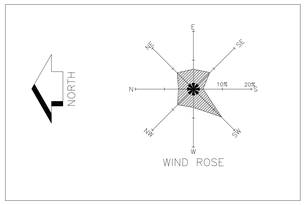
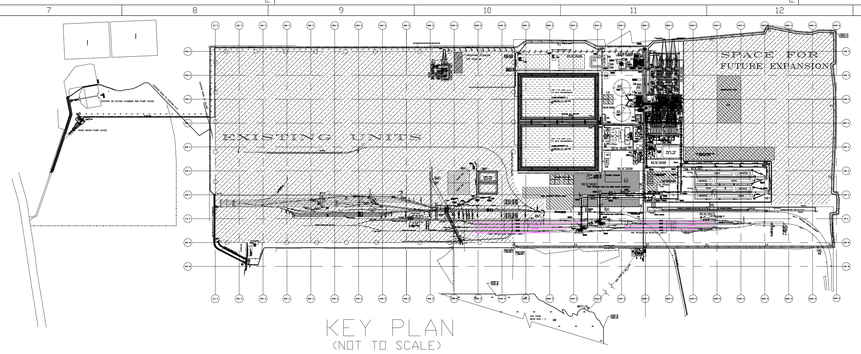
Annexure 1

Drawing list for Suratgarh ETC BOQ

S. No.	Title	Drawing No.	Rev . No.
1	Plot plan	PE-DG-392-100-M001	3
2	Single line diagram of 420kV system	TB-1-360-510-001	4
3	Layout Plan drawing of 400kV s/s	TB-0-360-316-002	3
4	Section drawing of 400kV s/s	TB-0-360-316-003	3
5	Conceptual Control room building Layout	TB-3-360-316-009	3
6	Structure loading drawing	TB-0-360-316-010	3
7	Equipment earthing details	TB-4-360-316-011	1
8	Layout Plan and elevation drawing of 11kV s/s	TB-3-360-316-016	0
9	Single line diagram of 11kV line	TB-1-360-510-001A	2

FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM
DRAWING NO. PE-DG-392-100-M001





KEY PLAN
(NOT TO SCALE)

LEGEND

	FENCING LINE/ PROPERTY LINE
	PLANT BOUNDARY WALL
	EXISTING PLANT BOUNDARY
	400KV INTERCONNECTING LINES
	ROAD BY BHEL-ISG
	GREEN BELT
⊠	WATCH TOWER
RWPH	RAW WATER PUMP HOUSE
WT	WAGON TIPPLER
BCN	BELT CONVEYOR
PH	PENT HOUSE
PCH	PRIMARY CRUSHER HOUSE
SCH	SECONDARY CRUSHER HOUSE
JNT	JUNCTION TOWER
TH	TRANSFER HOUSE
ERH	EMERGENCY RECLAIM HOPPER
	LIGHTING HIGH MAST

LIST OF BUILDING/EQUIPMENT SHOWN

NO	DESCRIPTION
1	SWITCH YARD FOR 2 UNITS
2	TRANSFORMER YARD FOR 2 UNITS
3	POWER HOUSE BUILDING
4	BOILER UNITS
5	MILL BAY
6	ELECTROSTATIC PRECIPITATOR
7	STACK
8	COAL STOCK YARD FOR 2 UNITS
9	ASH HANDLING PLANT
10	CHP CONTROL ROOM
11	OPEN YARD
12	BATCHING PLANT/FABRICATION YARD FOR CT VENDOR
13	PT PLANT
14	D.M PLANT,CHEMICAL LAB AND NEUTRALIZING PIT
15	D.M. WATER TANKS & PUMP HOUSE
16	SEWAGE TREATMENT PLANT
17	EFFLUENT TREATMENT PLANT
18	CW TREATMENT PLANT
19	F.O.STORAGE AREA & PRESSURING PUMP HOUSE
20	CANTEEN
21	STORES
22	WORKSHOP
23	COOLING TOWERS
24	C.W. PUMP HOUSE
25	COMPRESSOR HOUSE
26	CONTROL BUILDING
27	ADMINISTRATIVE BUILDING COMPLEX
28	FLY ASH SILO / ASH DESPATCH AREA
29	CONSTRUCTION YARD
30	DG SET
31	ESP CONTROL ROOM
32	CONDENSATE STORAGE TANK
33	ASH COMPRESSOR HOUSE CUM BLOWER HOUSE
34	H.F.O/L.D.O HANDLING & STORAGE AREA
35	CHEMICAL HOUSE
36	FIRE STATION
37	SECURITY POST
38	WEIGH BRIDGE
39	COAL RUN-OFF & TREATMENT AREA
40	SWITCHYARD CONTROL ROOM
41	DELETED
42	BLOW DOWN TANK/FIRE WATER PUMP HOUSE
43	MAIN GATE
44	DELETED
45	FUEL OIL UNLOADING PUMP HOUSE
46	LDO UNLOADING PUMP HOUSE
47	SERVICE BUILDING
48	GATE HOUSE
49	SECURITY BARRACK
50	COAL SAMPLE TESTING LAB
51	ASH WATER CLARIFIER/ASH WATER TANK/ SLURRY PUMP HOUSE
52	DSS PUMP HOUSE
53	INTERMEDIATE ASH SILO
54	GAS CHLORINATION BUILDING(FOR RIVER WATER INTAKE)
55	INLINE WEIGH BRIDGE
56	CONSTRUCTION POWER SUB STATION
57	DELETED
58	RAW WATER PUMP HOUSE
59	HYDROGEN GENERATION PLANT
60	RECOVERY WATER PUMP HOUSE
61	AUXILIARY BOILER
62	HOSTEL (CUSTOMER SCOPE)
63	RAILWAY STAFF BUILDING (CUSTOMER SCOPE)
64	FIRE BOOSTER PUMP
65	ELECTRO CHLORINATION BUILDING
66	RCC RAIN WATER HARVESTING COLLECTION PIT
67	RAIN WATER COLLECTION SURFACE POND
68	CUSTOMER OFFICE SPACES
69	FOAM PUMP HOUSE
70	FILTERED WATER TANK & PUMP HOUSE
71	WATCH TOWER
72	BULLDOZER SHED
73	SICK WAGON YARD
74	LOCO SHED
75	DELETED

NOTES

1. THE GRIDS SHOWN ARE IN METERS.
2. FINISHED GROUND FLOOR LEVEL OF TG BUILDING = RL +193.50 M, CORRESPONDS TO PLANT EL 0.0M. FFL IN BOILER AREA SHALL BE RL +193.30M AND FFL IN TRANSFORMER YARD SHALL BE RL +193.40M. FINISHED GROUND LEVEL IN BOP AREA SHALL BE AS MARKED.
3. THE ASH POND SHOWN IS APPROXIMATE AND AS PER THE DATA GIVEN BY RRVUNL.

REV.	DATE	ALTD	CHD	APPD
03	07.08.14	KK	SK	AJ
1.	LOCATIONS OF WATCH TOWERS REVISED AS PER CUSTOMER COMMENTS.			
2.	BATCHING PLANT/CT VENDOR BATCHING & FABRICATION YARD REVISED AS PER CUSTOMER REQUIREMENT.			
3.	DIMENSIONS OF ROAD AROUND COAL-STOCKYARD MARKED.			
4.	CUSTOMER OFFICE SPACE(ITEM NO-68) SHIFTED NEAR TO MECH.BRIDGE AS PER AGREEMENT BETWEEN PGCIL & RRVUNL.			
5.	DEMARCATION SHOWN FOR CHP CONVEYORS ,INTs COMING IN MATERIAL STORAGE YARD.			

REV	DATE	ALTD	CHD	APPD
02	05.07.14	KK	SK	AJ
1.	WATERCOURSE, R.C.C. CHP LAYOUT UPDATED AS PER LATEST DRWG. RECEIVED.			
2.	FOUR NOS. SILOS UPDATED AS PER LATEST DRAWINGS.			
3.	SWITCHYARD, TRANSFORMER YARD, TG HALL, BOILER, ESP, ESP CONTROL ROOM, CW PIPING, RAW WATER PUMP HOUSE, DM PLANT, CHEMICAL LAB, AUXILIARY BOILER, PUMP HOUSE, INTAKE PUMP HOUSE, EST P/H, COMPRESSOR HOUSE LAYOUT UPDATED AS PER LATEST DRAWINGS.			
4.	ASH WATER CLARIFIER, ASH WATER TANK, SLURRY PUMP HOUSE LAYOUT UPDATED.			
5.	RCN BOILER LOCATION CHANGED.			
6.	LOCATION OF FABRICATION YARD(ITEM-29) UPDATED.			
7.	LOCATION OF AHP/CHP FABRICATION YARD/BATCHING PLANT/SITE OFFICE MARKED.			

REV	DATE	ALTD	CHD	APPD
01	21.08.13	KK	SK	AJ
1.	DRAWING REVISED AS PER DISCUSSION IN MEETING WITH CUSTOMER DATED 23.05.13			
2.	ITEM NO. 44 DELETED & CLUBBED WITH 66.			
3.	FUEL OIL AREA, SWITCHYARD HAS BEEN UPDATED.			
4.	FENCING LINE UPDATED AS PER SURVEY DRAWING.			
5.	DRAWING GENERALLY REVISED.			

