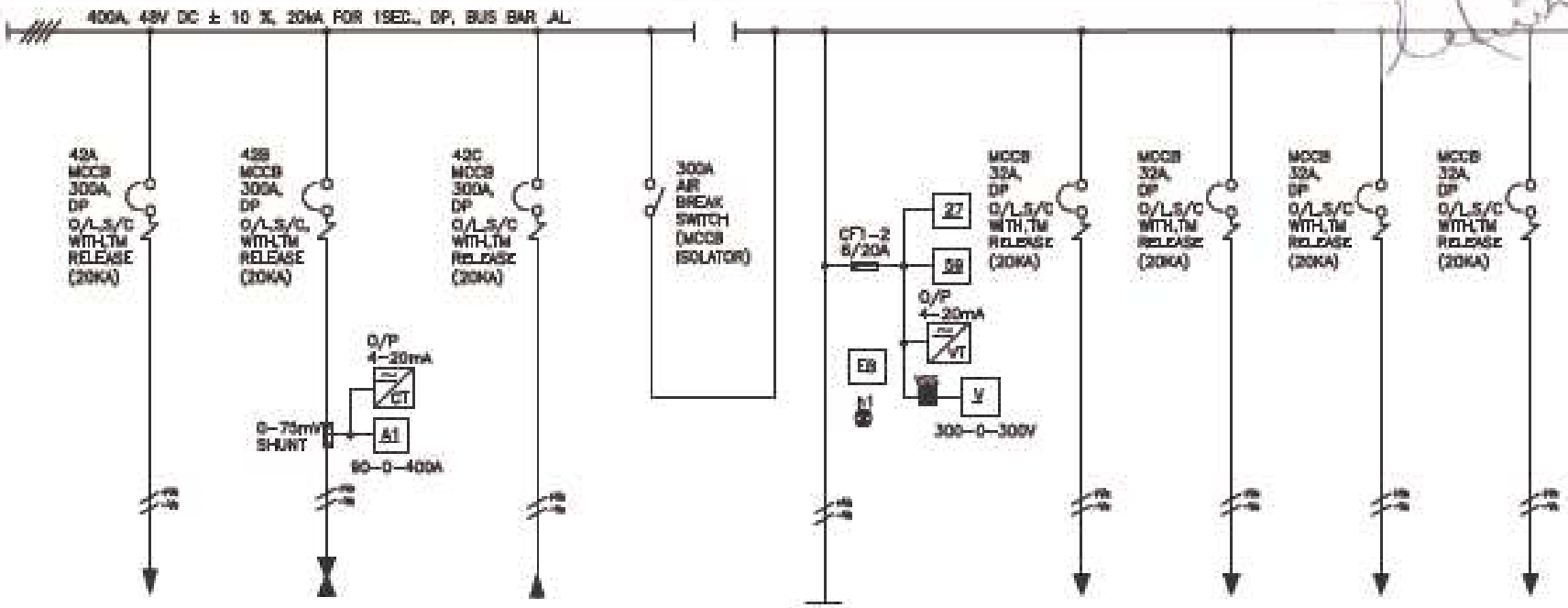

FEEDER NUMBER	2F6	1F6	1F5	1F4	2F1	2F2	2F3	1R1	1R2
MODULE TYEP	DC	DC	DC	H1	S1	X	X	X	X
FEEDER RATING	300A	300A	300A	300A	—	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	ISOLATOR	METERING	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BATTERY CURATIVE DISCHARGE FEEDER	48V DC BATTERY BANK-2	48V DC INCOMER FROM BATTERY CHARGER-2	MAIN BUSBAR CONTROL FEEDER 48V DCDB-2	--	EPAX PANEL	765kV PLCC PANEL 703 (F)	765kV PLCC PANEL 708 (F)	765kV PLCC PANEL 709
POWER CABLE SIZE (AL PVC)	2X1CX150 Sqmm.	2X1CX150 Sqmm.	2X1CX150 Sqmm.	—	--	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURA), TEHSIL - BOCHOCH, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-8 & F-9, IPSEC, LONGIC, SUNAUTHA INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-2(4D)(MCRB)
CA NO.	CC/T/W-HD/DOM/318/23/01806/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXAVY ELECTRICAL CHENNAI (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-206

JOB NO. 1241A

SH. NO.:- 01 OF 03

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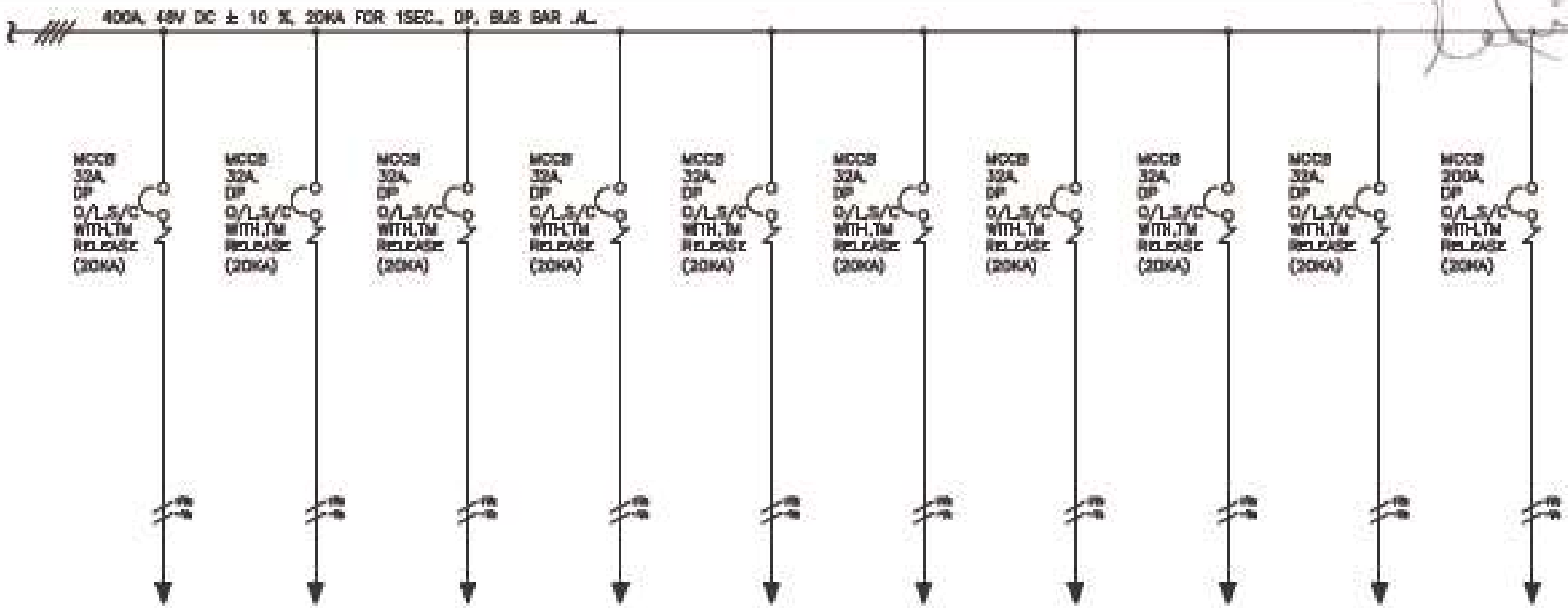

FEEDER NUMBER	1R3	1R4	1R5	2R1	2R2	2R3	2R4	2R5	2R6	1F2
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	200A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	765kV PLCC PANEL 712	765kV PLCC PANEL 721 (F)	765kV PLCC PANEL 724(F)	765kV PLCC PANEL 725 (F)	765kV PLCC PANEL 727 (F)	FOTE-1	FOTE-2	FOTE-3	FOTE-4	OUTGOING FEEDER TO AUX. BUILDING
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	2X1CX150Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-2(4D)(MCRB)
CA NO.	CC/T/W-HD/DOM/318/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-206		SH. NO.:- 02 OF 03

1 2 3 4 5 6 7 8 9

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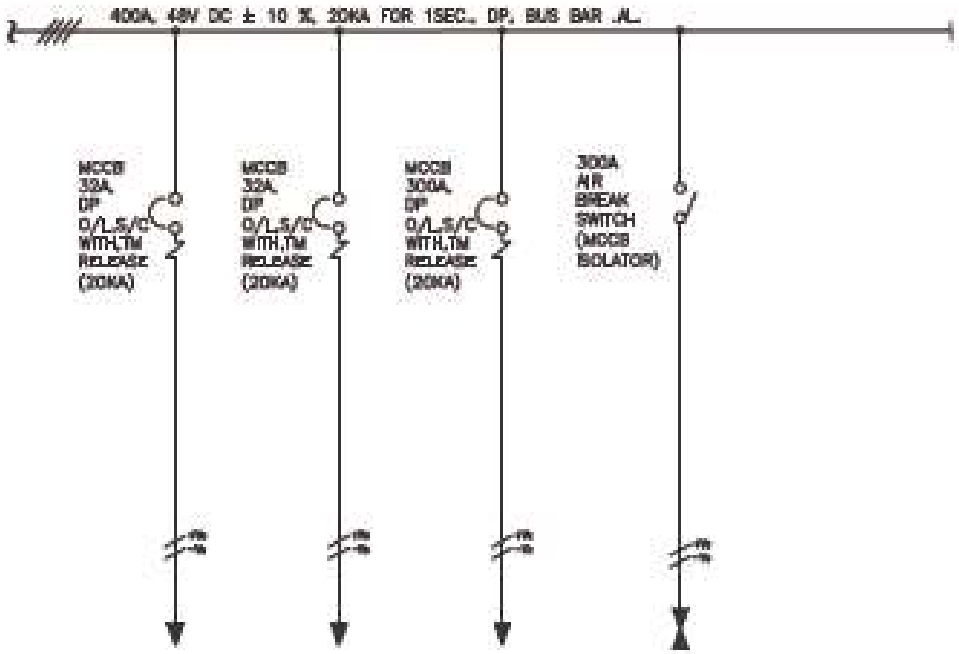

FEEDER NUMBER	2R7	2R8	1F1	1F3
MODULE TYEP	X	X	X	H1
FEEDER RATING	32A	32A	300A	300A
FEEDER TYPE	MCCB	MCCB	MCCB	ISOLATOR
DESCRIPTION	SPARE-4	SPARE-5	SPARE-6	TO 48V DCDB-1
POWER CABLE SIZE (AL PVC)	---	--	--	2X1CX150 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWAIPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITB-C, UPSIDC, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-2(4D)(MCCB)
CA NO.	CC/T/W-MS/DDN/010/23/01006/00A-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (INDIA) TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/POCL/BHEL/2024-2025/1241A-206

SH. NO.:- 03 OF 03

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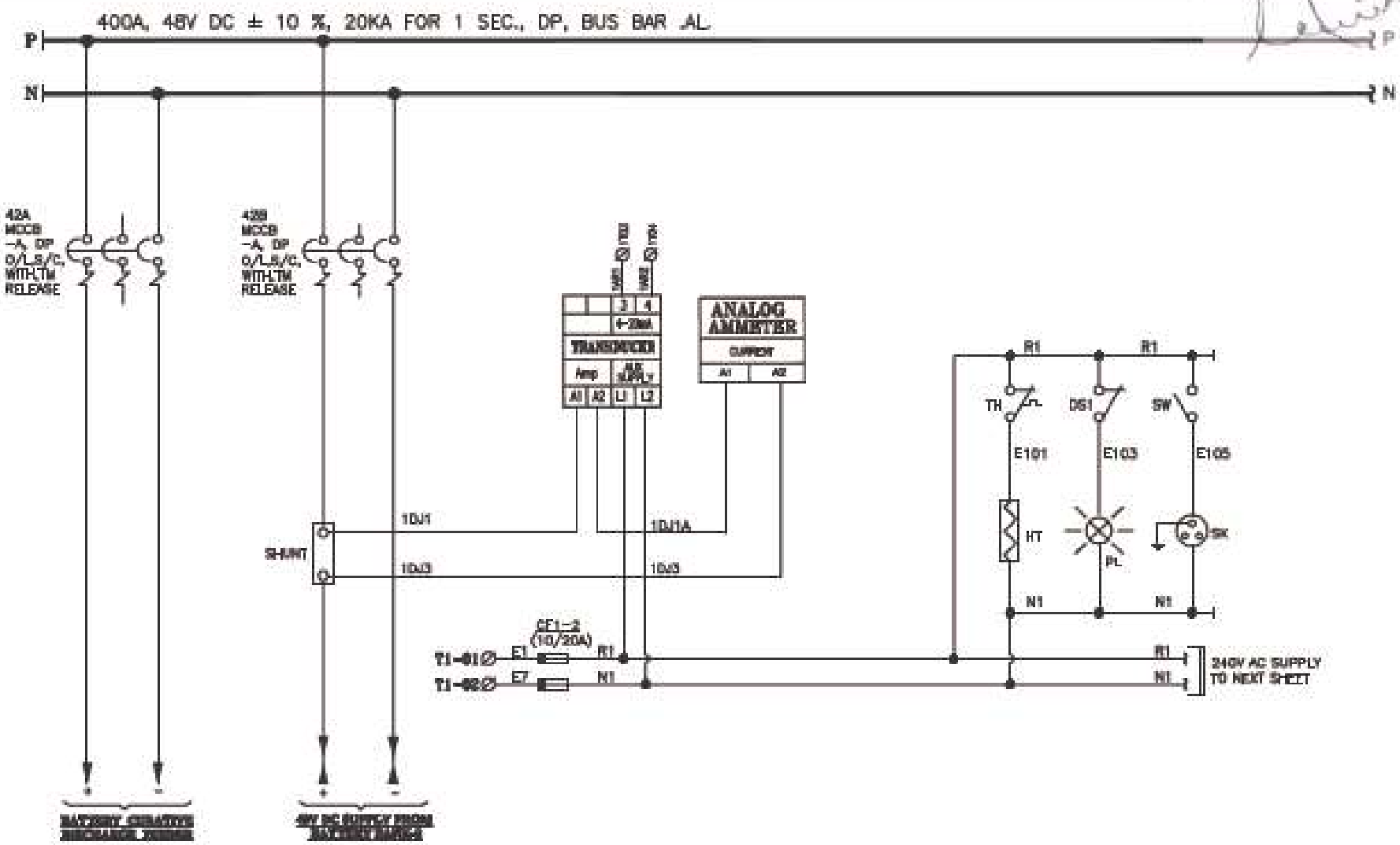

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 218, BTD. AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - BADRIPUR, DELHI, TEL. : [illegible]
UNIT-II F-8 & F-9, IPHB-C, UPSIDC, SIKANDRA INDUSTRIAL AREA, GREATER NOIDA - 203205 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-2(4D)(MCRB)
CA NO.	CC/T/W-HD/DDN/610/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXAVY ELECTRICAL CHENNAI (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-506
JOB NO.	1241A
SH. NO.:-	01 OF 03

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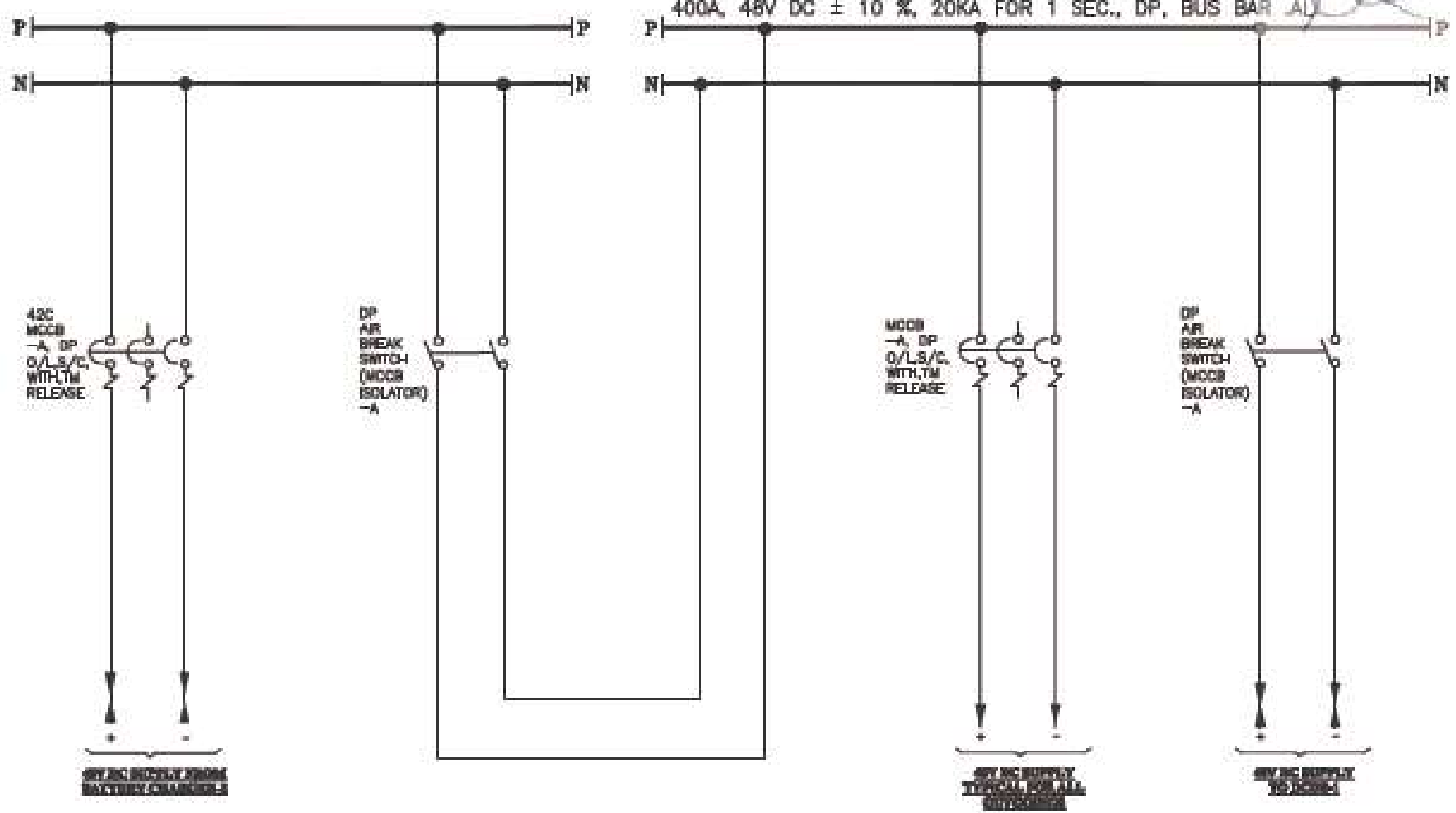

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARTHANA), TEHSIL - KOSIKALAN, DISTRICT HARDOI (UTTRAPRADESH) - 241001, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-III & F-IV, IPHB-C, UPSIDC, SIKANDRA INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-2(4D)(MCCB)
CA NO.	CC/T/W-MS/DDN/010/23/01006/WDN-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HIGHAT KHAYI ELECTRICAL CHAKRI (HKEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-506
JOB NO.	1241A
SH. NO.:-	02 OF 03

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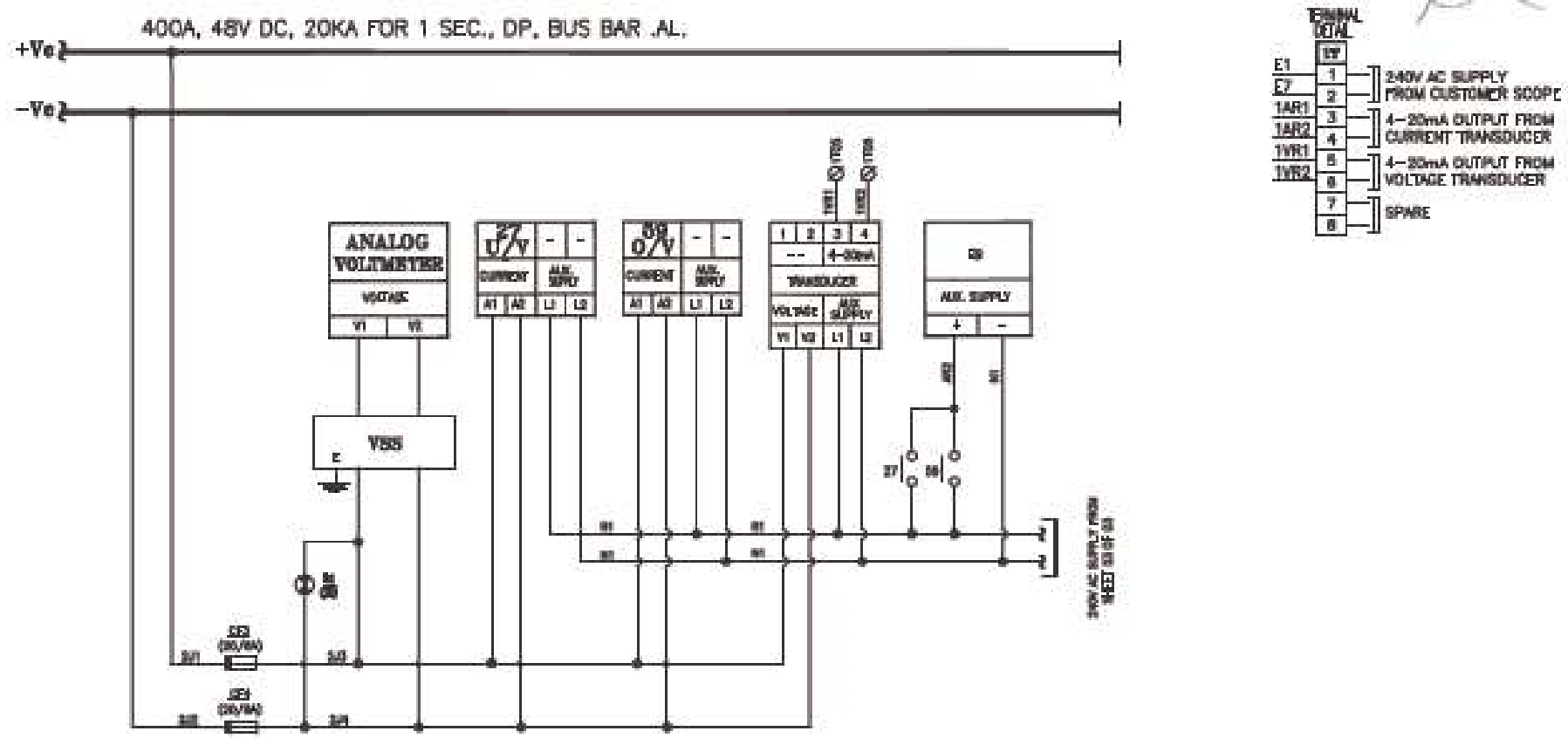

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-48 & F-49, IITBI-C, UPSIDC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-2(4D)(MCRB)
CA NO.	CC/T/W-HD/DOM/318/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPORT ELECTRICAL CHINA (HECA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-506
JOB NO.	1241A
SH. NO.:-	03 OF 03

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BILL OF MATERIAL FOR 48V DC DISTRIBUTION BOARD-2(HD)(MCBB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A	BILL OF MATERIAL FOR MODULE - (DC)				1 No.
1	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER LINK, ROTARY OPERATING MECHANISM (ROM), ICS = 100% ICU	L&T/C&S/HAVELLS	300A, 20kA, 48V DC	03
2	AI	DC ANALOG AMMETER, 96 X 96 Sq MM, WITH 0–75mV SHUNT	AE/RISHAB/NEWTEK/SECURE	90–0–400A	01
3	CT	DC CURRENT TRANSDUCER , SINGLE OUTPUT–4–20mA, WITH 0–75mV SHUNT, AUX. SUPPLY 240V AC	AE/RISHAB/SECURE	0–400A	01
B	BILL OF MATERIAL FOR MODULE (BI)				2 Nos.
1	MCCB ISOLATOR	DOUBLE POLE SINGLE THROUGH TYPE ON/OFF AIR BREAK SWITCH (MCCB ISOLATOR), WITH DOOR INTERLOCKING AND PAD LOCKING FACILITY	L&T/C&S/HAVELLS	300A, 48V DC	01
0	—	MECHANICAL LOCK 2 LOCK 1–KEY FOR 300A AIR BREAK SWITCH	PGCIL APPROVED	—	1–SET
C	BILL OF MATERIAL FOR MODULE (D)				
1	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER & ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	300A, 20kA, 48V DC	01
2	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH SPREADER & ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	200A, 20kA, 48V DC	01
3	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L, S/C PROTECTION WITH ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	32A, 20kA, 48V DC	15
D	BILL OF MATERIAL FOR MODULE - (BI)				1 No.
1	27	DC INSTANTANEOUS UNDER VOLTAGE RELAY WITH 95% OF 48V DC. THE RESETTING RATIO OF RELAY OF RELAY SHOULD NOT BE MORE THAN 1.25. THE RELAY SHALL BE PROVIDED WITH A SERIES RESISTOR AND A PUSH BUTTON ACROSS IF FOR RESETTING (PICK UP) THE RELAY AT ABOUT 105% OF THE DROP OUT VOLTAGE. FLUSH MOUNTED, AUX. SUPPLY 240V AC	C&S/JVS/ASHIDHA/PROCOM	NOMINAL VOLTAGE–48V DC	01
2	59	DC INSTANTANEOUS OVER VOLTAGE RELAY WITH SETTING RANGE OF 110% OF 48V DC. THE RESETTING RATIO OF RELAY SHOULD NOT BE LESS THAN 0.8. THE RELAY SHALL HAVE A PUSH BUTTON IN SERIES OF RESETTING THE RELAY AT ABOUT 95% OF THE OPERATING VOLTAGE. FLUSH MOUNTED, AUX. SUPPLY 240V AC	C&S/JVS/ASHIDHA/PROCOM	NOMINAL VOLTAGE–48V DC	01
3	V	DC ANALOG VOLTMETER 96 X 96 Sq MM	AE/RISHAB/NEWTEK/SECURE	300–0–300V	01
4	VSS	VOLTAGE SELECTOR SWITCH,3POSITION (+VE/–VE, +VE/EARTH, –VE/EARTH), CAM TYPE, 2POLE, THREE WAY WITH OFF.	SALZER/KAYCEE	6A	01
5	DI	'DC SUPPLY ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	48V DC	01
6	BB	ELECTRONIC BUZZER, 48V DC	SECO	—	01
7	CB-4	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	02
8	CB-4	HRC FUSE LINK	L&T/C&S/HAVELLS	6A	02
9	VT	DC VOLTAGE TRANSDUCER, SINGLE OUTPUT–4–20mA,CL–1.0, AUX. SUPPLY 240V AC	AE/RISHAB/SECURE	48V DC	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP; CHKD.: VDP; APPD.: –– ; ALL DIMENSIONS IN mm. SIGN.; TOLERANCE 5%; REVISIONS : 00

MANUFACTURER: ULTIMA SWITCHGEARS LTD.

DRAWING	BILL OF MATERIAL
TITLE	48V DC DISTRIBUTION BOARD–2(HD)(MCBB)
CA NO.	CC/T/W-MS/DOM/015/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEMANT KUMAR ELECTRICAL CHARGE (HEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024–2025/1241A–706
JOB NO.	1241A
SH. NO.:-	01 OF 02

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BILL OF MATERIAL FOR 48V DC DISTRIBUTION BOARD-2(HD)(MCBB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
E	BILL OF MATERIAL FOR MISC.				
1	CFI-2	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	02
2	CFI-2	HRC FUSE LINK	L&T/C&S/HAVELLS	10A	02
3	DS	DOOR SWITCH, 1C/O	SURAJ	--	02
4	PL	PANEL ILLUMINATION LIGHT, 240V AC	HAVELLS	5W	02
5	SH	SPACE HEATER, 240V AC	HOTWEL	60W	02
6	TH	THERMOSTATE, 240V AC	ELCON	30 – 85°C	02
7	SW-SOCKET	5/15A SWITCH SOCKET	ANCHOR	--	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPHB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING: BILL OF MATERIAL
TITLE: 48V DC DISTRIBUTION BOARD-2(HD)(MCBB)
CA NO.: CC/T/W-MS/DOM/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT: 765/400/220kV BHADLA-II POOLING STATION
JOB NO. 1241A
CLIENT: POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:- [illegible] ELECTRICAL CHECK (NCR) TRANSMISSION PROJECTS DIVISION
DRG. NO.: USL/PGCIL/BHEL/2024-2025/1241A-706
SH. NO.:- 02 OF 02

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ENGINEERING DRAWING DETAILS FOR

415V AC DISTRIBUTION BOARD (5A) (AB)

PROJECT :- 765/400/220kV BIKANER-III POOLING STATION

CLIENT :- POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR :- BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-68 & F-69, IPHB-C, LUKSAR, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	COVER PAGE
TITLE	415V AC DISTRIBUTION BOARD (5A) (AB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NON-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BIKANER-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-000

JOB NO. 1241A

SH. NO. 01 OF 01

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-: GUARANTEED TECHNICAL PARTICULARS/GENERAL NOTES :-

1. TYPE OF PRODUCT : FLOOR MOUNTED FIXED TYPE, COMPARTMENTALIZED AND DOUBLE FRONT
2. CABLE ENTRY : BOTTOM
3. DEGREE OF PROTECTION : IP-53
   (AS PER IS : IS/IEC 60947, 60529 FOR ENCLOSURE ONLY)
4. SUPPLY VOLTAGE
   a) POWER VOLTAGE : 415V ±10%, 3 PHASE, 4 WIRE
   b) CONTROL VOLTAGE : 240V AC
      220V DC
5. FABRICATION
   a) ENCLOSURE : 2.0MM CRCA
   b) DOORS/COVERS : 1.6MM CRCA
   c) BASE CHANNEL : 75MM ISMC
   d) GLAND PLATE : 3.0MM CRCA IN ALL CASES & 4.0MM THICKNESS NON MAGNETIC MATERIAL FOR SINGLE CORE POWER CABLE (REMOVABLE TYPE AS PER TS)
6. PAINTING
   a) PRETREATMENT : 9 TANK PROCESS
   b) PAINT TYPE : POWDER COATING
   c) PAINT SHADE : SMOKE GREY (SHADE NO 692 OF IS:5)
   d) PAINT THICKNESS : AS PER MDP
7. BUSBAR
   a) MAIN BUSBAR MATERIAL : ALUMINIUM ETIE GRADE (IS-5082)
   b) SLEEVE : HEAT SHRINKABLE PVC SLEEVES WITH RED, YELLOW, BLUE BLACK, GREEN COLORS
8. BUSBAR SUPPORTS : SMC/DMC
9. EARTH BUS BAR : SUITABLE SIZE OF GS THROUGH OUT THE PANEL AND HAVING TWO HOLES ON EACH AND FOR EARTH CONNECTION (AS PER GA DRAWING)
10. MINIMUM BUSBAR CLEARANCES (MAIN BUSBARS) :-
    (a) PHASE TO PHASE : 25.00 mm
    (b) PHASE TO NEUTRAL & POSITIVE TO NEGATIVE : 25.00 mm
    (c) PHASE/NEUTRAL TO EARTH : 25.00 mm
11. DOORS
    FEEDER DOORS : HINGED AND LOCKABLE
    BUSBAR CHAMBERS : BOLTED
12. CONTROL WIRING : STANDARD PVC FLEXIBLE FR CU WIRE 1100V GRADE
    CT CIRCUIT : 2.5 SQ. MM RED, YELLOW, BLUE COLOR
    AC VOLTAGE CIRCUIT : 1.5 SQ. MM RED, YELLOW, BLUE COLOR
    AC CIRCUIT : 1.5 SQ. MM BLACK COLOR
    DC CIRCUIT : 1.5 SQ. MM GREY FOR +VE AND WHITE FOR -VE COLOR
    EARTHING : 2.5 SQ. MM GREEN COLOR
13. POWER WIRE : PVC FLEXIBLE FR CU WIRE 1100V GRADE (COLOR - R,Y,B, BLACK)
    POWER CIRCUIT UP TO 20A : 4 Sq. MM
    POWER CIRCUIT 21 TO 32A : 6 Sq. MM
    POWER CIRCUIT 33 TO 40A : 10 Sq. MM
    POWER CIRCUIT 40 TO 63A : 16 Sq. MM
    ABOVE 63A : SOLID ALUMINIUM LINK (@ 1.0A/Sqmm)
14. CURRENT DENSITY : SOLID ALUMINIUM LINK @ 1.0A/Sqmm
15. SPACE HEATER : SPACE HEATER SHALL BE PROVIDED AT EACH CABLE ALLEY & ACB FEEDER
16. NAME PLATE : NAME PLATE SHALL BE OF NON-RUSTING METAL OR 3PLY LAMICOID WITH WHITE ENGRAVED LETTERING ON BLACK BACKGROUND
17. DANGER PLATE : PRINTED DANGER PLATE ON THE EACH HORIZONTAL/ VERTICAL BUSBAR CHAMBER SHALL BE PROVIDE
18. GASKETS : NEOPRENE RUBBER GASKETS TYPE-II CLASS 2A AS PER IS : 11149 SHALL BE PROVIDED AT ALL REMOVABLE DOORS & COVERS TO MAKE THE PANEL DUST & VERMIN PROOF
19. SHROUDING : ALL LIVE PART SHALL BE SHROUDED WITH 2MM THICK HYLEM/ACRYLIC SHEET.
20. ALL HINGED FRONT DOORS & COVERS SHALL BE PROVIDED WITH SUITABLE FLEXIBLE COPPER EARTHING CONNECTIONS.
21. CABLE SIZE AS PER APPROVED LT SLDs FOR POWER & CONTROL CABLE/PGCIL TS
22. ALL FUSES SHALL BE HRC TYPE WITH SHORT CIRCUIT LEVEL AS PER TS .
23. MANUFACTURING TOLERANCE TO BE AS PER IS :
    i) UP TO 50MM- ± 3% ii) 51 TO 100MM- ± 2%
    iii) 101 TO 300MM- ± 1% iv) ABOVE 300MM- ± 0.5%
24. TEMPERATURE RISE OF HORIZONTAL & VERTICAL BUSBAR SHALL IN NO CASE EXCEED 55 DEG.C WITH SILVER PLATED JOINTS & 40 DEG. C WITH ALL OTHER JOINTS OVER AN OUTSIDE AMBIENT TEMERATURE OF 50 DEG C.
25. CROSS SECTION OF ALL HORIZONTAL & VERTICAL BUS BAR SHALL BE UNIFORM THROUGH OUT THEIR LENGTH
26. ALL ITEMS SHALL BE POWERGRID GAs APPROVED
27. SWITCHBOARD SHALL BE EXTENDIBLE ON BOTH SIDES BY ADDITION OF VERTICAL SECTIONS AFTER REMOVING THE END COVER.
28. ALL POWER TERMINAL SHALL BE STUD TYPE
29. PANEL SHALL BE EXTENDABLE FROM BOTH SIDES
30. AMBIENT TEMPERATURE CONSIDERED IS 50°C
31. MEGGAR/INSULATION VOLTAGE TEST- IR-500V DC
    HV TEST -2.5KV FOR ONE MINUTE
32. IN ALL CIRCUIT BREAKER PANELS AT LEAST 10% SPARE TERMINALS FOR EXTERNAL CONNECTIONS SHALL BE PROVIDED AND THESE SPARE TERMINALS SHALL BE UNIFORMLY DISTRIBUTED ON ALL TERMINAL BLOCKS. SPACE FOR ADDING ANOTHER 10% SPARE TERMINALS SHALL ALSO BE AVAILABLE
33. TERMINAL BLOCKS FOR CT AND VT SECONDARY LEADS SHALL BE PROVIDED WITH TEST LINKS AND ISOLATING FACILITIES. CT SECONDARY LEADS SHALL BE PROVIDED WITH SHORT CIRCUITING AND EARTHING FACILITIES. IT SHALL BE SIMILAR TO 'ELMA,' 'CATI' - TYPE.
34. TERMINAL BLOCKS SHALL BE OF 750 VOLTS GRADE AND HAVE CONTINUOUS RATING TO CARRY THE MAXIMUM EXPECTED CURRENT ON THE TERMINALS.
35. TERMINAL BLOCKS SHALL BE ARRANGED WITH AT LEAST 100 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

DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00
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	01.		ALL DIMENSIONS IN mm. SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AMBA, VILLAGE RAIPUR (BHARTWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - PIN-247667, INDIA, TEL : [illegible]
UNIT-II: P-8 & P-9, IPHB-C, LANDCO, SIDCUL RAIPUR INDUSTRIAL AREA, GRAMPHIR ROORKEE-247667 (U. K.) INDIA
E-mail : [illegible]

DRAWING	GENERAL TECHNICAL SPECIFICATION
TITLE	415V AC DISTRIBUTION BOARD (DA) (AB)
CA NO.	CC/T/W-MS/DDN/010/23/01005/NOA-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CARRIER (INDIA)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-900 SH. NO. 01 OF 01

-: SYMBOLS :-

SR. NO.	DESCRIPTION	SYMBOL	SR. NO.	NAME	SYMBOL	SR. NO.	NAME	SYMBOL	SR. NO.	NAME	SYMBOL
1	CURRENT TRANSFORMER		13	CLOSING COIL	CC	25	DRAW OUT TERMINAL POWER		37	PROTECTION RELAY	
2	NEUTRAL LINK		14	SHUNT TRIP COIL	ST	26	DRAW OUT TERMINAL CONTROL		38	EARTHING	E
3	THERMOSTAT	Th	15	FUSE		27	ISOLATOR		39	EARTHING BOLT	
4	CHANGE OVER SWITCH		16	DIGITAL AMMETER	A	28	FUSE SWITCH UNIT		40	SPACE HEATER	SH
5	NO CONTACT		17	AMMETER SELECTOR SWITCH		29	TERMINAL		41	D/O ACB	
6	NC CONTACT		18	DIGITAL VOLTMETER	V	30	TERMINAL		42	ELECTRIC BELL	
7	MCCB (MOULDEDCASE CIRCUIT BREAKER)		19	VOLTMETER SELECTOR SWITCH		31	TERMINAL		43	ANALOG AMMETER	A
8	MINIATURE CIRCUIT BREAKER (MCB)		20	KILOWATT HOUR METER	KWH	32	PUSH BUTTON		44	ANALOG VOLTMETER	V
9	PUSH BUTTON SPRING RETURN TYPE WITH NC ELEMENT		21	CONTACTOR COIL		33	INDICATING LIGHT				
10	PUSH BUTTON SPRING RETURN TYPE WITH NO ELEMENT		22	ON DELAY TIMER COIL		35	CAPACITOR				
11	OVERLOAD RELAY (CTRL. CIRCUIT)		23	OFF DELAY TIMER COIL		34	HOOTER/BUZZER				
12	OVERLOAD RELAY (POWER CIRCUIT)		24	SWITCH/MCCB/ OPERATING KNOB		36	CONTROL TRANSFORMER				

DATE	No.	REVISIONS DESCRIPTION
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	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

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ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 218, BRD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPHB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	ELECTRICAL SYMBOL
TITLE	FOR ALL PANEL
CA NO.	CC/T/W-HD/DOM/015/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEMANT KHAYE ELECTRICAL CONTRACTOR (HEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-000-00
JOB NO.	1241A
SH. NO. 01 OF 01	

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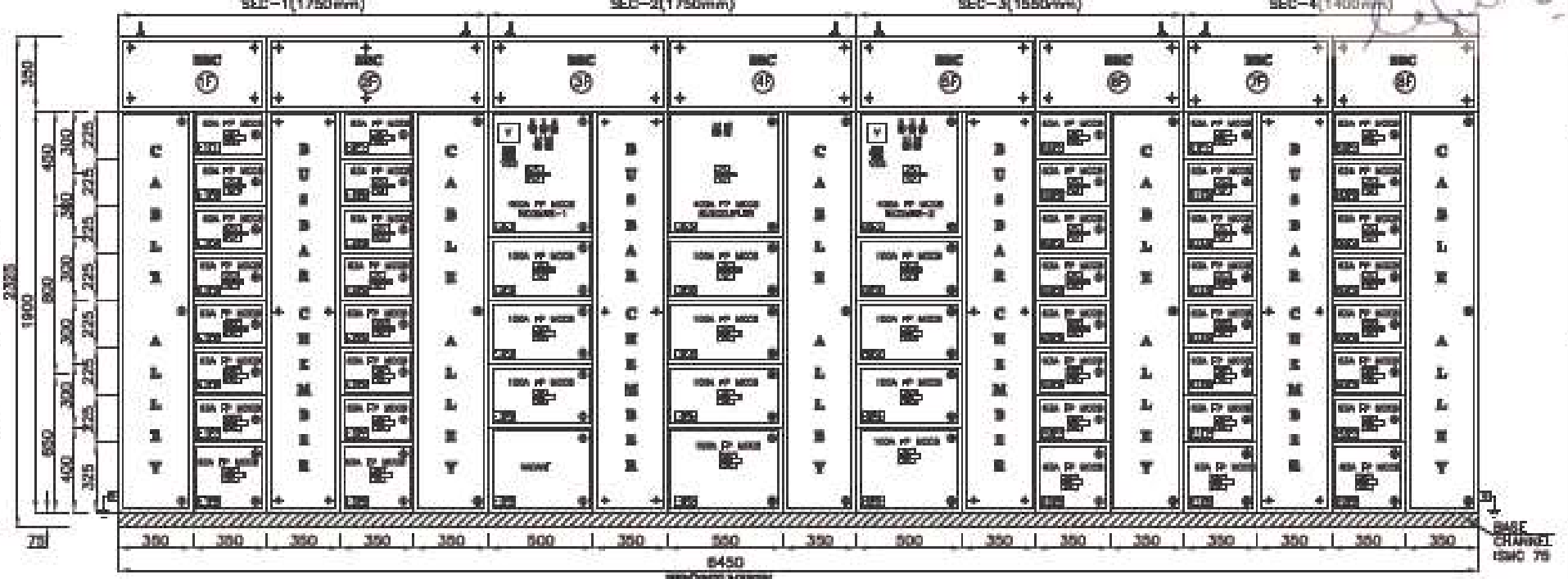

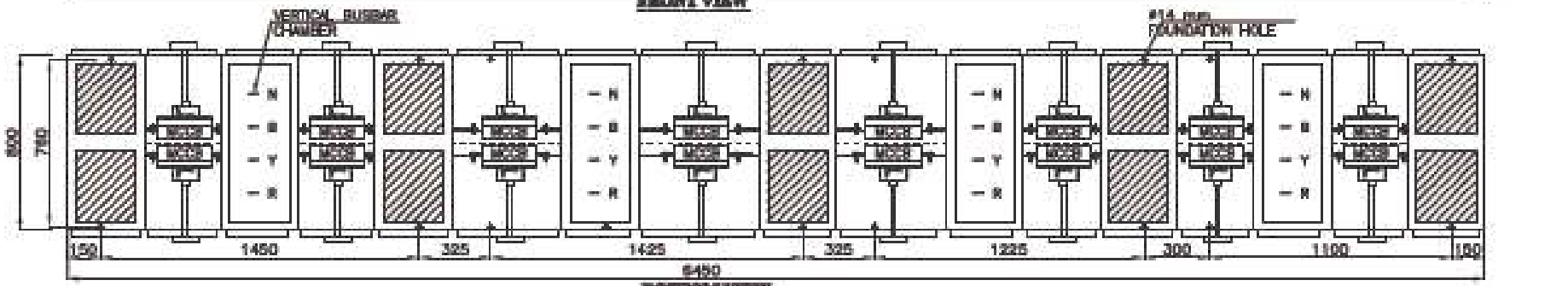

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	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-8 & F-9, IPHB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/N-MS/DOM/515/23/01656/NOA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIANDI-II POLING STATION

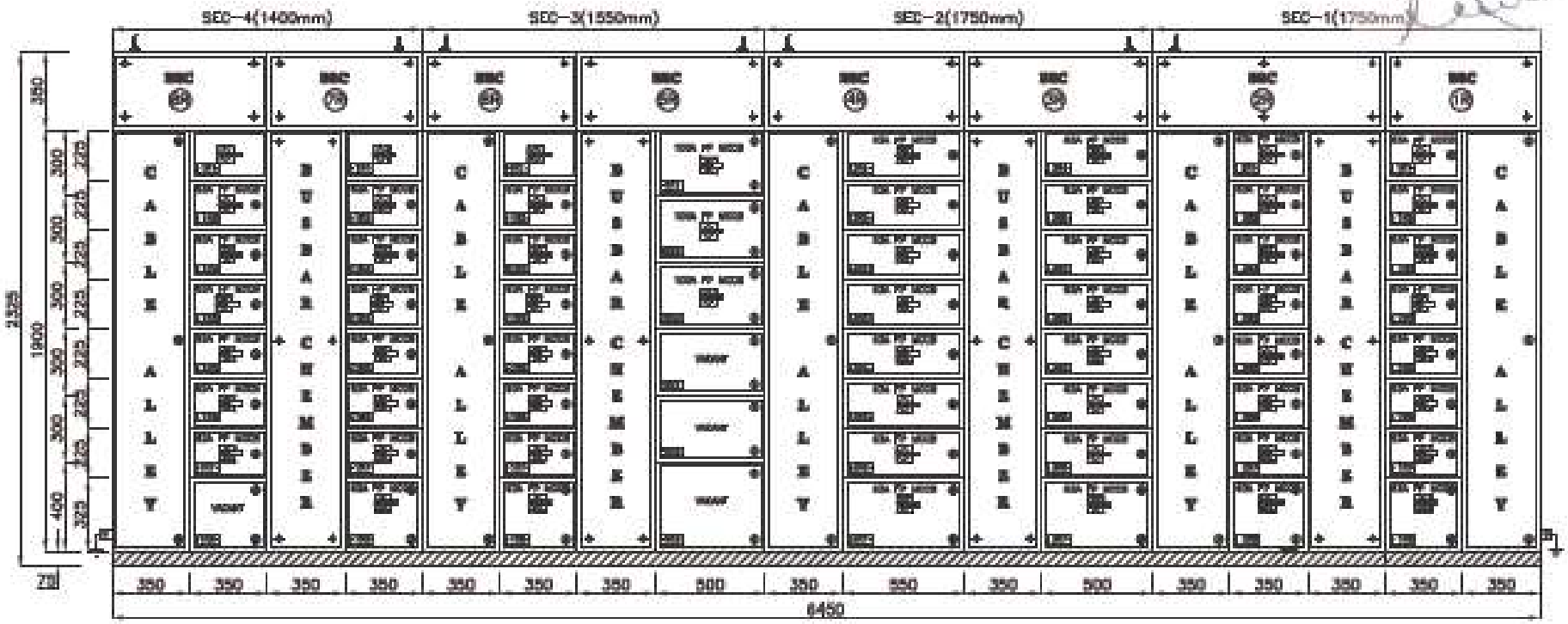
JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
BHARAT HEAVY ELECTRICALS LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-109

SH. NO. 01 OF 03



REAR VIEW

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BED. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPHB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V AC DISTRIBUTION BOARD (DA) (AB)
CA NO.	CC/T/N-MS/DDA/515/21/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIANDI-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
JOB NO.	1241A
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-109
SH. NO.	02 OF 03

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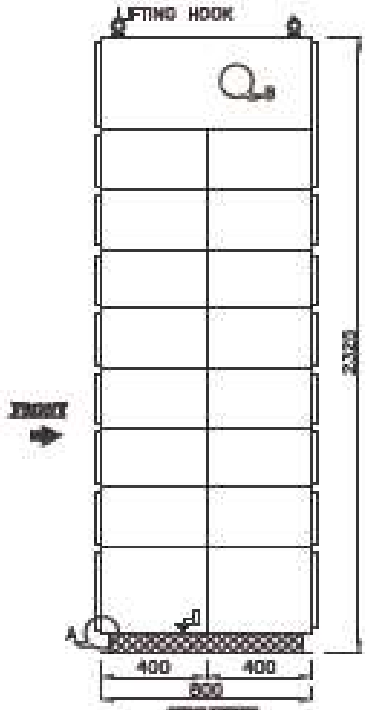
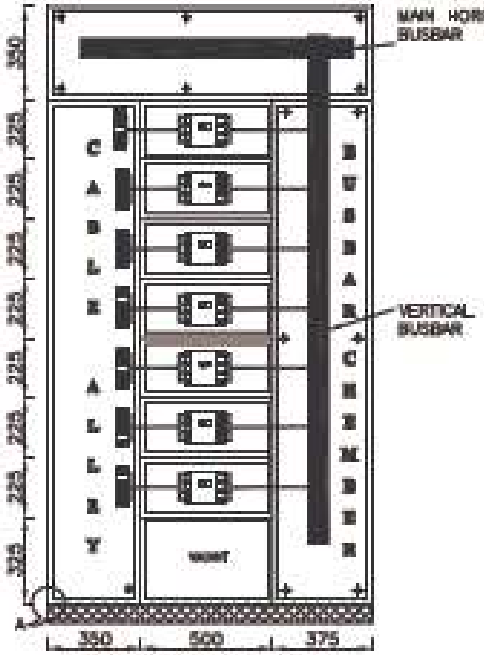


SIDE VIEW



MCCB & BUSBAR SECTION
(FRONT VIEW W/O DOOR & COVER)

PANEL DIMENSIONS

HEIGHT 2325 mm.
WIDTH 8450 mm.
DEPTH 800 mm.

CABLE ENTRY

BOTTOM ENTRY

HORIZONTAL BUS BAR SIZE :-

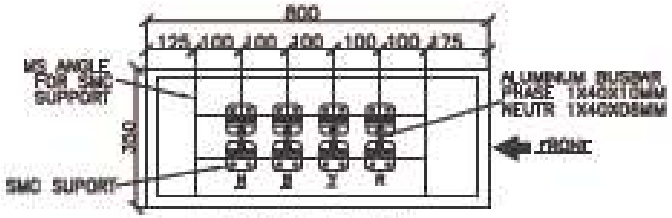
PHASE : 1x40x10 Sq.mm AL.
NEUTRAL : 1x40x06 Sq.mm AL.
EARTH : 1x40x06 Sq.mm. CS.

VERTICAL BUS BAR SIZE :-

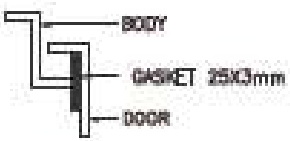
PHASE : 1x40x10 Sq.mm AL.
NEUTRAL : 1x40x06 Sq.mm AL.

LEGEND DESCRIPTION

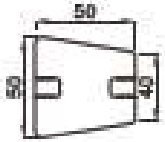
h1 = ON INDICATION RED
h2 = OFF INDICATION GREEN



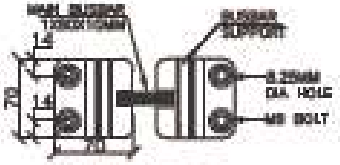
SECTIONAL VIEW AT
FOR HORIZONTAL BUSBAR
TOLERANCE
DETAIL-B



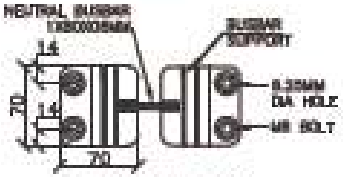
DETAIL-'A'



"DETAIL-B"
CONICAL SUPPORT



DETAIL OF MAIN BUSBAR SUPPORT



DETAIL OF NEUTRAL BUSBAR SUPPORT

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP	SIGN.
	04.	–	CHKD.	VDP	
	03.	–	APPD.	--	
	02.	–	ALL DIMENSIONS IN mm.		
	01.		TOLERANCE 5%		
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 218, BTD. AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - BADRIPUR, DELHI, TEL : [illegible]
UNIT-II F-8,9,F-7, IPHB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-MS/DDN/515/23/01656/WA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS/AIS-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-109

SH. NO. 03 OF 03

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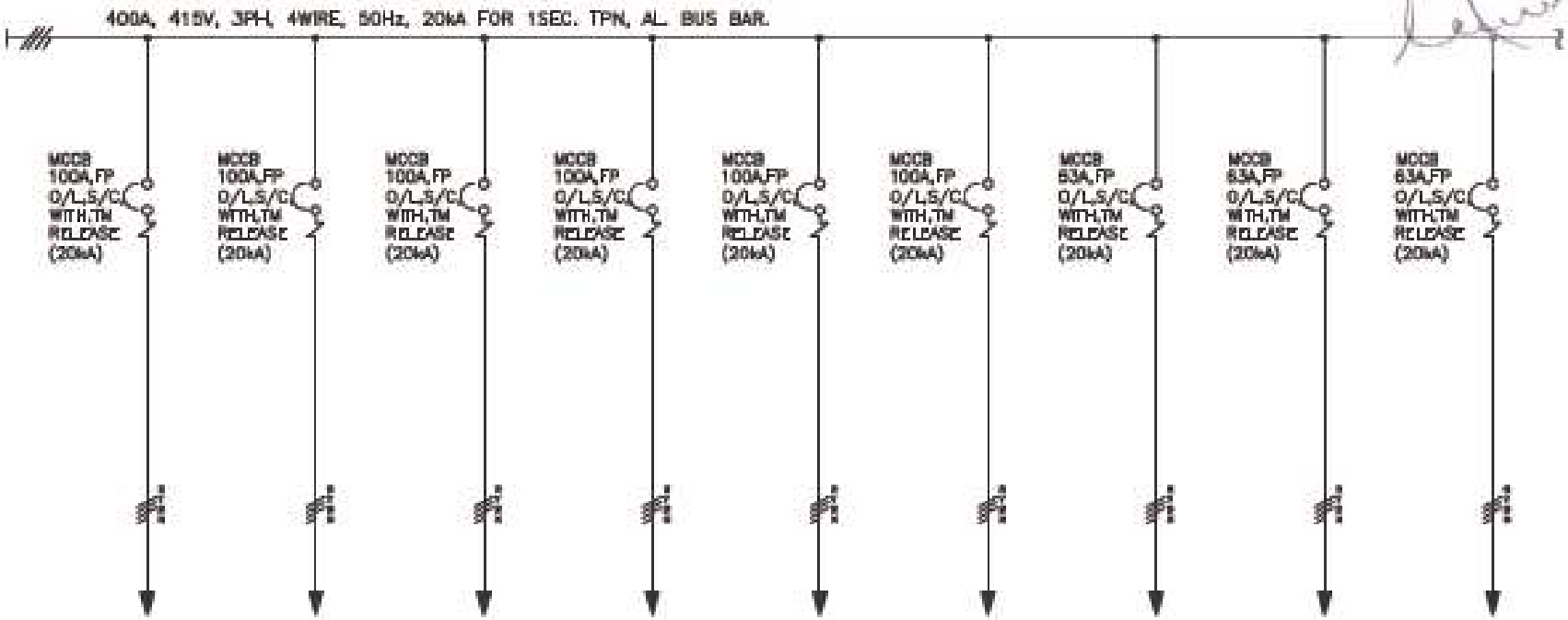

FEEDER NUMBER	3F2	3F3	3F4	4F2	4F3	4F4	1F1	1F2	1F3
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	100A	100A	100A	100A	100A	100A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	400\220 KV AUTO TRANSFORMER-1 MB	400\220 KV AUTO TRANSFORMER-3 MB	400\220 KV AUTO TRANSFORMER-5 MB	400\220 KV AUTO TRANSFORMER-7 MB (F)	400\220 KV AUTO TRANSFORMER-9 MB (F)	COUPLING TRANSFORMER MB (F)	400KV,125MVAR BUS REACTOR-1 MB	400KV,125MVAR BUS REACTOR-1 MB (F)	400KV,125MVAR LINE REACTOR-1 MB (F)
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-II & F-V, IPHB-C, LANDCO, SIDCUL INDUSTRIAL AREA, SELAQUI, DEHRADUN - 248197 U. K. INDIA (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-HB/DOM/D15/23/01655/WA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEMANT KUMAR ELECTRICAL CHARGE (HEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-209

JOB NO. 1241A

SH. NO.:- 01 OF 13

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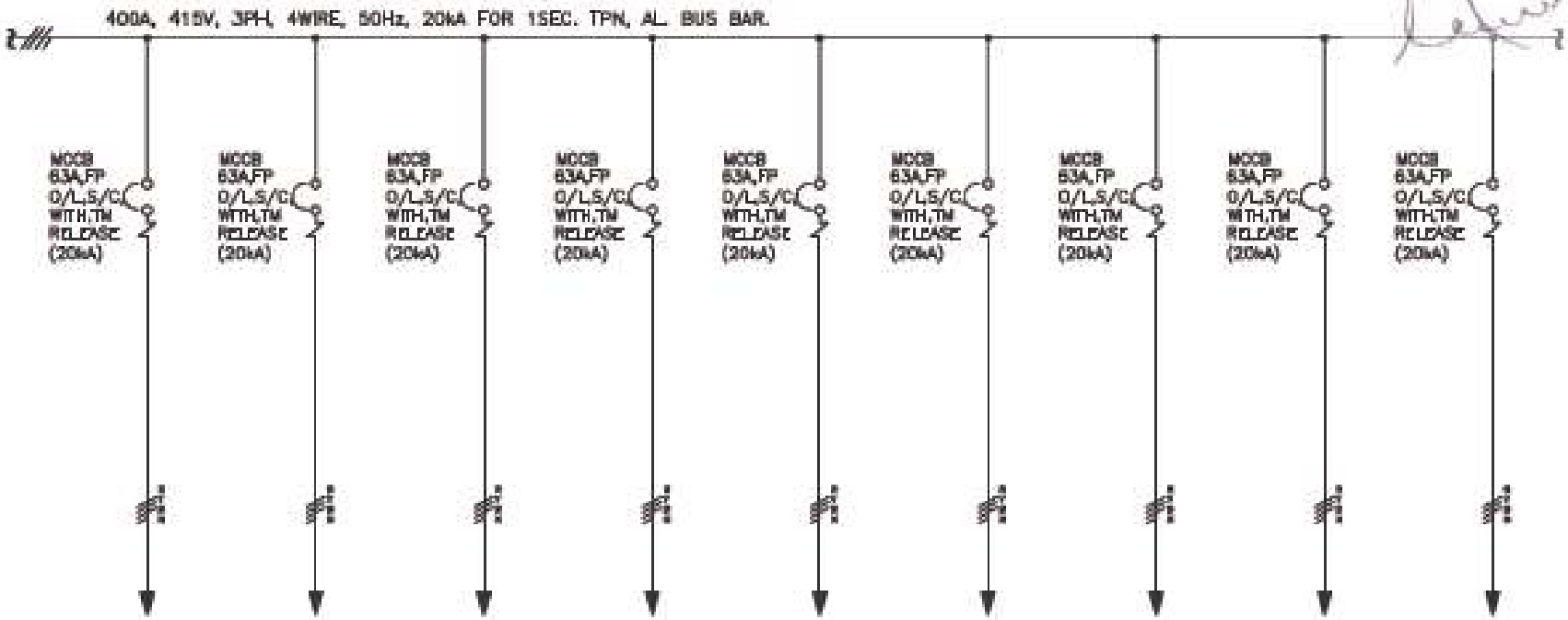

FEEDER NUMBER	1F4	1F5	1F6	1F7	1F8	2F1	2F2	2F3	2F4
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	400V,125MVAR LINE REACTOR-3 MB (F)	BMK-401	BMK-404	BMK-407	BMK-410	BMK-413	BMK-416	BMK-419	BMK-422 (F)
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, LANDCO, SIDCUL INDUSTRIAL AREA, GRAMPURI ROORKEE - 247667 (U. K. HARDWAR) (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-MS/DDN/515/23/01695/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHCL/2024-2025/1241A-209
SH. NO.:- 02 OF 13

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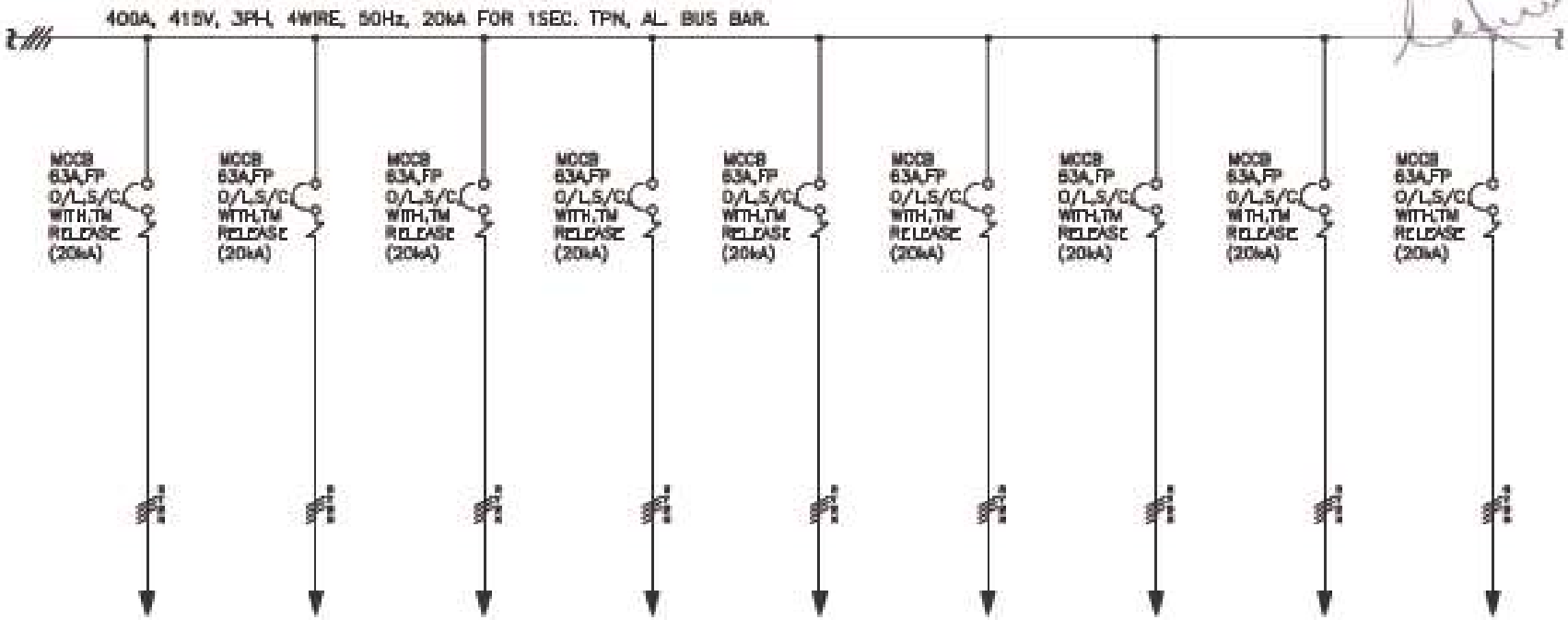

FEEDER NUMBER	2F5	2F6	2F7	2F8	1R1	1R2	1R3	1R4	1R5
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BMK-424	BMK-427	BMK-430	BMK-433 (F)	BMK-436 (F)	BMK-439 (F)	BMK-441 (F)	BMK-444 (F)	BMK-447 (F)
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IPIB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAUTER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-HD/DOM/318/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPORT ELECTRICAL CHINA (HEC) TRANSMISSION PROJECTS DIVISION
JOB NO.	1241A
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-209
SH. NO.:-	03 OF 13

1 2 3 4 5 6 7 8 9

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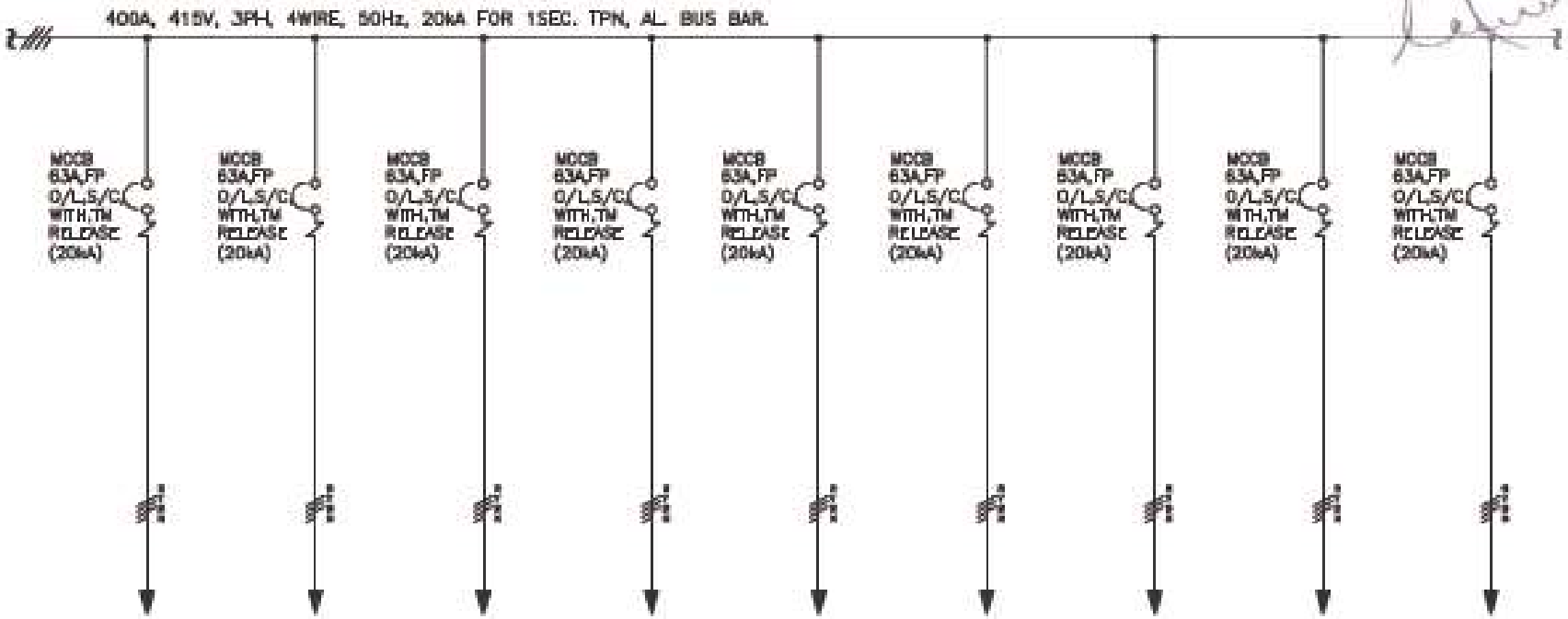

FEEDER NUMBER	1R6	1R7	1R8	2R1	2R2	2R3	2R4	2R5	2R6
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BMK-450 (F)	BMK-453 (F)	BMK-456 (F)	BMK-201	BMK-203	BMK-205	BMK-207	BMK-209	BMK-211
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-18 & F-19, IITBI-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GHAZIABAD ROORKEE - 247667 (U. P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEMANT KUMAR ELECTRICAL CHARGE (MOD) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-209

JOB NO. 1241A

SH. NO.:- 04 OF 13

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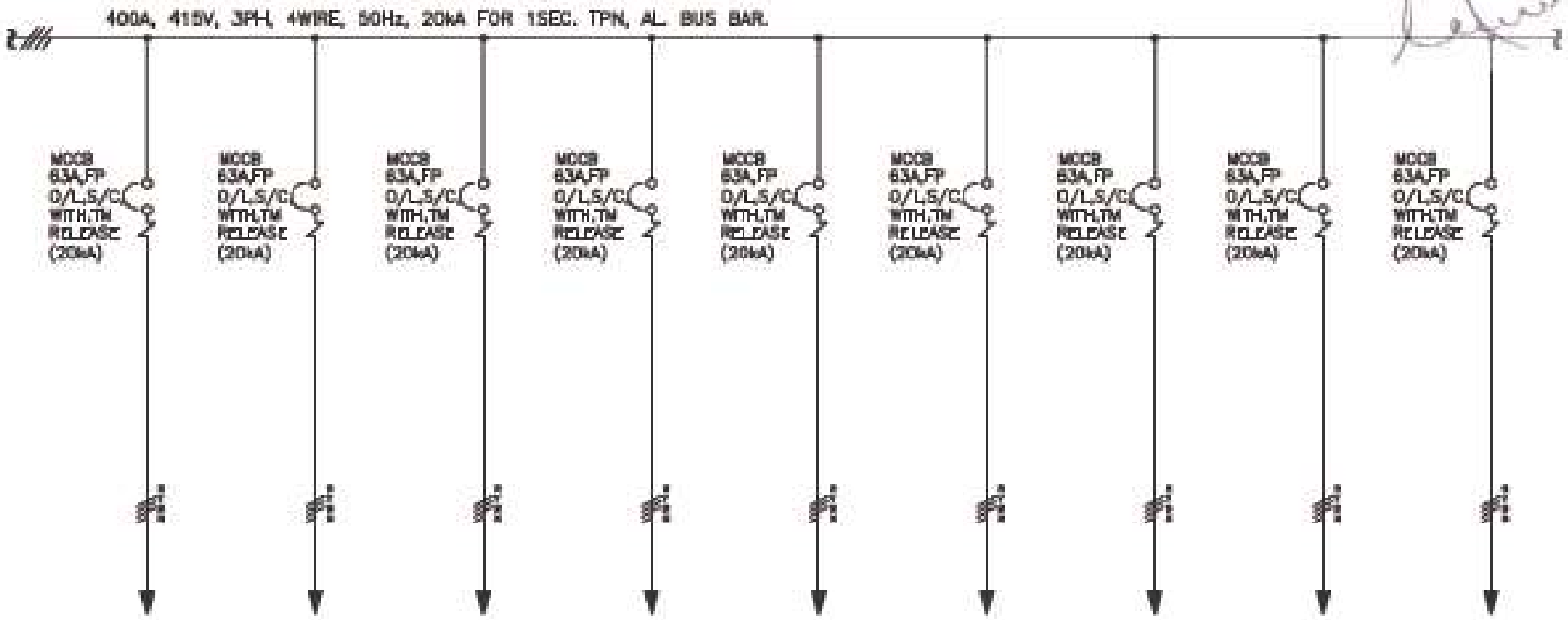

FEEDER NUMBER	2R7	2R8	3R1	3R2	3R3	3R4	3R5	3R6	3R7
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BMK-213	BMK-215	BMK-217 (F)	BMK-219 (F)	BMK-221 (F)	BMK-223 (F)	BMK-225 (F)	BMK-227 (F)	BMK-229 (F)
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAUTER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEMANT KUMAR ELECTRICAL CHARGE (HEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-209

JOB NO. 1241A

SH. NO.:- 06 OF 13

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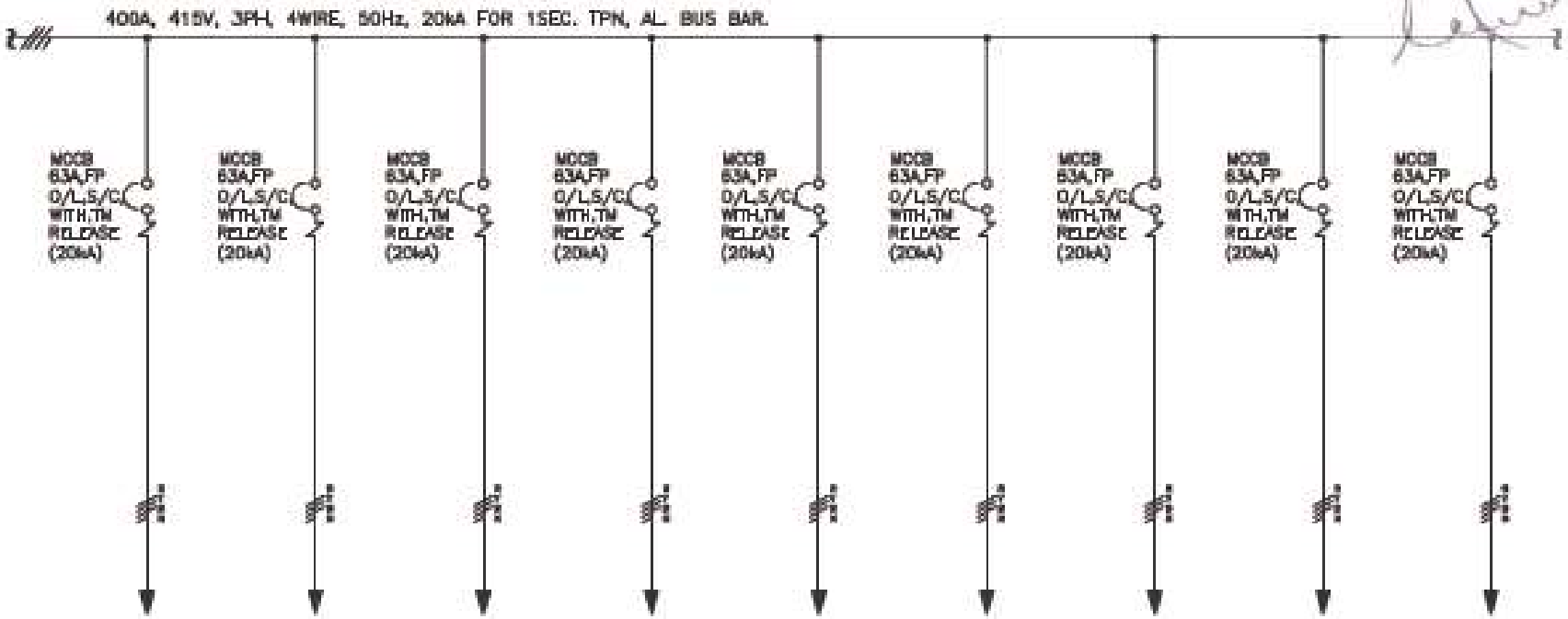

FEEDER NUMBER	3R0	4R1	4R2	4R3	4R4	4R5	4R6	4R7	4R8
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BMK-231 (F)	BMK-233 (F)	BMK-235 (F)	BMK-237 (F)	SPARE-1	SPARE-2	SPARE-3	SPARE-4	SPARE-5
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	—	--	—	—	--

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITBI-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-HD/DDN/318/23/01806/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	NIRANT KHAYY ELECTRICAL CHENNAI (INDIA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-209

JOB NO. 1241A

SH. NO.:- 06 OF 13

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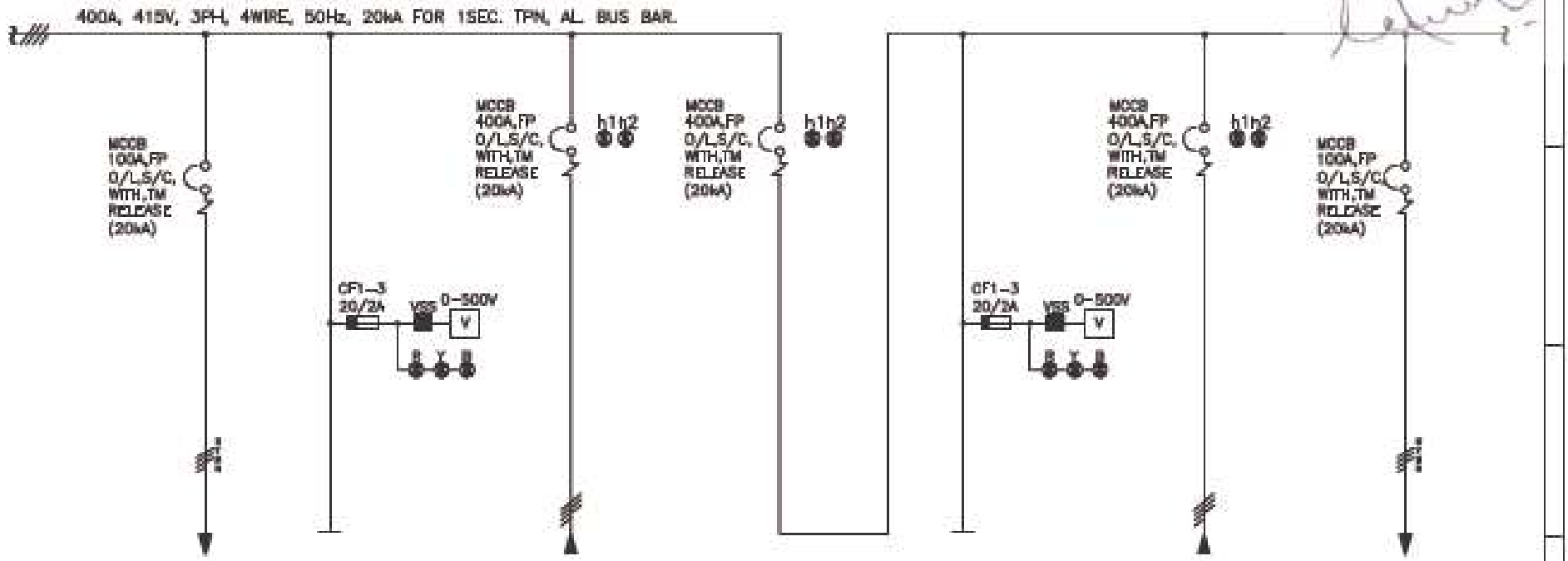

FEEDER NUMBER	4F5	3F1		4F1	5F1		5F2
MODULE TYEP	E	G2	E	E	G2	E	E
FEEDER RATING	100A	—	400A	400A	--	400A	100A
FEEDER TYPE	MCCB	METERING	ACB	MCCB	METERING	ACB	MCCB
DESCRIPTION	SPARE-8	—	INCOMER-1 FROM 415V AC DB 2A (CRB)	BUSCOUPLER	--	INCOMER-1 FROM 415V AC DB 2A (CRB)	COUPLING TRANSFORMER MB (F)
POWER CABLE SIZE	--		1X3.5CX300 Sqmm.	--		1X3.5CX300 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II: F-8 & F-9, IPSEC, LONIKAL, SIKANDRA INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-MS/DOM/515/23/01005/NOA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EARTH ELECTRICAL CHENNAI (HEEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-209

JOB NO. 1241A

SH. NO.:- 07 OF 13

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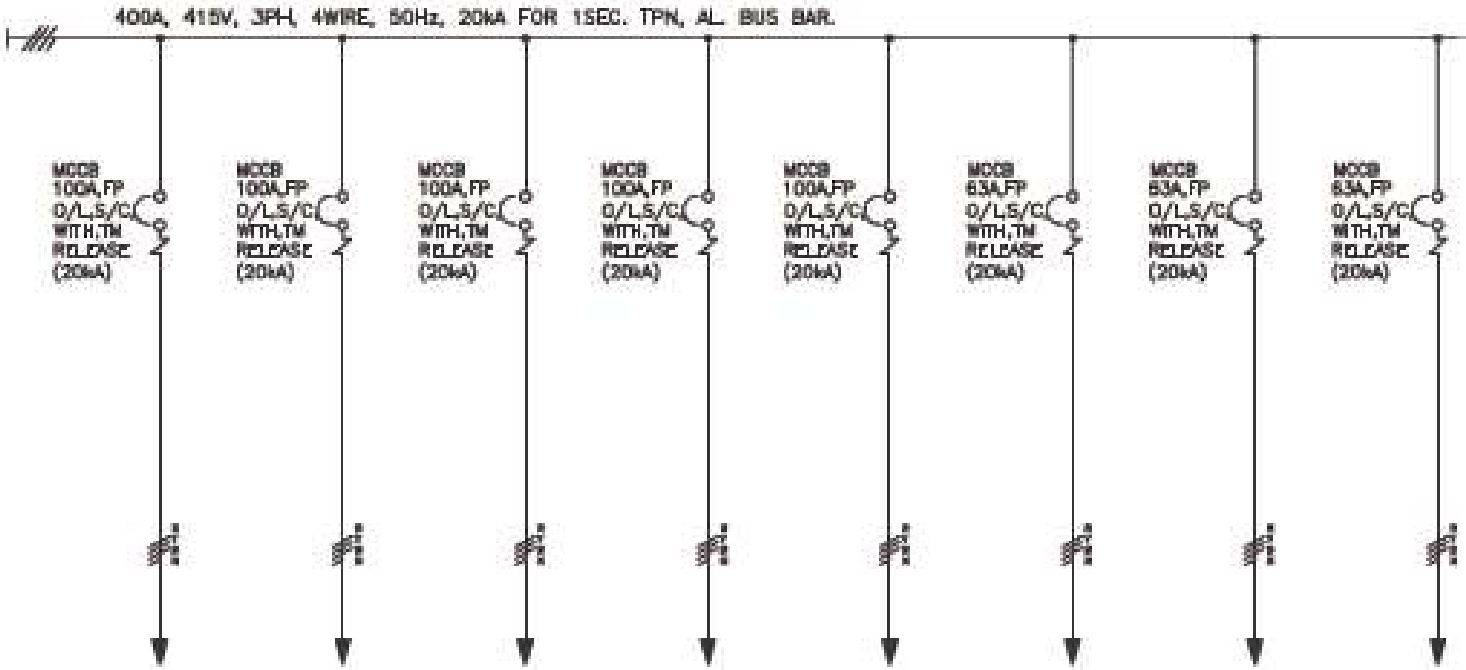