CUSTOMER	RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LTD.
CUSTOMER'S CONSULTANT	TATA CONSULTING ENGINEERS LIMITED MUMBAI
JOB No. 392	2 X 660 MW SUPER CRITICAL TPS (SURATGARH ,STAGE-V, UNIT # 7 & 8)
STATUS CONTRACT	
DISTRIBUTION	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA
TO	
No.OF'T	

DEPT		NAME	SIGN	DATE
CODC	DRN	KK		16.05.2013
M	DESN	KK		16.05.2013
	CHD	SK		16.05.2013
	APPD	AJ		16.05.2013

TITLE: PLOT PLAN

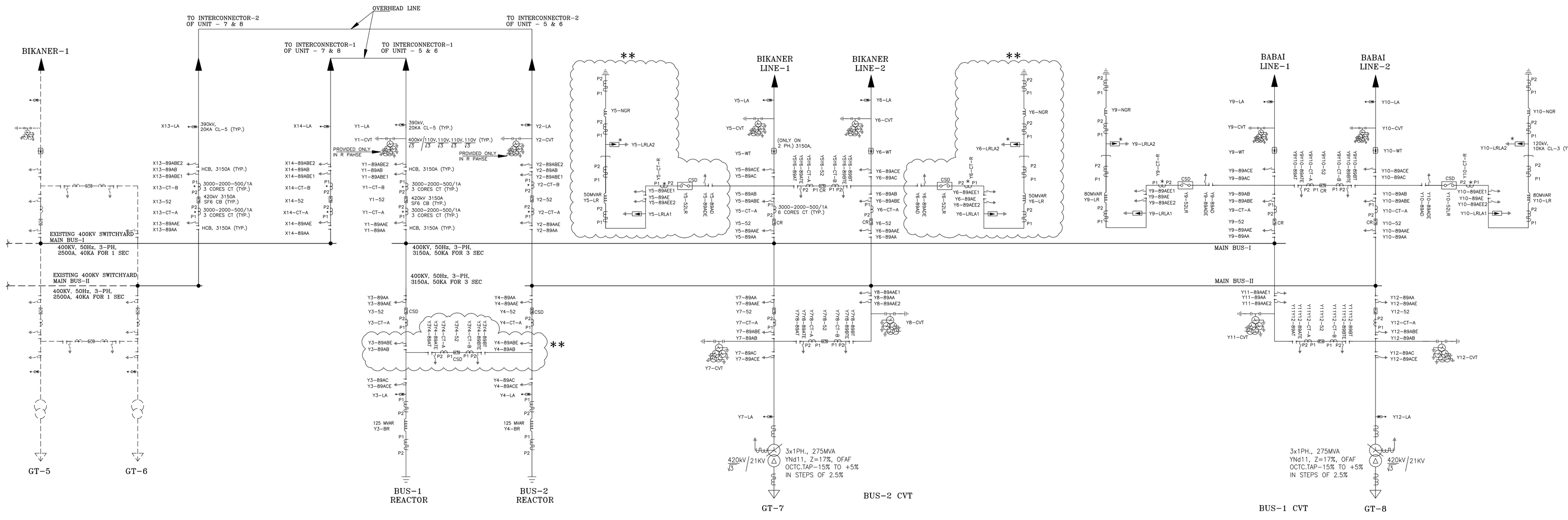
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						SIGN		PE-DG-392-100-M001
						DATE		SHEET 1 OF 2 REV 3

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COMPUTER FILE NAME: 392_100_M001.R3

FIRST ANGLE PROJECTION

DRG. NO. TB-1-360-510-001



420kV MAIN CT DETAILS

FOR ALL BAYS AT NEW SWITCHYARD EXCEPT INTERCONNECTOR BAYS & CTs PLACED AFTER LINE REACTOR CB

Core No.	Current Ratio	Output Burden (VA) at lowest Tap	Minimum KPV (Volts)	Max Ie (mA) at KPV	Maximum Rct (Ohms)	Accuracy Class	Purpose
1	3000-2000-500/1 A	-	3000-2000-500	20-30-120	15-10-2.5	PS	Protection
2	3000-2000-500/1 A	-	3000-2000-500	20-30-120	15-10-2.5	PS	Protection
3	3000-2000-500/1 A	20	-	-	-	0.2s, ISF ≤ 5	Metering
4	3000-2000-500/1 A	20	-	-	-	0.2s, ISF ≤ 5	Metering
5	3000-2000-500/1 A	-	3000-2000-500	20-30-120	15-10-2.5	PS	Protection
6	3000-2000-500/1 A	-	3000-2000-500	20-30-120	15-10-2.5	PS	Protection

FOR INTERCONNECTOR BAYS (IN BOTH SIDES OF CB) & CTs PLACED AFTER LINE REACTOR CB

Core No.	Current Ratio	Output Burden (VA) at lowest Tap	Minimum KPV (Volts)	Max Ie (mA) at KPV	Maximum Rct (Ohms)	Accuracy Class	Purpose
1	3000-2000-500/1 A	-	3000-2000-500	20-30-120	15-10-2.5	PS	Protection
2	3000-2000-500/1 A	-	3000-2000-500	20-30-120	15-10-2.5	PS	Protection
3	3000-2000-500/1 A	20	-	-	-	0.2s, ISF ≤ 5	Metering / Spare

420kV, 4400pF CVT DETAILS

Winding No.	Ratio	Accuracy Class	Rated Burden (VA)	Purpose
1	(400 kV/√3) / (110V/√3)	3P	50	Protection
2	(400 kV/√3) / (110V/√3)	3P	50	Protection
3	(400 kV/√3) / (110V/√3)	0.2	15	Metering
4	(400 kV/√3) / (110V/√3)	0.2	15	Metering

BUSHING CT DETAILS

420kV, 125MVAR BUS REACTOR (LINE SIDE)

Core No.	Current Ratio	Output Burden (VA) at lowest Tap	Minimum KPV (Volts)	Max Ie (mA) at KPV	Maximum Rct (Ohms)	Accuracy Class	Purpose
1	350/1 A	-	350	120	1	PS	SPARE
2	350/1 A	-	350	120	1	PS	REF
3	350/1 A	-	350	120	1	PS	BACK-UP PROTECTION
4	350/1 A	10	-	-	-	1	METERING - SPARE

420kV, 125MVAR BUS REACTOR (NEUTRAL SIDE)

(CT Placed Before Neutral)

Core No.	Current Ratio	Output Burden (VA) at lowest Tap	Minimum KPV (Volts)	Max Ie (mA) at KPV	Maximum Rct (Ohms)	Accuracy Class	Purpose
1	171/1.6 A	10	-	-	-	5	WTI CT (Y-PH ONLY)
2	3000-2000-500/1 A	-	3000-2000-500	20-30-120	15-10-2.5	PS	REACTOR DIFFERENTIAL
3	3000-2000-500/1 A	-	3000-2000-500	20-30-120	15-10-2.5	PS	REACTOR DIFFERENTIAL
4	350/1 A	-	350	120	1	PS	REF
5	350/1 A	-	350	120	1	PS	SPARE

420kV, 50/80MVAR LINE REACTOR (LINE SIDE)

Core No.	Current Ratio	Output Burden (VA) at lowest Tap	Minimum KPV (Volts)	Max Ie (mA) at KPV	Maximum Rct (Ohms)	Accuracy Class	Purpose
1	300/1 A	-	300	120	1	PS	SPARE
2	300/1 A	-	300	120	1	PS	REF
3	300/1 A	-	300	120	1	PS	BACK-UP PROTECTION
4	300/1 A	10	-	-	-	1	SPARE - METERING

420kV, 50/80MVAR LINE REACTOR (NEUTRAL SIDE)

(CT Placed Before Neutral)

Core No.	Current Ratio	Output Burden (VA) at lowest Tap	Minimum KPV (Volts)	Max Ie (mA) at KPV	Maximum Rct (Ohms)	Accuracy Class	Purpose
1	110/1.6 A (for 80MVAR Reactor) 69/1.6 A (for 50MVAR Reactor)	10	-	-	-	5	WTI CT (Y-PH ONLY)
2	500/1 A	-	500	120	2.5	PS	REACTOR DIFFERENTIAL
3	500/1 A	-	500	120	2.5	PS	REACTOR DIFFERENTIAL
4	3000-2000-500/1 A	-	3000-2000-500	20-30-120	15-10-2.5	PS	LINE DISTANCE PROTECTION
5	3000-2000-500/1 A	-	3000-2000-500	20-30-120	15-10-2.5	PS	LINE DISTANCE PROTECTION

LINE REACTOR NGR (LINE SIDE)

Core No.	Current Ratio	Output Burden (VA) at lowest Tap	Minimum KPV (Volts)	Max Ie (mA) at KPV	Maximum Rct (Ohms)	Accuracy Class	Purpose
1	300/1 A	-	300	120	1	PS	SPARE

LINE REACTOR NGR (NEUTRAL SIDE)

Core No.	Current Ratio	Output Burden (VA) at lowest Tap	Minimum KPV (Volts)	Max Ie (mA) at KPV	Maximum Rct (Ohms)	Accuracy Class	Purpose
1	300/1 A	-	300	120	1	PS	REF

REFERENCE :-

1 DRG. NO:- TCE-5750A-738-AU-3001 KEY ONE LINE DIAGRAM
2 DRG. NO:- TCE-5750A-738-AU-3002 MAIN ONE LINE DIAGRAM
3 DRG. NO:- 3VYN191103-400kV/220kV SWITCHYARD LAYOUT PLAN OF UNIT-6
4 CT AND CVT SIZING DOC. NO. TB-360-316-057