FEEDER NUMBER	5F3	5F4	5F5	5R1	5R2	6F1	6F2	6F3
MODULE TYEP	E	E	E	E	E	E	E	E
FEEDER RATING	100A	100A	100A	100A	100A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	400/220 KV AUTO TRANSFORMER-2 MB	400/220 KV AUTO TRANSFORMER-4 MB	400/220 KV AUTO TRANSFORMER-6 MB (F)	400/220 KV AUTO TRANSFORMER-8 MB (F)	400/220 KV AUTO TRANSFORMER-10 MB (F)	420KV,125MVAR BUS REACTOR-2 MB	420KV,125MVAR BUS REACTOR-3 MB (F)	420KV,125MVAR LINE REACTOR-2 MB (F)
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, LANDCO, SIDCUL INDUSTRIAL AREA, HARIDWAR - 249403 U. K. INDIA (U.P.) INDIA
E-mail : [illegible]

DRAWING: SINGLE LINE DIAGRAM
TITLE: 415V AC DISTRIBUTION BOARD (5A) (AB)
CA NO.: CC/T/W-AB/DOM/015/23/01656/WA-1/24-102643/01 & 02 DATED 23.02.2024
PROJECT: 765/400/220kV BHADLA-II POOLING STATION
JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
HEMANT KUMAR ELECTRICAL CHECKER (HKEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO.: USL/PGCIL/BHCL/2024-2025/1241A-209
SH. NO.:- 08 OF 13

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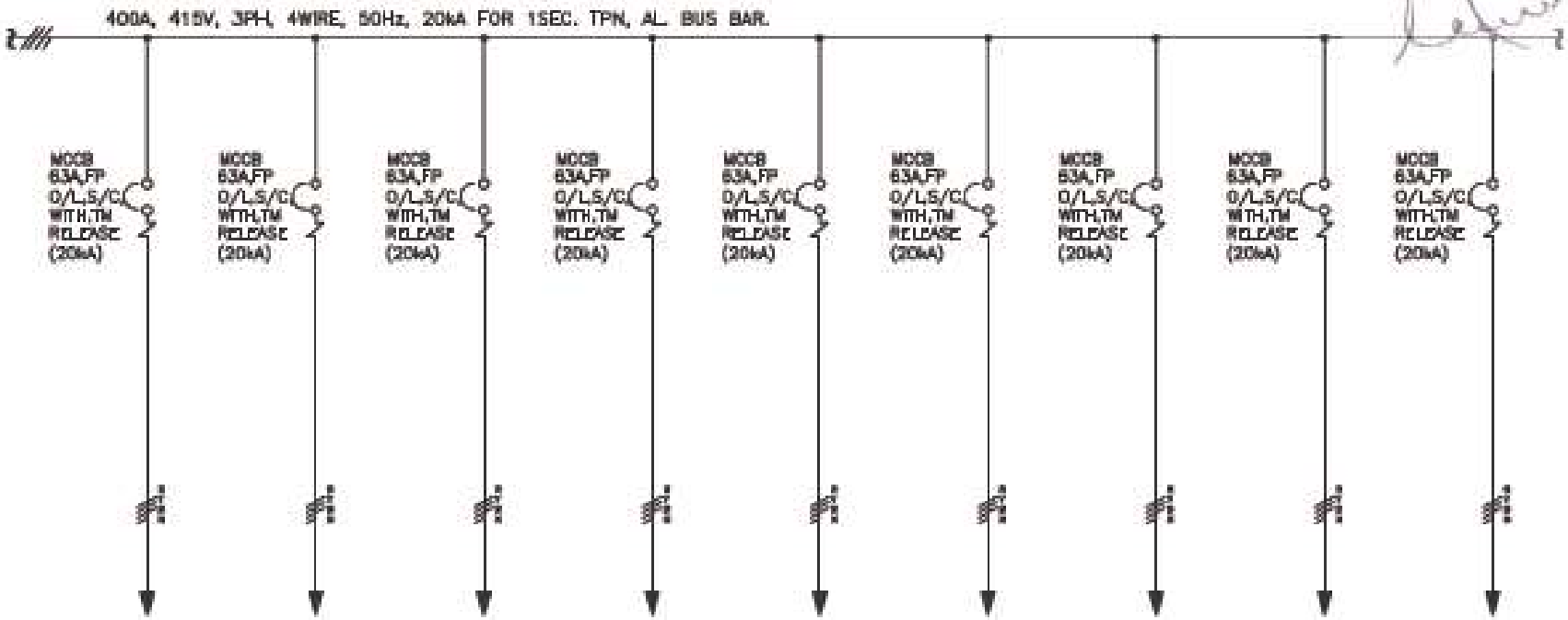


FEEDER NUMBER	6F4	6F5	6F6	6F7	6F8	7F1	7F2	7F3	7F4
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	400KV,125MVAR LINE REACTOR-1 MB (F)	BMK-403	BMK-406	BMK-409	BMK-412	BMK-415	BMK-418	BMK-421 (F)	BMK-423 (F)
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

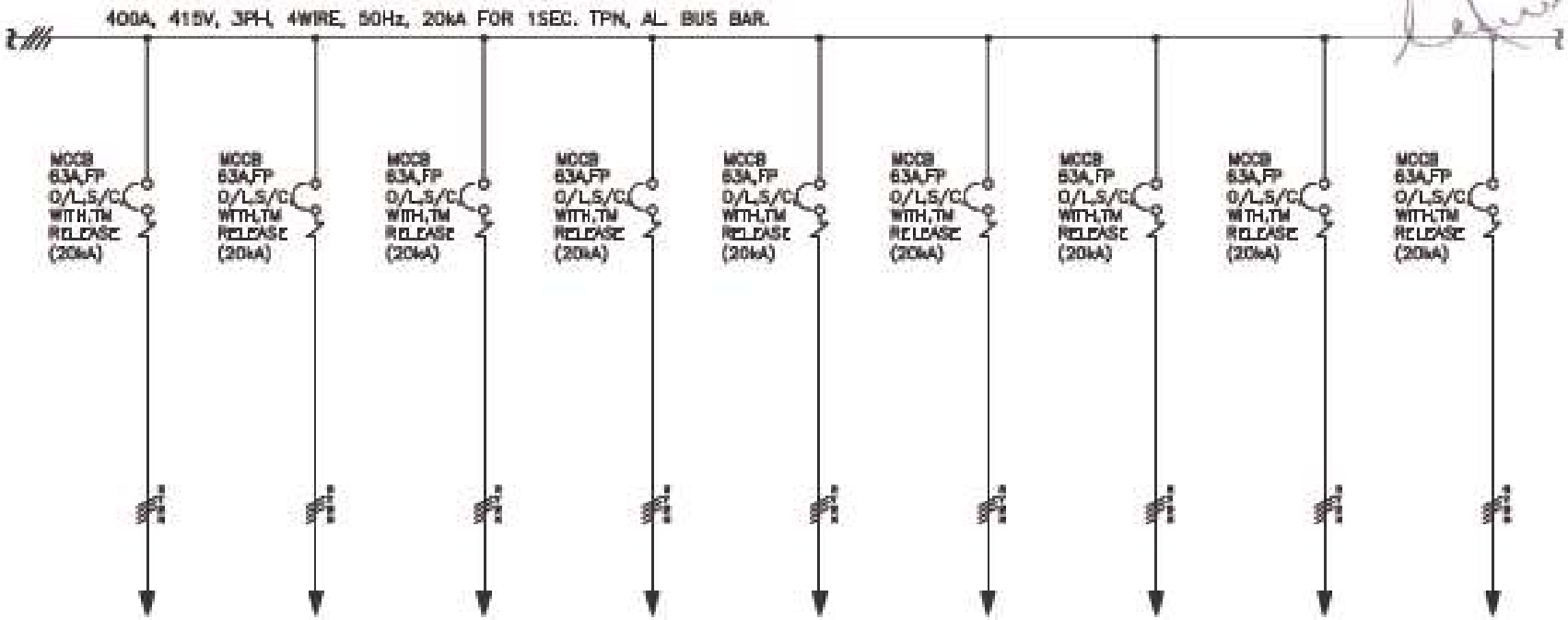
DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAUTAM BUDDHA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-MS/DDN/318/23/01806/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HIGHT TEMPT ELECTRICAL CHECK (INDIA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-209

JOB NO. 1241A

SH. NO.:- 09 OF 13



FEEDER NUMBER	7F5	7F6	7F7	7F8	8F1	8F2	8F3	8F4	8F5
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BMK-428	BMK-429	BMK-432	BMK-435 (F)	BMK-438 (F)	BMK-440 (F)	BMK-443 (F)	BMK-446 (F)	BMK-448 (F)
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II: F-68 & F-97, IITBI-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GHAZIABAD, INDIA - 201009 U. P. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-MS/DDM/515/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EQUIPMENT ELECTRICAL CHENNAI (HEEC) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-209
JOB NO.	1241A
SH. NO.:-	10 OF 13

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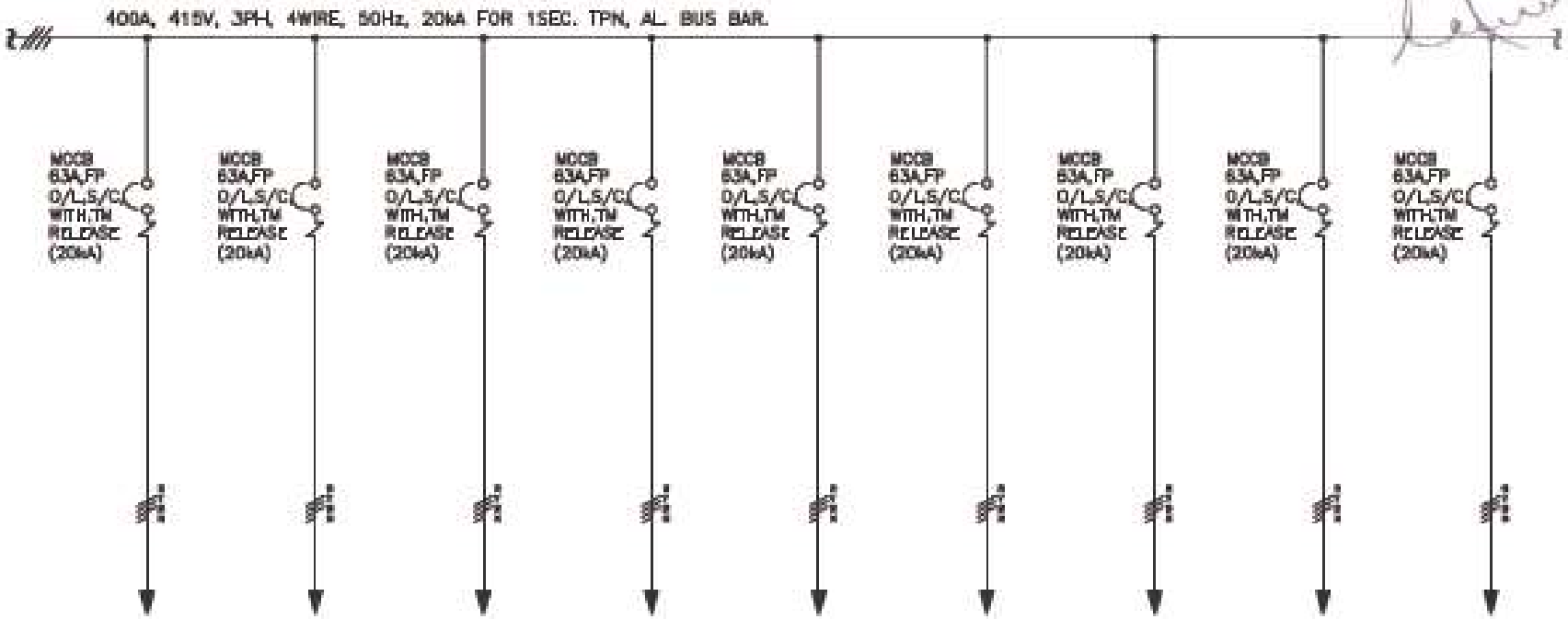

FEEDER NUMBER	6F6	6F7	6F8	6R1	6R2	6R3	6R4	6R5	6R6
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BMK-452 (F)	BMK-455 (F)	BMK-458 (F)	BMK-202	BMK-204	BMK-206	BMK-208	BMK-210	BMK-212
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, LANDCO, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-AB/DOM/318/23/01806/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (INDIA) TRANSMISSION PROJECTS DIVISION

JOB NO. 1241A

DRG. NO. USL/PGCIL/BHCL/2024-2025/1241A-209

SH. NO.:- 11 OF 13

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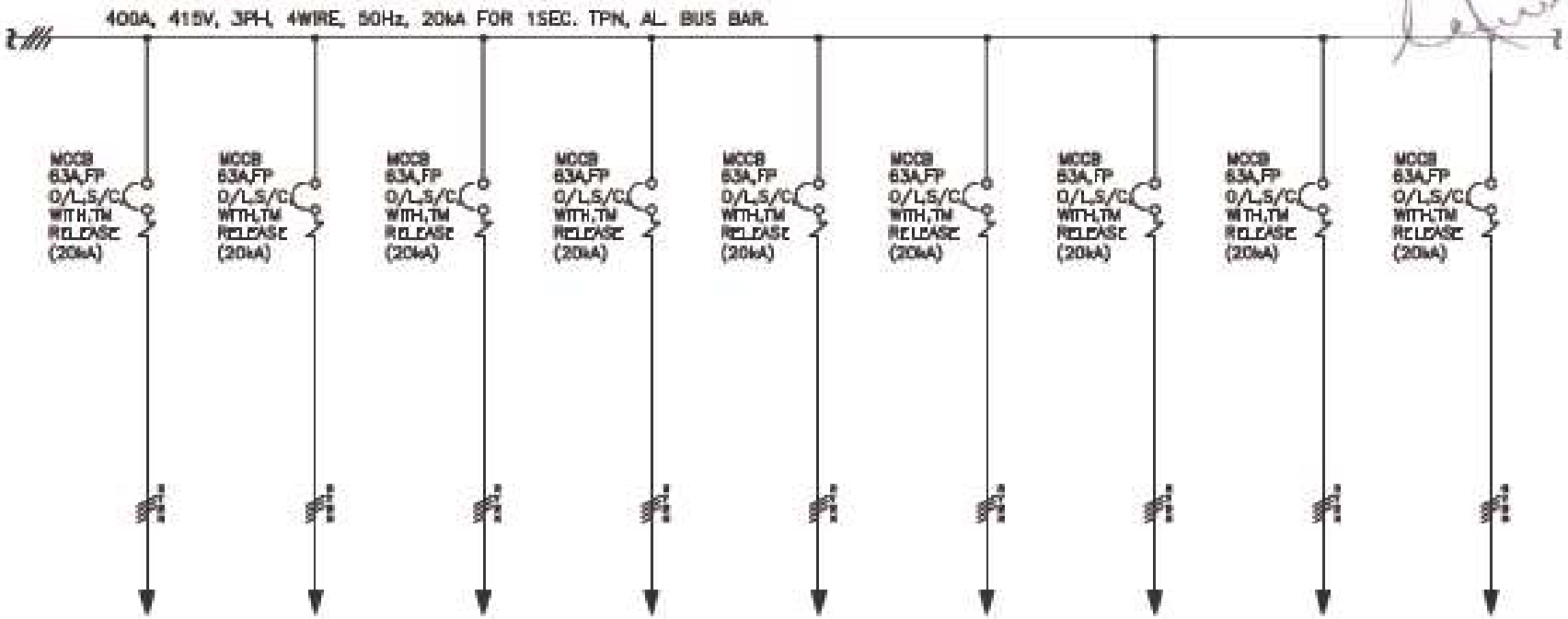

FEEDER NUMBER	6R7	6R8	7R1	7R2	7R3	7R4	7R5	7R6	7R7
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A	63A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BMK-214	BMK-216	BMK-218 (F)	BMK-220 (F)	BMK-222 (F)	BMK-224(F)	BMK-226 (F)	BMK-228 (F)	BMK-230 (F)
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IPIB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-HD/DOM/318/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPRT ELECTRICAL CHECK (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-209

JOB NO. 1241A

SH. NO.:- 12 OF 13

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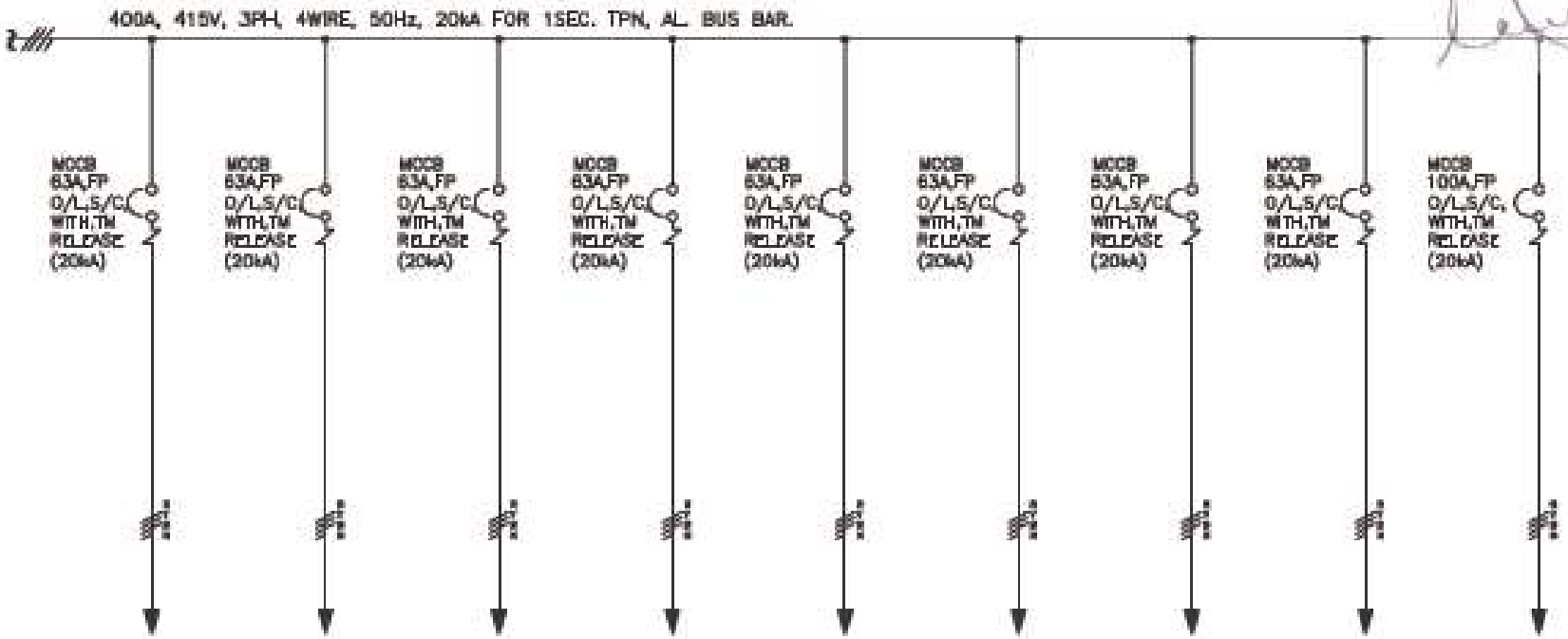

FEEDER NUMBER	7RB	8R1	8R2	8R3	8R4	8R5	8R6	8R7	9R3
MODULE TYEP	E	E	E	E	E	E	E	E	E
FEEDER RATING	63A	63A	63A	63A	63A	63A	63A	63A	100A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	BMK-232 (F)	BMK-234 (F)	BMK-236 (F)	SPARE-7	SPARE-8	SPARE-9	SPARE-10	SPARE-11	SPARE-12
POWER CABLE SIZE	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	1X3.5CX70 Sqmm.	--	—	--	—	—	--

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AMBA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAUTAM BUDDHA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-HD/DDN/318/23/01806/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPORT ELECTRICAL CHINA (HECA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-209

JOB NO. 1241A

SH. NO.:- 13 OF 13

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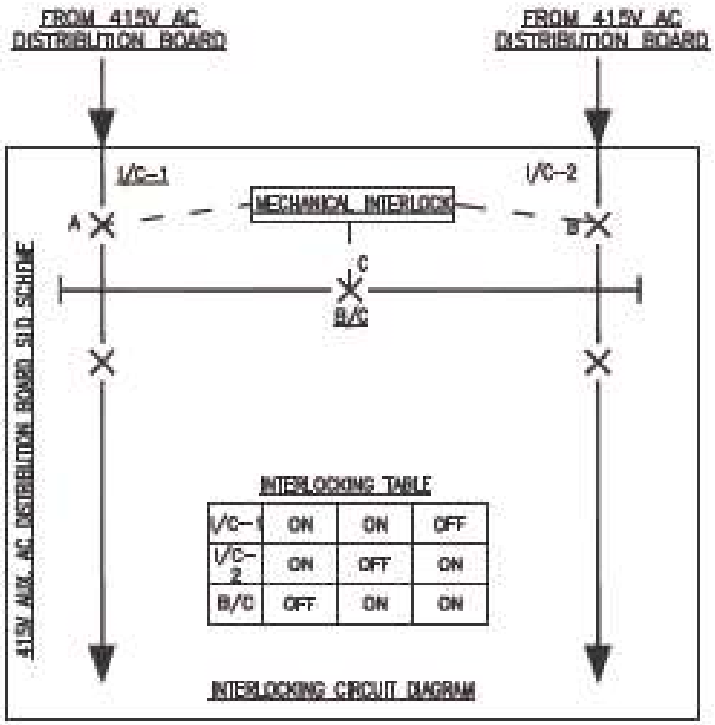
-: KEY LINE DIAGRAM & CONTROL LOGIC FOR AUX. ACDB



INTERLOCKING TABLE

I/C-1	ON	ON	OFF
I/C-2	ON	OFF	ON
B/C	OFF	ON	ON

CONTROL LOGIC:-

AS BOTH THE INCOMERS & BUSCOUPLER ARE MECHANICALLY INTERLOCK SO INCOMER & BUSCOUPLER CAN BE OPERATED MANUALY AS PER INTERLOCKING TABLE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP
CHKD.	VDP
APPD.	--
ALL DIMENSIONS IN mm.	SIGN.
TOLERANCE 5%	
REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-8 & F-9, IPHB-C, LOHARI, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-HD/DOM/019/23/01806/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CORPN (NCEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-509-00
SH. NO.:-	01 OF 01

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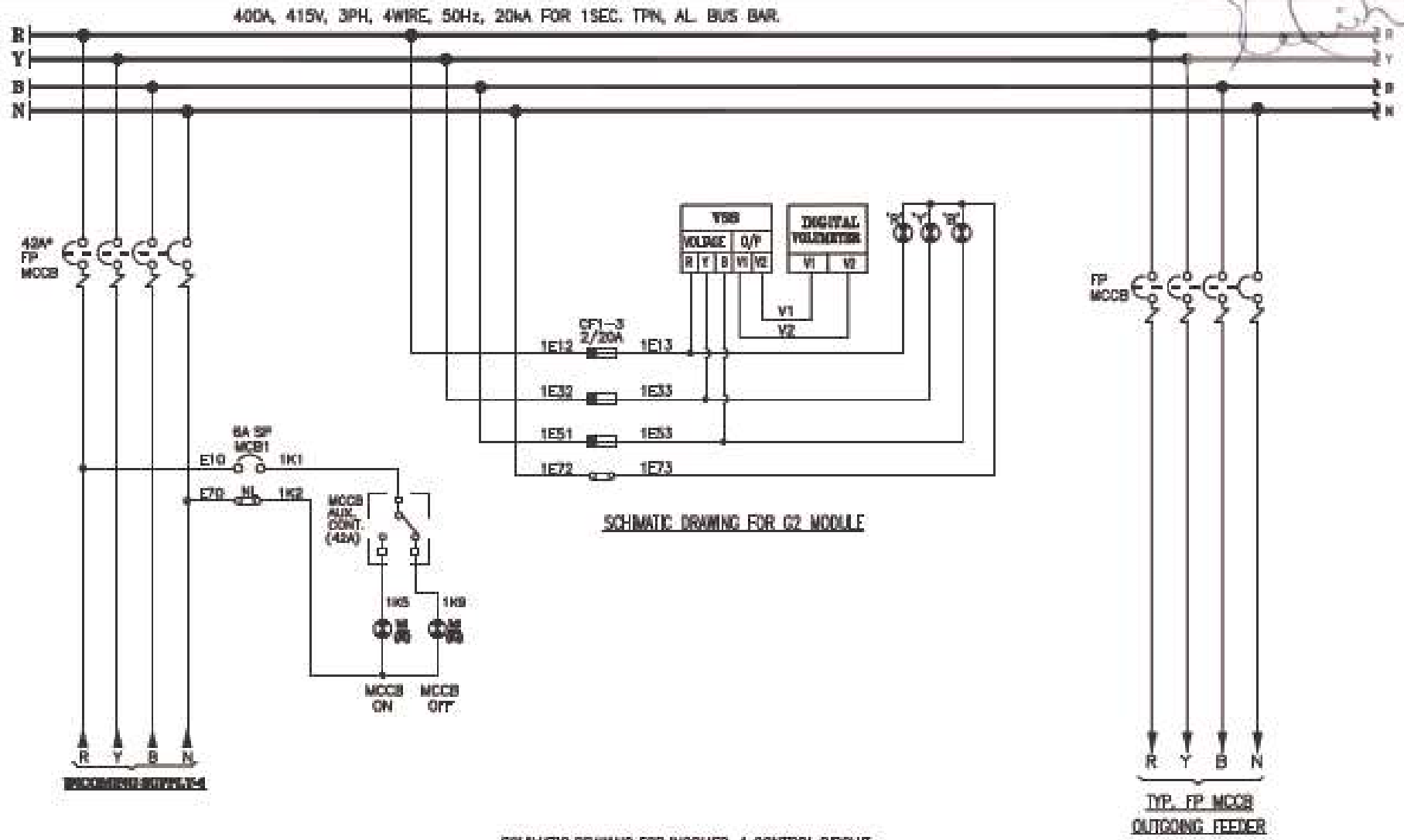

SCHMATIC DRAWING FOR C2 MODULE

SCHMATIC DRAWING FOR INCOMER-1 CONTROL CIRCUIT

* NOTE :- BOTH INCOMER & BUSCOUPLER SHALL BE MECHANICAL INTERLOCKED (3LOCK+2KEY)

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GRAMPUR ROORKEE - 247667 (U. K. HARDWAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-HD/DOM/318/23/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS/AIS-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	[illegible]
DRG. NO.	USL/PGCIL/SHED/2024-2025/1241A-509

JOB NO. 1241A

SH. NO.:- 01 OF 03

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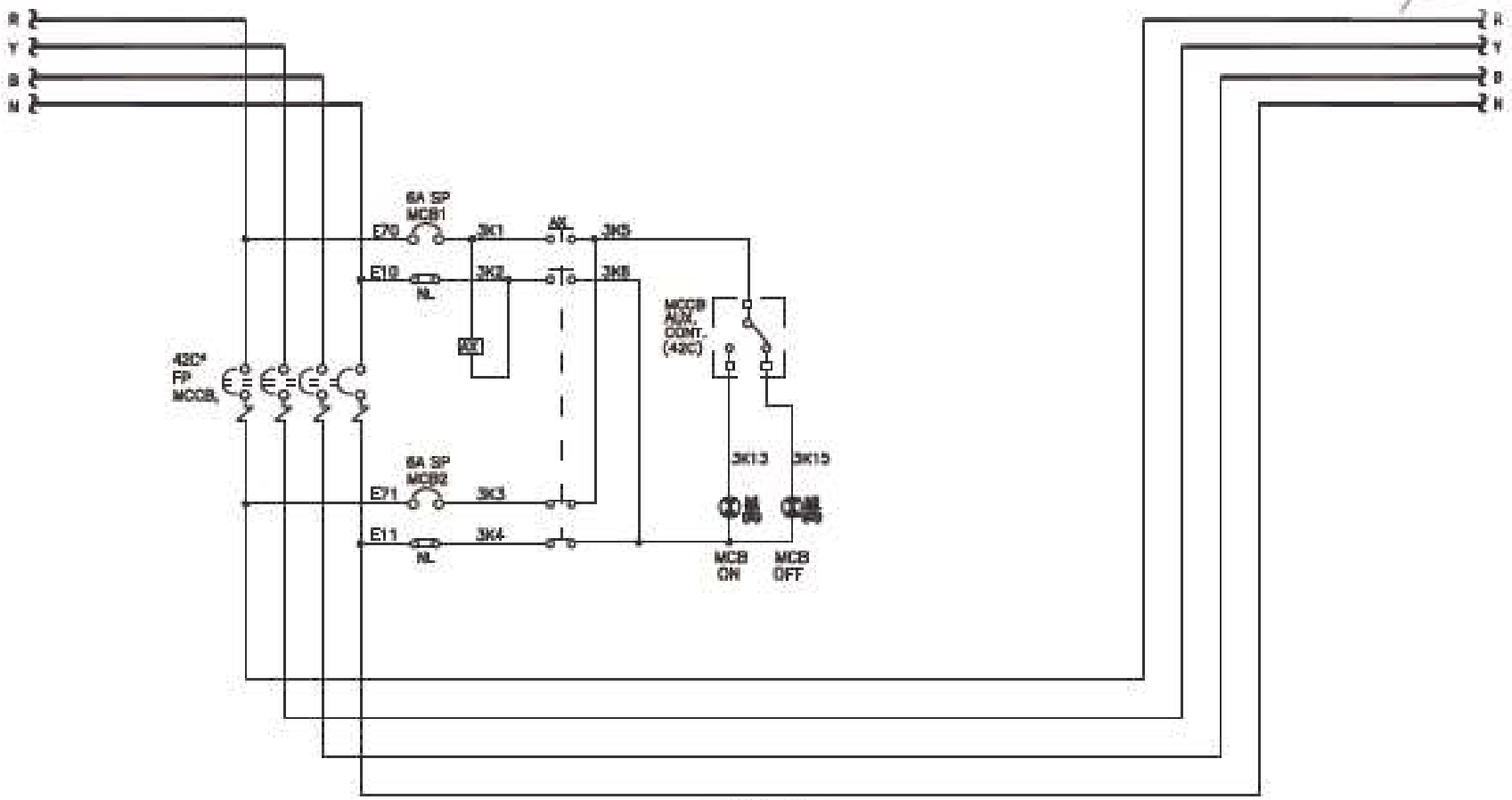

BUSCOUPLER

* NOTE :- BOTH INCOMER & BUSCOUPLER SHALL BE MECHANICAL INTERLOCKED (3LOCK+2KEY)

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP
CHKD.	VDP
APPD.	--
ALL DIMENSIONS IN mm.	SIGN.
TOLERANCE 5%	
REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II F-8 & F-9, IPHB-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (5A) (AB)
CA NO.	CC/T/W-HD/DOM/318/23/01806/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO.	LSL/PGCIL/BHCL/2024-2025/1241A-509
SH. NO.:-	02 OF 03

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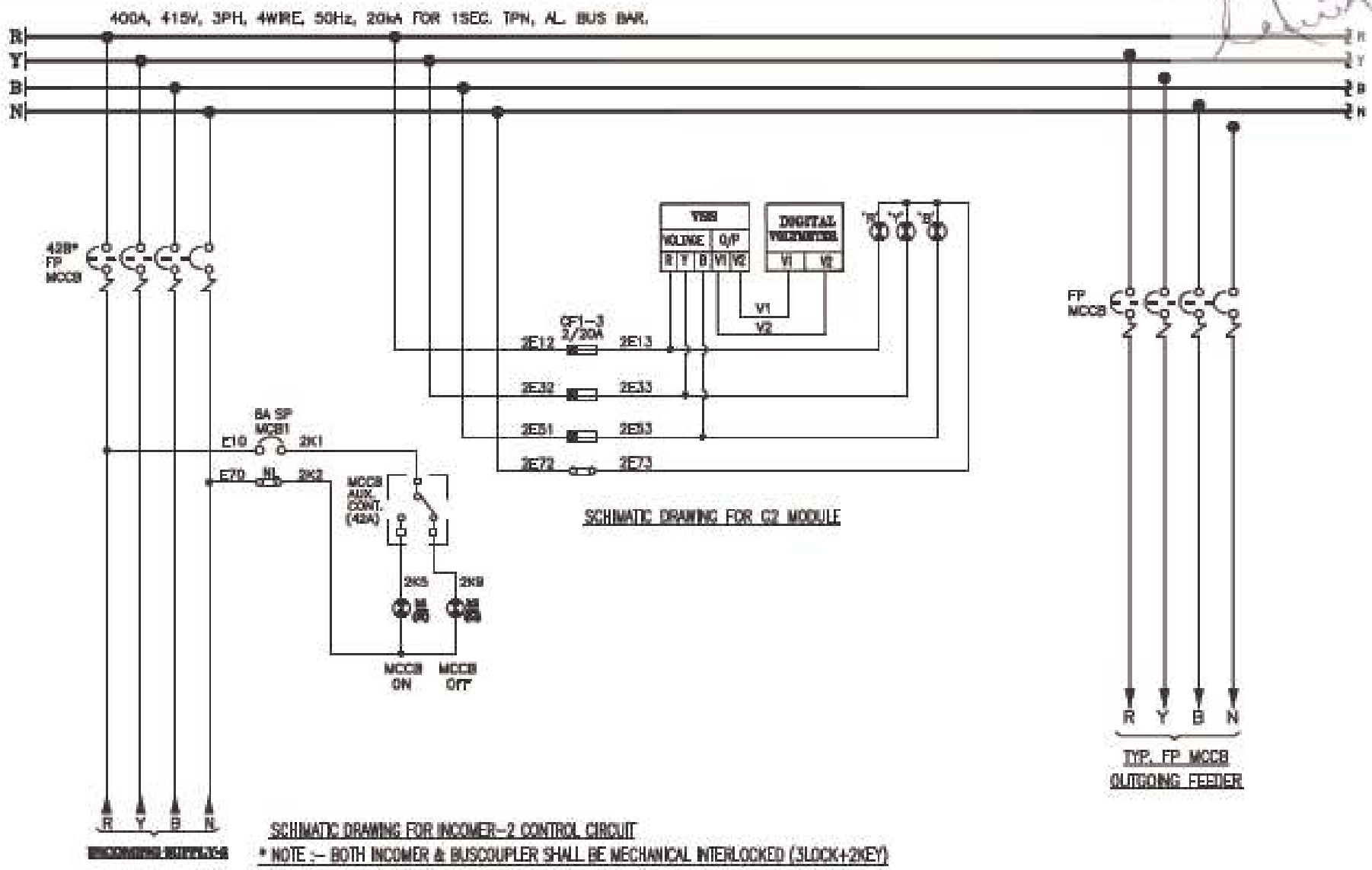

SCHEMATIC DRAWING FOR C2 MODULE

SCHEMATIC DRAWING FOR INCOMER-2 CONTROL CIRCUIT

* NOTE :- BOTH INCOMER & BUSCOUPLER SHALL BE MECHANICAL INTERLOCKED (3LOCK+2KEY)

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP		
CHKD.	VDP		
APPD.	--		
ALL DIMENSIONS IN mm.		SIGN.	
TOLERANCE 5%			
REVISIONS : 00			

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHARTHANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : 01332-285262 FAX : 01332-285262
UNIT-II: F-68 & F-97, IITBI-C, UPSIDC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : info@ultimaswitchgear.com

DRAWING	SCHEMATIC DIAGRAM
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-HD/DOM/318/23/01806/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV GIS/HS-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	MEGHAT KHAYY ELECTRICAL CHINA (MEKA) TRANSMISSION PROJECTS PRIVATE LIMITED
DRG. NO.	USL/PGCIL/SHCL/2024-2025/1241A-509
JOB NO.	1241A
SH. NO.:-	03 OF 03

This Drawing & Information or descriptive matter set out herein are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing, rendering or for any other purpose without their permission.