LEGEND :-

PRESENT ——————
EXISTING – – – – – – –
BUSHING CT

NOTES :-

01) SYSTEM FAULT LEVEL-50kA FOR 3 SEC FOR 400kV.
02) SYSTEM SHALL BE SOLIDLY GROUNDED.
03) 400kV WAVE TRAP WOULD BE PROVIDED IN TWO PHASE ONLY.
04) CREEPAGE: 31mm/kV.
05) REFER BHEL PEM DRAWING NO. PE-DG-392-510-E001 FOR DETAILS OF GT BUSHING CT.
06) 400kV HCB ISOLATOR SHALL BE ELECTRICALLY GANGED MOTOR OPERATED.
07) 400kV EARTH SWITCH SHALL BE MANUALLY OPERATED.
08) LIGHTNING ARRESTER IN GT BAY SHALL BE LOCATED NEAR RESPECTIVE GENRATOR TRANSFORMER.
09) INTERCONNECTOR LINES BETWEEN EXISTING AND PROPOSED SWITCHYARD WILL BE DESIGNED FOR A FAULT LEVEL OF 50kA FOR 3 SECONDS.
10) CT/CVT DETAILS INDICATED IN SLD ARE TENTATIVE AND SAME SHALL BE FINALISED AFTER APPROVAL OF CT/CVT SIZING CALCULATION.
11) **= THESE EQUIPMENTS SHALL BE PROVIDED WITH SUBJECT TO COMMERCIAL SETTLEMENT.

BILL OF QUANTITY (MAIN EQUIPMENT)

S.L.	ITEM DESCRIPTION	kV	QTY.	SYMBOL
1	80MVAR, 3-PH, SHUNT LINE REACTOR ALONG WITH NGR(60KVAR,600 ohm)	420	02	
2	125 MVAR, 3-PH, SHUNT BUS REACTOR	420	02	
3	50MVAR, 3-PH, SHUNT LINE REACTOR ALONG WITH NGR	420	02	#
4	3150A, 3-PH, 50kA FOR 3 SEC, SF6 CB SUITABLE FOR 1ø & 3ø OPERATION WITH CLOSING RESISTOR.	420	06	CR
5	3150A, 3-PH, 50kA FOR 3 SEC, SF6 CB SUITABLE FOR 1ø & 3ø OPERATION WITHOUT CLOSING RESISTOR.	420	08	
6	3150A, 3-PH, 50kA FOR 3 SEC, SF6 CB SUITABLE FOR 1ø & 3ø OPERATION WITHOUT CLOSING RESISTOR WITH CONTROLLED SWITCHING DEVICE	420	07	CSD
7	3150A, 3-PH, 50kA FOR 3 SEC. HCB ISOLATOR(ELECTRICALLY GANGED MOTOR OPERATED) WITH 1E/S (MANUALLY OPERATED). LEFT HAND SIDE=17 NOS., RIGHT HAND SIDE=25 NOS.	420	42	
8	3150A, 3-PH, 50kA FOR 3 SEC. HCB ISOLATOR(ELECTRICALLY GANGED MOTOR OPERATED) WITH 2E/S (MANUALLY OPERATED).	420	10	
9	3000 A, 6 CORE CURRENT TRANSFORMER, 1 PHASE, 120% EXTENDED CURRENT, 50kA for 3 sec.	420	54	
10	3000 A, 3 CORE CURRENT TRANSFORMER, 1 PHASE, 120% EXTENDED CURRENT, 50kA for 3 sec.	420	36	*
11	4400 pF CVT, 4 CORE, 1PH.	420	26	
12	SURGE ARRESTER, 1-PH., 20kA CLASS-5	390	48	
13	WAVE TRAP (3150A, 1mH), 50kA FOR 1 SEC, 1-PH, PEDESTAL TYPE	420	08	
14	LIGHTNING ARRESTER, 1-PH. 10kA CLASS-3 FOR REACTOR	120	04	

REMARKS - NGR RATING SHALL BE CONFIRMED BY CUSTOMER

SYSTEM PARAMETER

S. NOS.	DESCRIPTION	UNIT	
1.	NOMINAL SYSTEM VOLTAGE	kV	400
2.	HIGHEST SYSTEM VOLTAGE	kV	420
3.	FULL WAVE IMPULSE WITHSTAND	kVP	1425
4.	ONE MINIUTE POWER FREQUENCY WITHSTAND VOLTAGE	kVrms	630
5.	SWITCHING IMPULSE WITHSTAND VOLTAGE	kVP	1050
6.	MINIMUM PHASE TO PHASE CLEARANCE	MM	4100
7.	MINIMUM PHASE TO EARTH CLEARANCE	MM	3500
8.	MINIMUM SECTIONAL CLEARANCE	MM	6500
9.	MINIMUM LIVE PART TO GROUND CLEARANCE	MM	8000

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
04	13.08.14	AS PER TCE LETTER DATED 27.02.14	RK	SK	SKS/VK	RS
03	05.02.14	AS PER TCE LETTER DATED 14.11.13 NEW SCOPE	RK	-SD- SK	-SD- SKS/VK	-SD- RS
02	03.09.13	AS PER TCE LETTER DATED 19.08.13	RK	-SD- SK	-SD- SKS/VK	-SD- SS
01	20.07.13	AS PER TCE LETTER DATED 4.6.13	-SD- RK	-SD- SK	-SD- SKS/VK	-SD- SS

OWNER
RAJASTHAN RAJYA VIDYUT UTPANDAN NIGAM LIMITED

PROJECT
2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER
TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR
BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP

DEPT CODE		NAME	SIGN.	DATE
422	DRN	RK	-SD-	10.05.13
	DESN	SK	-SD-	
	CHD	SKS	-SD-	
	APPD	AS	-SD-	

TITLE
SINGLE LINE DIAGRAM FOR 400kV S/S AT SURATGARH

CV	ME	EL	I&C			DEPT.	SCALE NTS	BHEL/SUB VENDOR DRG NO. TB-1-360-510-001
						SIGN		
						DATE		SHT. No 01 OF 01 REV. 04

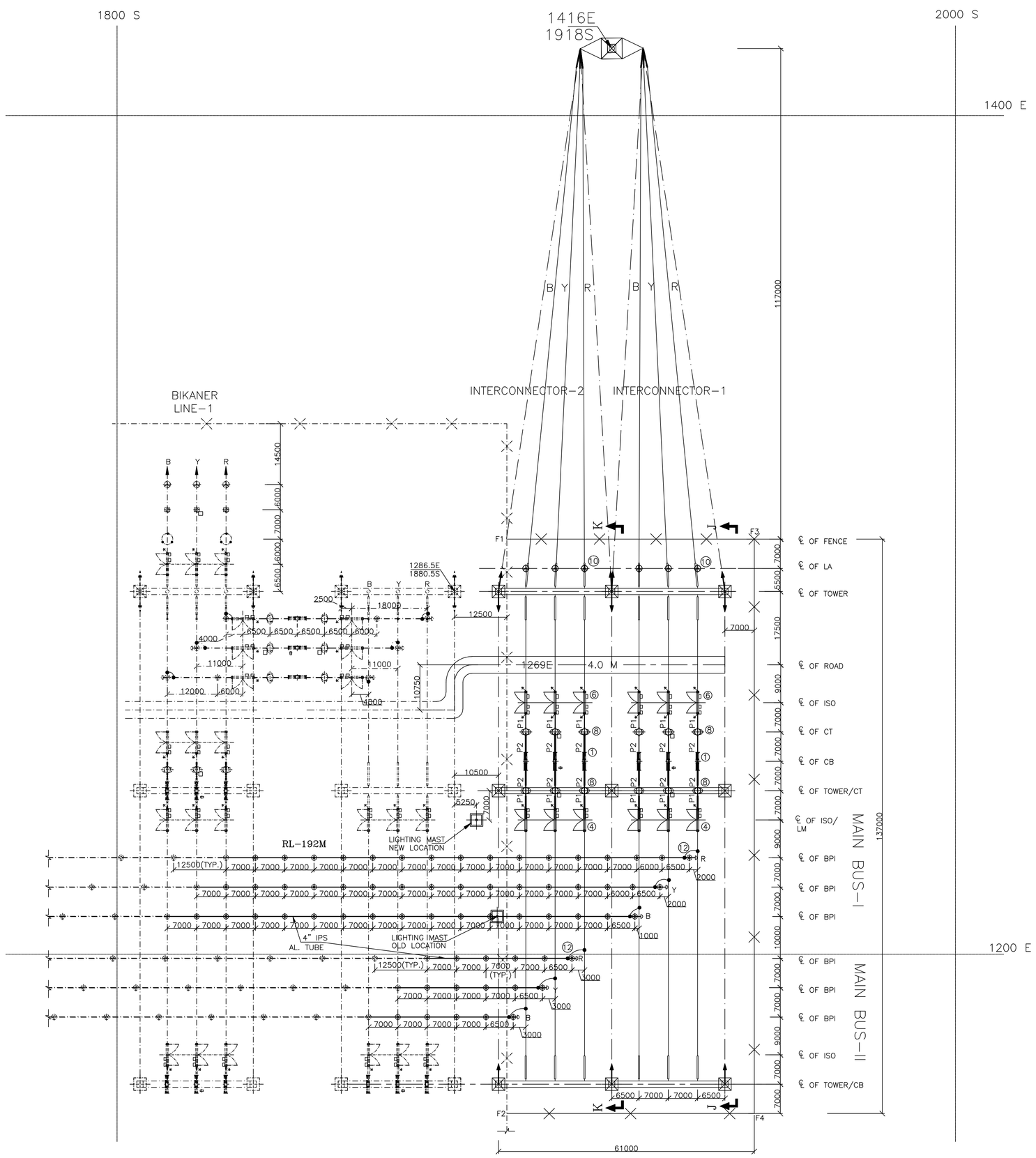
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COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