BILL OF MATERIAL FOR 415V AC DISTRIBUTION BOARD (SA) (AB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A	**BILL OF MATERIAL FOR MODULE - (I) INCOMER 1&2**				**2 Nos.**
1	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH SPREADER, EXTENDED ROM, 1C/O AUX. CONTACT, Ics = 100% Icu	L&T/C&S/HAVELLS	400A, 20kA	01
2	MCB	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T/C&S/HAVELLS	6A, 10kA	01
3	Id	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	240V AC	01
4	Id	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESBEE/VAISHNO/C&S	240V AC	01
B	**BILL OF MATERIAL FOR MODULE - (II) BUSCOUPLER**				**1 Nos.**
1	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH SPREADER, EXTENDED ROM, 1C/O AUX. CONTACT, Ics = 100% Icu	L&T/C&S/HAVELLS	400A, 20kA	01
2	--	MECHANICAL LOCK 3 LOCK 2-KEY FOR 400A FP MCCB	PGCIL APPROVED	--	1-SET
3		AUX. CONTACTOR RELAY, COIL VOLTAGE 240V AC WITH 2NO+2NC AUX. CONTACT	L&T	--	01
4	MCB	SP MINIATURE CIRCUIT BREAKER, 'C' CURVE	L&T	6A, 10kA	02
5	Id	'ON' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	240V AC	01
6	Id	'OFF' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, GREEN	ESBEE/VAISHNO/C&S	240V AC	01
C	**BILL OF MATERIAL FOR MODULE - (III)**				**2 Nos.**
1	CFU-B	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	03
2	CFU-B	HRC FUSE LINK	L&T/C&S/HAVELLS	2A	03
3	V	ANALOG VOLTMETER, SINGLE PHASE, SIZE-96X96 Sq. mm. CL-1.0, PTR-415AC	AE/RISHAB/NEWTEK/SECURE	0-500V	01
4	VSS	FOUR POSITION VOLTMETER SELECTOR SWITCH, ROTARY TYPE	SALZER/KAYCEE	6A	01
5	R-PHASE	'R' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, RED	ESBEE/VAISHNO/C&S	240V AC	01
6	Y-PHASE	'Y' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, YELLOW	ESBEE/VAISHNO/C&S	240V AC	01
7	B-PHASE	'B' INDICATION LAMP, 22.5 Sq. mm. DIA ,LED TYPE, BLUE	ESBEE/VAISHNO/C&S	240V AC	01
D	**BILL OF MATERIAL FOR MODULE - (V) FOR OUTGOINGS**				
1	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH SPREADER & EXTENDED ROM, Ics = 100% Icu	L&T/C&S/HAVELLS	100A, 20kA	14
2	MCCB	FP MCCB 415V, WITH THERMAL MAGNETIC BASED RELEASE FOR O/L,S/C PROTECTION WITH EXTENDED ROM, Ics = 100% Icu	L&T/C&S/HAVELLS	63A, 20kA	95

NOTE:- ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP | CHKD.: VDP | APPD.: -- | ALL DIMENSIONS IN mm. | SIGN. | TOLERANCE 5% | REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWAPPUR), TEHSIL - NOORPUR, DISTRICT HARDWAR (UTTRAKHAND) - 246747, INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	415V AC DISTRIBUTION BOARD (SA) (AB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	NIRANT KHAYY ELECTRICAL CHECK (INDIA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHCL/2024-2025/1241A-709
SH. NO.:-	01 OF 01

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ENGINEERING DRAWING DETAILS FOR

220V DC DISTRIBUTION BOARD-1(5D) & 2(6D) (AB)

PROJECT :- 765/400/220kV BIKANER-III POOLING STATION

CLIENT :- POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR :- BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP
CHKD.	VDP
APPD.	--
ALL DIMENSIONS IN mm.	SIGN.
TOLERANCE 5%	
REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II: F-III & F-V, IPHB-C, LIMBOC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	COVER PAGE
TITLE	220V DC DISTRIBUTION BOARD-1(5D) & 2(6D) (AB)
CA NO.	CC/T/W-HD/DOM/D10/23/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BIKANER-III POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-010

JOB NO. 1241A

SH. NO. 01 OF 01

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-: GUARANTEED TECHNICAL PARTICULARS/GENERAL NOTES :-

1. TYPE OF PRODUCT : FLOOR MOUNTED FIXED TYPE, COMPARTMENTALIZED & DOUBLE FRONT
2. CABLE ENTRY : BOTTOM
3. DEGREE OF PROTECTION : IP-53 (AS PER IS : IS/IEC 60947, 60529 FOR ENCLOSURE ONLY)
4. SUPPLY VOLTAGE
   - a) POWER VOLTAGE : 220V DC, 2 WIRE
   - b) CONTROL VOLTAGE : 240V AC, 220V DC
5. FABRICATION
   - a) ENCLOSURE : 2.0MM CRCA
   - b) DOORS/COVERS : 1.6MM CRCA
   - c) BASE CHANNEL : 75MM ISMC
   - d) GLAND PLATE : 3.0MM CRCA IN ALL CASES & 4.0MM THICKNESS NON MAGNETIC MATERIAL FOR SINGLE CORE POWER CABLE (REMOVABLE TYPE AS PER TS)
6. PAINTING
   - a) PRETREATMENT : 9 TANK PROCESS
   - b) PAINT TYPE : POWDER COATING
   - c) PAINT SHADE : SMOKE GREY (SHADE NO 692 OF IS-5)
   - d) PAINT THICKNESS : AS PER MQP
7. BUSBAR
   - a) MAIN BUSBAR MATERIAL : ALUMINUM E91E GRADE (IS-3082)
   - b) SLEEVE : HEAT SHRINKABLE PVC SLEEVES WITH RED, YELLOW, BLUE BLACK, GREEN COLORS
8. BUSBAR SUPPORTS : SMC/DMC
9. EARTH BUS BAR : SUITABLE SIZE OF GS THROUGH OUT THE PANEL AND HAVING TWO HOLES ON EACH AND FOR EARTH CONNECTION (AS PER GA DRAWING)
10. MINIMUM BUSBAR CLEARANCES (MAIN BUSBARS) :-
    - (a) PHASE TO PHASE : 25.00 mm
    - (b) PHASE TO NEUTRAL & POSITIVE TO NEGATIVE : 25.00 mm
    - (c) PHASE/NEUTRAL TO EARTH : 25.00 mm
11. DOORS
    - FEEDER DOORS : HINGED AND LOCKABLE
    - BUSBAR CHAMBERS : BOLTED
12. CONTROL WIRING : STANDARD PVC FLEXIBLE CU WIRE 1100V GRADE
    - AC CIRCUIT : 1.5 SQ. MM BLACK COLOR
    - DC CIRCUIT : 1.5 SQ. MM GREY FOR +VE AND WHITE FOR -VE COLOR
    - EARTHING : 2.5 SQ. MM GREEN COLOR
13. POWER WIRE : PVC FLEXIBLE FR CU WIRE 1100V GRADE (COLOR – R,Y,B, BLACK)
    - POWER CIRCUIT UP TO 20A : 4 Sq. MM
    - POWER CIRCUIT 21 TO 32A : 6 Sq. MM
    - POWER CIRCUIT 33 TO 40A : 10 Sq. MM
    - POWER CIRCUIT 40 TO 63A : 16 Sq. MM
    - ABOVE 63A : SOLID ALUMINUM LINK (@ 1.0A/Sqmm)
14. CURRENT DENSITY : SOLID ALUMINUM LINK @ 1.0A/Sqmm
15. SPACE HEATER : SPACE HEATER SHALL BE PROVIDED AT EACH CABLE ALLEY
16. NAME PLATE : NAME PLATE SHALL BE OF NON-RUSTING METAL OR 3PLY LAMICOID WITH WHITE ENGRAVED LETTERING ON BLACK BACKGROUND
17. DANGER PLATE : PRINTED DANGER PLATE ON THE EACH HORIZONTAL/ VERTICAL BUSBAR CHAMBER SHALL BE PROVIDE
18. GASKETS : NEOPRENE RUBBER GASKETS TYPE-II CLASS 2A AS PER IS : 11149 SHALL BE PROVIDED AT ALL REMOVABLE DOORS & COVERS TO MAKE THE PANEL DUST & VERMIN PROOF
19. SHROUDING : ALL LIVE PART SHALL BE SHROUDED WITH 2MM THICK HYLEM/ACRYLIC SHEET
20. ALL HINGED FRONT DOORS & COVERS SHALL BE PROVIDED WITH SUITABLE FLEXIBLE COPPER EARTHING CONNECTIONS..
21. CABLE SIZE AS PER APPROVED LT SLDs FOR POWER & CONTROL CABLE/PGCIL TS
22. ALL FUSES SHALL BE HRC TYPE WITH SHORT CIRCUIT LEVEL AS PER TS.
23. MANUFACTURING TOLERANCE TO BE AS PER IS :
    i) UP TO 50MM- ± 3% ii) 51 TO 100MM- ± 2%
    iii) 101 TO 300MM- ± 1% iv) ABOVE 300MM- ± 0.5%
24. ALL POWER TERMINAL SHALL BE STUD TYPE
25. PANEL SHALL BE EXTENDABLE FROM BOTH SIDES
26. AMBIENT TEMPERATURE CONSIDERED IS 50°C
27. MEGGAR/INSULATION VOLTAGE TEST- R-500V DC HV TEST –2.5KV FOR ONE MINUTE
28. IN ALL CIRCUIT BREAKER PANELS AT LEAST 10% SPARE TERMINALS FOR EXTERNAL CONNECTIONS SHALL BE PROVIDED AND THESE SPARE TERMINALS SHALL BE UNIFORMLY DISTRIBUTED ON ALL TERMINAL BLOCKS. SPACE FOR ADDING ANOTHER 10% SPARE TERMINALS SHALL ALSO BE AVAILABLE
29. TERMINAL BLOCKS FOR CT AND VT SECONDARY LEADS SHALL BE PROVIDED WITH TEST LINKS AND ISOLATING FACILITIES. CT SECONDARY LEADS SHALL BE PROVIDED WITH SHORT CIRCUITING AND EARTHING FACILITIES. IT SHALL BE SIMILAR TO 'ELEM.' 'CATD' – TYPE.
30. TERMINAL BLOCKS SHALL BE OF 750 VOLTS GRADE AND HAVE CONTINUOUS RATING TO CARRY THE MAXIMUM EXPECTED CURRENT ON THE TERMINALS.
31. TERMINAL BLOCKS SHALL BE ARRANGED WITH AT LEAST 100 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

DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00
	04.	–	DRAWN: MP
	03.	–	CHKD.: VDP
	02.	–	APPD.: --
	01.		ALL DIMENSIONS IN mm. SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BHD. AMBA, VILLAGE RAMPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL TECHNICAL SPECIFICATION
TITLE	220V DC DISTRIBUTION BOARD-1(50) & 2(60) (AB)
CA NO.	CC/T/W-HS/DOM/318/23/01656/WA-1/24-02943/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A

CLIENT: POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:- HIGHT TEMPT ELECTRICAL CABLES (INDIA) TRANSMISSION PROJECTS DIVISION

DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-1000	SH. NO. 01 OF 01

1 2 3 4 5 6 7 8 9

-: SYMBOLS :-

SR. NO.	DESCRIPTION	SYMBOL	SR. NO.	NAME	SYMBOL	SR. NO.	NAME	SYMBOL	SR. NO.	NAME	SYMBOL
1	CURRENT TRANSFORMER		13	CLOSING COIL	CC	25	DRAW OUT TERMINAL POWER		37	PROTECTION RELAY	
2	NEUTRAL LINK		14	SHUNT TRIP COIL	ST	26	DRAW OUT TERMINAL CONTROL		38	EARTHING	E
3	THERMOSTAT	Th	15	FUSE		27	ISOLATOR		39	EARTHING BOLT	
4	CHANGE OVER SWITCH		16	DIGITAL AMMETER	A	28	FUSE SWITCH UNIT		40	SPACE HEATER	SH
5	NO CONTACT		17	AMMETER SELECTOR SWITCH		29	TERMINAL		41	D/O ACB	
6	NC CONTACT		18	DIGITAL VOLTMETER	V	30	TERMINAL		42	ELECTRIC BELL	BB
7	MCCB (MOULDEDCASE CIRCUIT BREAKER)		19	VOLTMETER SELECTOR SWITCH		31	TERMINAL		43	ANALOG AMMETER	A
8	MINIATURE CIRCUIT BREAKER (MCB)		20	KILOWATT HOUR METER	KWH	32	PUSH BUTTON		44	ANALOG VOLTMETER	V
9	PUSH BUTTON SPRING RETURN TYPE WITH NC ELEMENT		21	CONTACTOR COIL		33	INDICATING LIGHT				
10	PUSH BUTTON SPRING RETURN TYPE WITH NO ELEMENT		22	ON DELAY TIMER COIL		35	CAPACITOR				
11	OVERLOAD RELAY (CTRL. CIRCUIT)		23	OFF DELAY TIMER COIL		34	HOOTER/BUZZER				
12	OVERLOAD RELAY (POWER CIRCUIT)		24	SWITCH/MCCB/ OPERATING KNOB		36	CONTROL TRANSFORMER				

DATE	No.	REVISIONS DESCRIPTION
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	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 218, BRD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPHB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	ELECTRICAL SYMBOL
TITLE	FOR ALL PANEL
CA NO.	CC/T/W-HS/DOM/015/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EHVT ELECTRICAL CHENNAI (HEEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-000-10

JOB NO. 1241A

SH. NO. 01 OF 01

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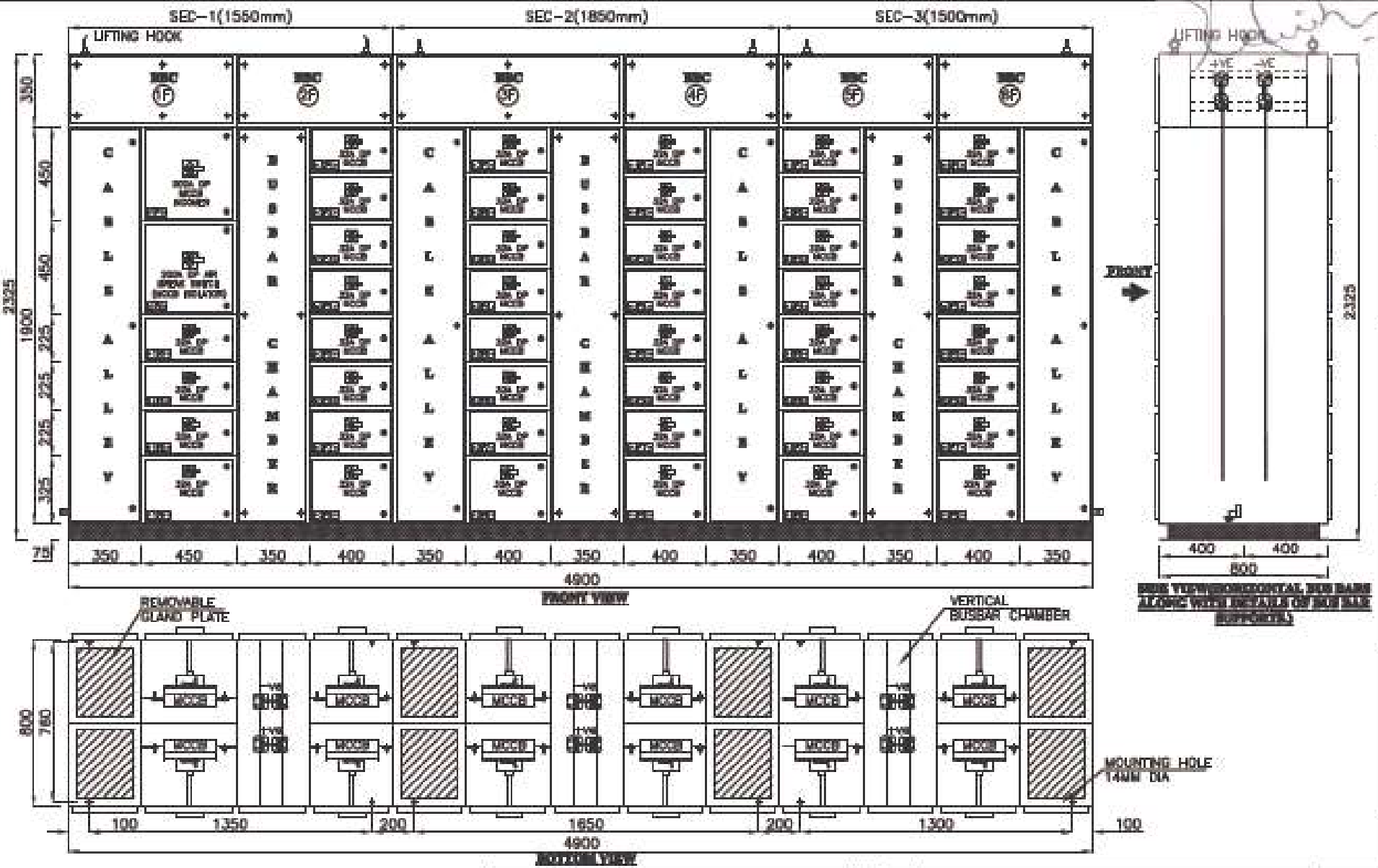

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-8 & F-9, IPHB-C, LOHARI, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/WA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCC) TRANSMISSION PROJECTS [illegible]

JOB NO. 1241A

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-110

SH. NO. 01 OF 02

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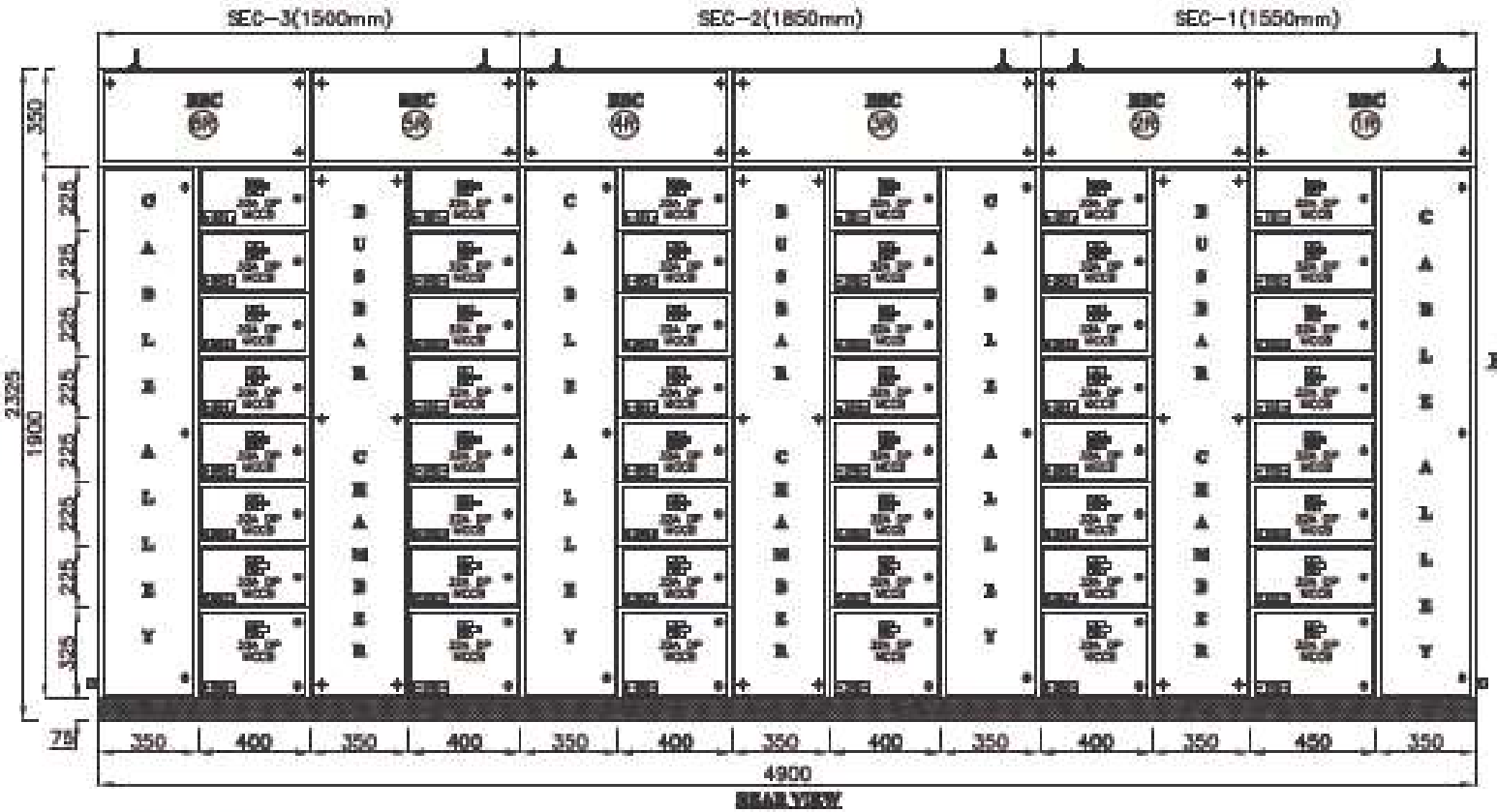
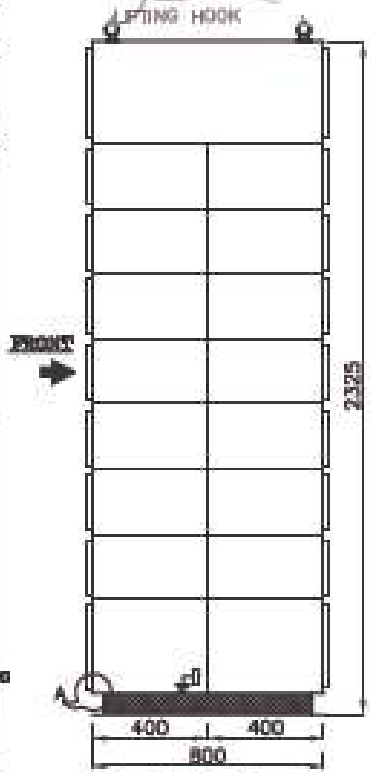


REAR VIEW



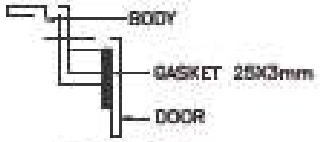
SIDE VIEW

PANEL DIMENSIONS

HEIGHT : 2325 mm.
WIDTH : 4900 mm.
DEPTH : 800 mm.

BUS BAR SIZE - (HOR./VER.)

POSITIVE : 1x40x10 Sq.mm Al.
NEGATIVE : 1x40x10 Sq.mm Al.
EARTH : 1x40X05 Sq.mm CU.



DETAIL-'A'

DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP	
	04.	-	CHKD.	VDP	
	03.	-	APPD.	--	
	02.	-	ALL DIMENSIONS IN mm.		SIGN.
	01.		TOLERANCE	±5%	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : 01332-285502 FAX : 01332-285502
UNIT-II F-61,F-67, IPHB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : info@ultimaswitchgear.com

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEMANT KUMAR ELECTRICAL CHECKER (MCEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-110

JOB NO. 1241A

SH. NO. 02 OF 02

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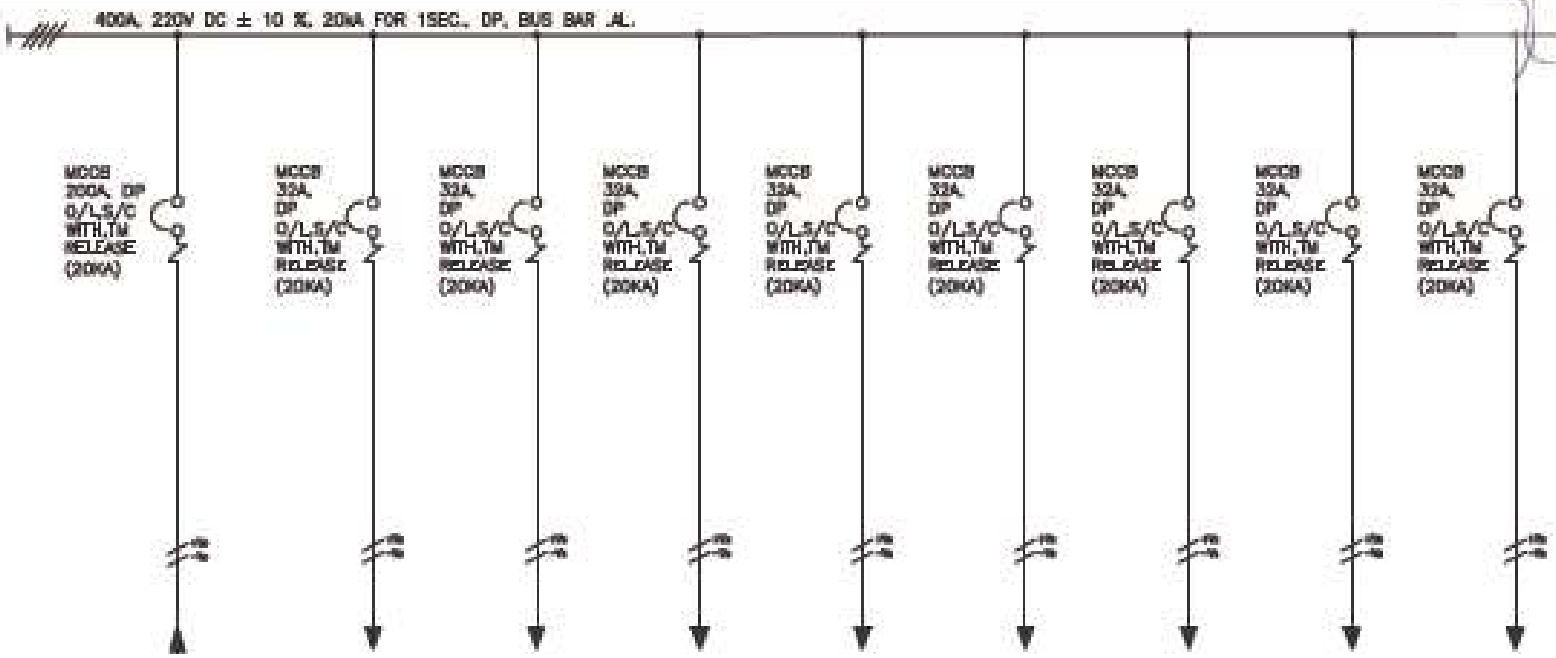

FEEDER NUMBER	1F1	1F3	1F4	1F5	1F6	2F1	2F2	2F3	2F4
MODULE TYEP	DC	X	X	X	X	X	X	X	X
FEEDER RATING	200A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	INCOMER	400 kV RELAY PANEL 401	400 kV RELAY PANEL 403	400 kV RELAY PANEL 404	400 kV RELAY PANEL 406	400 kV RELAY PANEL 407	400 kV RELAY PANEL 409	400 kV RELAY PANEL 410	400 kV RELAY PANEL 412
POWER CABLE SIZE (AL PVC)	2X1CX150 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IITBI-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-HD/DOM/318/23/01656/WA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXAVY ELECTRICAL CHENNAI (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-210

JOB NO. 1241A

SH. NO.:- 01 OF 10

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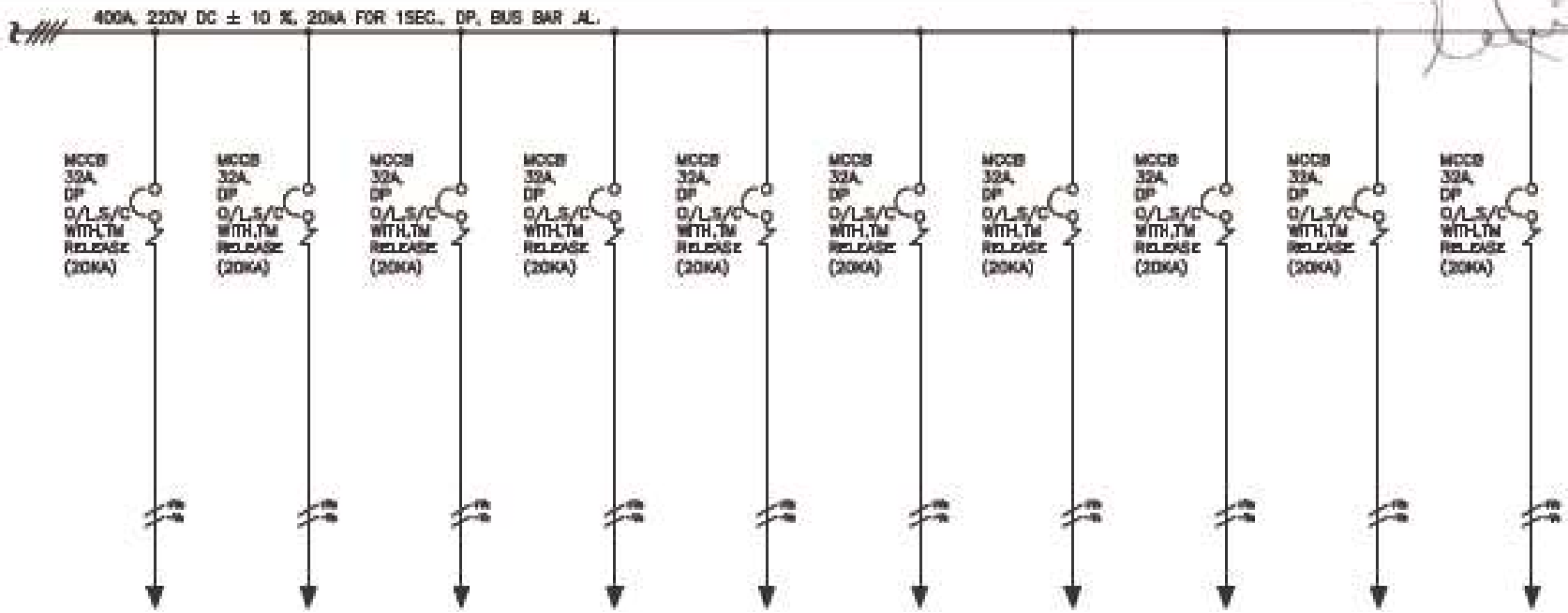

FEEDER NUMBER	2F5	2F6	2F7	2F8	3F1	3F2	3F3	3F4	3F5	3F6
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	400 kV RELAY PANEL 413	400 kV RELAY PANEL 415	400 kV RELAY PANEL 416	400 kV RELAY PANEL 418	400 kV RELAY PANEL 419	400 kV RELAY PANEL 421 (F)	400 kV RELAY PANEL 422 (F)	400 kV RELAY PANEL 423 (F)	400 kV RELAY PANEL 424	400 kV RELAY PANEL 426
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - BOCHOCH, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITIE-C, UPSIDC, SIKANDRA INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXAVY ELECTRICAL CHENNAI (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-210

JOB NO. 1241A

SH. NO.:- 02 OF 10

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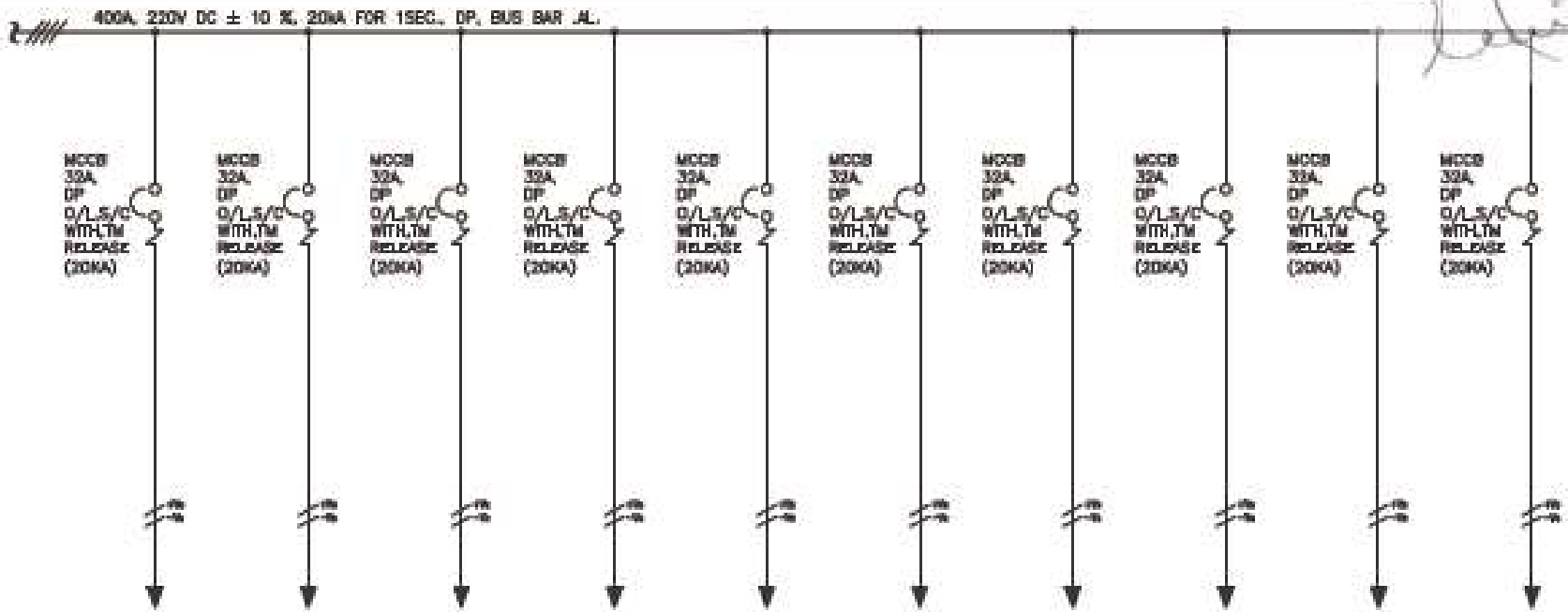

FEEDER NUMBER	3F7	3F8	4F1	4F2	4F3	4F4	4F5	4F6	4F7	4F8
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	400 kV RELAY PANEL 427	400 kV RELAY PANEL 429	400 kV RELAY PANEL 430	400 kV RELAY PANEL 432	400 kV RELAY PANEL 433 (F)	400 kV RELAY PANEL 435 (F)	400 kV RELAY PANEL 436 (F)	400 kV RELAY PANEL 438 (F)	400 kV RELAY PANEL 439 (F)	400 kV RELAY PANEL 441 (F)
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTHANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-MS/DDM/515/23/01656/WA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-210

SH. NO.:- 03 OF 10

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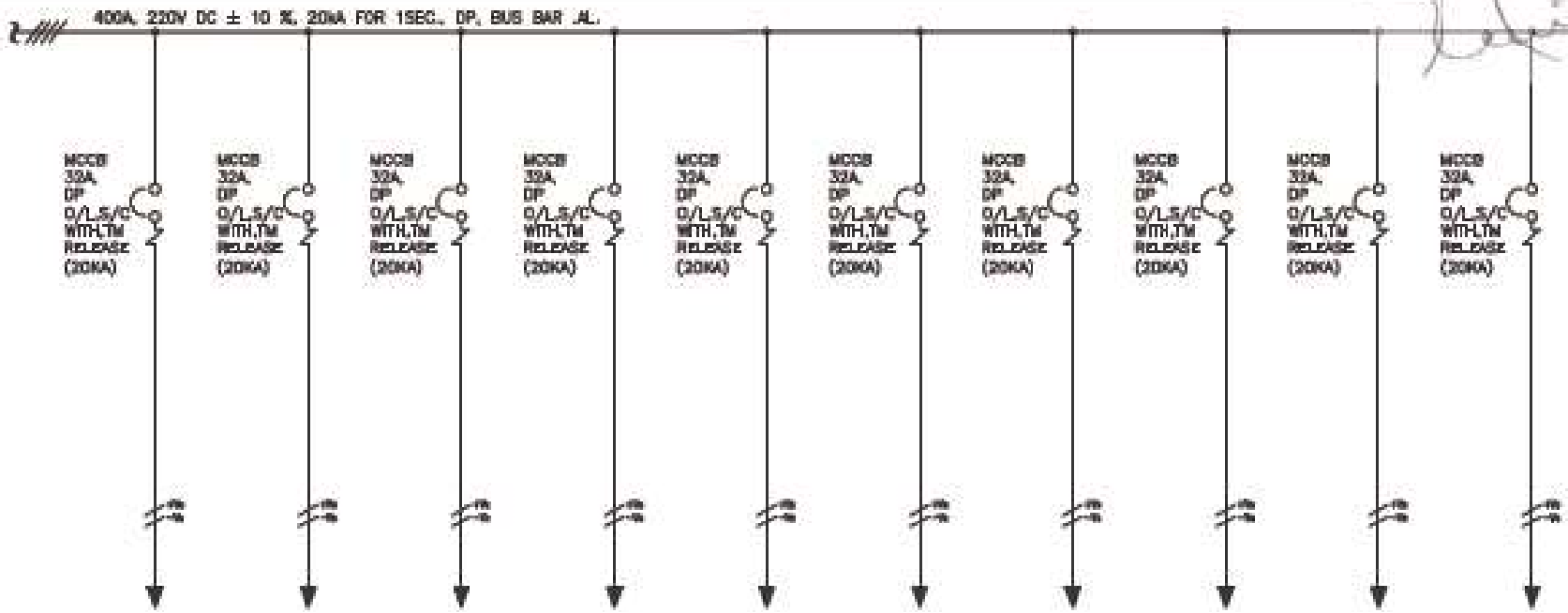

FEEDER NUMBER	5F1	5F2	5F3	5F4	5F5	5F6	5F7	5F8	6F1	6F2
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	400 kV RELAY PANEL 443 (F)	400 kV RELAY PANEL 444 (F)	400 kV RELAY PANEL 445 (F)	400 kV RELAY PANEL 447 (F)	400 kV RELAY PANEL 449 (F)	400 kV RELAY PANEL 450 (F)	400 kV RELAY PANEL 452 (F)	400 kV RELAY PANEL 453 (F)	400 kV RELAY PANEL 455 (F)	400 kV RELAY PANEL 456 (F)
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II F-II & F-V, IPHB-C, UPSIDC, SIDCUL PLUS INDUSTRIAL AREA, GRAUTHI ROORKEE - 247667 (U. K. HARDWAR) (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-MS/DDN/318/23/01656/WA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPRY ELECTRICAL CHINA (HECA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-210

JOB NO. 1241A

SH. NO.:- 04 OF 10

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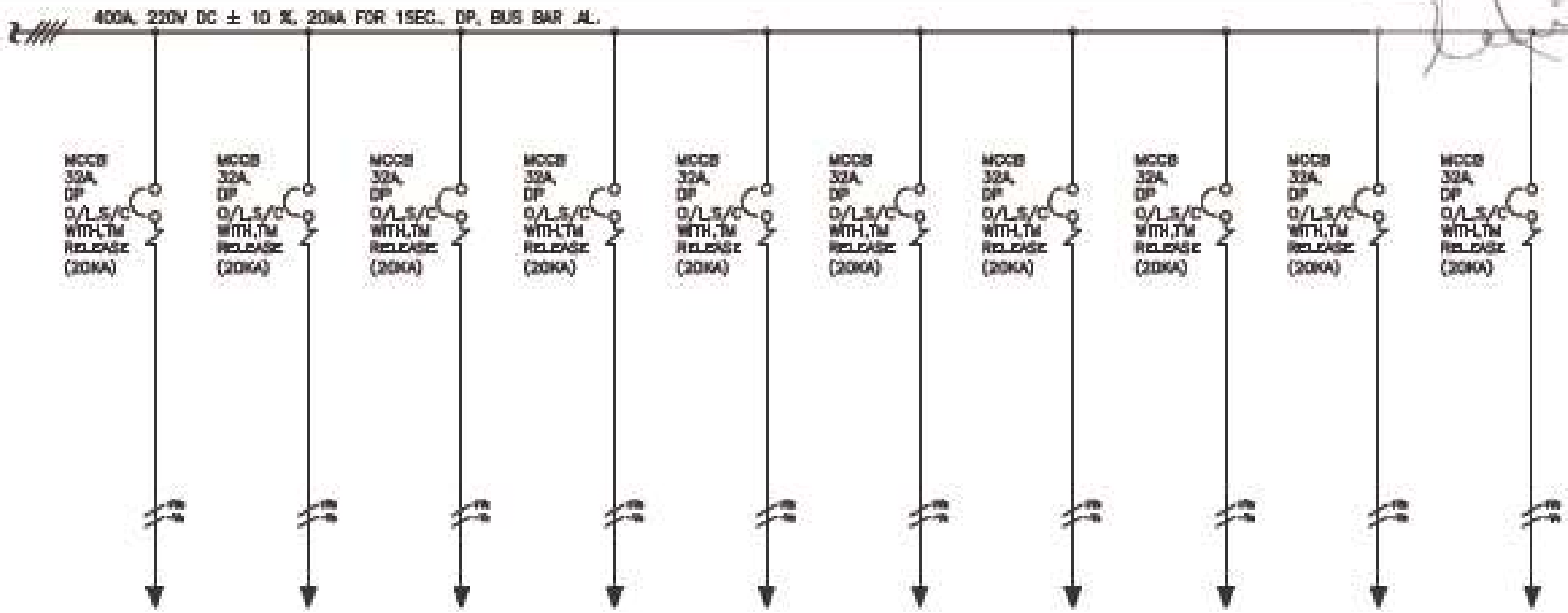

FEEDER NUMBER	6F3	6F4	6F5	6F6	6F7	6F8	1R1	1R2	1R3	1R4
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	400 kV RELAY PANEL 458 (F)	400 kV RELAY PANEL BUSBAR	400 kV RELAY PANEL BUSBAR	400 kV RELAY PANEL BUSBAR	220 kV RELAY PANEL 201	220 kV RELAY PANEL 202	220 kV RELAY PANEL 203	220 kV RELAY PANEL 204	220 kV RELAY PANEL 205	220 kV RELAY PANEL 206
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION		
	04.	–	DRAWN	MP
	03.	–	CHKD.	VDP
	02.	–	APPD.	--
	01.		ALL DIMENSIONS IN mm.	SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%	
			REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITBI-C, UPSIDC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-HD/DOM/D15/23/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPRY ELECTRICAL CHINA (HEC) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-210

JOB NO. 1241A

SH. NO.:- 06 OF 10

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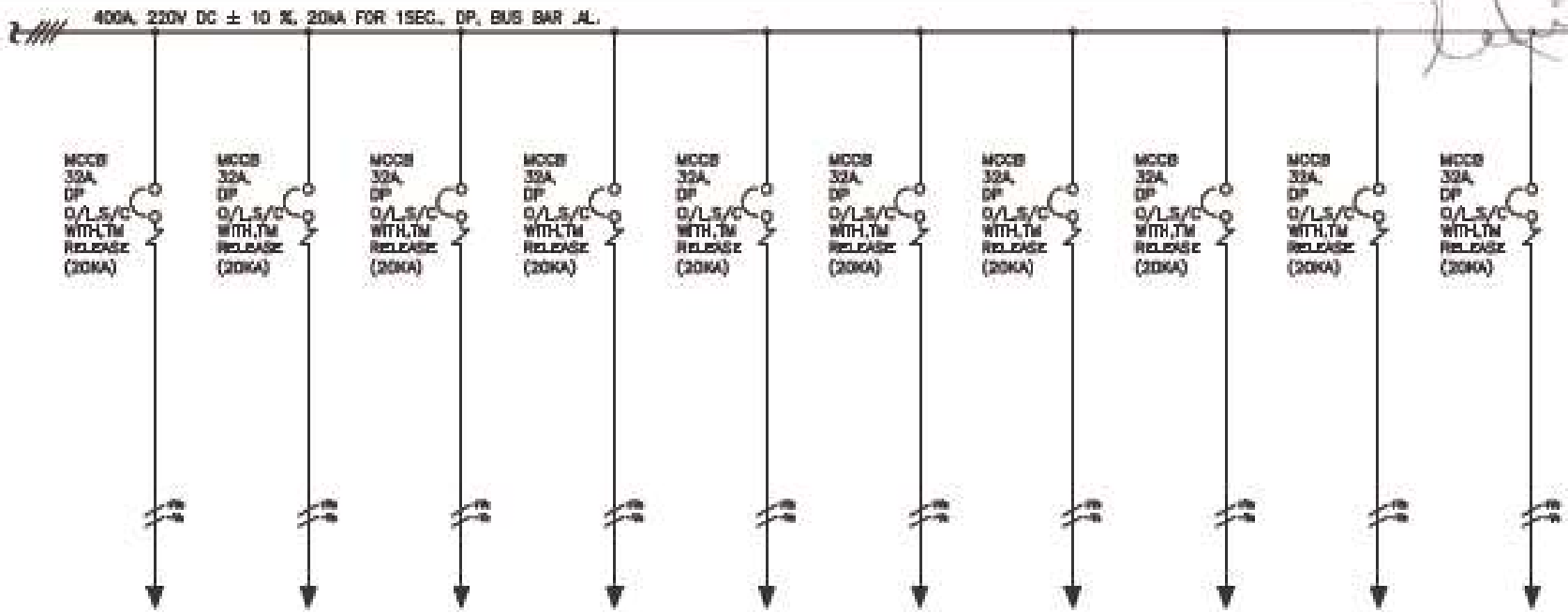