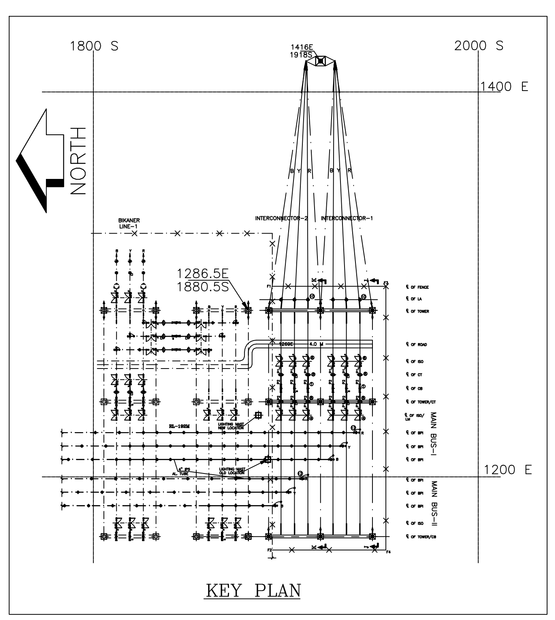
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

FIRST ANGLE PROJECTION

DRG. NO. TB-0-360-316-002



LAYOUT PLAN OF UNIT–6 EXTENSION 420kV SWITCHYARD



KEY PLAN

SCHEDULE OF EQUIPMENT (OUTDOOR)

ITEM CODE	DESCRIPTION	SYMBOLS	QUANTITY IN NOS. UNIT 7&8 SWITCHYARD	QUANTITY IN NOS. UNIT 6 EXTN. SWITCHYARD
1.	420kV, 3150A, 3–PHASE, 50 kA FOR 3 Sec. SF6 CIRCUIT BREAKERS WITHOUT CLOSING RESISTOR SUITABLE FOR SINGLE AND 3–PHASE OPERATION.		6	2
2.	420kV, 3150A, 3–PHASE, 50 kA FOR 3 Sec. SF6 CIRCUIT BREAKERS WITH CLOSING RESISTOR SUITABLE FOR SINGLE AND 3–PHASE OPERATION.		6	–
3	420kV, 3150A, 3–PHASE, 50 kA FOR 3 Sec. SF6 CIRCUIT BREAKERS WITHOUT CLOSING RESISTOR WITH CONTROLLED SWITCHING DEVICE SUITABLE FOR SINGLE AND 3–PHASE OPERATION.		7	–
4	420kV, 3150A 3–PHASE, 50 kA FOR 3 Sec. HCB ISOLATOR (ELECTRICALLY GANGED MOTOR OPERATED) WITH ONE E/S ON RIGHT SIDE (MANUALLY OPERATED)		23	2
5	420kV, 3150A 3–PHASE, 50 kA FOR 3 Sec. HCB ISOLATOR (ELECTRICALLY GANGED MOTOR OPERATED) WITH ONE E/S ON LEFT SIDE (MANUALLY OPERATED)		17	–
6	420kV, 3150A 3–PHASE, 50 kA FOR 3 Sec. HCB ISOLATOR (ELECTRICALLY GANGED MOTOR OPERATED) WITH TWO E/S (MANUALLY OPERATED)		8	2
7	420kV, 3000A, 50kA FOR 3 Sec. 1–PHASE, 6 CORE CURRENT TRANSFORMER		54	–
8	420kV, 3000A, 50kA FOR 3 Sec. 1–PHASE, 3 CORE CURRENT TRANSFORMER		24	12
9	420kV, 4400 pF, $\frac{400}{\sqrt{3}} / \frac{0.110}{\sqrt{3}} / \frac{0.110}{\sqrt{3}} / \frac{0.110kV}{\sqrt{3}} / \frac{0.110kV}{\sqrt{3}}$, 1–PHASE , 4 CORE CAPACITOR VOLTAGE TRANSFORMER		26	0
10	390kV, 1–PHASE LIGHTNING ARRESTERS,20KA,CLASS–5		42	6
11	420kV, 3150A, 1mH, 1–PHASE WAVE TRAP 50 kA FOR 1 Sec.		8	–
12	420kV, 1–PHASE BUS POST INSULATOR		186	63
13	420kV, 80MVAR, 3–PHASE LINE SHUNT REACTOR		02	–
14	420kV, 50MVAR, 3–PHASE LINE SHUNT REACTOR		02	–
15	420kV, 125MVAR, 3–PHASE BUS SHUNT REACTOR		02	–
16	120kV, 1–PHASE LIGHTNING ARRESTERS,10KA,CLASS–3		04	–
17	145kV NGR(60 KVAR, 600 ohm) FOR BABAI LINE REACTOR		02	–
18	145kV NGR FOR BIKANER LINE REACTOR		02	– #

NGR RATING SHALL BE CONFIRMED BY CUSTOMER

NOTE :–

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. SYSTEM PARAMETERS

S. NOS.	DESCRIPTION	UNIT	
1.	NOMINAL SYSTEM VOLTAGE	kV	400
2.	HIGHEST SYSTEM VOLTAGE	kV	420
3.	BASIC IMPULSE LEVEL	kVP	1425
4.	POWER FREQUENCY WITHSTAND	kVrms	630
5.	SWITCHING IMPULSE WITHSTAND VOLTAGE	kVrms	1050
6.	CREEPAGE DISTANCE (MINIMUM)	mm/kV	31
7.	SYSTEM FAULT LEVEL FOR 3 SEC	kA	50

3. CONDUCTOR DETAIL

S. NOS.	DESCRIPTION	UNIT 6 EXTN. SWITCHYARD	UNIT 7&8 SWITCHYARD
1.	MAIN BUS	4"IPS (EXTRA HEAVY DUTY) Al. TUBE OD=114.20mm ID=97.18mm	4.5"IPS (EXTRA HEAVY DUTY) Al. TUBE OD=127mm ID=108.967mm
2.	EQUIPMENT INTERCONNECTION	4.5"IPS (EXTRA HEAVY DUTY) Al. TUBE/TWIN/ QUAD MOOSE ACSR	4.5"IPS (EXTRA HEAVY DUTY) Al. TUBE/TWIN/ QUAD MOOSE ACSR
3.	JUMPER /DROPPERS	TWIN/QUAD MOOSE ACSR	TWIN/QUAD MOOSE ACSR
4.	SHIELD WIRE	7/4.06 (7/8 SWG) GALVANISED STEEL (12.2mm DIA)	7/4.06 (7/8 SWG) GALVANISED STEEL (12.2mm DIA)

4. ALL THE BUS BARS AND STRUNG BUSES ARE PROTECTED FROM 7/4.06 GALVANISED STEEL WIRE.
5. DURING ERECTION, 3 NOS. FOUNDATIONS FOR WAVE TRAP IN EACH FEEDER BAY OF 400KV SWITCHYARD TO BE CASTED. ONLY 2 NOS. WAVE TRAP PER FEEDER BAY WILL BE UTILISED DURING COMMISSIONING AS PER PLCC REQUIREMENT AND AFTER NECESSARY TESTING.
6. SUPPLY AND STRINGING OF BIKANER & BABAI LINE CONDUCTOR, SHIELD WIRE, INSULATOR AND HARDWARE BETWEEN DEAD END TOWER AND SUBSTATION TERMINAL GANTRY ARE NOT IN BHEL SCOPE, HOWEVER, JUMPERING FOR THE RESPECTIVE EQUIPMENT SHIELDING REQUIREMENT FOR PROTECTION OF LIVE EQUIPMENT, JUMPERS & HARDWARE REQUIRED FOR JUMPERS ARE IN SCOPE OF BHEL.
7. ROAD INSIDE SWITCHYARD FENCE, & APPROACH ROAD TO SWITCHYARD FROM POWER PLANT ROAD SHALL BE IN TBG SCOPE.
8. ALL SWITCHYARD EQUIPMENTS & TOWER STRCTURE SHALL BE LATTICE TYPE.
9. THE TOP OF THE BOLT OF LA (COMING IN TRANSFORMER YARD) FOUNDATION SHALL BE LOWER BY 150MM THAN THE TOP OF RAIL, THIS IS TO FACILITATE THE REMOVAL OF LA STRUCTURE DURING TRANSFORMER TO BE TAKEN OUT FOR REPAIR/ REPLACEMENT.
10. REFER PLOT PLAN FOR MAIN ROAD OUTSIDE OF SWITCHYARD.
11. SEPARATE DRAWING SHALL BE REFERRED FOR ERECTION KEY DIAGRAM, TRENCH LAYOUT, EARTHMAT LAYOUT, CONTROL ROOM, TOWER/ BEAM, FIRE FIGHTING SYSTEM, ILLUMINATION SYSTEM, AIR CONDITIONING & VENTILATION SYSTEM, FENCE, GATE, GRAVEL ETC.
12. RL OF UNIT 6 EXTENTION SWITCHYARD IS RL–192MTR. FGL RL OF UNIT 7 & 8 SWITCHYARD IS 193.0 MTR. FFL/PAVING LEVEL OF TRANSFORMER YARD IS 193.4MTR. FGL OF TRANSFORMER YARD IS 193.0MTR.
13. STATIC TENSION ON THE BUSES AND SHIELD WIRE SHALL BE SHOWN IN THE STRUCTURE LOADING DAIGRAM SEPARATELY.
14. EXISTING FENCE BETWEEN F1–F2 SHALL BE DISMANTLED BY BHEL & DISMENTALED FENCE SHALL BE USED BY RUVNL. NEW FENCE BETWEEN F1–F3, F3–F4 & F4–F2 WILL BE PROVIDED BY BHEL.
15. SIZE OF CONTROL BUILDING IS TENTATIVE & SAME SHALL BE FINALIZED AFTER THE APPROVAL OF CONTROL BUILDING DRAWING.
16. SPACING OF SPACER CLAMP WILL BE 4MTR. FOR ALL QUAD./TWIN SPAN.
17. LOCATION OF DEAD END TOWER OF OUTGOING LINE SHALL BE DECIDED JOINTLY BY BHEL & CUSTOMER.
18. SEPARATE DRAWING SHALL BE REFERRED FOR 11kV SWITCHYARD (DRAWING NO. TB–3–360–316–016) & 420kV INTERCONNECTING LINE (DRAWING NO. TB–0–360–316–017).
19. THE ROAD TURNING FOR LOCATION MARKED WITH RT1 SHALL BE TO SUIT TO AND FRO MOVEMENT OF TRAILOR CARRYING 80/50 MVAR LINE REACTOR.
20. NEUTRAL GROUNDING REACTOR OF LINE REACTOR WILL BE MOUNTED ON STRUCTURE OF MINIMUM HEIGHT OF 2.5 MTR.
21. LOCATION OF DEAD END TRANSMISSION LINE SHALL BE DECIDED JOINTELY BY BHEL & CUSTOMER.