FEEDER NUMBER	1R5	1R6	1R7	1R8	2R1	2R2	2R3	2R4	2R5	2R6
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	220 kV RELAY PANEL 207	220 kV RELAY PANEL 208	220 kV RELAY PANEL 209	220 kV RELAY PANEL 210	220 kV RELAY PANEL 211	220 kV RELAY PANEL 212	220 kV RELAY PANEL 213	220 kV RELAY PANEL 214	220 kV RELAY PANEL 215	220 kV RELAY PANEL 216
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II: F-II & F-V, IPIB-C, UPSIDC, SIKANDRA INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (INDIA) TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-210

SH. NO.:- 06 OF 10

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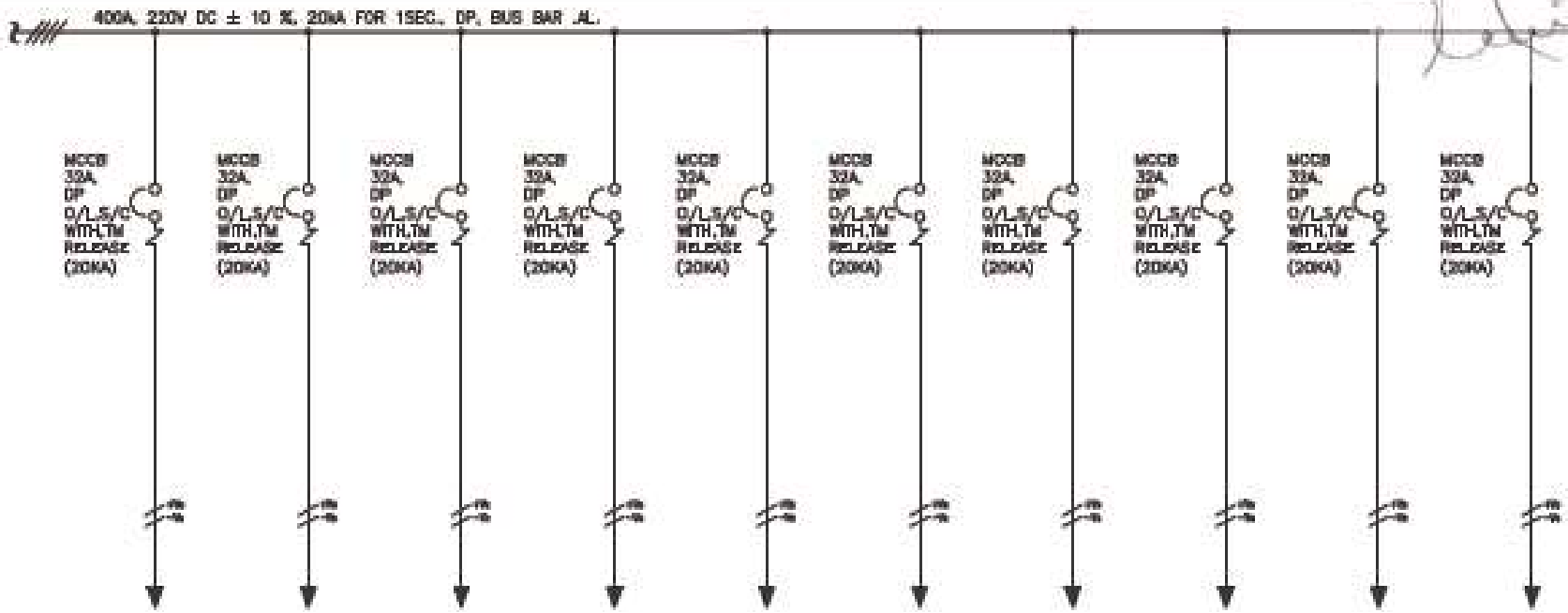

FEEDER NUMBER	2R7	2R8	3R1	3R2	3R3	3R4	3R5	3R6	3R7	3R8
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	220 kV RELAY PANEL 217 (F)	220 kV RELAY PANEL 218 (F)	220 kV RELAY PANEL 219 (F)	220 kV RELAY PANEL 220 (F)	220 kV RELAY PANEL 221 (F)	220 kV RELAY PANEL 222 (F)	220 kV RELAY PANEL 223 (F)	220 kV RELAY PANEL 224 (F)	220 kV RELAY PANEL 225 (F)	220 kV RELAY PANEL 226 (F)
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible] FAX : [illegible]
UNIT-II F-II & F-V, IITBI-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-HD/DDN/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEMANT KHAYE ELECTRICAL CONTRACTOR (HEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-210
JOB NO.	1241A
SH. NO.:-	07 OF 10

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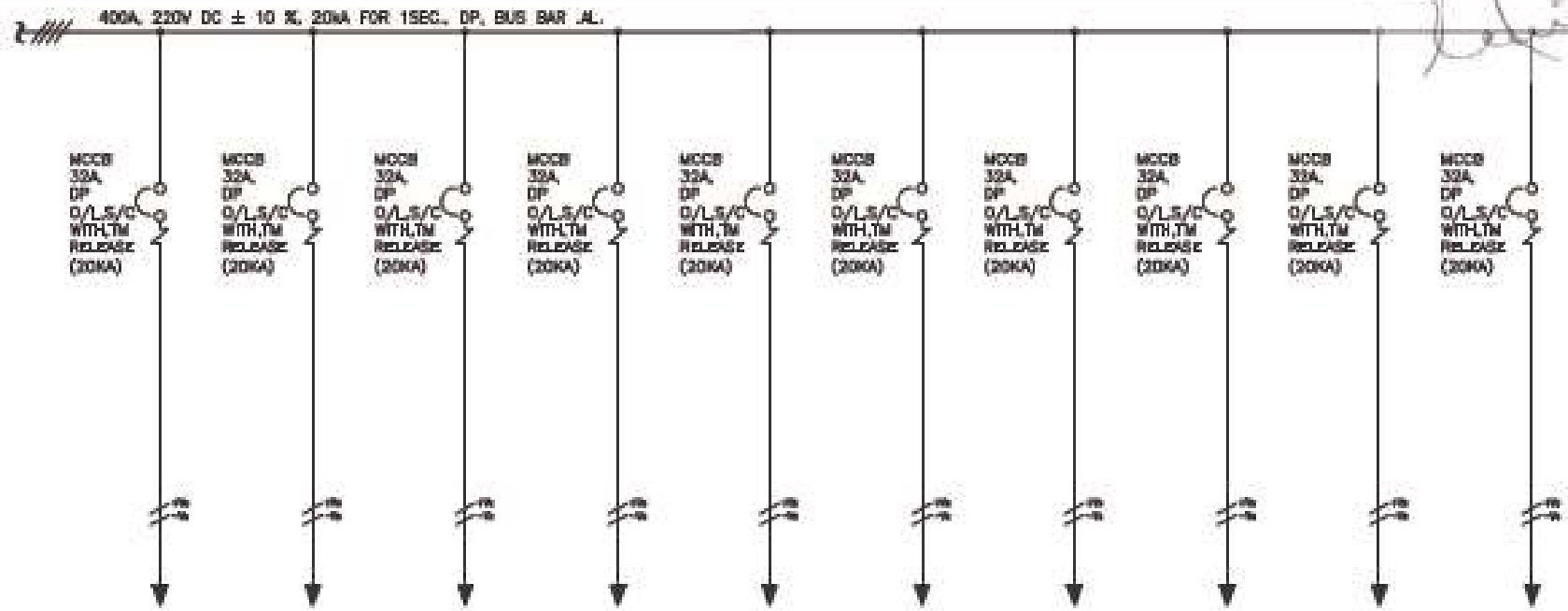

FEEDER NUMBER	4R1	4R2	4R3	4R4	4R5	4R6	4R7	4R8	5R1	5R2
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	220 kV RELAY PANEL 227 (F)	220 kV RELAY PANEL 228 (F)	220 kV RELAY PANEL 229 (F)	220 kV RELAY PANEL 230 (F)	220 kV RELAY PANEL 231 (F)	220 kV RELAY PANEL 232 (F)	220 kV RELAY PANEL 233 (F)	220 kV RELAY PANEL 234 (F)	220 kV RELAY PANEL 235 (F)	220 kV RELAY PANEL 236 (F)
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II F-II & F-V, IPHB-C, LUKSAR, SUNAURA INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING: SINGLE LINE DIAGRAM
TITLE: 220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.: CC/T/N-MS/DDN/515/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT: 765/400/220kV BHADLA-II POOLING STATION
JOB NO. 1241A
CLIENT: POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:- HEMANT KHAYE ELECTRICAL CHENNAI (INDIA) TRANSMISSION PROJECTS DIVISION
DRG. NO.: USL/PGCIL/BHEL/2024-2025/1241A-210
SH. NO.:- 08 OF 10

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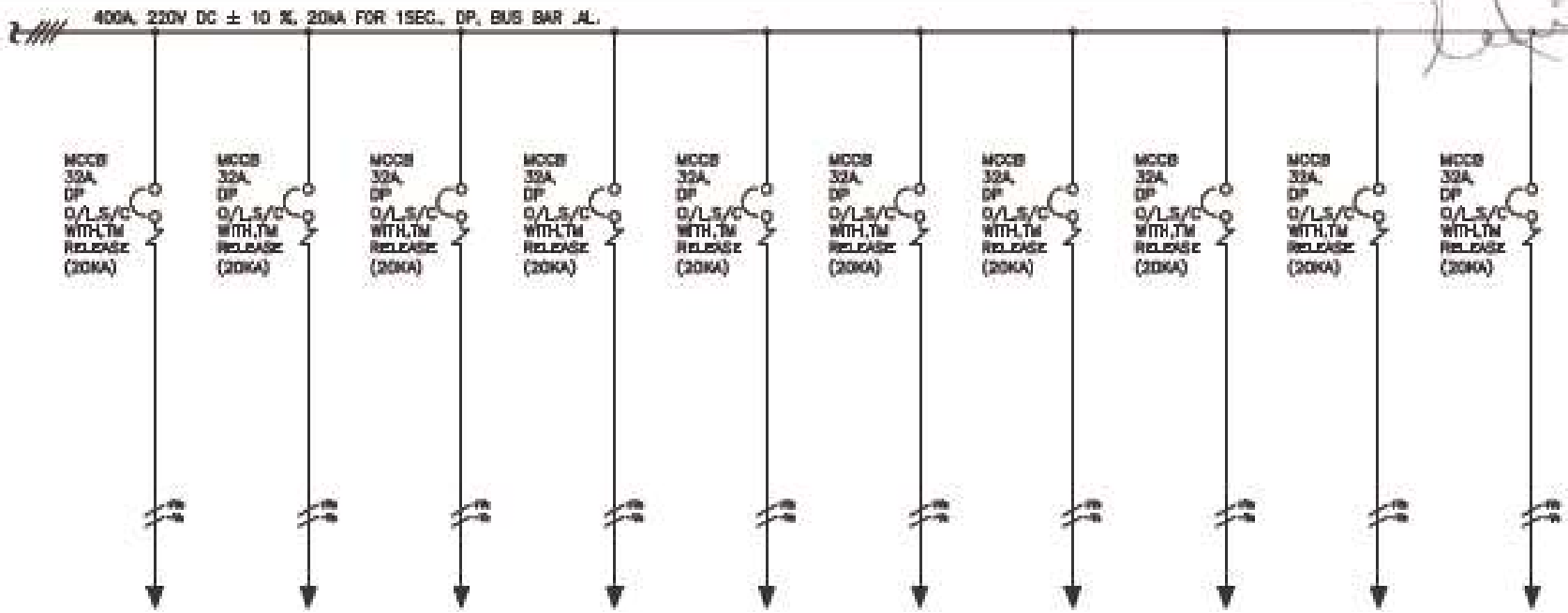

FEEDER NUMBER	5R3	5R4	5R5	5R6	5R7	5R8	6R1	6R2	6R3	6R4
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	220 kV RELAY PANEL 237 (F)	220 kV RELAY PANEL BUSBAR (F)	220 kV RELAY PANEL BUSBAR (F)	220 kV RELAY PANEL BUSBAR (F)	220 kV RELAY PANEL BUSBAR (F)	DC SUPPLY FOR ACDB-2A	SPARE-1	SPARE-2	SPARE-3	SPARE-4
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	—	--	--	—

DATE	No.	REVISIONS DESCRIPTION			
	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWAIPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITBI-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-MS/DDN/318/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXAVY ELECTRICAL CHENNAI (HEEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-210
JOB NO.	1241A
SH. NO.:-	09 OF 10

1 2 3 4 5 6 7 8 9

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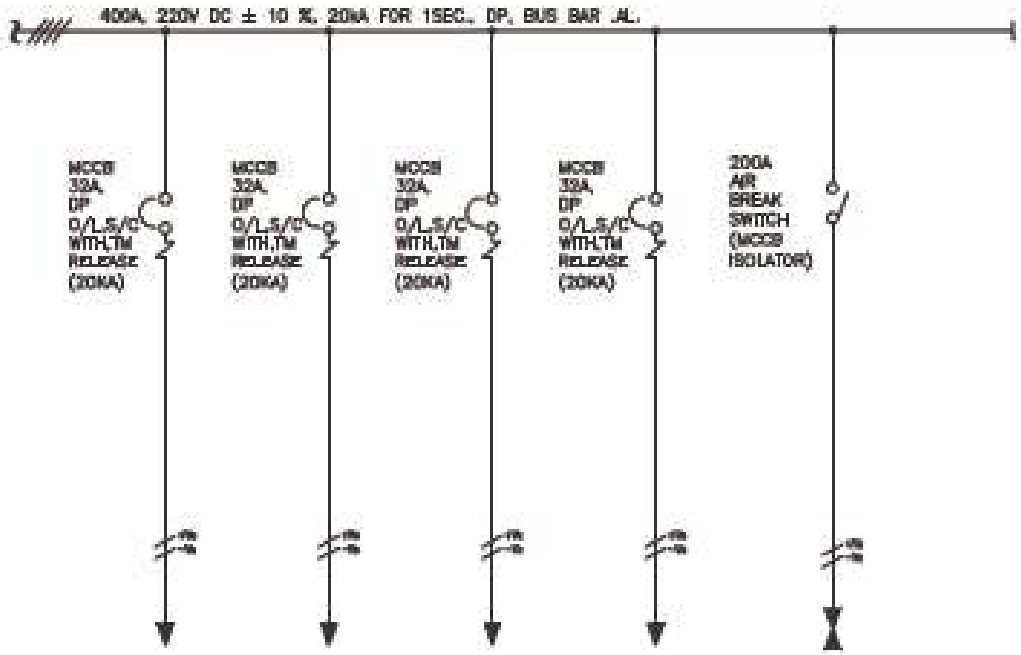

FEEDER NUMBER	6R5	6R6	6R7	6R8	1F2
MODULE TYEP	X	X	X	X	H1
FEEDER RATING	32A	32A	32A	32A	200A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB ISOLATOR
DESCRIPTION	SPARE-5	SPARE-6	SPARE-7	SPARE-8	TO 220V DCDB-1
POWER CABLE SIZE (AL PVC)	--	--	—	--	2X1CX150 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN	MP	
CHKD.	VDP	
APPD.	--	
ALL DIMENSIONS IN mm.		SIGN.
TOLERANCE 5%		
REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWAPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, UPSIDC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEL)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-210

SH. NO.:- 10 OF 10

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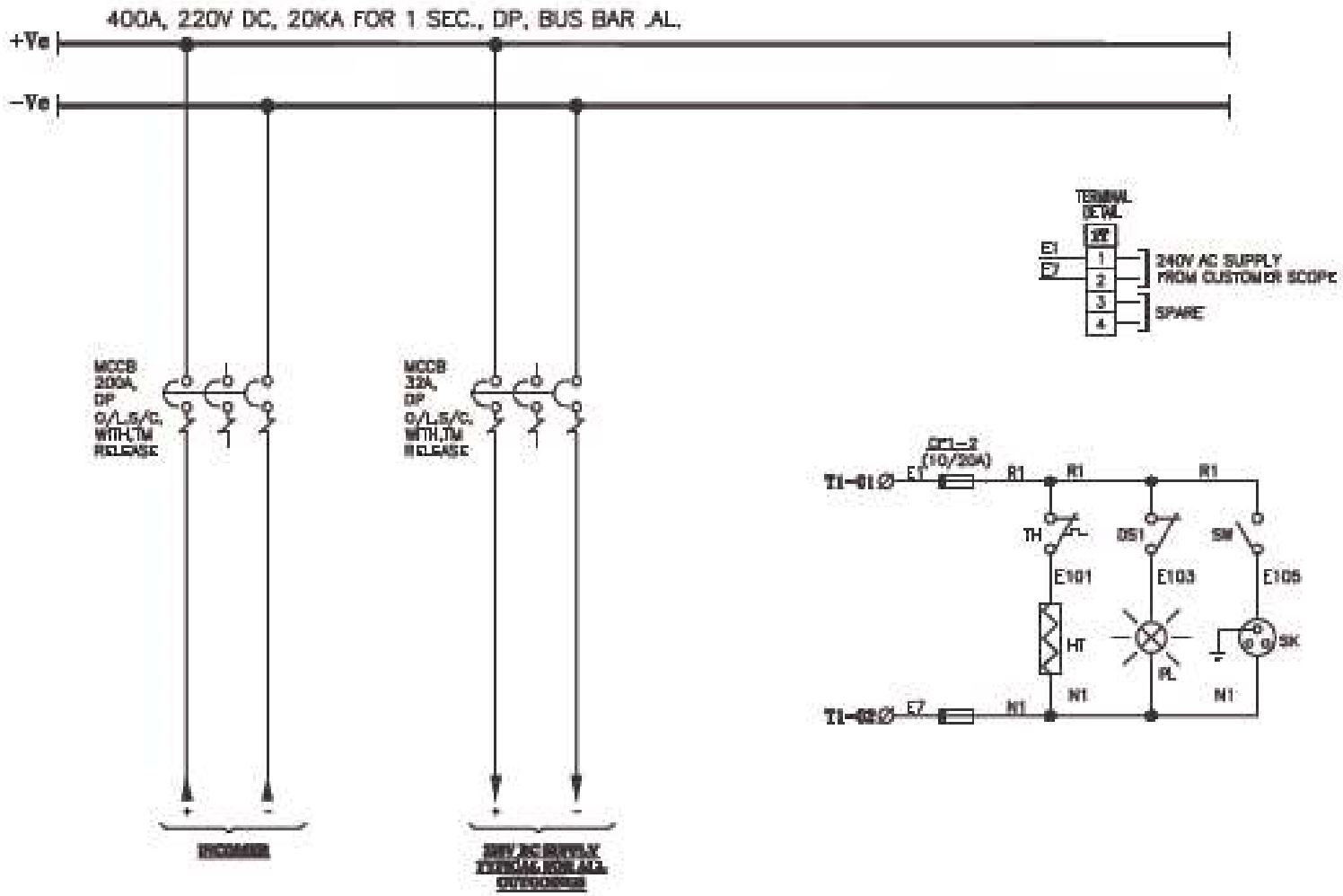

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWAPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - BADRIPUR, DELHI, TEL : [illegible]
UNIT-II F-II & F-V, IPIB-C, UPSIDC, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-MS/DDN/515/23/01696/WA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-510

JOB NO. 1241A

SH. NO.:- 01 OF 01

This Drawing & information or descriptive matter set out hereon are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing, rendering or for any other purpose without their permission.

BILL OF MATERIAL FOR 220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A	**BILL OF MATERIAL FOR INCOMER**				1 No.
1	**MCCB**	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L S/C PROTECTION WITH SPREADER LINK, ROTARY OPERATING MECHANISM (ROM), ICS – 100% ICU	L&T/C&S/HAVELLS	200A, 20kA, 220V DC	01
B	**BILL OF MATERIAL FOR MODULE (X)**				
1	**MCCB**	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L S/C PROTECTION WITH ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	32A, 20kA, 220V DC	92
C	**BILL OF MATERIAL FOR MODULE (RI)**				1 No.
1	**MCCB ISOLATOR**	DOUBLE POLE SINGLE THROUGH TYPE ON/OFF AIR BREAK SWITCH (MCCB ISOLATOR), WITH DOOR INTERLOCKING AND PAD LOCKING FACILITY	L&T/C&S/HAVELLS	200A, 220V DC	01
D	**BILL OF MATERIAL FOR MISC.**				
1	**CFI-E**	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	08
2	**CFI-E**	HRC FUSE LINK	L&T/C&S/HAVELLS	10A	08
3	**DS**	DOOR SWITCH, 1C/O	SURAJ	---	04
4	**PL**	PANEL ILLUMINATION LIGHT, 240V AC	HAVELLS	5W	04
5	**SH**	SPACE HEATER, 240V AC	HOTWEL	60W	04
6	**TH**	THERMOSTATE, 240V AC	ELCON	30 – 80°C	04
7	**SW-SOCKET**	5/15A SWITCH SOCKET	ANCHOR	---	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IPHB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	220V DC DISTRIBUTION BOARD-1(SD) & 2(SD) (AB)
CA NO.	CC/T/W-HD/DOM/318/23/01656/NOA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	MEGHAT KHAKI ELECTRICAL CHECK (MEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024–2025/1241A–710
JOB NO.	1241A
SH. NO.:-	01 OF 01

This Drawing & Information or descriptive matter set out herein are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing, rendering or for any other purpose without their permission.

ENGINEERING DRAWING DETAILS FOR

48V DC DISTRIBUTION BOARD-1(7D) & 2(8D) (AB)

PROJECT :- 765/400/220kV BIKANER-III POOLING STATION

CLIENT :- POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR :- BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
TRANSMISSION PROJECTS DIVISION

DATE	No.	REVISIONS DESCRIPTION			
	04.	-	DRAWN	MP	
	03.	-	CHKD.	VDP	
	02.	-	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
			REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-48 & F-47, IPHB-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	COVER PAGE
TITLE	48V DC DISTRIBUTION BOARD-1(7D) & 2(8D) (AB)
CA NO.	CC/T/W-MS/DOM/318/23/01656/NOA-1/24-02643/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BIKANER-III POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICAL LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-011
JOB NO.	1241A
SH. NO.	01 OF 01

This Drawing & Information or descriptive matter set out herein are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing, rendering or for any other purpose without their permission.

-: GUARANTEED TECHNICAL PARTICULARS/GENERAL NOTES :-

1. TYPE OF PRODUCT : FLOOR MOUNTED FIXED TYPE, COMPARTMENTALIZED & DOUBLE FRONT
2. CABLE ENTRY : BOTTOM
3. DEGREE OF PROTECTION : IP-53 (AS PER IS : IS/IEC 60947, 60529 FOR ENCLOSURE ONLY)
4. SUPPLY VOLTAGE
   - a) POWER VOLTAGE : 48V DC, 2 WIRE
   - b) CONTROL VOLTAGE : 240V AC, 48V DC
5. FABRICATION
   - a) ENCLOSURE : 2.0MM CRCA
   - b) DOORS/COVERS : 1.6MM CRCA
   - c) BASE CHANNEL : 75MM ISMC
   - d) GLAND PLATE : 3.0MM CRCA IN ALL CASES & 4.0MM THICKNESS NON MAGNETIC MATERIAL FOR SINGLE CORE POWER CABLE (REMOVABLE TYPE AS PER TS)
6. PAINTING
   - a) PRETREATMENT : 9 TANK PROCESS
   - b) PAINT TYPE : POWDER COATING
   - c) PAINT SHADE : SMOKE GREY (SHADE NO 692 OF IS-5)
   - d) PAINT THICKNESS : AS PER MQP
7. BUSBAR
   - a) MAIN BUSBAR MATERIAL : ALUMINUM E91E GRADE (IS-3082)
   - b) SLEEVE : HEAT SHRINKABLE PVC SLEEVES WITH RED, YELLOW, BLUE BLACK, GREEN COLORS
8. BUSBAR SUPPORTS : SMC/DMC
9. EARTH BUS BAR : SUITABLE SIZE OF GS THROUGH OUT THE PANEL AND HAVING TWO HOLES ON EACH END FOR EARTH CONNECTION (AS PER GA DRAWING)
10. MINIMUM BUSBAR CLEARANCES (MAIN BUSBARS) :-
    - (a) PHASE TO PHASE : 25.00 mm
    - (b) PHASE TO NEUTRAL & POSITIVE TO NEGATIVE : 25.00 mm
    - (c) PHASE/NEUTRAL TO EARTH : 25.00 mm
11. DOORS
    - FEEDER DOORS : HINGED AND LOCKABLE
    - BUSBAR CHAMBERS : BOLTED
12. CONTROL WIRING : STANDARD PVC FLEXIBLE CU WIRE 1100V GRADE
    - AC CIRCUIT : 1.5 SQ. MM BLACK COLOR
    - DC CIRCUIT : 1.5 SQ. MM GREY FOR +VE AND WHITE FOR -VE COLOR
    - EARTHING : 2.5 SQ. MM GREEN COLOR
13. POWER WIRE : PVC FLEXIBLE FR CU WIRE 1100V GRADE (COLOR – R,Y,B, BLACK)
    - POWER CIRCUIT UP TO 20A : 4 Sq. MM
    - POWER CIRCUIT 21 TO 32A : 6 Sq. MM
    - POWER CIRCUIT 33 TO 40A : 10 Sq. MM
    - POWER CIRCUIT 40 TO 63A : 16 Sq. MM
    - ABOVE 63A : SOLID ALUMINUM LINK (@ 1.0A/Sqmm)
14. CURRENT DENSITY : SOLID ALUMINUM LINK @ 1.0A/Sqmm
15. SPACE HEATER : SPACE HEATER SHALL BE PROVIDED AT EACH CABLE ALLEY
16. NAME PLATE : NAME PLATE SHALL BE OF NON-RUSTING METAL OR 3PLY LAMICOID WITH WHITE ENGRAVED LETTERING ON BLACK BACKGROUND
17. DANGER PLATE : PRINTED DANGER PLATE ON THE EACH HORIZONTAL/ VERTICAL BUSBAR CHAMBER SHALL BE PROVIDE
18. GASKETS : NEOPRENE RUBBER GASKETS TYPE-II CLASS 2A AS PER IS : 11149 SHALL BE PROVIDED AT ALL REMOVABLE DOORS & COVERS TO MAKE THE PANEL DUST & VERMIN PROOF
19. SHROUDING : ALL LIVE PART SHALL BE SHROUDED WITH 2MM THICK HYLEM/ACRYLIC SHEET
20. ALL HINGED FRONT DOORS & COVERS SHALL BE PROVIDED WITH SUITABLE FLEXIBLE COPPER EARTHING CONNECTIONS..
21. CABLE SIZE AS PER APPROVED LT SLDs FOR POWER & CONTROL CABLE/PGCIL TS
22. ALL FUSES SHALL BE HRC TYPE WITH SHORT CIRCUIT LEVEL AS PER TS.
23. MANUFACTURING TOLERANCE TO BE AS PER IS :
    i) UP TO 50MM- ± 3% i) 51 TO 100MM- ± 2%
    (ii) 101 TO 300MM- ± 1% ii) ABOVE 300MM- ± 0.5%
24. ALL POWER TERMINAL SHALL BE STUD TYPE
25. PANEL SHALL BE EXTENDABLE FROM BOTH SIDES
26. AMBIENT TEMPERATURE CONSIDERED IS 50°C
27. MEGGAR/INSULATION VOLTAGE TEST- R-500V DC HV TEST –2.5KV FOR ONE MINUTE
28. IN ALL CIRCUIT BREAKER PANELS AT LEAST 10% SPARE TERMINALS FOR EXTERNAL CONNECTIONS SHALL BE PROVIDED AND THESE SPARE TERMINALS SHALL BE UNIFORMLY DISTRIBUTED ON ALL TERMINAL BLOCKS. SPACE FOR ADDING ANOTHER 10% SPARE TERMINALS SHALL ALSO BE AVAILABLE
29. TERMINAL BLOCKS FOR CT AND VT SECONDARY LEADS SHALL BE PROVIDED WITH TEST LINKS AND ISOLATING FACILITIES. CT SECONDARY LEADS SHALL BE PROVIDED WITH SHORT CIRCUITING AND EARTHING FACILITIES. IT SHALL BE SIMILAR TO 'ELEM.' 'CATD' – TYPE.
30. TERMINAL BLOCKS SHALL BE OF 750 VOLTS GRADE AND HAVE CONTINUOUS RATING TO CARRY THE MAXIMUM EXPECTED CURRENT ON THE TERMINALS.
31. TERMINAL BLOCKS SHALL BE ARRANGED WITH AT LEAST 100 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

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - KOTKASIM, DISTRICT RAMGARH (UTTRAKHAND) - [illegible], INDIA, TEL : [illegible]
UNIT-II: F-II, F-V, IPHB-C, UPSIDC, SURAJPUR INDUSTRIAL AREA, GREATER NOIDA - 203205 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL TECHNICAL SPECIFICATION
TITLE	48V DC DISTRIBUTION BOARD-1(70) & 2(80) (AB)
CA NO.	CC/T/W-HS/DOM/318/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
JOB NO.	1241A
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HIGHT TEMPT ELECTRICAL CABLES (INDIA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-1100
SH. NO.	01 OF 01

-: SYMBOLS :-

SR. NO.	DESCRIPTION	SYMBOL	SR. NO.	NAME	SYMBOL	SR. NO.	NAME	SYMBOL	SR. NO.	NAME	SYMBOL
1	CURRENT TRANSFORMER		13	CLOSING COIL	CC	25	DRAW OUT TERMINAL POWER		37	PROTECTION RELAY	
2	NEUTRAL LINK		14	SHUNT TRIP COIL	ST	26	DRAW OUT TERMINAL CONTROL		38	EARTHING	E
3	THERMOSTAT	Th	15	FUSE		27	ISOLATOR		39	EARTHING BOLT	
4	CHANGE OVER SWITCH		16	DIGITAL AMMETER	A	28	FUSE SWITCH UNIT		40	SPACE HEATER	SH
5	NO CONTACT		17	AMMETER SELECTOR SWITCH		29	TERMINAL		41	D/O ACB	
6	NC CONTACT		18	DIGITAL VOLTMETER	V	30	TERMINAL		42	ELECTRIC BELL	BB
7	MCCB (MOULDEDCASE CIRCUIT BREAKER)		19	VOLTMETER SELECTOR SWITCH		31	TERMINAL		43	ANALOG AMMETER	A
8	MINIATURE CIRCUIT BREAKER (MCB)		20	KILOWATT HOUR METER	KWH	32	PUSH BUTTON		44	ANALOG VOLTMETER	V
9	PUSH BUTTON SPRING RETURN TYPE WITH NC ELEMENT		21	CONTACTOR COIL		33	INDICATING LIGHT				
10	PUSH BUTTON SPRING RETURN TYPE WITH NO ELEMENT		22	ON DELAY TIMER COIL		35	CAPACITOR				
11	OVERLOAD RELAY (CTRL. CIRCUIT)		23	OFF DELAY TIMER COIL		34	HOOTER/BUZZER				
12	OVERLOAD RELAY (POWER CIRCUIT)		24	SWITCH/MCCB/ OPERATING KNOB		36	CONTROL TRANSFORMER				

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DATE	No.	REVISIONS DESCRIPTION	DRAWN	MP
	04.	–	CHKD.	VDP
	03.	–	APPD.	--
	02.	–	ALL DIMENSIONS IN mm.	SIGN.
	01.		TOLERANCE 5%	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	REVISIONS : 00	

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BRD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-8 & F-9, IPHB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 201306 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	ELECTRICAL SYMBOL
TITLE	FOR ALL PANEL
CA NO.	CC/T/W-MS/DOM/015/23/01656/WOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	MEGHAT KHAVY ELECTRICAL CHENNAI (MEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-000-11
JOB NO.	1241A
SH. NO.	01 OF 01

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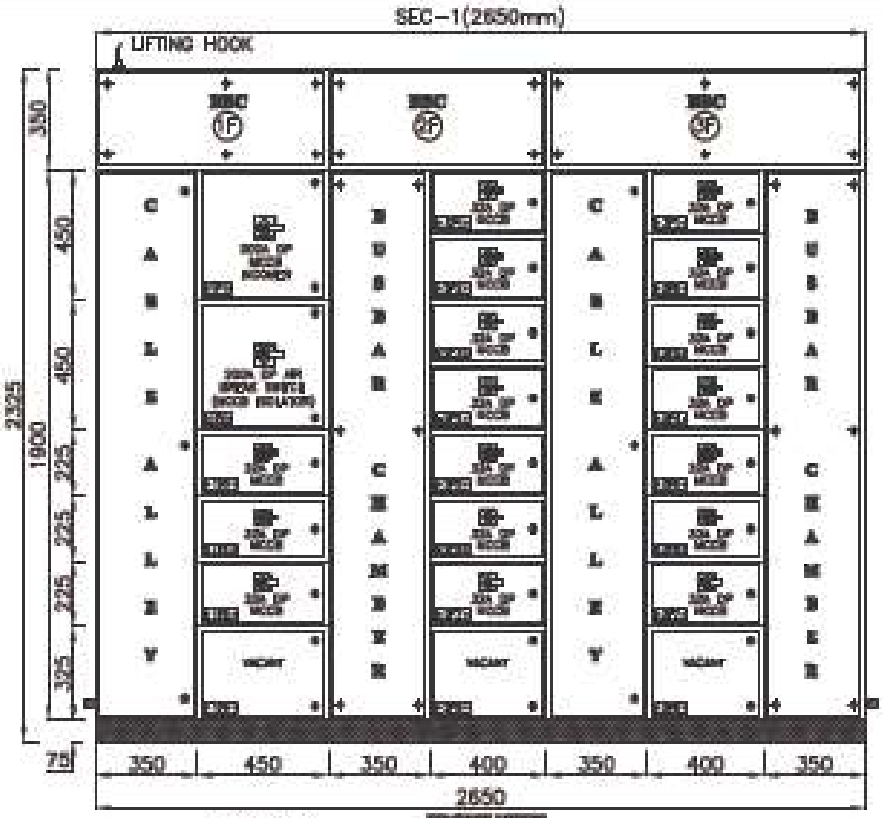
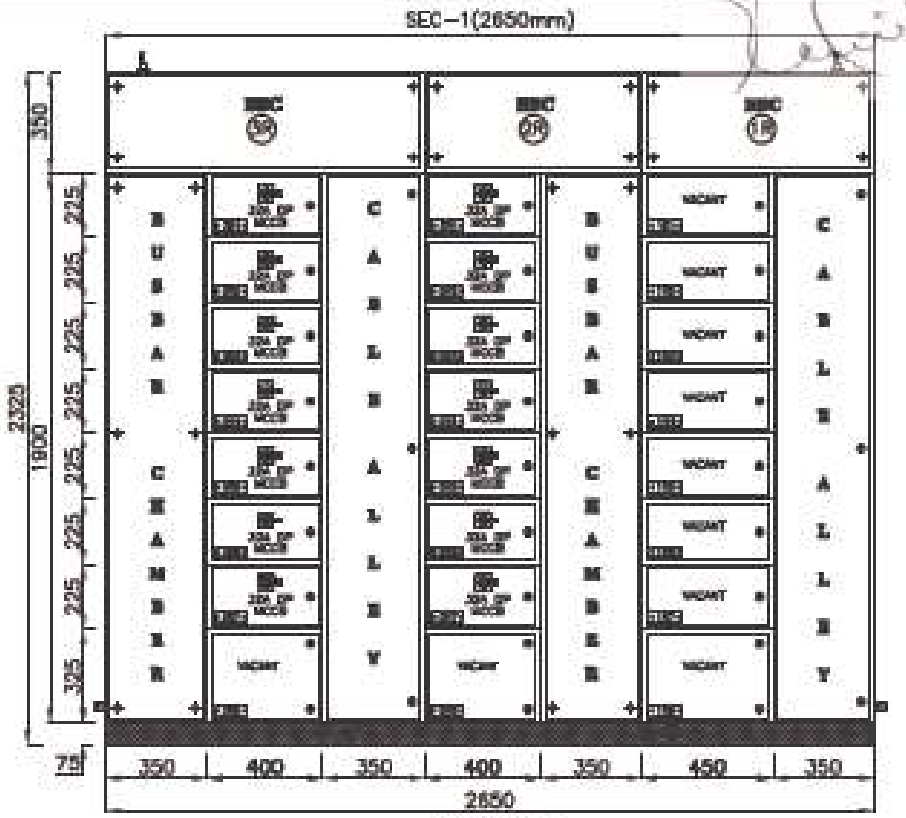
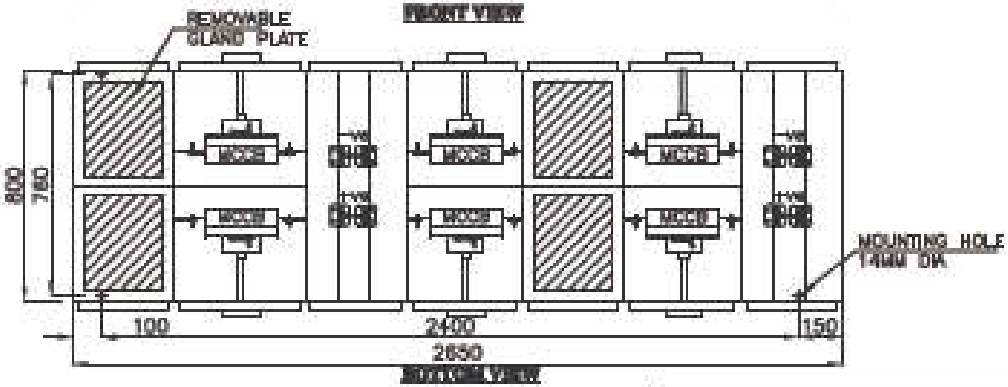


FRONT VIEW



REAR VIEW



BOTTOM VIEW

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER

ULTIMA SWITCHGEARS LTD.

UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTARKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-8 & F-9, IPSEC, LOHARI, SIDCUL INDUSTRIAL AREA, GREATER NOIDA - 201308 U. P. INDIA (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	48V DC DISTRIBUTION BOARD-1(70) & 2(60) (AB)
CA NO.	CC/T/N-MS/DOM/515/23/01696/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (MCEC)
TRANSMISSION PROJECTS DIVISION

DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-111
SH. NO.	01 OF 02

1 2 3 4 5 6 7 8 9

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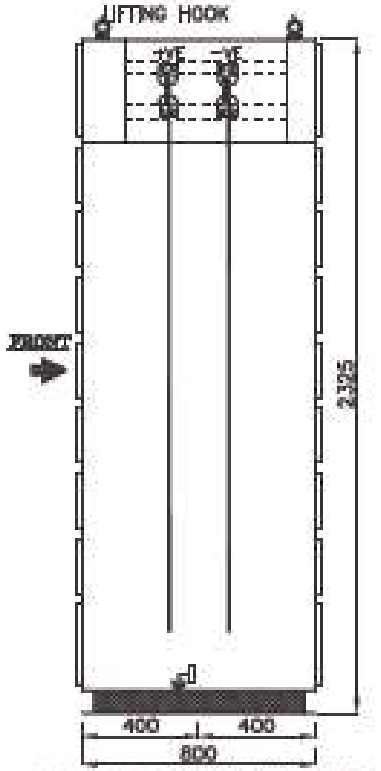
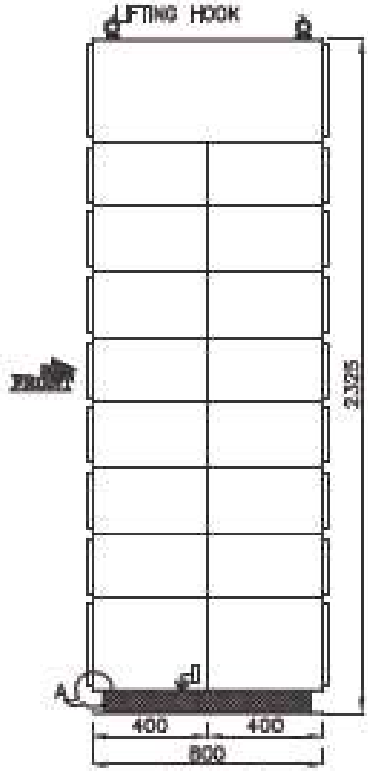


SIDE VIEW(HORIZONTAL BUS BARS ALONG WITH DETAILS OF BUS BAR SUPPORTS)



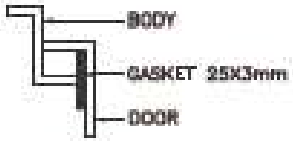
SIDE VIEW

PANEL DIMENSIONS

HEIGHT : 2325 mm.
WIDTH : 2600 mm.
DEPTH : 800 mm.

BUS BAR SIZE :- (HOR./VER.)

POSITIVE : 1x40x10 Sq.mm Alu.
NEGATIVE : 1x40x10 Sq.mm Alu.
EARTH : 1x40X10 Sq.mm CU.



DETAIL-'A'

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-68,F-70, IPHB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	GENERAL ARRANGEMENT DRAWING
TITLE	48V DC DISTRIBUTION BOARD-1(70) & 2(80) (AB)
CA NO.	CC/T/N-MS/DOM/515/23/01656/NOA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEMANT KHAYE ELECTRICAL CHECKER (HEKA) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-111

JOB NO. 1241A

SH. NO. 02 OF 02

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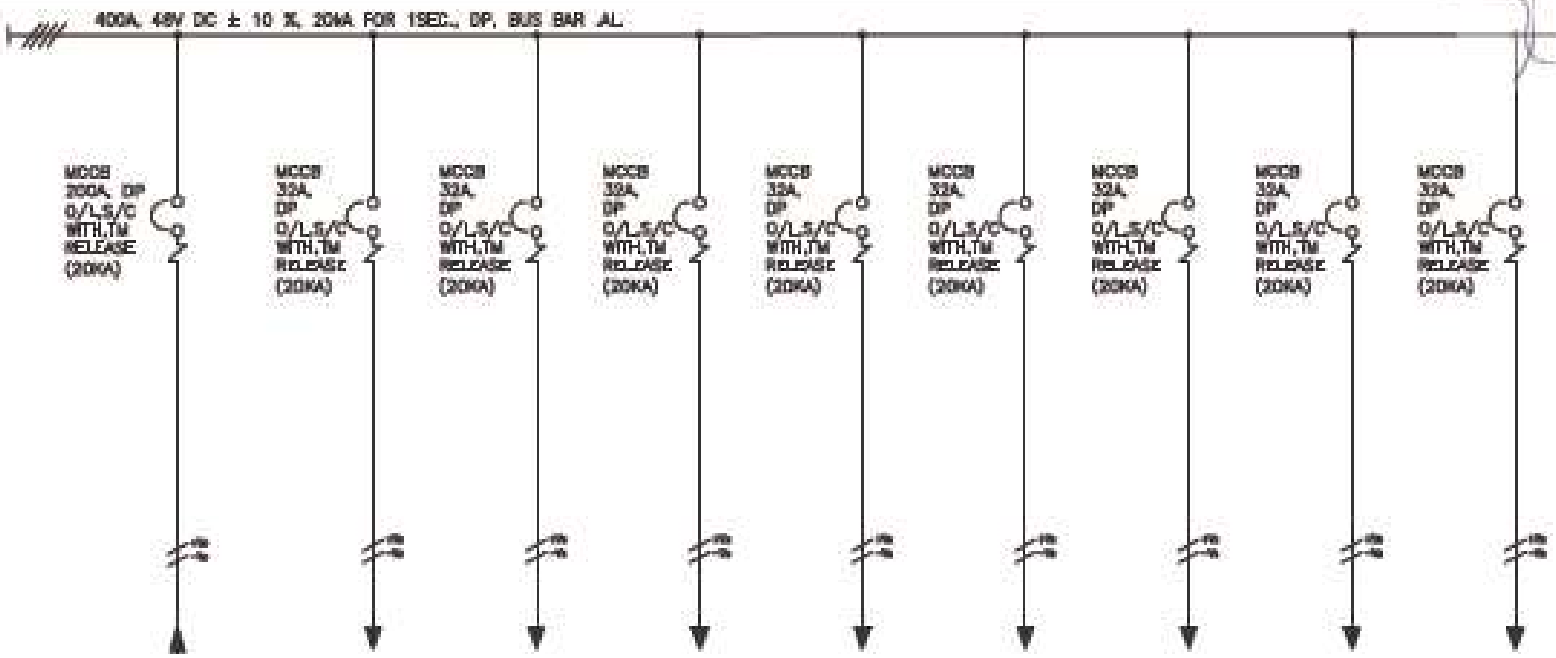

FEEDER NUMBER	1F1	1F3	1F4	1F5	2F1	2F2	2F3	2F4	2F5
MODULE TYEP	DC	X	X	X	X	X	X	X	X
FEEDER RATING	200A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	INCOMER	400 kV PLCC PANEL 401	400 kV PLCC PANEL 403	400 kV PLCC PANEL 404	400 kV PLCC PANEL 406	400 kV PLCC PANEL 407	400 kV PLCC PANEL 410	400 kV PLCC PANEL 444 (F)	400 kV PLCC PANEL 446 (F)
POWER CABLE SIZE (AL PVC)	2X1CX150 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHARWANPURA), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITB-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-1(7D) & 2(8D) (AB)
CA NO.	CC/T/W-MS/DDM/515/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HEAVY EXPRT ELECTRICAL CHECK (HECL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-211

JOB NO. 1241A

SH. NO.:- 01 OF 04

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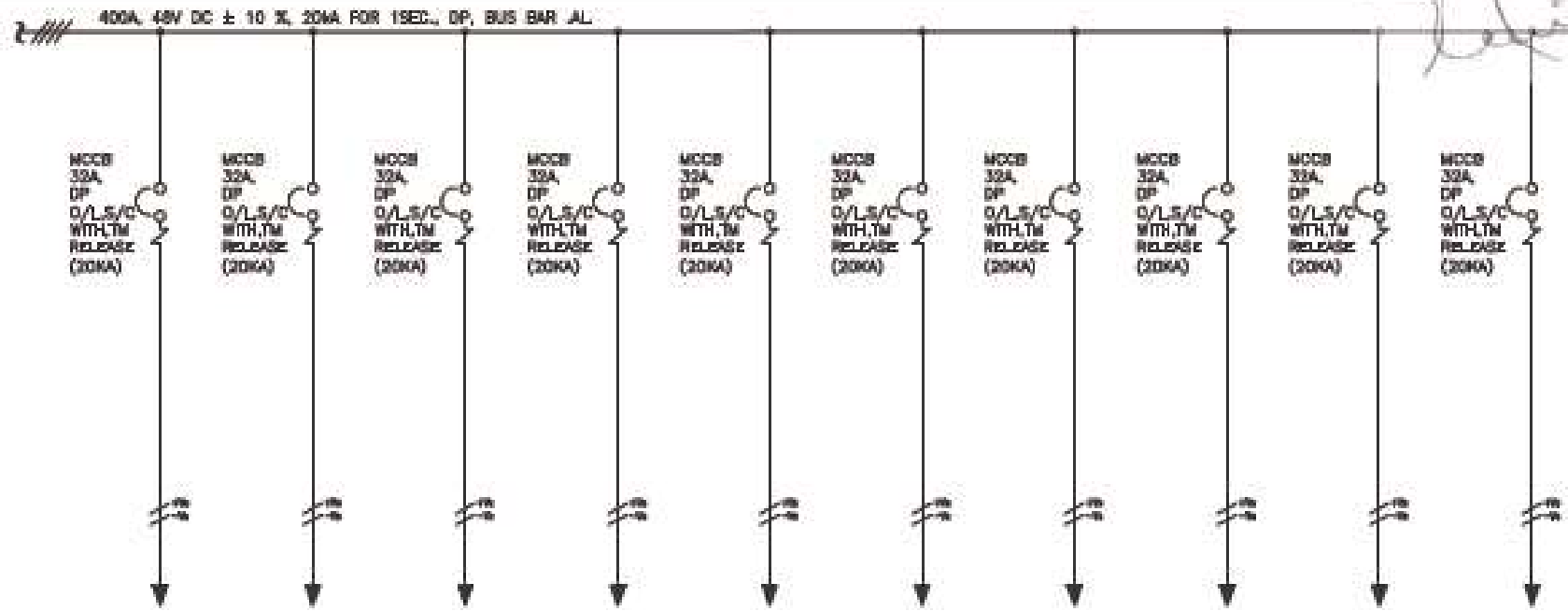

FEEDER NUMBER	2F6	2F7	3F1	3F2	3F3	3F4	3F5	3F6	3F7	2R1
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	400 kV PLCC PANEL 449 (F)	400 kV PLCC PANEL 450 (F)	400 kV PLCC PANEL 452 (F)	400 kV PLCC PANEL 453 (F)	400 kV PLCC PANEL 455 (F)	400 kV PLCC PANEL 456 (F)	400 kV PLCC PANEL 458 (F)	220 kV PLCC PANEL 201	220 kV PLCC PANEL 203	220 kV PLCC PANEL 205
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible]
UNIT-II F-II & F-V, IITBI-C, UPSIDC, SIDKULPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING: SINGLE LINE DIAGRAM
TITLE: 48V DC DISTRIBUTION BOARD-1(7D) & 2(8D) (AB)
CA NO.: CC/T/N-MS/DDA/315/23/01656/NOA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT: 765/400/220kV BHADLA-II POOLING STATION
JOB NO. 1241A
CLIENT: POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:- HEMANT KUMAR ELECTRICAL CHENGAL (INDIA) TRANSMISSION PROJECTS DIVISION
DRG. NO.: USL/PGCIL/BHEL/2024-2025/1241A-211
SH. NO.:- 02 OF 04

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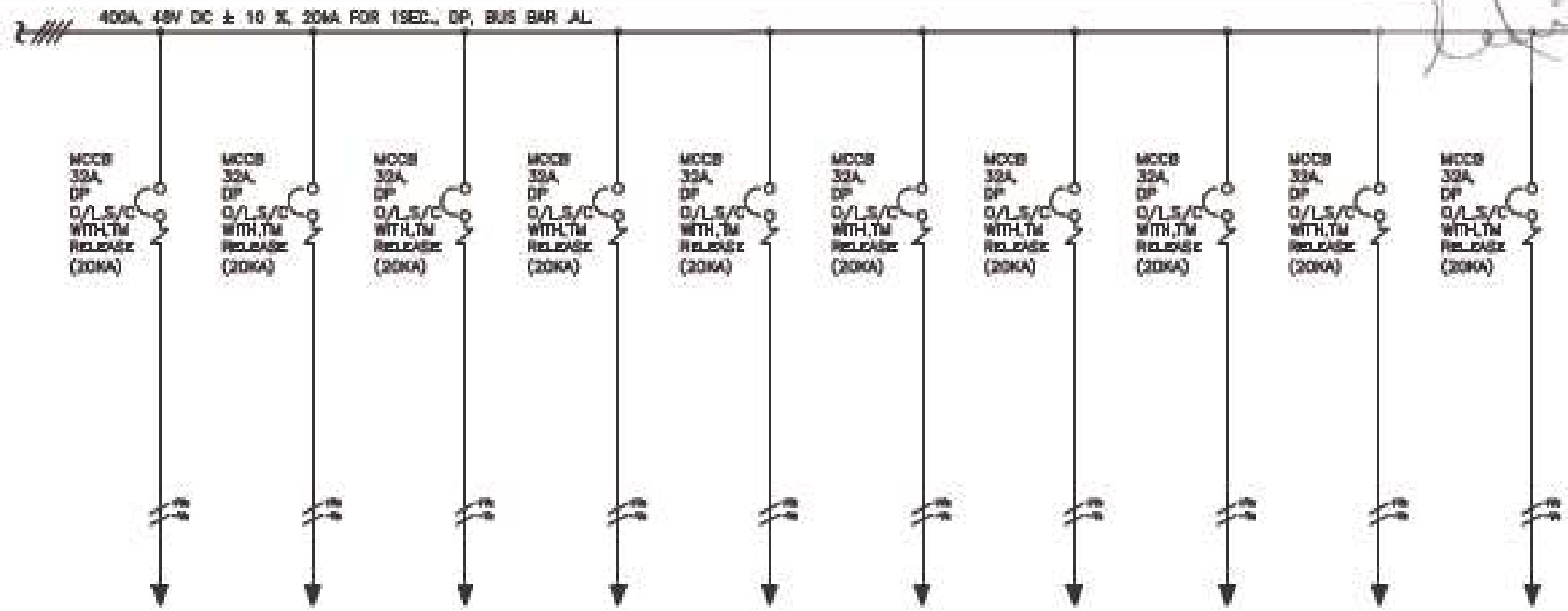

FEEDER NUMBER	2R2	2R3	2R4	2R5	2R6	2R7	3R1	3R2	3R3	3R4
MODULE TYEP	X	X	X	X	X	X	X	X	X	X
FEEDER RATING	32A	32A	32A	32A	32A	32A	32A	32A	32A	32A
FEEDER TYPE	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
DESCRIPTION	220 kV PLCC PANEL 211	220 kV PLCC PANEL 213	220 kV PLCC PANEL 217 (F)	220 kV PLCC PANEL 220 (F)	220 kV PLCC PANEL 222 (F)	220 kV PLCC PANEL 224 (F)	220 kV PLCC PANEL 226 (F)	220 kV PLCC PANEL 228 (F)	220 kV PLCC PANEL 232 (F)	220 kV PLCC PANEL 234 (F)
POWER CABLE SIZE (AL PVC)	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.	1X4CX16 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARTWANPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]
UNIT-II F-II & F-V, IITB-C, UPSIDC, SIDKUPUR INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	SINGLE LINE DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-1(70) & 2(80) (AB)
CA NO.	CC/T/W-HD/DOM/515/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION

JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHENNAI (INDIA)
TRANSMISSION PROJECTS DIVISION

DRG. NO. USL/PGCIL/BHEL/2024-2025/1241A-211
SH. NO.:- 03 OF 04

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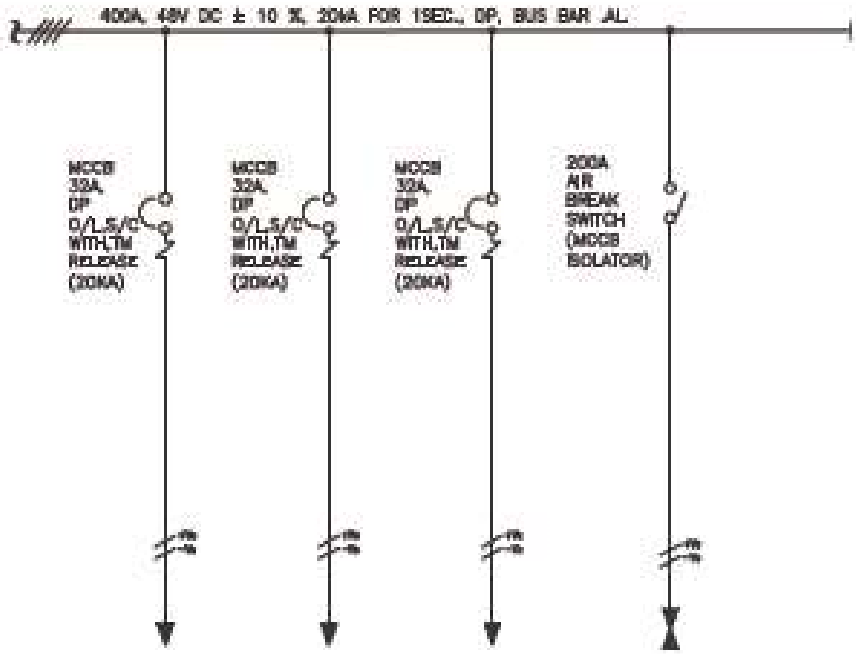

FEEDER NUMBER	3R5	3R6	3R7	1F2
MODULE TYEP	X	X	X	H1
FEEDER RATING	32A	32A	32A	200A
FEEDER TYPE	MCCB	MCCB	MCCB	ISOLATOR
DESCRIPTION	SPARE FEEDER-1	SPARE FEEDER-1	SPARE FEEDER-1	TO 48V DCDB-1
POWER CABLE SIZE (AL PVC)	--	--	--	2X1CX150 Sqmm.

DATE	No.	REVISIONS DESCRIPTION
	04.	-
	03.	-
	02.	-
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHARWAIPURI), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II F-II & F-V, IITB-C, UPSIDC, SUNAUTHI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING: SINGLE LINE DIAGRAM
TITLE: 48V DC DISTRIBUTION BOARD-1(7D) & 2(8D) (AB)
CA NO.: CC/T/N-MS/DDN/010/23/01656/NOA-1/24-02043/01 & 02 DATED 23.02.2024
PROJECT: 765/400/220kV BHADLA-II POOLING STATION
JOB NO. 1241A

CLIENT
POWER GRID CORPORATION OF INDIA LIMITED

CONTRACTOR:-
[illegible] ELECTRICAL CHINA (INDIA) TRANSMISSION PROJECTS DIVISION

DRG. NO.: USL/PGCIL/BHEL/2024-2025/1241A-211
SH. NO.:- 04 OF 04

TB202 369-10 02369-E-CAT-RDA-TSMTR-DRG-0-0/CAT-II/Page: 265 of 269

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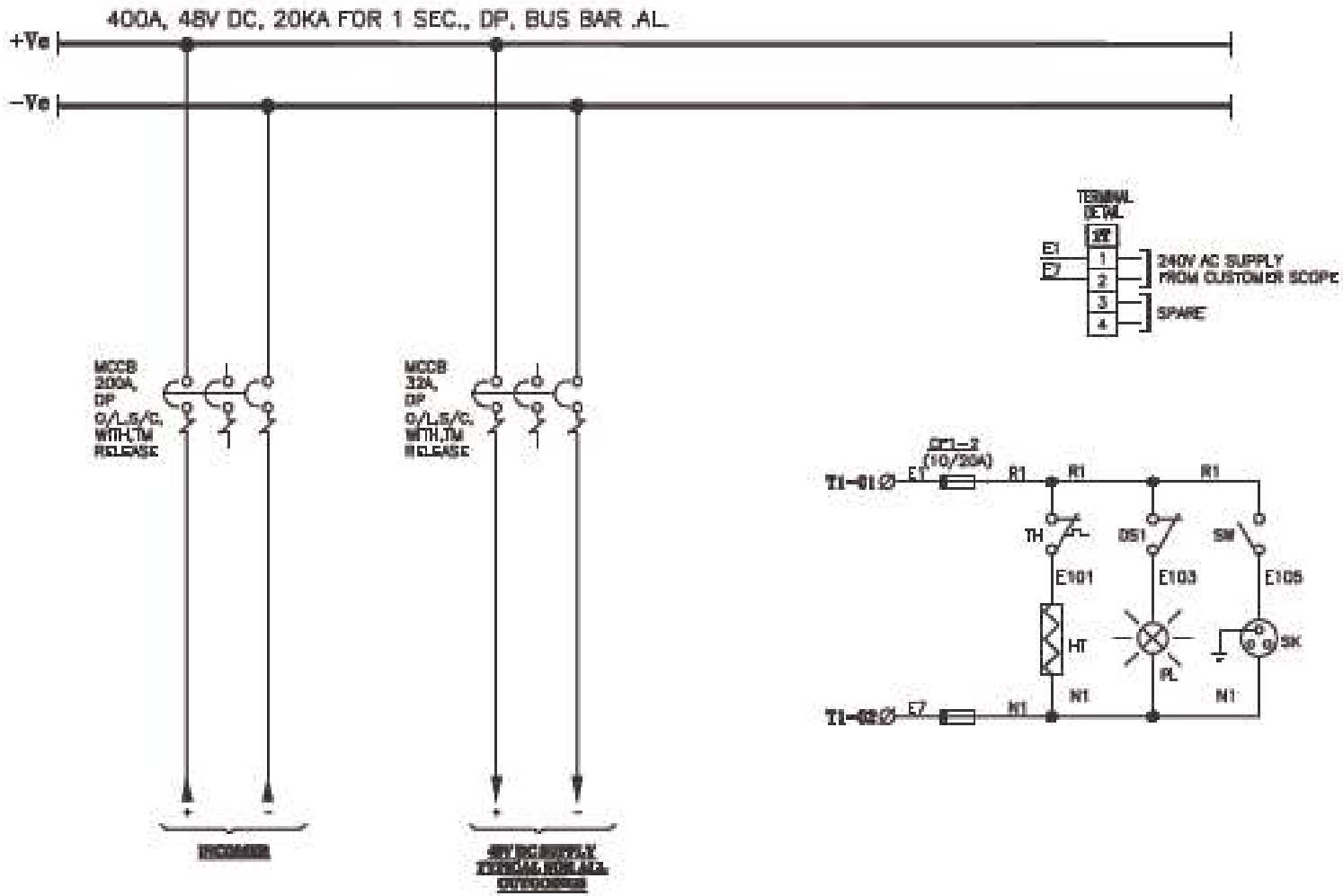

	04.	–	DRAWN	MP	
	03.	–	CHKD.	VDP	
	02.	–	APPD.	--	
	01.		ALL DIMENSIONS IN mm.		SIGN.
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL	TOLERANCE 5%		
DATE	No.	REVISIONS DESCRIPTION	REVISIONS : 00		

MANUFACTURER

ULTIMA SWITCHGEARS LTD.

UNIT-I KHASRA NO. 318, 319, AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL : [illegible] FAX : [illegible]

UNIT-II F-61,F-67, IPSEC, LOHSIGE, SUNAUPUR INDUSTRIAL AREA, GREATER NOIDA - 201308 G. B. NAGAR (U.P.) INDIA

E-mail : [illegible]

DRAWING	SCHEMATIC DIAGRAM
TITLE	48V DC DISTRIBUTION BOARD-1(70) & 2(80) (AB)
CA NO.	CC/T/W-MS/DOM/515/23/01656/WA-1/24-02843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	BHARAT HEAVY ELECTRICALS LIMITED (BHEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024-2025/1241A-511
JOB NO.	1241A
SH. NO.:-	01 OF 01

This Drawing & information or descriptive matter set out hereon are the confidential property of ULTIMA SWITCHGEARS LIMITED & must not be disclosed, copied, loaned or used for manufacturing, rendering or for any other purpose without their permission.

BILL OF MATERIAL FOR 48V DC DISTRIBUTION BOARD-1(TD) & 2(SD) (AB)

S.NO.	ITEM CODE	DESCRIPTION	MAKE	RATING	QTY.
A	BILL OF MATERIAL FOR INCOMER				1 No.
1	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L S/C PROTECTION WITH SPREADER LINK, ROTARY OPERATING MECHANISM (ROM), ICS – 100% ICU	L&T/C&S/HAVELLS	200A, 20kA, 48V DC	01
B	BILL OF MATERIAL FOR MODULE (O)				
1	MCCB	DP MCCB, WITH THERMAL MAGNETIC BASED RELEASE FOR 80–100 % O/L S/C PROTECTION WITH ROTARY OPERATING MECHANISM (ROM)	L&T/C&S/HAVELLS	32A, 20kA, 48V DC	92
C	BILL OF MATERIAL FOR MODULE (RI)				1 No.
1	MCCB ISOLATOR	DOUBLE POLE SINGLE THROUGH TYPE ON/OFF AIR BREAK SWITCH (MCCB ISOLATOR), WITH DOOR INTERLOCKING AND PAD LOCKING FACILITY	L&T/C&S/HAVELLS	200A, 48V DC	01
D	BILL OF MATERIAL FOR MISC.				
1	CFI-B	HRC FUSE BASE	L&T/C&S/HAVELLS	20A	08
2	CFI-B	HRC FUSE LINK	L&T/C&S/HAVELLS	10A	08
3	DS	DOOR SWITCH, 1C/O	SURAJ	---	04
4	PL	PANEL ILLUMINATION LIGHT, 240V AC	HAVELLS	5W	04
5	SH	SPACE HEATER, 240V AC	HOTWEL	60W	04
6	TH	THERMOSTATE, 240V AC	ELCON	30 – 80°C	04
7	5W-SOCKET	5/15A SWITCH SOCKET	ANCHOR	---	01

NOTE:– ALL COMPONENTS SHALL BE POWER GRID (QA&I) APPROVED MAKE

DATE	No.	REVISIONS DESCRIPTION
	04.	–
	03.	–
	02.	–
	01.	
29.01.2025	00.	FIRST SUBMISSION FOR APPROVAL

DRAWN: MP
CHKD.: VDP
APPD.: --
ALL DIMENSIONS IN mm. SIGN.
TOLERANCE 5%
REVISIONS : 00

MANUFACTURER
ULTIMA SWITCHGEARS LTD.
UNIT-I: KHASRA NO. 318, BTD. AREA, VILLAGE RAIPUR (BHAGWANPUR), TEHSIL - ROORKEE, DISTRICT HARDWAR (UTTRAKHAND) - 247667, INDIA, TEL. : [illegible]
UNIT-II: F-II & F-V, IPIB-C, UPSIDC, SIDKULI INDUSTRIAL AREA, GREATER NOIDA - 203207 G. B. NAGAR (U.P.) INDIA
E-mail : [illegible]

DRAWING	BILL OF MATERIAL
TITLE	48V DC DISTRIBUTION BOARD–1(TD) & 2(SD) (AB)
CA NO.	CC/T/N-MS/DOM/318/23/01656/NOA-1/24-102843/01 & 02 DATED 23.02.2024
PROJECT	765/400/220kV BHADLA-II POOLING STATION
CLIENT	POWER GRID CORPORATION OF INDIA LIMITED
CONTRACTOR:-	HIGHAT KHAIRY ELECTRICAL CHENNAI (HEEL) TRANSMISSION PROJECTS DIVISION
DRG. NO.	USL/PGCIL/BHEL/2024–2025/1241A–711
JOB NO.	1241A
SH. NO.:-	01 OF 01

PROCEDURE FOR WELDING OF ALUMINIUM BUSES

A. Recommended welding procedures to insure a sound weld are as follows:

Pure aluminum melts at 660 Deg. C while aluminum alloy melts in the range of 519 Deg. C depending on the alloy content of the particular metal involved. When aluminum alloy are heated there is no change in color. This makes it difficult, if not impossible; to tell metal is near the welding temperature.

The ever present surface oxide films on aluminum have a melting point of 1982 Deg. C. The parent aluminum or aluminum alloy can therefore be melted without fusing the surface oxides. Unless this film is removed, cleanliness of the molten filler metal and the parent metal cannot be completed and both strength and conductivity may be sacrificed. Therefore, it is of prime importance that aluminum oxides be removed from the aluminum alloys before welding is started. In the shielded arc welding method the shielding gas has a tendency to clean the material as welding progresses.

B. CLEANING OF BUSES & FITTINGS:

It is very important to remove all greases and oxides from the surfaces to be welded. This can be accomplished by using a mild alkaline solution or standard degreasing solution. The preferred method is to use a stainless steel wire brush and vigorously scrub the surfaces to be welded. The stainless steel brushes are speeified because the stainless steel has fewer tendencies to pick up particles of aluminum.

C. WELDING METHODS

The following types of welding methods for welding aluminum fittings and buses are recommended.

1. TUNGESTEN-ARC WELDING (TIG)

The inert-gas shielded tungsten arc process is widely used for welding aluminum bus fittings. In this process the arc is established between a non-consumable tungsten electrode and the section to be welded. Inert gas envelopes the arc to prevent oxidation during welding.

Hence no flux is required. A bare filler rod supplies filler metal to the weld area. To initiate the arc the tungsten eleetrode is placed in contact with the component and then withdrawn to establish an arc length of approximately 3/16". The arc is given a circular motion until the base metal liquefies and the weld puddle is established. Filler metal is added by hand as required. In this process, if more than one pass is required for a sufficient weld, the weld should be wire brushed between passes, to remove any surface dirt or oxides which have accumulated from the previous pass. Since no flux is used the finished weld does not require cleaning. In this process the heat of the tungsten arc is concentrated in a smaller area and is much faster than the conventional type of welding and distortion of the weld is negligible since the heat is concentrated in a small area. In this process, if thickness is greater than 0.5" arc to be welded, pre-heating of parts will increase the arc speed.

2. METALLIC ARC INERT GAS SHIELDED WELDING

MIG welding process combines the advantages of tungsten arc welding with the increased welding speed. Welding can be done from any position and the process can be either manual or automatic, Manual welding techniques are somewhat different from other methods. However, a welder can be trained to use the MIG process with only a few days concentrated training. In the MIG process the bare filler rod is supplied as a coil of bare wire. In the commercially available equipment this wire is added to the weld at predetermined rate by a motor driven feed that can be adjusted to the magnitude of the welding current. In this process as well as the tungsten arc process, gas forms a shield around the arc to prevent oxidation during welding.

Either helium, argon or a mixture of helium and argon are suitable shielding gases. Pure argon is most widely used on the gas arc usually mixed to combine the hotter are argon. If exeeptionally hot are charaeteristies are required pure helium can be substituted for the gas mixture. Precaution should be exercised if this substitution is made in that it is very easy to burn through the items that are to be welded with a pure helium atmosphere.

As it is readily apparent, the basic difference between the two types of welding apparatus is the automatic feeding mechanism for the filler wire. In both types of apparatuses the electrode holder and the welding gun can or cannot be eooled by water. If welding currents of more than 125 Amps are required, both methods will have to have water cooling apparatuses to the electrode holder and the welding gun.

D.WELDERS QUALIFICATIONS

No welding should be done until the operator has had experience with welding aluminum alloys by the methods described above, Men with previous experience with in metal welding should be selected for training in welding aluminum for a period of training of not less than one week after which time the man can be considered to be proficient in the use of the equipment and in the welding of aluminum joints. After this period there should be no difficulty experienced in welding aluminum alloys. It is suggested, if practical, that welders should practice on actual fittings or buses before proceeding with the welding of the required job.

The following is the recommended specification for the current fittings wire feeds, gas flows etc. These specifications are of a general nature to the extent that many factors have to be considered such as:

1. Type of equipment used, whether water cooled or not.
2. The size and mass of the piece to be welded.
3. The position of the weld.
4. And most important of all, the operator's skill
5. All persons in the welding area would wear the proper shields. The arc is approximately twice as strong as the standard AC welding arc. Extreme caution should be exercised for the protection of eyes.

ACCEPTANCE STANDARDS FOR NON-DESTRUCTIVE TESTING LIQUID PENETRANT EXAMINATION OF WELDED JOINTS

a) Evaluation of indications:
   - Relevant indications are those which result from mechanical discontinuities.
   - Linear indications are those indications in which the length is more than three times with width.
   - Rounded indications or indication, which are circular or elliptical with the length less than three times, the width.
   - Any questionable or doubtful indications shall be re-tested to verify whether or not actual defects are present.
   - Localised surface imperfections, such as may occur from machining marks, surface conditions, may produce similar indications, which are not relevant to detection of unacceptable discontinuities.

b) **Acceptance standards**:

- Linear indications
- Four or more rounded defects with any dimensions more than 1.6 mm in a line separated by 1/16 inch (1.6 mm) or less (edge to edge)

c) **Defect removal and repair:**

Unacceptable imperfections shall be removed and reexamination madc to assure the complctc removal. Whenever a defect is removed and subsequent repair by welding is not required, the excavatcd area shall be blendcd into the surrounding surface so as to avoid sharp notches, crevices or corners. Where welding is required after removal of a defect, the area shall bc cleaned and welding performed in accordance with a qualificd welding procedurc, Completed repairs shall be re-cxamined by the method originally used for detection of the defection.

d) **Treatment of imperfections believed non-relevant.**

Any indication of an imperfection, which is belicved to be non-relevant, shall be regarded as defect unless, on re-evaluation, it is shown by re-examination by the same method or by the use of other non-destructive methods and/ or by surface conditioning that no unacceptable defcct is present.

e) **Examination of areas form which defects have been removed:**

After a defect is thought to have been removed and prior to making weld repairs, the area shall be examined by suitable methods to ensure the defect has been eliminated.

f) **Re-examination of repaired areas:**

After repairs are made, the repaired areas shall be blended.

ACCEOTANBCE STANDARDS FOR NON-DESTRUCTIVE TESTING RADIOGRAPHIC EXAMINATION OF WELDED JOINTS

Radiographic examination shall cover minimum 10% of weld seam and acceptance standard for visual examination and Radiography shall be as follows:

Any of the following imperfeetions shall not be aceeptable.

1. Cracks

2. Zone of incomplete fusion or penetration, which exceed 10% of the weld length of the joint in longitudinal or transverse butt weld, where full penetration is intended by the weld procedure, some lack of penetration acceptable. The total length of weld with lack of penetration shall not exceed 10% of the overall weld length. At no place, shall weld penetration be less than 90% of the thickness of the material. Continuous occurrence of lack of penetration is permitted, but shall not exceed 50 mm in any 500 mm length of weld.

3. Inadequate weld dimensions, root cavity (shrinkage) and incompletely filled groove greater than 10% effeetive throat thickness.

4. Excess penetration shall be permitted provided it does not exceed 25% of the wall thickness or 4 mm whichever is smaller.

5. Weld reinforcement: Build up in excess of 25% of the effective throat thickness shall be dressed. Any reinforcement shall be substantially symmetrical about the center line of the weld and shall be of smooth contour blending smoothly at the toes with the parent material.

6. Undercutting and overlapping, greater than 10% effective throat thickness.

7. Elongated cavities and/or worm holes exceeding 3 mm dia or equivalent area in length provided the limitations on porosity are met with.

8. Copper, tungsten or oxide inclusions greater than t/1 or 3 mm whichever is smaller.

9. Crater pipes exceeding 2597o effective throat thickness or 3 mm whichever is smaller.

10. Porosity: Scattered porosity not exceeding 0.5% by volume is acceptable. In general, the size of the pores shall not exceed 0.8 mm dia, but occasional 1.6 mm dia pores may be acceptable, provided the following limits are not exceeded.
    a) Where pore size is 0.4 mm or less, up to 150 t pores may be permitted in 1000 mm sq. area of radiograph.
    b) Where pore size is 0.8 mm or less, up to 19 t pores may be permitted in 1000 mm. sq. area of radiograph.
    c) Where pore sizes are generally 0.8 mm dia or less, but occasional 1.6 mm dia/pores are present, up to 9t pores of 0.8 mm dia may be permitted in 1000 sq. mm area of radiograph, provided the number of pores up to 1.6 mm in dia does not exceed it.
    d) However, visible surface porosity> 1mm dia is not acceptable.

Note:

i. In all cases, t+ thickness of the thinnest section of the weld under examination.

ii. Unacceptable weld defects shall be repaired in accordance with the original welding procedure. All repairs shall be 100% inspected in accordance with original testing procedure.

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

DOCUMENT No.	TB xxx 618 002a	Rev 04	Prepared	Checked	Appd
TYPE OF DOC.	TECHNICAL SPECFICATION	NAME	BVG	PLK	RMS
TITLE	G I HARDWARES	SIGN	-SD-	-SD-	-SD-
		DATE			
		GROUP	TBEM		
		W.O. No			
CUSTOMER/ CONSULTANT					
PROJECT					

Contents:

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SECTION-2	STANDARD SPECIFICATION	03
SECTION-3	PROJECT DETAILS AND GENERAL SPECIFICATION	01
SECTION-4	GUARANTEED TECHNICAL PARTICULARS (Not Applicable)	....
SECTION-5	MANUFACTURING QUALITY PLAN (Not Applicable)	....
SECTION-6	CHECK LIST	01

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Rev	Date	Altered	Checked	Approved	
04	18.11.10	BVG	PLK	RMS	Unit wt of hardware added
02	13.4.06.	BVG	PLK	RMS	Eqpt mounting hardwares added.

Distribution	To			
	Copies			

SECTION - 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS & QUANTITIES

1.1 SCOPE

The scope of this specification is to specify all details required by a supplier for supply of galvanized hardwares for projects being executed by BHEL on turnkey basis for NTPC, PGCIL, SEBs and other Customers.

1.2 SPECIFIC TECHNICAL REQUIREMENTS

The specific technical requirements shall be as per Standard Technical Specification (Refer Section 2).

1.3 QUANTITIES

The quantities shall be as per attached BOQ.

SECTION - 2

2.0 GENERAL

This section covers the standard technical specification for GI Hardwares.

2.1 BOLTS:

M16 bolts shall be used in all types of structures except equipment mounting/ earthing bolts which shall be as per equipment requirement.

All bolts for member connections in towers, beams & equipment support structures shall conform to IS: 12427 - 2001 and for step bolts shall conform to IS: 10238 – 1982.

The mechanical properties shall conform to property class 5.6 of IS:1367 (part 3) - 1991.

All bolt heads shall have hexagonal shape, the heads being forged out of the solid material truly concentric and square with the shank, which must be perfectly straight.

Fully threaded bolts should not be used.

All bolts shall be threaded with metric standard thread to take the full depth of the nut and permit firm grip of the member.

All bolts shall be hot dip galvanized as per IS: 1367 (Part 13) – 1983.

2.2 NUTS:

All nuts shall conform to IS: 1363 (Part 3) –1992.

The mechanical properties shall conform to property class 5 of IS:1367 (part 6) – 1980.

The nuts shall be capable of being worked with fingers along the entire threaded portion of the bolt with a neat fit capable of developing the full strength of the bolt.

All nuts shall be hot dip galvanized as per IS: 1367 (Part 13) – 1983.

2.3 PLAIN WASHERS:

All plain washers shall be punched washers, A type conforming to IS: 2016-1967.

These shall be hot dip galvanized as per IS: 4759 – 1984.

2.4 SPRING WASHER:

All spring washers shall be of spring steel, positive lock type and conforming to type B of IS: 3063-1972. The thickness of spring washer shall be as specified under:

Bolt Diameter	Thickness of Spring washers
16 mm	3.5 mm
12 mm	2.5 mm

These shall be electro-galvanized as per IS: 1573 – 1986.

2.5 UNIT WEIGHT OF BOLTS I/C NUT, PLAIN AND SPRING WASHERS:

For purpose of payment, following unit weights as indicated below shall be considered.

A.) STANDARD BOLTS I/C ONE NUT UNIT WEIGHTS

S. NO.	TYPE	SIZE OF BOLTS	TOTAL WT (KG)
1	M16	16 ϕ X 35 LG	**0.117**
2	M16	16 ϕ X 40 LG	**0.125**
3	M16	16 ϕ X 45 LG	**0.133**
4	M16	16 ϕ X 50 LG	**0.141**
5	M16	16 ϕ X 55 LG	**0.149**
6	M16	16 ϕ X 60 LG	**0.157**
7	M16	16 ϕ X 65 LG	**0.164**
8	M16	16 ϕ X 70 LG	**0.172**
9	M16	16 ϕ X 75 LG	**0.180**
10	M16	16 ϕ X 80 LG	**0.188**
11	M16	16 ϕ X 85 LG	**0.196**
12	M16	16 ϕ X 90 LG	**0.204**
13	M16	16 ϕ X 95 LG	**0.212**
14	M16	16 ϕ X 100 LG	**0.220**
15	M12	12 ϕ X 35 LG	**0.0620**
16	M12	12 ϕ X 40 LG	**0.0664**
17	M12	12 ϕ X 45 LG	**0.0708**
18	M12	12 ϕ X 50 LG	**0.0753**
19	M12	12 ϕ X 55 LG	**0.0797**
20	M12	12 ϕ X 60 LG	**0.0842**

B.) SPRING WASHER

S. NO.	TYPE	TOTAL WT (KG)
1	3.5mm thk (M16 bolt)	**0.00891**
2	2.5mm thk (M12 bolt)	**0.00382**

C.) For supplies of bolts i/c nuts, plain washers and spring washer other than those listed above, payment shall be made based on unit weights worked out considering theoretical dimensions & density of steel as 7850kg/cum.

Annexure-TRF

Procedure for transformer / Reactor Installation , Testing and Commissioning

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP- NORTHERN SECTOR

Rev.0

Procedure for transformer / Reactor Installation , Testing and Commissioning

Sl no.	Description	Remarks
A.	**On Arrival of Transformer Tank**	
A.1	Checking of Pressure, Dew point , IR of CC- CL - Tank	Record the values If tank pressure is zero then reports to Bhopal
A.2	Removal of Impact Recorder after placement on Plinth	Sent to Bhopal for review
A3	Before signing LR on receipt of material - Transformer shall be physically checked for any damage /physical abrasion during transportation	Remarks to be mentioned on the LR .
B.	**Installation work**	
B.1	Drum oil test - BDV, PPM, Tan Delta, Resistivity and IFT	Number of sample to be tested as per customer standard procedure.
B.2	Ensure the availability of drawing (OGA, Assembly drawing like cooler bank, aux system and other piping work, Part List etc.)	
B.3	Material Verification	Shortages to be reported to BHEL prior installation of work.
B.4	Turret CT and Bushing to be tested, Dry Air Generator Dew point level to be examined before raise the call for internal inspection	Bushing to be tested on variable frequency upto 391Hz. Reports to be submitted for clearance. PS class CT's ratio error@ 100%rating to be <0.25%
B.5	Internal inspection and Bushing erection a. Ensure crane availability b. Ensure Dry air generator to achieve dew point -60 c. Dew point measurement kit (Vaisala Make kit) d. Ensure CT ratio measurement kit for internal CT test	23T capacity crane or last boom capacity 2T and minimum 60 feet boom length)
B6	Transformer GT/ICT /ST /UAT / Reactor to be examined for any loose earthing / core locking arrangement /Wall shunts / clearance between the Tanks and Bushing leads . Transformer should be flushed with Hot oil and thoroughly cleaned before Boxing up of Transformer.	Any abnormality may please be reported to the Manufacturing BHEL Unit
B.6	**TESTING AFTER ERECTION - BEFORE DRYOUT** Testing of WRM and Turn Ratio (HV/IV, HV/LV, IV/LV at all taps - applicable for transformer)and SFRA	Reactor- WRM and SFRA ICT - WRM & Turn ratio and SFRA for Transformer Acceptance Limit - error should be less than 0.5% for turn ratio and WRM <2.5%
C	**PREPARATION BEFORE START OF ERECTION**	
1	**PIPEWORKS** -All pipe works shall be checked as per checklist before start of the work . Pipe work be thoroughly cleaned before Erection and if required flushed with oil	Cleaning and Flushing of the pipe work to be ensured before Erection
2	**CONSERVATOR** - Air cell of the conservator to be tested for leak test at 1 PSI / 0.07kg/cm2 for 1 hrs . Conservator without Air cell may be checked for 2 PSI for a period of 1 hr .After successful testing of Air cell and Conservator and MOG and changing the inspection cover "O Ring " - Erection of Conservator to be carried out .	In case of the any leakage noticed , concerned OEM Unit to be informed .
3	**RADIATORS/ COOLER BANKS** - All Radiator to be mounted are to be leakage tested as per BHEL standard protocol through Air pressure of 2 psi for 15 min (time span for soap solution test). This is followed by Flushing of each radiator for 15min with the Transformer oil as provided by BHEL Engineer in charge at site	Details to be filled as per standard protocol
C.	**Dry out of Transformer- (once WRM & turn ratio in Limit)**	
C.1	Cooling bank & Conservator must be isolated from main tank	
C.2	Leakage test at pressure upto 5 PSI for Main Tank after complete Box up of Transformer .	If test is cleared go for the next cycle of vacuum test .

Procedure for transformer / Reactor Installation , Testing and Commissioning

Sl no.	Description	Remarks
C.3	Vacuum Test to be performed after successful leakage Test at vacuum (500-700mmHG)	Check for any leakage after 1 hrs and subsequent 0.5 hrs in 2 intervals .
C.4	Leakage test at vacuum (L1 & L2 method) between 1 to 2 torr in McLeod gauge	for PGCIL project . Calculate leakage rate (L2-L1)volume/Time) L1 is reading at start and L2 is reading at time duration. Leakage should be less than <100
C.5	1st Vacuum cycle for 72 hour after reaching 0.5 torr vacuum in McLeod Gauge	Continuous running of vacuum pump for 72 Hour
C.6	After 72 hour vacuum - fill the **N2/dry air cylinder** (prefably Nitrogen from cylinders) **of Dew point better than -60** at 0.25 to 0.35 kg / sq cm (3.5 to 5 PSI)	
C.7	Check the Dew point after 24 hour of N2 filling	Record the values, If dew point is -20 or below. Process of Heating +vacuum of main tank to be done.
C.8	2nd cycle of Vacuum for 48 hour after reaching 0.5 torr vacuum in McLeod Gauge	
C.9	After 48 hour vacuum - fill the **N2/dry air cylinder** (prefably Nitrogen from cylinders) **of Dew point better than -60** at 0.25 to 0.35 kg / sq cm (3.5 to 5 PSI)	
C.10	Check the Dew point after 24 hour of N2 filling	Acceptable value of dew point is -36 **(0.5 RH)** or better. If desired dew point not obtained then go for 3rd cycle of 48 hrs (depend on the 2nd cycle test results). Dry out cycle to be repeated till achieving Main Tank - active part dew point -36 **(0.5 RH)** or better.
D.	**Oil Filling and Filtration**	
D.1	Provision for Storage capcity of complete required oil to be filled in Transformer Tank in one go to be maintained. Oil of each storage Tank to be tested at Power grid Lab. Complete oil to be made ready before oil filling .	BDV, PPM, Tan Delta @90, Interfacial tension & Resistivity. BDV value -75 (Min) and PPM<5
D.2	Oil filling in the ICT / Reactor Tank to be done under vacuum to be maintained for 24-48 hrs prior to oil filling . Oil to be inside the Tank shall be at temp 40-50 degree . Complete oil fillingto be done in one go after achieving the required parameters	Before filling, oil to be tested for each storage tank in PGCIL approved Lab. BDV - 75 (min) and PPM <5
D.3	OLTC to be filled through Main tank and after filling equalizing link atatched during entire process may be removed.	After OLTC filling upto tank level. Equalising pipe to be remove and connect all pipe of OLTC
D.4	Remove the Dummy plate between cooling bank and main tank under B/F in closed condition	
D.5	Oil filling in cooling to be filled through bottom pipe line through main tank or cooling to be filled separately .	Oil to be filled under open condition of air plug in header pipe and all B/F of cooling bank.
D.6	Fill the Oil in conservator to be done as per standard comissioning process after completion of HOC process .	Follow OEM instruction for Conservator commissioning .
E	**Filtration and HOT Oil Circulation**	
E.1	Closed the B/F valve of Top/Bottom pipe of cooling bank if opened	
E.2	HOC to be done for min period of 72 Hour or more till achieving the PI value . Time of HOC shall be considered after reaching outlet oil temperature from ICT Tank /OTI/WTI Temp (60 degree) or as per recommendation of OEM. HOC period will be extended if PI value does not reach.	Ensure filter M/C outlet pipe (heated oil pipe) must be connected at bottom valve of main tank. PI to be taken in last 24 Hour. Inlet and outlet temperature to be recorded. Following PI to be measured at Regular interval of 4 hour. a. HV+IV+N /E+LV : PI >1.75 b. HV+IV+N/LV : PI>1.75 c. LV/E+ HV+IV+N: PI> 1.75

Sl no.	Description	Remarks
E.3	After clearance of HOC . Each Cooling bank to be filtered separately with minor opening of B/F of top pipe line to ensure breathing of oil through conservator. Minimum 8 Hour	Local BDV (>75) & PPM (<5) to be checked. Minimum 4 rotation of oil (calculation based on with 50% capacity of Filter M/C)
E.4	After completion of filtration of cooling bank, oil to be mixed with main tank. Filtration to be done for minimum 24 hours	All B/F of Top and Bottom to be opened.
E.5	Particle count test to be done when the Transformer oil is completely mixed and under motion .Fine filtration carried out with Filter Machine of 0.3-0.5 micron filters . While carrying out particle count Filter machine to be kept under throughout during the process of Particle count .	Under running condition of cooling bank pump. Particle count must be **maximum 4 micron, 10,000 particle count per liter** (i.e. ISO 10) Minimum three sample to be tested. For measurement (Oil qty 100mL in each measurement) to be taken under each sample with test duration of 4.5- 5min.
E.6	Complete Electrical test to be done. A. WRM & Turn Ratio as per factory test b. Bushing at variable freq & Winding Tan Delta Test c. Magnetic Balance /Vector group d. Magnetizing current e. SFRA test f. IR test of winding g. Short circuit impedance calculation . h. Floating point voltage calculation . i. Meaurement of Vibration in case of Reactor after charging g. Other Balance test as per PGCIL.	Testing kit with Calibration certificate is required. Test to be performed under electrical operation of OLTC tab.
E.7	Following oil Test to be done : sample to be taken from Tank Bottom & Tank Top 1. BDV , PPM, Tan Delta@90, DGA, IFT & resistivity 2. Any other test as per Power Grid contract	

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SECTION 2

INSTALLATION

2. INSTALLATION

2.1 RECEPTION AND ASSEMBLING OF TRANSFORMER / REACTOR DESPATCHED PARTLY DISMANTLED AND FILLED WITH NITROGEN.

To ensure that a Transformer will function satisfactorily it is important that handling, lifting, storing and assembling are carried out with great care and cleanliness by experienced personnel who know the various working operations very well.

This section gives instructions how handling, lifting, storing and assembling should be carried out. For large Transformers it is recommended that the work is done by BHEL or is under supervision by experts from BHEL.

2.1.1 INSPECTION

In connection with receiving and unloading at site, and at the final storing place before assembling, the transformers shall be inspected carefully. External visible damages as dents, paint damages etc. may imply that the transformer has been subjected to careless handling during transport and/or re-loadings, and a careful investigation is therefore justified.

After the arrival of the material at receiving points, the customer should, in case of possible damage/loss of any component, make the necessary claims with the contractors representatives under intimation to BHEL so that such claims can be registered with the transport agents. Before unloading, the condition of packing and of the visible parts should be checked and possible traces of leaks verified (condenser bushings). If necessary, appropriate statements and claims should be made.

Drums containing oil which have been dispatched separately should be examined carefully for leaks or any sign of tampering. All drums are dispatched filled up to their capacity and any shortage should be reported.

In order to protect the active part against moisture, the transformer tank is filled with nitrogen during transport at an over pressure of 0.17 kg/ sq.cm (2.5 psi) approximately at room temperature.

Check immediately the gas pressure at the arrival. A positive pressure indicates that the tank and the transformer components respectively are tight, and that the active part including the insulation materials is dry.

If there is no positive gas-pressure, transformer should be immediately filled with dry Nitrogen gas at a pressure of 0.17 kg/cm^2 (2.5 psi) without loss of time as per instructions given para 1.2.3

Otherwise, it should be checked if the core isolation is satisfactory and that accessories packed separately have not been damaged during the transport. Instructions for checking of the core isolation are given in clause 2.10

2.1.2 UNLOADING

Typical unloading arrangement of the transformer is shown in fig 2.1.

Whenever rollers/trolleys are supplied with transformer, movement of transformer at site is carried out by mounting these rollers/trolleys. For mounting of rollers refer roller mounting drawing included in Vol.I.

Alternatively for movement of transformer from loading bay to actual site of the equipment, skidding on greased rails etc. can also be resorted to.

2.1.3 STORING

Dismantled equipment and components are packed to be protected against normal handling and transport stresses. The instructions for lifting given on the packages, must be complied with to avoid damages. Goods stored outdoors must not be placed directly on the ground, and should be covered carefully with tarpaulin or similar material. Oil drums should be stored in horizontal (lying) position with both the bungs also in horizontal position.

2.1.4 LIFTING

Lifting devices on the transformer tank are dimensioned for lifting of the complete transformer filled with oil. The positioning of the lifting devices, permissible lifting angles, minimum height to crane hook and transformer weight, appear from the OGA drawings. Check at lifting of complete transformer that the lifting wires/ropes are not in contact with bushing or other components on the cover. For lifting with hydraulic jacks, the transformer is provided with jacking pads dimensioned for lifting of complete transformer filled with oil. The positions of the pads appear on the OGA drawings. If active part is to be lifted refer instructions given in clause 2.7.

2.1.5 LOCATION AND SITE PREPARATION

a) Reactor shall always be placed on concrete plinth without rollers as per foundation plan drawing whereas transformer may be even placed with rollers. Therefore it is very important to refer foundation drawing before placing the transformer/reactor on final location.

b) Transformer/reactor should be placed on the foundation so that easy access is available all around and diagram plates, thermometers, valves, oil gauges, etc. can be easily reached or read. Adequate electrical clearances are also to be provided from various live points of the transformer to earthed parts.

c) ONAN type transformers/reactors depend entirely upon the surrounding air for carrying away the heat generated due to losses. For indoor installation, therefore, the room must be well ventilated so that the heated air can escape readily and be replaced by cool air . Air inlets and outlets should be of sufficient size and number to pass adequate air to cool the transformer. The inlets should be as near the floor as possible and outlets as high as the building will allow. Where necessary, exhaust fans can be installed for the purpose.

d) The transformers should always be separated from one another and from all walls and partitions to permit free circulation of air. In this connection reference is also drawn to IS: 10028 (Part II).

e) Where rollers are not fitted, level concrete plinth with bearing plates of sufficient size and strength can be adopted for outdoor transformers. To prevent the formation of rust, it is essential to avoid presence of air and water in the space between the plinth and the base of the transformer by use of cretex or similar bituminous compound.

f) Where rollers are fitted, suitable rails or tracks should be used and the wheels locked to prevent accidental movement of the transformer. Where walls are provided, it should be ensured that the transformer gets a good ventilation as mentioned above for indoor transformers. Provision should be made for the emergency drainage of the oil from the transformers (e.g. in case of fire in neighboring apparatus or bushing or the transformer tank), by surrounding the transformer plinth with sump filled with small pebbles.

2.1.6 INTERNAL INSPECTION AND CHECK POINTS FOR ASSEMBLING THE TRANSFORMER/REACTOR

(a) Check-points before starting assembly:

1. Conditions of leads.
2. Bracing, clamping of leads.
3. Connections.
4. Tap changer checks.
5. General conditions of insulation.
6. Core check that it has not moved in transit.
7. Core-ground; this is checked with the megger after removing earth connection.
8. CTs, including the secondary leads and their passage through metal parts.
9. Check that shipping frame for bushings have been removed.
10. Check that coil position has not moved in transit.
11. Check for dirt, metal swarf, moisture.
12. Check that the bushing leads set without being too close to ground or other points of different potential.

(b) Check-points during Assembly

By means of the Part list and the transformer/reactor OGA, the assembling of a fully completed transformer is carried out according to the following instructions. The following precautions are to be taken:

1. Fire-fighting equipment shall be available at the oil-treatment equipment as well as at work on and adjacent to the transformer.
2. Welding work on or adjacent to the transformer shall be avoided, but if this is not possible, the work shall be supervised by fire-protection personnel.
3. Smoking on or near the transformer shall not be allowed.
4. Transformer tank, control cabinet etc. as well as assembling and oil treatment equipment shall be connected with the permanent earthing system of the station.
5. Check that there is no overpressure in the transformer when blanking plates or connection lids are to be opened.
6. All loose objects, tools, screws, nuts etc., shall be removed from the transformer cover before opening the connection and blanking lids.
7. All loose objects (tools, pencils, spectacles etc.,) shall be removed from the boiler-suit pockets etc. before starting the work through man holes.
8. Tools to be used inside the transformer/reactor -e.g. for tightening of screw-joints- shall be fastened to the wrist or another fixed point by means of cotton tape or string.
9. Tools with loose sleeves and tools with catches must not be used at work inside the transformer.
10. Greatest possible cleanliness shall be observed at work inside the transformer/reactor, and at handling of parts to be mounted inside the transformer.
11. Fibrous cleaning material should not be used as it can deteriorate oil when mixed with it.
12. All components dispatched separately should be cleaned inside and outside before being fitted.
13. A transformer/reactor is best protected from damp hazard by circulating warm, dry, de-aerated oil through it until it temperature is 5 °C to 100 °C above ambient. This should be done before allowing external excess to the interior of the tank. The warm oil should be circulated all the time transformer is open to atmosphere,
14. Oil pump & all joints in the oil pipe work should be airtight to avoid entrance of air through leakage joints.

15. The active part (core and winding) should be exposed to the surrounding air as short time as possible. Open therefore only one blanking plate or connection lid at a time for remounting of bushings, valves etc.
16. Objects which-despite all precaution are dropped inside transformer/reactor, must absolutely be brought up from the equipment.
17. Check that the oxygen content inside the transformer tank is minimum 20% if a person is to enter the tank.

2.1.7 ASSEMBLY OF WHEELS

Mounting of wheels under reactor/transformer is to be done as per roller arrangement drawing. The reactor however in service, is to be placed on plinth with anti-earthquake fastening without rollers. Transformer placement can be with or without rollers as per applicable OGA/foundation drawing.

2.1.8 ASSEMBLY OF BUSHINGS

In case the bushings are mounted on turrets on the transformer/reactor cover, they are either delivered mounted on their turret or -in case of large bushings dismantled from the turrets. The turrets are often individually adapted; check therefore that they are re-mounted in correct places, which appear from the OGA drawing and ,part list.

Assembling of bushings is carried out according to bushings installation manual available. In case of draw rod / lead connection of bushing with transformer lead, half connector joint to be insulated with 3 layers of crepe paper after making proper connection.

2.1.9 ASSEMBLY OF VALVES

Valves which may affect the loading gauge, or will be subjected to damages, should be dismounted before delivery. Re-mount the valves as per the positioning appear from the OGA drawing and part list. The gasketting surfaces shall be cleaned well and new gaskets fitted. Check that all valves are closed.

2.1.10 ASSEMBLY OF COOLING DEVICES

Valves which are not dismantled like shut-off valves for radiators, coolers and possible headers shall be provided with blanking plates during the transport. Remove the blanking plates when the assembling of the coolers is to be started. Check first that the valves are closed. Check that each radiator and possible header is assembled in the correct positions according to OGA drawing. In case of OFAF or OFWF cooler mounting shall be done as per the relevant leaflet given in Vol.I

The shut-off valves against the transformer tank shall be closed until the oil-filling is started.

2.1.11 ASSEMBLY OF OIL CONSERVATOR

The conservator, which may be with or without aircell is assembled either on the transformer, or on a separate frame. Before the conservator is assembled it shall be checked that belonging equipment -e.g. Oil-level indicator -functions satisfactorily.

The breather is connected to the oil conservator, and it is very important that joints and couplings in the pipe between breather and conservator are air tight. Refer Clause 2.6 for detailed instruction for oil filling.

2.1.12 ASSEMBLY OF PIPE WORK

Pipes with flanges for connection of conservator, radiators, as well as pipes for equalizing of turrets etc. are mostly delivered completely ready for assembling according to OGA & part list. In certain cases -e.g. at a separately assembled oil conservator –certain fitting and welding of pipes and flanges on site is however required. Instruction for such assembly of external pipes is given in Clause 2.3. Before assembly, all associated pipework for cooler system/radiators to be physically inspected for the presence of any dirt/dust etc. and all visible dirt/dust to be thoroughly cleaned with clean cloth. Individual radiator/cooler and pipework to be flushed with compressed air followed by carrying out Pressure test on individual radiator/cooler Bank to check any leakages/damages before start of Erection at site

2.1.13 FLANGES, BLANKING PLATES

When re-mounting blanking plates, connection flanges etc., the gasketting surface shall be cleaned well and new gaskets fitted.

2.1.14 ACCESSORIES

Accessories like cooling fans, pumps, OLTC and components for supervision and control, oil-level indicator, flow indicators, gauges, Buchholz relay, PRV, thermometers etc. are assembled according to leaflet/description valid for the components (refer Vol. I).

2.1.15 CONTROL CABLING

Re-assemble the control cables according to the drawing of wiring system and connect the cable ends to terminal blocks in instruments, terminal boxes, junction boxes and control cabinets according to valid connection diagram.

2.1.16 GASKETS

The sealing system normally used against oil and gas in BHEL's transformers and belonging components has rubber gaskets in grooves and nitrile rubber bonded cork gaskets at other places. Refer clause 2.8 for general information and assembly instructions for gasket mounting.

2.1.17 OIL FILLING

The completely mounted Transformer is oil-filled according to directions in Clause 2.5 & 2.6. The oil shall be treated according to Clause 2.4. The lower and upper shut-off valves for radiators/coolers and possible headers shall be open during evacuation and oil-filling. If coolers are placed on suspension beams, which are mounted at right angle to the tank, the suspension beams shall be supported against the ground during the evacuation. Also radiators mounted on the tank wall shall be supported in a similar way. The hose for filling of oil is connected to the bottom valve of the transformer which must not be opened until the hose has been de-aerated and completely filled with oil.

2.1.18 CLEANING & PAINTING

The transformer and its equipment are cleaned carefully from dirt, oil, lubricating grease, and damaged surfaces are touch-up painted with the primer paints and finish paints delivered as per clause 2.11.

2.1.19 EXCHANGE OF BUSHING

When it is required at site to replace the Bushing (HV/ IV/ LV/ Neutral) due to reasons associated with the deviation in test results from the standard acceptable values or any other reason, following process to be adopted –

Close the Gate valve and Butterfly valve provided in the pipeline (80 NB) between Transformer / Reactor Main Tank and Conservator .

Drain out the oil from Transformer Main tank into the storage Tank up to the level of stress shield.

Fill the Transformer Tank with Dry Nitrogen, UHP grade of Dew point less than -50 or better, if the replacement is not planned to be carried out immediately after draining out of oil from Main Tank up to the required level.

While carrying out the replacement, release the filled in Dry Nitrogen inside the Main Tank (as mentioned in step 3 of replacement procedure). During replacement of Bushing keep the Transformer tank pressurized from continuous flow of Dry air of UHP grade of Dew point less than -50 or better in order to avoid the ingress of moisture.

Before replacement of the Bushing, carry out IR, Tan Delta and capacitance measurement test on the new Bushing's to be replaced. Replacement of the bushing shall be carried out after clearance of pre-erection test results from concerned Division.

Carry out the replacement of bushing as per BHEL standard procedure, in case of replacement of 400 KV HV bushing having half connector joint between bushing and winding lead at Turret level care shall be taken that hardware used should be of appropriate length and after connection the bolt used in connection shall not be protruded from profile of half connector.

During replacement the half connector joint between Bushing and winding lead shall be wrapped by three layer of Crepe paper with half overlap.

Carry out the profile inspection of winding lead entering inside the bottom of stress shield of Bushing replaced. Also take the photographs of winding lead profile after replacement for record purpose. In case of any doubt during bushing replacement contact concerned Service division.

All Nitrile rubber cord of the inspection cover opened during the bushing replacement needs to be replaced by new Nitrile rubber cord.

After replacement of bushing, apply vacuum in the Main Tank and start filling the filtered oil (as per BHEL standard) in the main Tank under vacuum .

Equalize the Main Tank and Conservator after opening the valves in the pipeline between Main tank and Conservator of Transformer (as mentioned in step 1 of the process).

Carry out the de aeration from Turrets, Bushing and Main Tank, cooler bank and if required carry out conservator commissioning as per site requirement.

After replacement carry out the Tan Delta and Capacitance measurement of the bushing replaced and provide the test results to BHEL.

2.2 STORING OF TRANSFORMER/REACTOR DESPATCHED FILLED WITH NITROGEN

2.2.1 STORING BEFORE COMPLETE ASSEMBLING

The storing place should be easily accessible for inspection and maintenance of the transformer. The bedding for the equipment should be larger than its bottom surface and dimensioned for the load. The transformer is placed on boardings or beams so that good ventilation is obtained underneath the transformer bottom.

Before storing, the transformer is inspected according to directions in Clause 2.1 "Reception and assembling of transformer/reactors dispatched partly dismantled and filled with nitrogen".

A transformer without remarks may be stored up to 6 months after arrival at the site without oil-filling. During the storing time, the inert gas (nitrogen) filling shall be maintained and pressure regulated, so that exposure of active part to atmosphere is avoided. If the storage time is judged to exceed 6 months, the transformer should be provided with oil conservator including oil-level indicator and breather, and oil-filled according to Clause 2.5. "Oil filling under vacuum". Certain valves must be re-mounted to enable the oil-filling being carried out. Furthermore, at the time at oil-filling of a completely assembled transformer, certain rules in Clause 2.5 & 2.6 must be complied with absolutely.

The oil quality should also be periodically monitored. If for some reason, oil filling cannot be carried out after a storage period longer than 6 months, the nitrogen pressure shall be maintained and supervised carefully. If the storage time without oil exceeds 18 months BHEL should be consulted about measures to be taken.

Wherever it is desired to keep the transformer energized at a low voltage so that its temperature is higher than the ambient temperature, the low voltage may be applied to LV winding with other winding in open circuit or short circuit conditions depending upon the current to be fed. However, before energizing the transformer, protection system of transformer (including electrical protection) must be checked. It may also be ascertained whether partial cooling is required in this case.

2.2.2 STORING OF COMPONENTS AND ACCESSORIES BEFORE COMPLETE ASSEMBLING

Independent of the duration of the storing time, the directions below apply for dismounted components and accessories, as well as for material to be used in connection with the assembling work.

(a) Storing indoors

In such a room, the following articles should be stored:

1. Insulation material as paper, pressboard, Bakelite, wood, cotton tape etc.
2. Insulated details as paper-insulated conductors, pressboard insulated shielding bodies etc.
3. Chemicals as solvents, glues, varnishes, hardeners etc.
4. Breathers, drying agents.
5. Terminal boxes, connection boxes, control cabinets.
6. Gas relays, oil-level indicators, thermometers, pressure valves etc.
7. M Box, OLTC motor drive, Fans, Pumps, Instruments & fittings. (Heating elements provided shall be connected to supply)
8. Online DGA, Online moisture removal system, sudden pressure relay, Conservator isolation valve

(b) Storing outdoors

The below components may be stored outdoors. They should be placed above ground and covered with tarpaulin etc.

1. Oil-conservator with blanking plates for all openings.
2. Radiators and coolers with blanking plates for all openings.
3. Structures, A frames, Pipe supports, Supports for oil-conservators, radiators, control cabinets etc.

2.2.3 SUPERVISION

During the storing time, the storing place, transformer/reactor components and accessories are inspected regularly. Tap changer if provided should be operated at 6 monthly intervals. Two or three runs from one end of the range to the other and back are sufficient. Observations, readings, measures and dates should be noted and BHEL should be contacted for directions about possible measures. Check at even intervals -and further more at weather changes as rain, storm, frost or thawing the foundation material (boardings, beams etc.) and the condition of the ground.

Inspect the transformer/reactor periodically with regard to possible external faults and/or rust-damage.

Check also that screws and nuts in sealing joints (covers, lids etc.) are tightened. Check every second week that the connected-in heating elements in control cabinets function.

If the Transformer is inert gas filled, one shall check every second week the overpressure or inert gas consumption.

2.3.7 RADIATORS/COOLERS

The positioning of the radiators/coolers is indicated on OGA drawing. These are positioned so that the highest point of the oil-pipe system is always positioned below the bottom level of the conservator.

The pipe system is provided with filter valves at the start and finish to enable pumping the oil through the system.

All places where air may be collected are provided with air release plugs/ valves.

2.3.8 RADIATORS/COOLERS PIPES

The pipe having dimensions as per OGA drawing and may be provided with weld-flanges, expansion joints. No pipe part is allowed to be so long that internal inspection and cleaning will be difficult.

The pipes shall be placed so that air release plugs will be positioned at the highest point of the pipe part. The pipes shall be painted internally with a yellow, oil-resistant paint and externally according to the paint as per specification.

2.3.9 SHORTING LINKS / EARTHING STRIPS

All shorting links on tanks, turrets and fittings to be provided as per OGA

Note – 2: The documents, relevant to Oil, are prepared based on the IEC standard applicable as on October-2016. If user wants to refer the latest standard applicable, the confirmation shall be obtained from manufacturer.

Note - 3: For Mixing of oil, please refer IEC: 60296. Please ask the OEM, before mixing the oil.

2.4.3 HANDLING

Transformer oil should be carefully handled at site to ensure satisfactory service. Drums used for transport and storage should be kept under cover. In practice owing to contamination in the containers, difficulty may be experienced in maintaining the purity of the oil when it is transferred from one vessel to another, and once a vessel or drum has been filled with moist oil it is extremely difficult to clean. Drums should be clearly marked to indicate whether they are for clean or for dirty oil and should be reserved for the type indicated.

Oil drums should be stored at site preferably on pallets or Bricks layer, in horizontal position, with both the bung closures horizontally opposite (in 3 & 9 o'clock position) so that ingress of moisture is prevented. It is always recognized that storage of oil in drums is not always satisfactory, particularly when oil is stored in drums which have been bent or otherwise damaged in transit or storage, and the transfer of oil from such containers to electrical equipment should normally be through a suitable treatment plant.

In substations with fixed oil handling equipment like oil storage tank, the pipe work from the clean oil tank to the electrical apparatus should be kept clean and free from moisture. Where portable oil handling equipment is used, flexible pipe work and hand pump should be carefully inspected to ensure that they are free from dirt and water and should be flushed with clean oil before use. If the clean oil is being used from drums, it should have been recently tested and filling orifices of the drums should be clean. Hoses used for clean oil and dirty oil should be clearly marked and provided with plugs for sealing the ends when not in use.

Special care must be taken for oil filtration machine, which is used during treatment of oil. It is to be ensured that there is on residual quantity of oil left in oil filtration machine. The paper filters or centrifuges used with filtration machine shall be cleaned or replaced periodically as per supplier's recommendation. The pipe/hoses used with filtration machine should be properly blanked after use.

Before using oil tankers and filtration plant for handling of oil, the internals/chambers need to be thoroughly cleaned using good transformer oil so that the residual of earlier used chemical/oil is removed totally.

2.4.4 RECONDITIONING

Transformer oil is usually contaminated during handling, transport and storage due to ingress of moisture and solid impurities. Hence, oil shall be vacuum filtered separately at 50^0C to 60^0C using a suitable filtration machine and a spare clean tank before filling in the transformer. Details of filtration are given in Clause 11 of IEC: 60422-2013. Oil treatment shall be terminated when the following parameters are attained.

Table 2.1

Sl. no.	KV Class of the transformer	Recommended Permissible limit	
		Electrical strength (BDV) in kV (min)	Moisture content ppm (Max)
1	Upto 170 kV	65	15
2	245	70	10
3	420 to 765 kV	70	05

Storage Tank oil shall be tested for Electrical strength (BDV)/ Moisture content and Tan delta from NABL accredited lab / CPRI / ERDA/NETRA . Test Results carried out on Units mounted on filtration Machine will not be acceptable. Storage tank shall be as per typical arrangement shown in Fig 2.2 Electric strength and moisture content shall be determined following the test procedure of IEC: 60296-2012.Final oil test also needs to be carried out through NABL accredited lab / CPRI / ERDA

2.4.5 Evaluation of mineral insulating oil in new equipment

After reconditioning, Insulating Oil is filled into Transformer/ Reactor. As the oil comes into contact with insulating and other materials, it can no longer be considered as “unused oil” as defined in IEC 60296-2012. Therefore its properties are regarded as those applicable to oil in service, even though the electrical equipment itself may not have been energized. Oil properties should be appropriate to the category and functions of the equipment (see Annexure- 4.3).

The extent of the changes in properties may vary with the type of equipment due to the different types of material and ratios of liquid-to-solid insulation, and should be within the limits of Annexure- 4.3. Properties not included in Annexure- 4.3 (with the exception of oxidation stability for which no in-service limits have been established) should be within the limits of IEC 60296-2012.

2.5 OIL FILLING UNDER VACUUM

2.5.1 APPLICATION

Transformers and Reactors with vacuum-proof tanks shall be filled with oil according to this method.

2.5.2 STORING TIME

Generally it applies that Transformers and reactors which during transport are filled with dry nitrogen on arrival at the site shall be evacuated and oil filled. Before storing, the equipment shall be inspected according to the directions given in Clause 2.1 "Reception and assembling of transformer/reactor dispatched partly dissembled and filled with nitrogen". During the storing time, overpressure shall be maintained, and nitrogen consumption checked according Clause 2.2.

2.5.3 FLOW CHART FOR HANDLING

In Annexure 2.1 is given a flow chart of handling procedures. The pressure should be measured at different times. The pressure is OK if it is maintained according to instructions given in Clause 2.2. Reference is also drawn to para 9.0 of IS: 1866 regarding handling and filling of oil.

2.5.4 UNITS

Annexure 2.1 gives the relation between different units.

2.5.5 PROCEDURE OF DRY OUT BY N2 / ASSOCIATED HEATING METHOD

For effective and faster removal of moisture from Transformer / Reactor, method of dry out by vacuuming followed by N2 filling and if required heating is to be adopted. The detail procedure are as under

2.5.5.1 FIRST CYCLE

(i) Blank all the openings on the Transformer / Reactor Main Tank. Transformer / Reactor Main Tank is than subjected to vacuum up to 1.00 torr (1 mm of Hg) to be pulled and maintained for 72 hrs duration. During this first dry out cycle leakages if any observed in the system to be attended and rectified in this cycle.

(ii) After vacuum cycle Dry Nitrogen of dew point more than -60°C or of UHP grade (purity 99.9999%) to be pushed in Main Tank under vacuum till Min. pressure of 2.0 psi is achieved in Transformer Main tank. The Transformer Tank is to be kept pressurized for a duration of 24 hrs.

(iii) At the end of Nitrogen pressure cycle of 24 hrs, measure dew point values and recorded as dry out values of first dry out cycle. Moistened N2 inside transformer tank will be removed during second dry out vacuuming cycle.

2.5.5.2 SECOND CYCLE

(i) Again start vacuuming of Transformer Main Tank up to 1.00 torr (1 mm of Hg) and vacuum is to be maintained for 48 hrs in second dry out cycle.

(ii) Dry Nitrogen of dew point more than -60°C dew point or nitrogen of UHP grade (purity 99.9999%) is again pushed inside Main Tank under vacuum till pressure of Min. 2.0 psi is achieved in Transformer Main Tank. The Transformer Tank is to be kept pressurized for a duration of 24 hrs.

(iii) Measure dew point after 24 hrs in second N2 cycle and record these dew point values as dew point values of second dry out cycle and refer these values with BHEL standard norms or contact concerned Services Deptt..

(iv) If the dew point values of second cycle is in line with the BHEL Standard norms, Transformer is cleared for further vacuuming followed by filling of filtered oil under vacuum and carrying out Hot Oil Circulation process.

(v) In case desired value of dew point is not achieved than Transformer tank is to be again subjected for vacuum pulling for 24 hrs, followed by N2 filling for duration of 24 hrs. After each dry out cycle measure the Dew point values and compare with BHEL standard norms.

As per BHEL standard norm's minimum 2 Dry out cycle of Transformer has to be carried out before filling of filtered oil under vacuum in Transformer Main Tank.

Note: If the dew point values were not achieved as per BHEL standard norms in 2 dry out cycle and higher content of moisture was noticed as per Dry out process carried out in 2 cycle, than further Dry out process shall be carried out in consultation with BHEL Transformer Services Deptt.

However for improving Dry out values it is suggested that Nitrogen Dry out cycle associated with heating cycle shall be carried out. In this process after vacuuming cycle pressurized Dry Nitrogen in Main Transformer Tank shall be heated externally to raise the temperature of Transformer upto 55-65°C during 24 hours duration followed by measurement of Dew point after completion of heated Nitrogen Dry out process. These Dew point values shall be compared with BHEL standard norms and the process of vacuum followed by insertion of Dry Nitrogen and heating is to be repeated till the dew point values were not achieved as per BHEL standards.

The equipment required for vacuum treatment and oil-filling under vacuum should generally be as per Annexure 2.2. The transformer tank and electrical terminals shall be earthed for safety reasons.

No electrical test on the Transformer is permitted during the evacuation.

Fig. 2.3 shows a typical example of pipe work and valve positioning.

2.5.6 OIL FILLING

2.5.6.1 OIL QUALITY

The transformer/reactor shall be filled under vacuum with oil which has been purified and degassed according to Clause 2.4

2.5.6.2 OIL FILLING IN MAIN TANK

For main tank, the oil shall be heated to a temperature of 50°- 60°C measured at the filter outlet valve. The pressure during the filling shall be max. 1 torr. During the oil-filling, a transparent plastic tube (5) can be used as an oil-level gauge. The tube which

should be a wall thickness of 5-8 mm, may be connected to a top and a bottom valve on the transformer.

Oil-filling of the tank is done through valve (12) at a low level on the transformer and at a maximum rate of 4-5 kL/hour. The pressure in the oil pipes shall be kept positive and shall be checked by a manometer 13 (if provided).Oil filling to be done as per cl. 2.6.9.

For oil filling in diverter switch assembly of an OLTC refer leaflet (Vol.1).

Separate vacuum-proof cooler system/radiators can be evacuated for about 1-2 hours and filled separately with purified and degassed oil. The oil is then circulated through the vacuum filter at least twice via drain valves as near as possible to the transformer. Oil circulation is considered completed until the oil parameters as per table 2.3 is achieved. Care should be taken to keep all air release plugs and valves open to allow escape of trapped air during oil filling operation. These valves/plugs should be closed after completion of oil filling.

2.5.7 HOT OIL CIRCULATION/ DRYING OUT, OIL RINSING, PARTICLE REDUCTION AND PARTCLE COUNTING

To facilitate oil-penetration and absorption of possible gas bubbles, the temperature of transformer shall-after completed oil-filling-be increased by circulating the oil through the vacuum filter and with circulation direction according to Fig. 2.4.

The oil will be circulated through a high vacuum filter machine at 57 °C to 60 °C of transformer oil temperature for minimum 3 days. The start time for hot oil circulation is considered after achieving the stabilized temperature of oil i.e. Inlet and out let oil temp difference should not be more than 3 degree and the Oil temperature to be achieved in the process is between 57- 60 degree centigrade and record the IR value at an interval of 4 hrs after achieving the stabilized oil temperature values. Also record the IR value along with temperature, vacuum of M/c & IR value till oil parameter achieved as per table 2.3. Polarisation Index should be preferably more than 1.75. Other than this limit please refer the case to BHEL Bhopal.

TABLE 2.3

kV Class of Transformer	Recommended Permissible Limits			
	Electric Strength (BDV) in kV (min)	Moisture Content ppm (Max)	Resistivity * at 90°C (Ohm-cm)	Tan delta* at 90°C
Upto 170	60	15	$1x10^{12}$	0.005
245	70	10	$1x10^{12}$	0.005
420 & above	70	5	$1x10^{12}$	0.005

* Subject to availability of testing facility at site.

Method of test for Electric Strength and moisture content shall be as per IS: 335. / IEC-60296

CAUTION:

The temperature during oil circulation should not increase beyond 70°C otherwise this may cause oxidation of oil.

For transformer & reactor of 400 kV class or above, after completion of the hot oil circulation in main tank and cooler/radiator system separately, the valves between main tank and cooler/radiator system to be opened to allow the mixing of oil. The oil rinsing shall be carried out by connecting transformer/reactor to the oil rinsing plant connected with particle counter. Initially the oil inlet is connected to the lower portion of the tank and the outlet to the upper portion and start rinsing plant for circulation and creating turbulence of oil for approx. 1 hour. Thereafter the connection to be reversed (Oil inlet to the top of tank and oil outlet to the bottom of tank) and start rinsing plant. This process to be continued till the 3 consecutive readings at the interval of 1 hour of particle content of the insulation oil is achieved as per below:

If measured with particle counter which works on ISO 4402 and ISO 4406:1987	≥ 2 microns cumulative particle count should be <10000 particle/litre
If measured with particle counter which works on ISO 11171 and ISO 4406:1999	≥ 4 microns cumulative particle count should be <15000 particle/litre

Relevant ISO count for 4 Micron particle is in the range of 10.