LEGEND TABLE

———	PRESENT BHEL SCOPE OF SUPPLY
- - - -	EXISTING
———	CUSTOMER SCOPE
——•——	SHIELD WIRE
——×—×——	FENCE
	TENSION STRING INSULATOR
	SUSPENSION STRING INSULATOR
	COLUMN WITH PEAK
	CORONA END BELL
———	TUBE
———	CONDUCTOR
═══	RAIL

REFERENCE

1. SINGLE LINE DIAGRAM FOR 400 kV SURATGARH SUBSTATION – DRG. TB–1–360–510–001
2. PLOT PLAN DRAWING NO. PE–DG–392–100–M001
3. LAYOUT OF TRANSFORMER YARD DRAWING NO. PE–DG–392–100–E001
4. 400kV SWITCHYARD LAYOUT PLAN & SECTION DRAWING NO. TCE.5750A–739–GA–3011,P4
5. 400/220kV SWITCHYARD LAYOUT PLAN OF UNIT–6 DRAWING NO. 3VYN191103
6. SWITCHYARD CONTROL ROOM DRAWING NO. TB–3–360–316–009
7. LAYOUT & ELEVATION OF 11kV S/S DRAWING NO. TB–3–360–316–016
8. LAYOUT & ELEVATION OF INTERCONNECTION LINE DRAWING NO. TB–0–360–316–017
9. ELECTRICAL CLEARENCE DIAGRAM DRAWING NO. TB–3–360–316–015
10. TRENCH LAYOUT OUTDOOR S/S DRAWING NO. TB–0–360–316–005
11. EARTHMAT LAYOUT DRAWING NO. TB–0–360–316–007
12. ERECTION KEY DIAGRAM OF S/S DRAWING NO. TB–3–360–316–006
13. STRUCTURE LOADING DIAGRAM DRAWING NO. TB–0–360–316–010

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
03	13.08.14	AS PER TCE LETTER DATED 27.02.14	RK	SK	SKS	RS
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01	04.10.13	AS PER TCE LETTER DATED 16.09.13	RK	SK –SD–	SKS –SD–	RS –SD–

OWNER

RAJASTHAN RAJYA VIDYUT UTPANDAN NIGAM LIMITED

PROJECT

2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER

TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR

BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP

DEPT CODE		NAME	SIGN.	DATE
422	DRN	RK	–SD–	05.08.13
	DESN	SK	–SD–	
	CHD	SKS	–SD–	
	APPD	SS	–SD–	

TITLE

LAYOUT PLAN FOR 400kV S/S AT SURATGARH

CV	ME	EL	I&C		DEPT.	SCALE 1:600	BHEL/SUB VENDOR DRG NO. TB-0-360-316-002
					SIGN		
					DATE		SHT. No 01 OF 02 REV. 03

COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

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INVENTORY NO	SIGN. AND DATE	REF. DRG. NO.	COMPUTER FILE NAME

DRG. NO. **TB-0-360-316-002**

FIRST ANGLE PROJECTION

NORTH

TENTATIVE LOCATION OF DEAD END TRANSMISSION LINE TOWER

TENTATIVE LOCATION OF DEAD END TRANSMISSION LINE TOWER

3594.0S
1425.0E

3600 S

3800 S

1400 E

1200 E

1000 E

3683.0S
1391.0E

INTERCONNECTOR–1

INTERCONNECTOR–2

LINE–1 BIKANER

LINE–2 BIKANER

LINE–1 BABAI

LINE–2 BABAI

TENTATIVE LOCATION OF COMMON BURNT OIL PIT–1 (UNDER HOLD)

GATE HOUSE

10M ROAD 3594.0S

7M ROAD 3919.0S

11kV DOUBLE CIRCUIT LINE

11kV S/S

BUS–1 REACTOR

BUS–2 REACTOR

TENTATIVE LOCATION OF COMMON BURNT OIL PIT–2 (UNDER HOLD)

SWITCHYARD CONTROL ROOM

GT–7

GT–8

BUS–2 CVT

BUS–1 CVT

MAIN BUS–I

MAIN BUS–II

FGL RL 193.0

4.5" IPS AL. TUBE

PRE WALL

3870.512S
1086.0E

3820.502S
1052.0E

3827.502S

3793.502S

3638.5S
1044.0E

3660.0S
945.0E

3885.823S
1019.3E

3872.323S
1063.0E

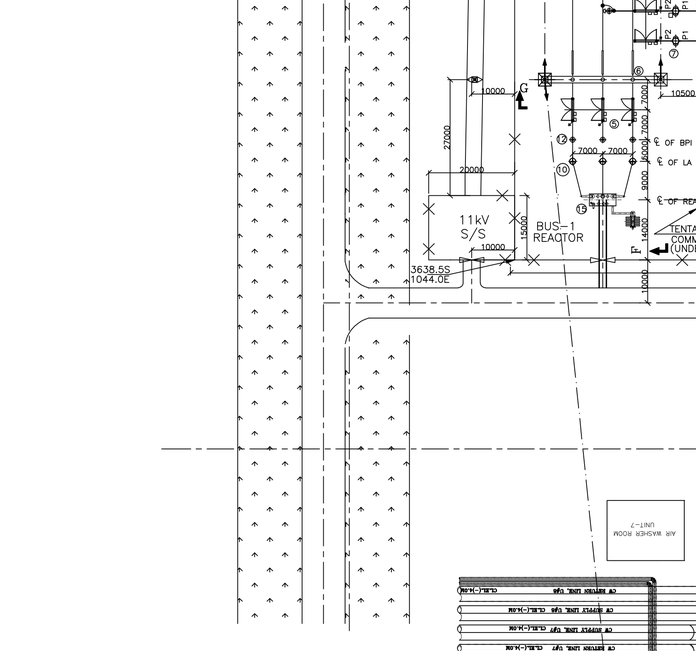
1034E

AIR WASHER ROOM UNIT–7

AIR WASHER ROOM UNIT–8

DG BUILDING

LAYOUT PLAN OF UNIT–7 & 8 420kV SWITCHYARD



KEY PLAN

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
03	13.08.14	AS PER TCE LETTER DATED 27.02.14	RK	SK	SKS	RS
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OWNER

RAJASTHAN RAJYA VIDYUT UTPANDAN NIGAM LIMITED

PROJECT

2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER

TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR

BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP

DEPT CODE		NAME	SIGN.	DATE
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	DESN	SK	–SD–	
	CHD	SKS	–SD–	
	APPD	SS		

TITLE

LAYOUT PLAN FOR 400kV S/S AT SURATGARH

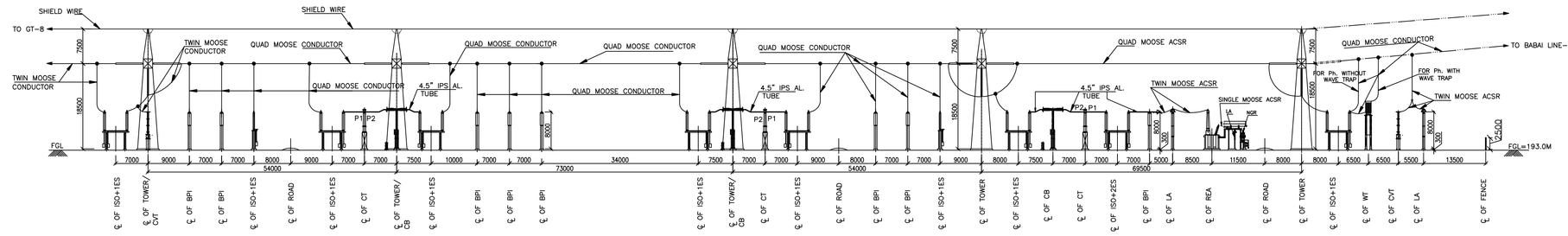
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						SIGN		SHT. No 02 OF 02 REV. 03
						DATE		

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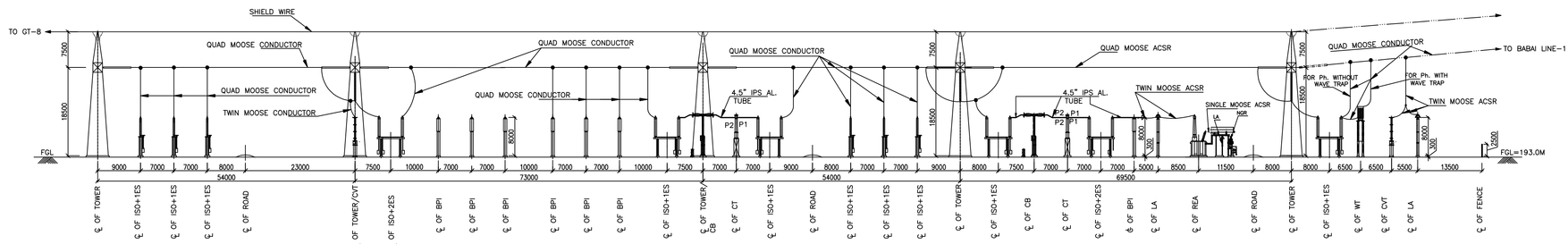
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FIRST ANGLE PROJECTION