2.5.7.1 SAMPLING

Oil sampling at various stages shall be done in accordance with IS: 6855 / IEC-60475. When samples are taken from transformer tank, oil will be drawn from Top & bottom of the tank. When it is desired to know gas content and composition of dissolved gases in transformer oil before commissioning for reference purposes (required for interpretation of Dissolved Gas Analysis results during service), sampling shall be done as per IS 9434 / IEC: 60567.

2.5.8 STANDING TIME

Standing time is the time between 'finished oil circulation' and 'energization'. The time appears from table 2.2.

2.5.9 FINAL OIL FILLING OF TRANSFORMERS/REACTORS DESPATCHED OIL FILLED.

Smaller transformers/reactors are often factory-filled with degassed oil up to about 10% below the cover and transported in this condition. The final filling up to the correct level in the conservator is made at site.

2.5.9.1 TRANSFORMERS / REACTORS WITH SYSTEM VOLTAGE < 36 KV

Previously degassed oil (e.g., at the factory) stored in tight drums may be used for the filling. Check the dielectric strength of the oil which should be as per Clause 2.4.4. If accepted, the oil is pumped into the conservator and in this way fed into the transformer / reactor. To prevent any free water in the drums from entering the

transformer / reactor the opening of the suction tube must lie 0.1 m above the lowest point in the drum. A suitable valve on the cover and/or valves or upper tightening nuts at the bushings have to be opened for complete removal of air below the cover and in the bushings. When the oil is seeping out at these points, shut the valves and tighten the nuts at the bushings.

2.5.9.2 TRANSFORMERS/REACTORS WITH SYSTEM VOLTAGE > 36 KV

The filling is performed as described above, but at least a paper filter must be used for drying the oil.

2.6 OIL FILLING INSTRUCTIONS FOR CONSERVATORS WITH AIR CELL

2.6.1 INTRODUCTION

In all transformers specially in high voltage class, maintenance of insulating oil notably its dielectric property forms one of the determining factors of reliability of equipment in service. Oxidation and contamination of transformers/reactor oil can be avoided in a simple and effective way by use of above oil preservation system. The complete system is known as "Conservator with Air Cell". In this oil preservation system a flexible air cell made of oil resistant

Nitrile rubber is placed inside the conservator and floats on the oil surface. The air cell inflates or deflates as the oil level in the conservator falls or rises depending on the ambient temperature and load on the reactor. The inside of the rubber bag (Air Cell) is put into communication with atmosphere by means of a silica gel breather which ensures dry atmosphere inside the air cell. In addition to the above this system provides following advantages.

i. It avoids saturation of absorbed gases.

ii. As no gas is used in this system, which operates at constant pressure, this formation of gas bubbles at low ambient temperature and load is eliminated. The system thus preserves the oil quality particularly its dielectric properties.

The conservator with air cell is provided with a magnetic oil gauge having one electrical contact. The indication shown on the dial physically corresponds to the oil level in the conservator which is due to balance of static pressure between the oil of the conservator and the atmospheric air inside the air cell. This system is also provided sometimes with a set of pressure and vacuum valves. These valves operate to pass either oil or air in the event of over filling or under filling the conservator during installation.

When oil is to be filled by taking vacuum through conservator refer section 2.6.9 whereas when conservator is to be isolated during oil filling in transformer refers section 2.6.2. For deciding the applicability of either process consult OGA drawing / BHEL representative

2.6.2 DESCRIPTION OF OPERATION

Figure 2.5 indicates the general arrangement of oil preservation system. The oil connection between conservator and transformer tank is made through Buchholz relay and valves are provided in between.

The flexible air cell is connected to the top of the conservator through gasket joint. Under normal condition air cell is completely surrounded by oil and floats in the conservator. The air cell inflates/deflates as the oil volume changes. The float of the MOG which is always in contact with under side of the air cell moves up and down and indicates the oil level. The cell will sink in the remote event if it is damaged and MOG alarm will operate. The conservator then functions as a conventional conservator without affecting the performance of the transformers/reactor.

2.6.3 INSTALLATION

This system is shipped separately from main tank. The air cell is shipped fitted in the conservator. A low positive pressure of less than .07 kg/sq.cm (1 psi) is maintained to avoid excessive movement of air cell in the conservator during transit. MOG is also shipped fitted on the conservator. Install the conservator and associate parts except breather as per transformers/reactor outline drawings and assemble oil pipe work.

2.6.4 OIL FILLING

The following procedure is recommended.

i. Close and blank the valve (14) to isolate the conservator from main tank. Fill the oil in transformer under vacuum upto Buchholz level as per instructions given elsewhere. '

ii. After filling the oil in transformer and breaking the vacuum, oil can be filled in the conservator either through reactor or by drain valve (4).

iii. Remove the inspection cover (11) provided on the side of the conservator and check the air cell assuring that it is inflated. The air cell must remain in fully inflated condition during oil filling operation. If the air cell is found deflated fit the inspection cover and inflate the air cell with dry air/nitrogen gas to 0.035 kg/sq.cm max. through connection (8). A gauge may be put by removing plug (10). After filling close these connections.

iv. Remove air release plugs (5) (6) and (7) provided on top of the conservator.

v. Slowly pump the oil through the main reactor/drain valve (4). Temporarily stop filling operation when oil starts coming from opening (5) and (6) after ensuring that no air bubbles come out through these air release holes. Fit the two air release plugs.

vi. Continue oil filling till oil start coming from air release plug (7) stop oil after ensuring that no air bubbles come out. Fit the plug (7).

vii. Now release the air pressure held inside the air cell from point (8) and continue oil filling until magnetic oil gauge (3) indicates 35°C level.

viii. Remove oil pump and connect air cell to breather (9) from point (8). Also remove pressure gauge and put plug (10).

ix. The system is now properly filled. Air release plugs (5), (6) and (7) are fitted in normal operation.

2.6.5 PRECAUTIONS

i. Oil filling in the conservator and also draining whenever required must be done very slowly. During oil filling, pressure in the air cell should not exceed 0.1kg/sq.cm (1.5 psi).

ii. If a pressure or vacuum is ever applied to the main reactor tank the conservator must be disconnected and a blanking plate fitted on shut off valve.

iii. Do not weld on conservator to avoid damage to the air cell.

iv. Once all the air has been driven out during oil filling in the conservator do not remove air release plugs (5), (6) and (7). Otherwise air will be sucked inside the conservator.

2.6.6 MAINTENANCE

Little maintenance work will normally be required except routine visual inspection. However, it is desirable to check the breather opening to ensure it is not blocked. Further silica gel should be regenerated/replaced when its colour changes from blue to pink.

2.6.7 AIR CELL

Air cell is made from Nylon fabric coated with Nitrile rubber, In the event it becomes necessary to replace or test the air cell for leaks the following method is recommended.

i. De-energise the transformers/reactor.

ii. Isolate the conservator by closing the valves (14).

iii. Drain the oil from the conservator through the valve (4) by removing air release plugs (5) and (6).

iv. Remove inspection cover (11) if necessary, Install the pressure gauge on point (10).

v. Pressurize the air cell (2) by dry air/nitrogen to a max. pressure of 1.5 psi and seal. Check the pressure for 6 hours.

vi. If leaks are found, air cell to be repaired by patching or replaced by a new air cell.

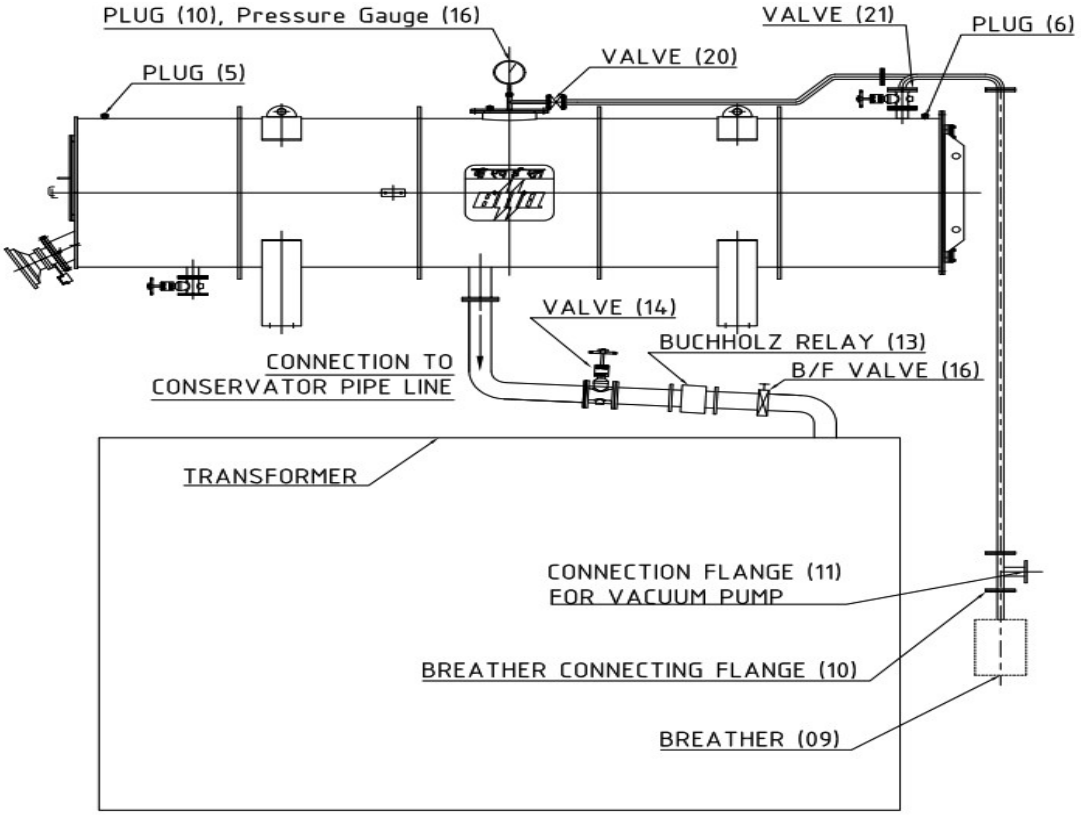
vii. For taking out the air cell from conservator, remove the air cell flange and loops from hooks provided on inside of the conservator top. Collapse the air cell slowly and fold, remove it from conservator very carefully.

viii. In the event air cell is not available immediately, conservator may be used as a conventional conservator.

2.6.8 OIL PRESSURE TEST

Oil pressure test on fully erected Transformer / Reactor to be conducted as per annexure 2.3 before hot oil circulation.

2.6.9 INSTRUCTION FOR EVACUATING OF THE TRANSFORMER / REACTOR VIA THE CONSERVATOR FOR FILLING OIL.



1. Release the overpressure in the Air cell by unscrewing the Plug (10). Open the plug (5) and (6) on the top of the conservator and blow dry compressed air for a short while, to relieve the air cell from the walls of the conservator. Wait for at least an hour to allow the Air cell to collapse completely. Tighten the plug (10) and close plug (5) and (6).
2. Remove the breather (09) and blank the flange (10).
3. Open the shut off valve (14) and (16) between conservator and transformer. Open the bypass pipe valve (20) between conservator and Air cell and valve (21). Connect the Vacuum pump to pipe flange (11) hanging down from conservator.
4. Filling of the oil through the tank can start when vacuum has reached below 1 torr. When the oil level reaches the Buchholz relay in the pipe between tank and conservator, the Shut off valve (14) located in same pipe to be closed.
5. End the vacuum and close the bypass pipe valve (20) between conservator and Air cell and open the plug 5 and 6 on top of conservator.

6. Open the Plug (10) provided on top of conservator.
7. Mount the pressure gauge (16) in position of plug (10) and close the valve (21).
8. Fill the Air in Air cell by opening valve (20) up to 1.5 PSI and close the Valve (20) when pressure reached.
9. Open the Shut off valve (14) between conservator and transformer and press up oil slowly.
10. Continue the Oil flow until oil flows from the plug (5) and (6).
11. Close the Shut off valve (14) and the plug (5) and (6), open the valve (20) and breather flange (9) to release air from Air cell.
12. When the pressure in the Air cell has decreased to atmospheric pressure, the pressure gauges (16) shows no detection open the Shut off valve (14) again and continue oil filling until the oil level specified has been reached and MOG shows 35 °C reading.
13. Connect the Breather (09) to flange (10) and blank flange (11) .

Note: The above Oil Filling under Vacuum to be followed for 765 kV & above transformers /reactors in case of specific requirement.

2.7 UNTANKING OF ACTIVE PART

2.7.1 GENERAL

If for some reason it becomes necessary to un-tank the active part (core and windings) of a large reactor/transformer, it ought to be done under supervision by BHEL erectors. Universal instruction for the un tanking procedure cannot be given, as the design practices of large equipment vary. The following general directions are, however, applicable in most cases.

The un tanking must be done indoors. If there is no suitable hall available, lifting can be done in the temporarily arranged room. e.g. a tent. The oil & the internal parts of the transformer must not in any case be exposed to rain or humidity.

In case of bell shaped transformer, only bell cover is lifted for access to active part.

2.7.2 OIL DRAINAGE

Drain off the oil from the transformers/reactor either partly or completely.

2.7.3 DISCONNECTING

Open all inspection covers for observation. Disconnect leads to bushings, current transformers, winding temperature devices, Oil temperature devices and earthing leads (common CC-CL-G) between active part and cover or tank side from earthing terminal board and any other connections like fiber optic probes from feed through plate welded on tank wall. Disconnections mentioned above can usually be made through hand holes in cover or tank side.

2.7.4 REMOVAL

Remove all large bushings, tank cover or top tank mounted conservator, lightning arrestors (if provided), thermo siphon (if provided), PRV pipe work, heavy gate valves (150 NB, 200 NB, 250 NB), neutral grounding arrangement : post insulator, copper strips & connectors (if provided). Break all connections between tank cover or top tank and tank-piping to oil conservator and cooler thermometers etc.

Remove the cover bolts. If the cover is welded to the tank flange, free the cover according to directions given in Clause 2.9.

2.7.4.1 COVER OR TOP TANK

Before lifting tank cover or top tank, refer the instructions given in outline general arrangement and on lifting bollard on tank wall. When lifting the cover or top tank use the cover-lifting eyes or lifting bollard which are designed for a minimum angle of 60 degrees between sling branches and the horizontal plane. The length of the sling should therefore be sufficient for at least this angle. Wall shunts with press board barriers (if provided) and tap changer should be properly mounted on tank wall and on tap changer mounting bracket welded on end frame or stool locked on bottom tank respectively. HV, IV, tapping & neutral leads should be properly clamped with supporting cleats provided with Terminal gear. to avoid damage.

Place the cover on suitable wooden supports and in such a way that thermometer pockets, small bushing etc. underneath the cover are not damaged.

No grinding or cleaning up of the tank flange is to be carried out before the active part is lifted out of the tank.

2.7.4.2 UNTANKING

Loosen locking devices, if any, between top core clamps and tank side.

Refer instructions given in outline general arrangement before lifting. Lift the active part by means of lifting eyes or lifting lugs provided on the top core clamps. To avoid damages on the active part it is important that it is centered carefully in the tank during lifting procedure.

After un-tanking, place the active part on a horizontal foundation.

2.7.5 RE-TANKING

Grinding or/and cleaning up of the tank flange has to be done before the active part is lowered into the tank. Check that the tank inside is free from contaminations.

Re-tanking is then done in the reverse order that is outlined above. Note that guiding pins or blocks are welded to the tank bottom to prevent the active part from moving in the tank. When lowering the active part, check that it fits exactly the guiding pins or blocks.

2.7.6 REASSEMBLING

Wipe the underside of the cover free from any dirt or foreign matter before lifting it into correct position above the reactor tank. Lower the cover the last few inches exactly into position without sliding on the gaskets.

Reassemble bolts nuts of supporting devices. Weld the cover when the welded construction is used. Reassemble Bushings, conservator etc., and reconnect pipings, leads to bushings, current transformers, etc. Reassemble inspection covers.

After the transformer is completely assembled, it may be necessary to dry it before oil fining- see clause 2.5.

2.8 MOUNTING OF GASKETS

2.8.1

The gaskets have a circular/flat cross-section and are made of oil and heat- resistant synthetic nitrile rubber/nitrile rubber bonded cork. For small gaskets, O-rings are used with diameter 3,5.0 or 8.0 mm, while round rubber cords with diameters 8,12 or 19 mm are used for large gaskets.

The groove is normally milled or turned, but for large flanges the groove is created by means of steel bars welded on top of the flange. The width of the groove is slightly smaller than the cross-section diameter of the gasket in order to keep the gasket in position during the assembling work.

Opened sealing joints may be sealed again using the new gasket. When handling and lifting flange, cover etc. with gasket grooves, care should be taken when using tools and lifting devices to avoid that the grooves getting damaged or deformed.

Before assembling of groove gaskets, it is checked that the grooves and contact-surface in the joint are free from foreign particles and that the paint is free from thick coatings, trickles and drops.

When assembling the rubber cord in the groove, the cord length shall be continuous. The gasket is given a small surplus length to compensate for shrinkage.

The gasket is pressed down into the groove without stretching or slackening.

To prevent the gasket from falling from the groove on vertical surfaces, the gasket may necessarily be spot-glued to the bottom of the groove.

The screws in the sealing joint shall be tightened so that an even pressure is obtained on the gasket. This is obtained preferably by means of a moment spanner. Rubber gaskets in grooves need not normally be re-tightened.

Above description is followed generally for turrets, inspection cover etc. For main tank rim joint, LV turrets of Generator Transformers where metallic stops are provided, nitrile rubber bonded cork is used, for which following instructions shall apply.

2.8.2

i. Gaskets when supplied loose, have no bolt holes in them. They are usually cut to the size and shape required, although they may be supplied as straight, angled pieces from which complete gaskets can be built up.

ii. Scarfed joints should be used. A 40 mm scarf in 5 mm thick material is recommended. Joints should be located away from corners and bolt holes, and should be well bonded, smooth and free from local thickening. Neoprene solution is used as an adhesive for joints.

iii. Gaskets are best stored in hermetically sealed containers in a cool place. They must be protected from damp, oil and grease-

iv. To make a gasket joint, first clean the metal surfaces by thinner to ensure that they are free from oil, rust, scale etc. Using one of the flanges as a template, punch the necessary bolt holes. Insert the bolts and tighten the bolts sequentially, a little every time so that uniform pressure is exerted on the gasket until the gasket is compressed to about 2/3 of its original thickness. Joints should not be subjected to pressure until tightening is complete. If care is taken in making joints, and in handling the gasket, it is possible to break and remake a joint several times, using the same gasket.

v. For making leak proof and good gasket joints, it is necessary that uniform pressure is achieved all over the gasket after matching rims/ flanges have been clamped with bolts/studs.

Following instructions be followed for proper tightening of bolts/studs.

a) Tighten lightly the bolts/studs diagonally in the sequence as shown in the fig. 2.6.

b) Tighten again bolts/studs in the same sequence with the torque given below :

Bolt Stud Size	Max Toque in Kg.m		
	IS 1367 Cl. 4.6	IS 1367 Cl. 8.8	IS 1367 Cl. 12.9
M 10	3	5	8
M 12	5	9	14
M 16	12	23	35
M 20	12	47	69
M 24	17	81	119
M 27	23	117	172
M 30	28	160	234

In case of metallic stoppers tighten until metal to metal contact is achieved.

c) Do not overtighten, otherwise gasket will get crushed.

2.9 WELDED COVER (IF APPLICABLE)

In order to obtain a good sealing between the transformer tank and the cover a welded joint is recommended. The welding is performed in a certain way to permit opening and new welding repeated a number of times. The chiselling up and re-welding will take about the same time as dismantling and reassembling of bolted cover.

If the welded cover for any reason has to be removed proceed as follows:

2.9.1 OPENING THE COVER

When opening the cover the welding joint should be removed by a suitable grinding wheel. The cover should be clamped to the frame by means of G-clamps to prevent iron chips from penetrating into the tank. Any parts of the weld which may possibly remain on the tank flange should be removed by a chisel to enable a good result of the re-welding.

2.9.2 RE-ASSEMBLY

When fitting the cover again cork-rubber gaskets, 25 x 5 or as specified are fitted on the tank flange, see fig. 2.7.

The gaskets are kept in the correct position with glue base on rubber base. The cover should be clamped to the tank flange by means of G-clamps evenly distributed along the flange with about 600 mm spacing. Tack welding is carried out with about 100 mm spacing. An extra G-clamp is used during the tack welding and is moved along the flange during the progress of the work. The continuous weld is then applied. Finally the weld should be cleaned and painted.

WARNING

When welding, a fire-extinguishing equipment should be available, and the work supervised by fire-protection personnel.

2.10 EARTHING OF ACTIVE PART AND CORE INSULATION TEST

2.10.1 REACTORS

The ground-connection terminals for the reactor active part are located in a box at the tank end, close to the bottom. Please see fig. 2.8.

The terminals are protected by a cover. The cover can be removed with the tank oil-filled.

The terminal box contains a terminal block with three terminals.

- The terminal marked CL is connected to the core laminations.
- The terminal marked CC is connected to the core clamps.
- The terminal marked G is connected to ground (the tank).

For the core-insulation test, remove the cover. Disconnect the closing link that connects the two terminals CL-G. Use preferably 1000V mega direct voltage between CL and CC + G. The tank shall be grounded during the test. The insulation value after

1 min. test- time shall be minimum 1000 k-ohms. There is no general requirement on the insulation level CC-G .

2.10.2 TRANSFORMERS

For checking core insulation in case of transformers refer Fig. 2.9 for connection details.

2.11 TOUCH-UP PAINTING

2.11.1 PURPOSE

A basic principle at touch-up painting should be to restore a damaged paint coat on a surface to the same quality and finish as of the surrounding surface. The touch-up painting should be limited to a surface as small as possible.

2.11.2 CLEANING

Both damaged and surrounding surface should be cleaned so that all grease, dust and other impurities will be removed.

2.11.3 GRINDING OF DAMAGES

Large damages and defects are ground by means of a coarse abrasive paper, e.g. No.100. The surface is then ground with a finer paper in connection with the damage, e.g. 150 or 180. Damages that are limited to the paint coat only should be ground off completely at which glazing can be avoided.

2.11.4 FINISHING PAINT

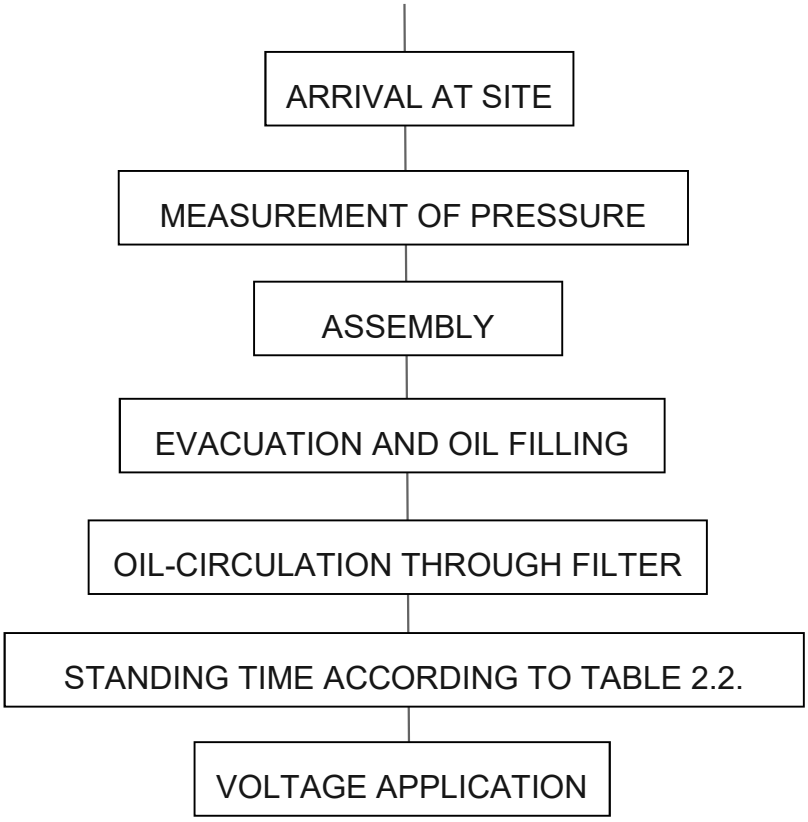
Two coats of finishing paint should be applied as per specification which is generally light grey shade No.631 of IS: 5. Please refer Table 2.4 for suppliers reference.

TABLE 2.4

Paint Make	Internal Surface	External Surface		
Asian	APCODUR CF699 WHITE	APCODUR RAPID RECOAT ZP PRIMER GRAY	APCODUR RAPID RECOAT HB MIO	APCOTHANE CF678
Akzo Nobel	INTERLINE 1012 WHITE	INTERGUAR D 251	INTERGUAR D 966	INTERTHANE 990
Jotun	PENGUARD HB WHITE	PENGUARD HSP ZP	PENGUARD MID COAT MIO	HARD TOP XP
Ching	CHING EP EMC 182 WHITE	CHING EP PRIMER EMD 183	CHING EP MIO EMD 30	CHING EP TOP COAT ADD47

ANNEXURE 2.1

FLOW CHART FOR HANDLING



Relationship between different units

1 bar = 10^5 Pa = 750 Torr = 14.5 psi = 1.02 kg/sq.cm

1 Torr = 1.33 mbar = 0.133 kPa

1 kPa = 10^3 Pa = 10 mbar = 7.501 Torr

1 MPa = 10^6 Pa

Force

1 kp = 9.807 N

Volume

1Liter	= 0.26 US gallons
1 US gallon	= 3.781Liters
1Liter	= 0.22 Imp gallons
1 Imp gallon	= 4.551Litres

Temperature

C = 5 x (F-32)/9

F = 9 x (C+32)/5

ANNEXURE 2.2

EQUIPMENT FOR OIL-FILLING UNDER VACUUM

i. High-vacuum 2 stage oil filtration plant provided with thermostat controlled

ii. oil heaters and vacuum-proof hoses with independent vacuum pumping system for tank evacuation. Capacity: 6000 LPH

iii. Oil-storage tanks provided with silica-gel breathers and inlet/outlet valves for oil circulation. Recommended capacity 20 kL -30 kL (Clause2.4)

iv. Vacuum gauges provided in filtration plant.

v. Equipment for measurement of electric strength (BDV) of oil- 100 kV set.

vi. Equipment for moisture content of oil.

vii. Equipment for measurement of Resistivity and Tan delta at 90°C .

viii. Oil-sampling cans or bottles.

ix. Transparent vacuum-proof tubes for checking of oil-level during oil filling.

x. Valves, fittings, gaskets etc.

xi. Dry nitrogen cylinders.

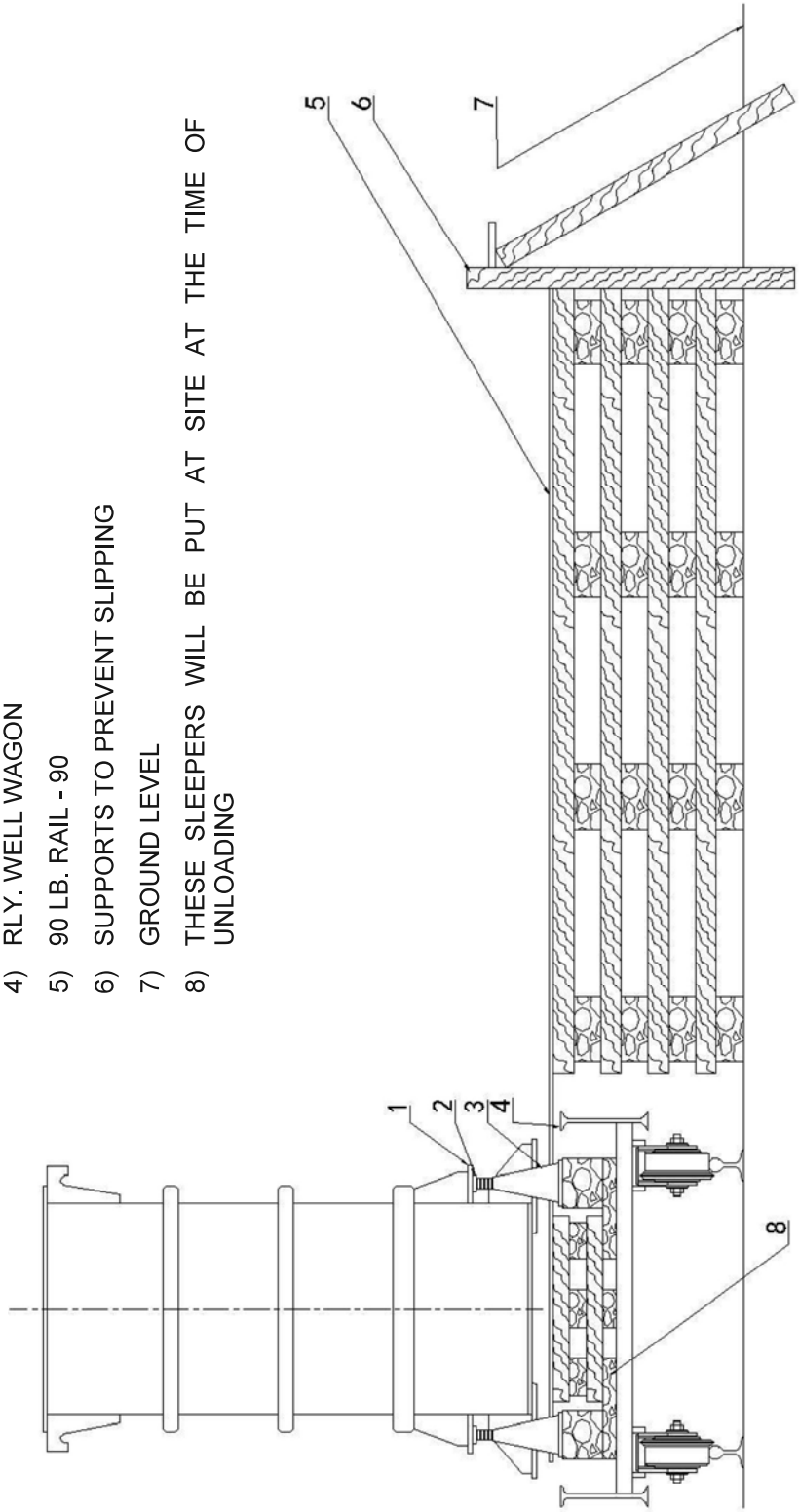


Fig. 2.1 Typical Unloading Arrangement of the Transformer

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
NEW DELHI

DOCUMENT No.	TB-XXX-316-041	Rev. No.	02		Prepared	Checked	App.
TYPE OF DOC.	STANDARD TECHNICAL SPECIFICATION			NAME	NK	MK	KK
TITLE	PVC PIPE & BENDS			SIGN	Sd/-	Sd/-	Sd/-
				DATE			
				GROUP	TBEM	W.O. No	

CUSTOMER	
CONSULTANT	
PROJECT	RATE CONTRACT

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SCOPE AND SPECIFIC TECHNICAL REQUIREMENT

1.0 SCOPE

This technical specification covers design, manufacture, testing at works, packing and dispatch of 'PVC pipe, its fittings and bends'. The material supplied shall fully comply with relevant Indian Standard given below and the product shall be BIS certified. The sizes and types of Pipes shall be as specified below. No Technical Deviations shall be acceptable in this regard.

1.1 SPECIFIC TECHNICAL REQUIREMENT

1.1.1 UPVC Pipe

The UPVC pipes shall be of nominal diameter 50 mm and/ or 110 mm, as per the indent. The pipe shall be of Class-II & Class-IV Grade as per IS 4985: 2000 and shall be of standard length of 6 meters. The pipe shall fully comply with specified standard and carry the BIS certification marking.

1.1.2 Sockets

The sockets shall fully comply with the requirements of IS 7834 (Part-6)-1977.

1.1.3 For Bends

The bends shall be of 45°, 60°, 90° and Tee as specified, for above mentioned pipes. The bends shall, in general, comply with the requirement of IS 10124. The specific requirements and BIS certification marking of these bends shall be as per IS 10124 (Part-9) and IS 10124 (Part-10) respectively.

1.2 BILL OF MATERIAL

As per enclosed Annexure-1.

Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS
02	06.09.13	[illegible]	[illegible]	[illegible]	90° Bends added.
01	30.11.10	-SD-	-SD-	-SD-	Document revised.

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2.2.2 *Dimensions* — The dimensions of 45° bends shall comply with Table 1 read with Fig. 1.

2.2.3 The bends may either be plain at both ends or socketed either at one end or at both ends as agreed to between the manufacturer and the purchaser. In the case of socketed bends, the socket measurements shall comply with IS : 10124 (Part 1)-1988*.

NOTE 1 — For 0·25 MPa pressure class, fabricated bends should not be made from 0·25 MPa pressure class pipes. For this, bends made from 0·4 MPa pressure class pipe should be used.

NOTE 2 — The drawing is only intended to define the terms used in Table 1 and is not intended to illustrate specific design features.

3. MARKING

3.1 Each 45° bend fitting shall be marked with the following information:

a) Manufacturer's name or identification mark,

b) The size of the bend and the appropriate class (working pressure) of IS : 4985-1988* to which the pressure rating of the fitting corresponds,

c) The degree of bend, and

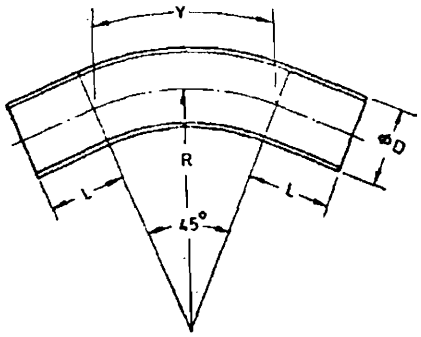

FIG. 1 45° BEND

*Specification for fabricated PVC fittings for potable water supplies: Part 1 General requirements.

*Specification for unplasticized PVC pipes for potable water supplies (*second revision*).

TABLE 1 DIMENSIONS OF 45° BENDS

(*Clauses* 2.2.2 and 2.2.3, and *Fig.* 1)

All dimensions in millimetres.

Size	Y* Min	L Min (Only for plain ends)	R† Min	Minimum Wall Thickness (t) for Working Pressure		
				0·4 MPa (Class 2)	0·6 MPa (Class 3)	1·0 MPa (Class 4)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
63	149	63	189	1·4	2·0	3·2
75	177	75	225	1·7	2·4	3·8
90	212	90	270	1·9	2·8	4·5
110	259	110	330	2·3	3·4	5·5
125	295	125	375	2·7	3·9	6·3
140	330	140	420	2·9	4·4	7·0
160	377	160	480	3·4	4·9	8·0
180	424	180	540	3·8	5·5	9·0
200	471	200	600	4·2	6·2	10·0
225	530	225	675	4·7	6·9	11·2
250	589	250	750	5·2	7·7	12·5
280	660	280	840	5·8	8·6	13·9
315	742	315	945	6·5	9·7	15·6
355	837	355	1 065	7·3	10·8	17·7
400	842	400	1 200	8·2	12·2	19·8
450	1 060	450	1 350	9·3	13·7	22·4
500	1 178	500	1 500	10·3	15·3	24·8
560	1 319	560	1 680	11·6	17·2	27·8
630	1 484	630	1 890	13·0	19·2	31·3

NOTE — Minimum wall thickness if calculated on the basis of 90 percent of the minimum wall thickness of the corresponding size and pressure class of pipe rounded off to the next higher 0·1 mm.

*Y is calculated from $\frac{45°}{360°} \times 2\pi R$.

†*R, radius of the bend, is equal to 3 times the nominal outside diameter (D).*

2.2.2 *Dimensions* — The dimensions of 90° bends shall comply with Table 1 read with Fig. 1.

2.2.3 The bends may either be plain at both ends or socketed either at one end or at both ends as agreed between the manufacturer and the purchaser. In the case of socketed bend, the socket measurements shall comply with IS : 10124 (Part 1)-1988*.

NOTE — For 0·25 MPa pressure class, fabricated bends should not be made from 0·25 MPa pressure class pipes. For this, bends made from 0·4 MPa pressure class pipe should be used.

NOTE — The drawing is only intended to define the terms used in Table 1 and is not intended to illustrate specific design features.

3. MARKING

3.1 Each 90° bend fitting shall be marked with the following information:

a) Manufacturer's name identification mark,

b) The size of the bend and the appropriate class (working pressure) of IS : 4985-1988* to which the pressure rating of the fitting corresponds,

c) The degree of bend, and

d) The bend shall be marked in colour as indicated below for different classes of fittings:

Class of Fitting	*Colour*
Class 2 (0·4 MPa)	Blue
Class 3 (0·6 MPa)	Green
Class 4 (1·0 MPa)	Yellow

*Specification for fabricated PVC fittings for potable water supplies: Part 1 General requirements (*first revision*).

*Specification for unplasticized PVC pipes for potable water supplies (*second revision*).

TABLE 1 DIMENSIONS OF 90° BENDS

(*Clauses* 2.2.2, 2.2.3 and *Fig.* 1)

All dimensions in millimetres.

SIZE	*Y** *Min*	*L* *Min* (Only for plain ends)	*R*† *Min*	MINIMUM WALL THICKNESS (*t*) FOR WORKING PRESSURE		
				0·4 MPa (Class 2)	0·6 MPa (Class 3)	1·0 MPa (Class 4)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
63	297	63	189	1·4	2·0	3·2
75	354	75	225	1·7	2·4	3·8
90	424	90	270	1·9	2·8	4·5
110	519	110	330	2·3	3·4	5·5
125	589	125	375	2·7	3·9	6·3
140	660	140	420	2·9	4·4	7·0
160	754	160	480	3·4	4·9	8·0
180	848	180	540	3·8	5·5	9·0
200	942	200	600	4·2	6·2	10·0
225	1 060	225	675	4·7	6·9	11·2
250	1 178	250	750	5·2	7·7	12·5
280	1 319	280	840	5·8	8·6	13·9
315	1 484	315	945	6·5	9·7	15·6
355	1 673	355	1065	7·3	10·8	17·7
400	1 884	400	1200	8·2	12·2	19·8
450	2 120	450	1350	9·3	13·7	22·4
500	2 355	500	1500	10·3	15·3	24·8
560	2 638	560	1680	11·6	17·2	27·8
630	2 968	630	1890	13·0	19·2	31·8

NOTE — Minimum wall thickness is calculated on the basis of 90 percent of the minimum wall thickness of the corresponding size and pressure class of pipe rounded off to the next higher 0·1 mm.

*Y is calculated from $\frac{90°}{360°} \times 2\pi R$.

†R, radius of the bend, is equal to 3 times the nominal outside diameter (D).

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
NEW DELHI

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SCOPE AND SPECIFIC TECHNICAL REQUIREMENT

1.0 SCOPE

This technical specification covers design, manufacture, testing at works, packing and dispatch of 'GI pipe, its fittings and bends'. The material supplied shall fully comply with relevant Indian Standard given below and the product shall be BIS certified. The sizes and types of Pipes shall be as specified below. No Technical Deviations shall be acceptable in this regard.

1.1 SPECIFIC TECHNICAL REQUIREMENT

1.1.1 Galvanized Iron (GI) Pipe

The GI pipes shall be of nominal diameter 50 mm and/ or 100 mm, as per the indent. The pipe shall be of medium Grade as per IS 1239 and shall be of standard length of 6 meters. The pipe shall fully comply with specified standard and carry the BIS certification marking. The pipe shall have a socket at one end and threaded at both ends.

1.1.2 Sockets

The sockets shall fully comply with the requirements of IS 1239 (Part-2).

1.1.3 For Bends

The bends shall be of 90°, 112.5° and/ or Tee, as specified, for above mentioned pipes. The bends shall, in general, comply with the requirement of IS 1239 (part-2). The specific requirements and BIS certification marking of these bends shall be as per IS 1239 (Part-2). 90°, 112.5° and Tee bends shall have a socket at one end and threaded at all ends.

1.2 BILL OF MATERIAL

As per enclosed Annexure-1.

Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS
02	25.04.13			Rakesh	90° bends has been included.
01	30.11.10	Sd/-	Sd/-	Sd/-	Document revised.

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