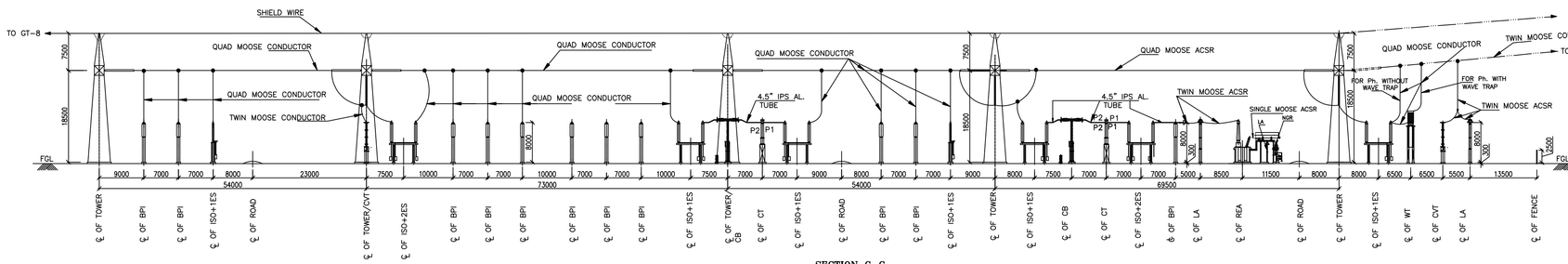
DRG. NO. TB-0-360-316-003



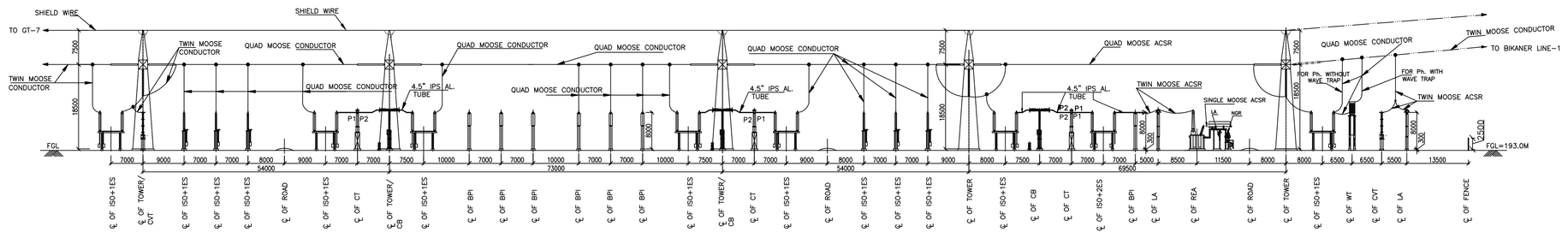
SECTION A-A
BABAI LINE-2 & GT-8



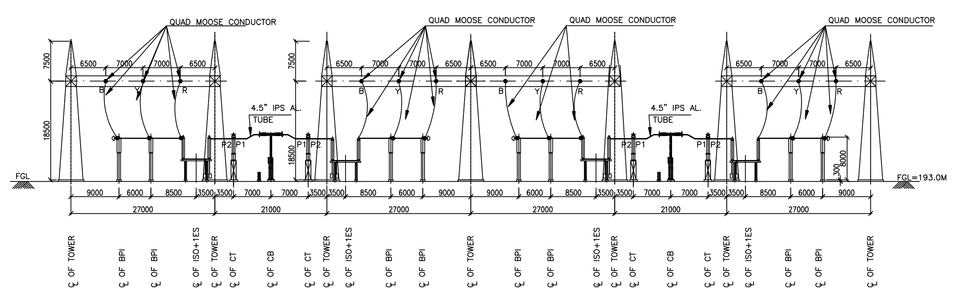
SECTION B-B
BABAI LINE-1 & BUS-1 CVT



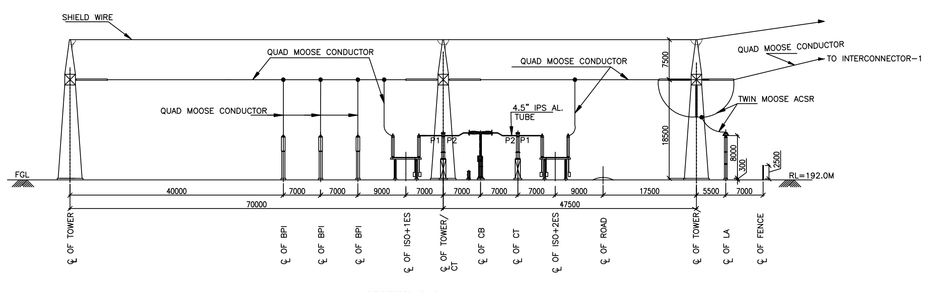
SECTION C-C
BIKANER LINE-2 & BUS -2 CVT



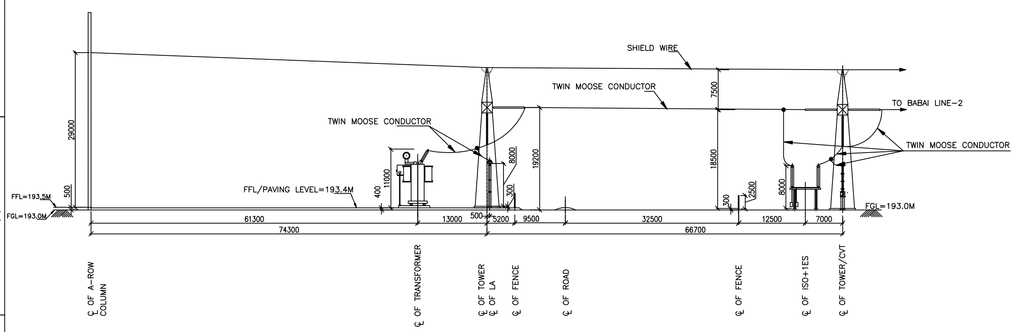
SECTION D-D
BIKANER LINE-1 & GT-7



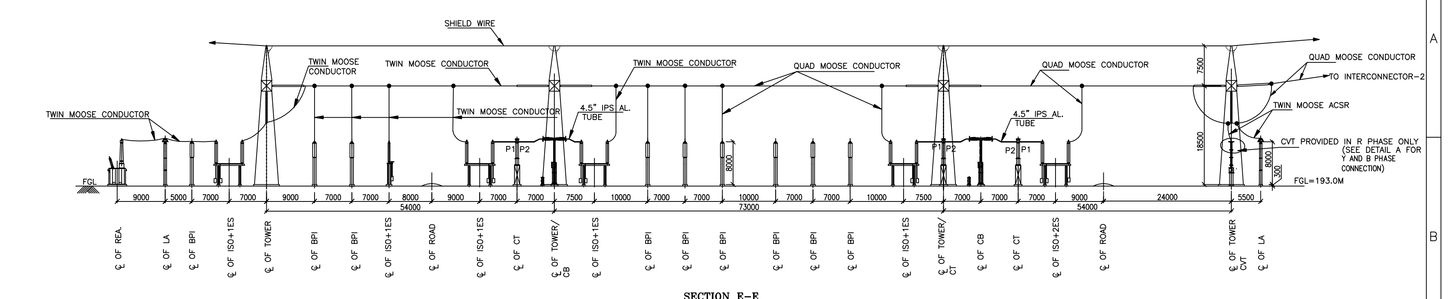
SECTION H-H
TIE BAY LINE SIDE



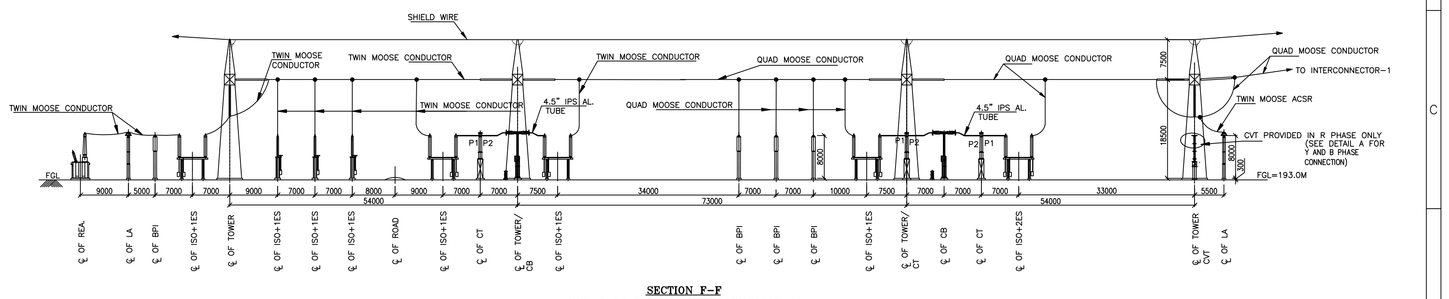
SECTION J-J
INTERCONNECTOR-1 OF UNIT-6



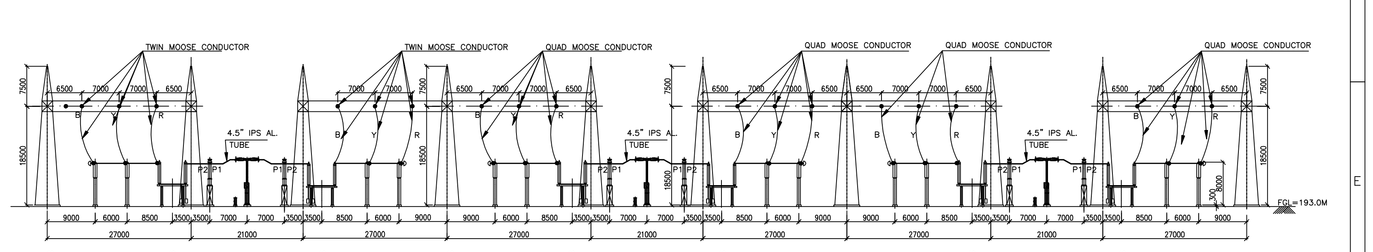
SECTION I-I
GT-8



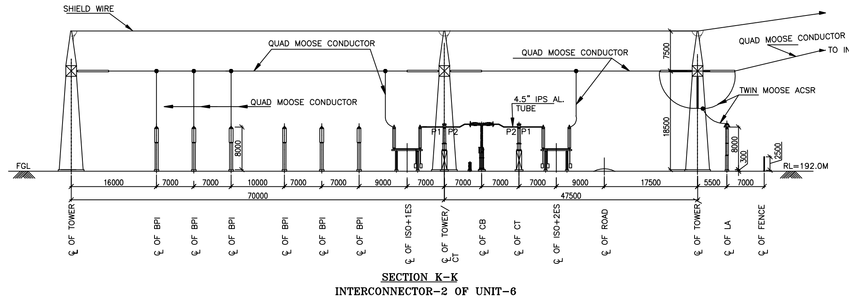
SECTION E-E
BUS-2 REACTOR & INTERCONNECTOR-2



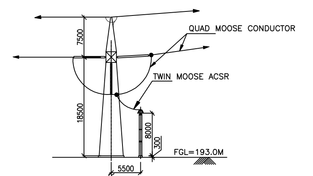
SECTION F-F
BUS-1 REACTOR & INTERCONNECTOR-1



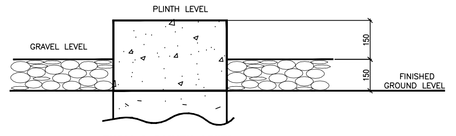
SECTION G-G
TIE BAY GT SIDE & BUS REACTOR



SECTION K-K
INTERCONNECTOR-2 OF UNIT-6



DETAIL-A



TYPICAL PLINTH LEVEL

LEGEND TABLE

———	PRESENT BHEL SCOPE OF SUPPLY
-·-·-	EXISTING
-··-··-	CUSTOMER SCOPE
	LOCAL CONTROL CABINET OF CB

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. MINIMUM CLEARANCE TABLE (IN AIR)

S. NOS.	DESCRIPTION	UNIT	
1.	PHASE TO PHASE	mm	4100
2.	PHASE TO EARTH	mm	3500
3.	MINIMUM DISTANCE OF THE LOWEST EARTH PART OF INSULATOR SUPPORTING LIVE CONDUCTORS FROM GROUND	mm	2550
4.	SECTION CLEARANCE	mm	6500
5.	HEIGHT OF TUBE/COND. CENTER LINE OF FIRST LEVEL FROM GROUND LEVEL	mm	8300
6.	HEIGHT OF MAIN BUS FROM GROUND LEVEL	mm	8300
7.	PLINTH HEIGHT FROM GROUND LEVEL	mm	300
8.	SUB CONDUCTOR SPACING	mm	450

3. INSULATOR DATA
   A. 400KV DOUBLE TENSION STRING = 31 NOS. ANTI FOG TYPE DISC.
   B. 400KV SINGLE SUSPENSION STRING = 31 NOS. ANTI FOG TYPE DISC.
   C. ELECTRO-MECHANICAL FAILING LOAD PER DISC = 120 kN
   D. CREEPAGE DISTANCE OF INDIVIDUAL DISC = 430MM

REFERENCE DRAWING

SINGLE LINE DIAGRAM FOR 400 kV SURATGARH SUBSTATION - DRG. TB-1-360-510-001
PLOT PLAN DRAWING NO. PE-DG-392-100-M001
LAYOUT OF TRANSFORMER YARD DRAWING NO. PE-DG-392-100-E001
400kV SWITCHYARD LAYOUT PLAN & SECTION DRAWING NO. TCE.5750A-739-GA-3011,P4
400/220kV SWITCHYARD LAYOUT PLAN OF UNIT-6 DRAWING NO. 3VN191103
LAYOUT PALN FOR 400kV S/S AT SURATGARH DRAWING NO. TB-0-360-316-002

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
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OWNER

RAJASTHAN RAJYA VIDYUT UTPANDAN NIGAM LIMITED

PROJECT

2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER

TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR

BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP

DEPT CODE		NAME	SIGN.	DATE
422	DRN	A.S	-SD-	05.08.13
	DESN	SK	-SD-	
	CHD	SKS	-SD-	
	APPD	SS	-SD-	

TITLE

SECTION ELEVATION FOR 400kV S/S AT SURATGARH

CV	ME	EL	I&C			DEPT.	SCALE 1:550	BHEL/SUB VENDOR DRG NO. TB-0-360-316-003
						SIGN		
						DATE		SHT. No 01 OF 01 REV. 03

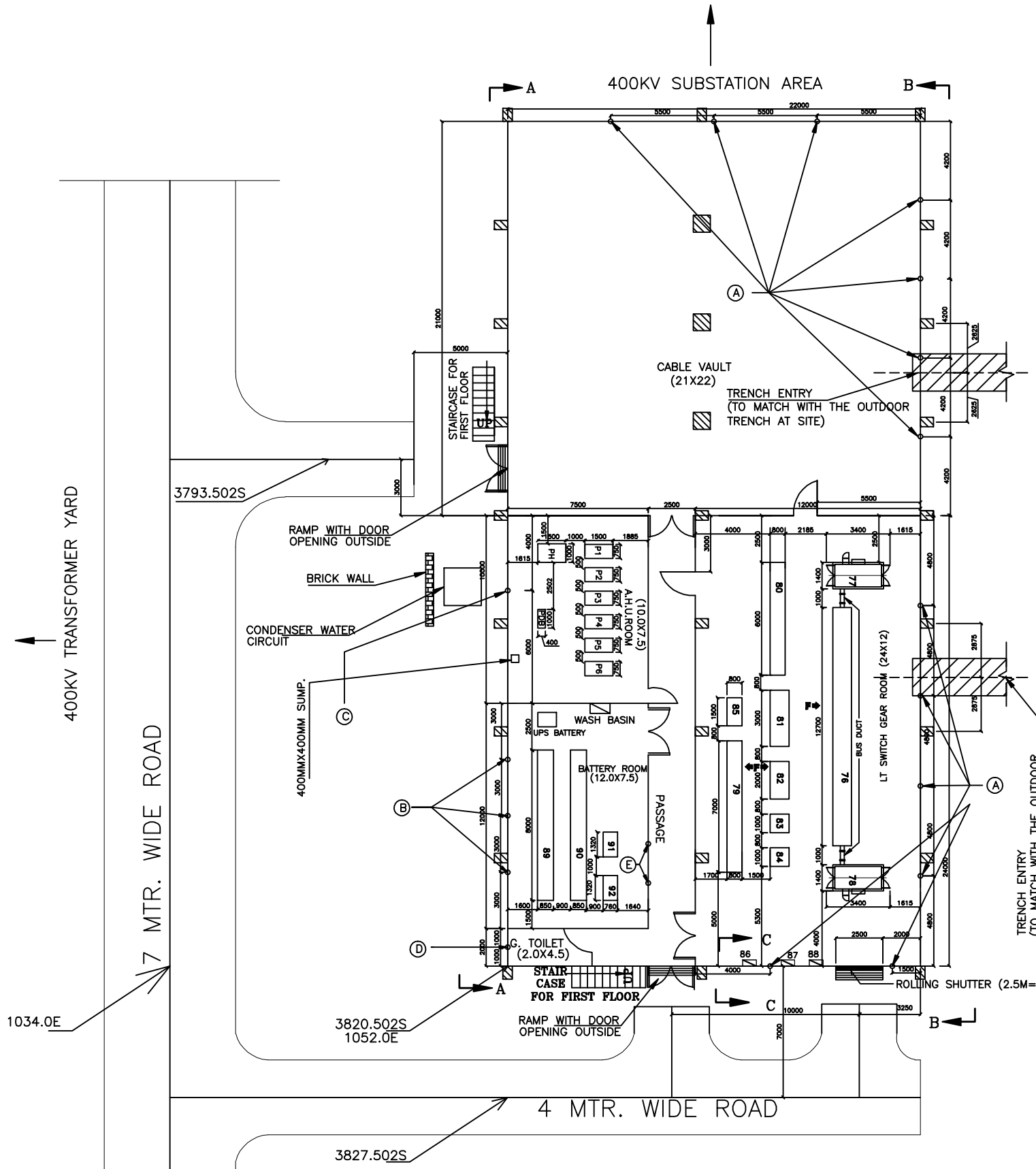
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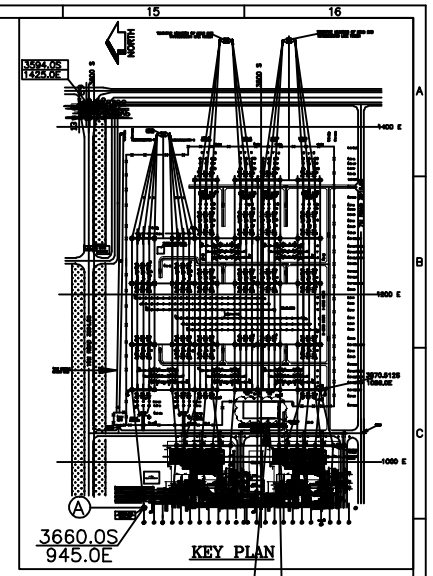
FIRST ANGLE PROJECTION

DRG. NO. TB-3-360-316-009



GROUND FLOOR PLAN AT E.L=+0.5M

NORTH



3820.502S
1052.0E

SWITCHYARD CONTROL ROOM

NOTES:–

1. ALL DIMENSION ARE IN mm EXCEPT ELEVATION OF BUILDING AND OVERALL ROOM DIMENSION ARE IN METER.
2. SEPARATE DRAWING SHALL BE SUBMITED FOR DETAILED ARCHITECTURE AND TRENCH LAYOUT OF CONTROL ROOM BUILDING.
3. CONTROL ROOM, RELAY ROOM, PLCC ROOM AND CONFERENCE ROOM SHALL PACKAGE AIRCONDITIONED.
4. STORE, PANTRY AND TOILET SHALL BE PROVIDED WITH EXHAUST FAN. BATTERY ROOM SHALL BE PROVIDED WITH EXAUST FAN AND LOVERS FOR FRESH AIR.
5. ELECTRONICS TEST LAB, LIBRARY CUM RECORD ROOM, SHIFT INCHARGE ROOM, MAINTENANCE STAFF ROOM, MAINTENANCE ROOM & ENGINEERS ROOM SHALL BE PROVIDED WITH SPILT AC OF ADEQUATE CAPACITY.
6. LT SWITCH GEAR ROOM & CABLE VAULT SHALL BE PROVIDED WITH SUPPLY AIR FAN FOR POSITIVE PRESSURE VENTILATION. AHU ROOM SHALL BE PROVIDED WITH FRESH AIR FAN.
7. THE DIMENSION AND ARRANGEMENT OF PANELS INSIDE ROOM ARE INDICATIVE AND SHALL BE FINALISED DURING DETAILED ENGINEERING.
8. ALL ROOM EXCEPT AHU ROOM SHALL BE PROVIDED WITH WINDOW.
9. — — DENOTE FUTURE PANEL
10. ALL THE DIMENSIONS OF THE ROOMS ARE FROM CENTER LINE OF WALL (THICKNES OF WALL 230MM)
11. ALUMINIUM GLAZED WINDOW SHALL BE PROVIDED IN THE FIRST FLOOR (AROUND THE CONTROL ROOM, RELAY ROOM & PLCC ROOM) TO HAVE A CLEAR VIEW OF SWITCHYARD EQUIPMENT
12. ** =DETAILED ARRANGEMENT OF MONORAIL, PLATFORM, REMOVABLE HANDRAIL AND ELECTRICAL HOIST FOR LIFTING OF PANEL AT FIRST FLOOR SHALL BE SHOWN IN CIVIL DRAWING. RATING OF MONORAIL FOR EQUIPMENT LIFTING IS 1.5 TON.
13. NON SEGREGATED PHASE BUS DUCT BETWEEN DRY TYPE TRANSFORMER & 415V ACDB SHALL BE SUITABLE FOR TOP ENTRIES. THE DETAILED OF BUS DUCT CONNECTION SHALL BE SHOWN IN SEPARATE DRWING.
14. CONTROL ROOM TOWARDS CABLE VAULT SHALL BE SUITABLE EXTENDIBLE TO ACCOMMODATE CONTROL & RELAY PANEL FOR FOUR FUTURE BAYS.
15. CONTROL ROOM, RELAY ROOM, LT SWITCH GEAR ROOM, BATTERY ROOM & PLCC ROOM SHALL BE PROVIDED WITH FIRE PROOF DOOR. THE FIRE PROOF DOOR SHALL BE RATED FOR A MINIMUM OF TWO HOURS.
16. WASH BASIN SHALL BE PROVIDED IN BATTERY ROOM
17. ▨ IN AIR LOCK LOBBY ENTRY ALUMINIUM GALZED AUTOMATIC CENTER OPENING SLIDING DOOR SHALL BE PROVIDED . DETAILES SHALL BE SHOWN IN CIVIL DRAWING. AUTOMATIC DOOR POWER SUPPLY SHALL BE FED FROM EMERGENCY AC SECTION OF LT SWITCHGEAR.
18. STAIR CASE SHALL BE COVERED. LOWER HEIGHT DOOR SHALL BE PROVIDED FOR BOTH EXTERNAL STAIR CASE.
19. BATTERY SHALL BE LEAD ACID PLANTE TYPE. BATTERY ROOM FLOOR SHALL BE PROVIDED WITH ACID PROOF TILES. UP TO HEIGHT 2.3M FROM FFL.
20. HEAT LOAD PER PANEL IS APPROX. 100W. WEIGHT PER PANEL IS APPROX. 300Kg
21. NLP, ELP ,DLP , ACAN AND FIRE ALARM PANEL SHALL BE WALL MOUNTED.
22. PORTABLE PUMP AND MOTOR SHALL BE PROVIDED IN AHU ROOM FOR LIFTING THE WATER FROM 400MMX400MM SUMP.
23. COLUMN LOCATION ARE INDICATIVE AND DETAILED SHALL BE SHOWN IN CIVIL DRAWING.
24. SUB FIRE ALARM PANEL SHALL BE LOCATED IN SWITCHYARD CONTROL ROOM AND SAME SHALL BE INTERFACED WITH MAIN FIRE ALARM PANEL. INTERFACE SHALL BE IN BHEL TBG SCOPE.
25. BRICK WALL SHALL BE PROVIDED TOWARDS SOUTH OF CONDENSER WATER CIRCUIT.

LEGEND–

MLDB= MAIN LIGHTING DISTRIBUTION BOARD
WDB= WELDING DISTRIBUTION BOARD
ELDB= EMERGENCY LIGHTING DISTRIBUTION BOARD
LT= LIGHTING TRANSFORMER
DCDB= DC DISTRIBUTION BOARD
AHU= AIR HANDLING UNIT
PLCC= POWER LINE CARRIER COMMUNICATION
P1 TO P6= PACKAGE UNITS
PH= PAN HUMIDIFIER
PDB= POWER DISTRIBUTION BOARD
MT= 11/0.433kV, 630kVA DRY TRANSFORMER
FFL= FINISHED FLOOR LEVEL
FGL= FINISHED GROUND LEVEL
F = FRONT
CH = CHARGER
NLP = NORMAL AC LIGHTING PANEL
ELP = EMERGENCY AC LIGHTING PANEL
DLP = DC LIGHTING PANEL
EPABX = ELECTRONIC PRIVATE AUTOMATIC BRANCH EXCHANGE
= BUS DUCT
FA =FIRE ALARM PANEL
ACAN= AIR CONDITIONING ANNUNCIATION PANEL
D2 AUTOMATIC (CENTER OPENING) DOUBLE SLIDING DOOR ALUMINIUM GLAZE
= CABLE TRENCH.
= COLDUMN

REFERENCE DWG. :–

LAYOUT PLAN FOR 400kV S/S AT SURATGARH
DWG. NO. TB–0–360–316–002

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
03	05-08-14	AS PER TCE LETTER DATED- 11-07-14	SK	SK	SKS	RS
02	18-06-14	AS PER TCE LETTER DATED- 16-05-14	SK -SD-	SK -SD-	SKS -SD-	RS -SD-
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OWNER
RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

PROJECT
2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER
TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR
BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP

DEPT CODE		NAME	SIGN.	DATE
422	DRN	RK	–SD–	14.08.13
	DESN	SK	–SD–	
	CHD	SKS	–SD–	
	APPD	SS	–SD–	

TITLE
CONCEPTUAL CONTROL ROOM BUILDING LAYOUT FOR 400kV S/S AT SURATGARH

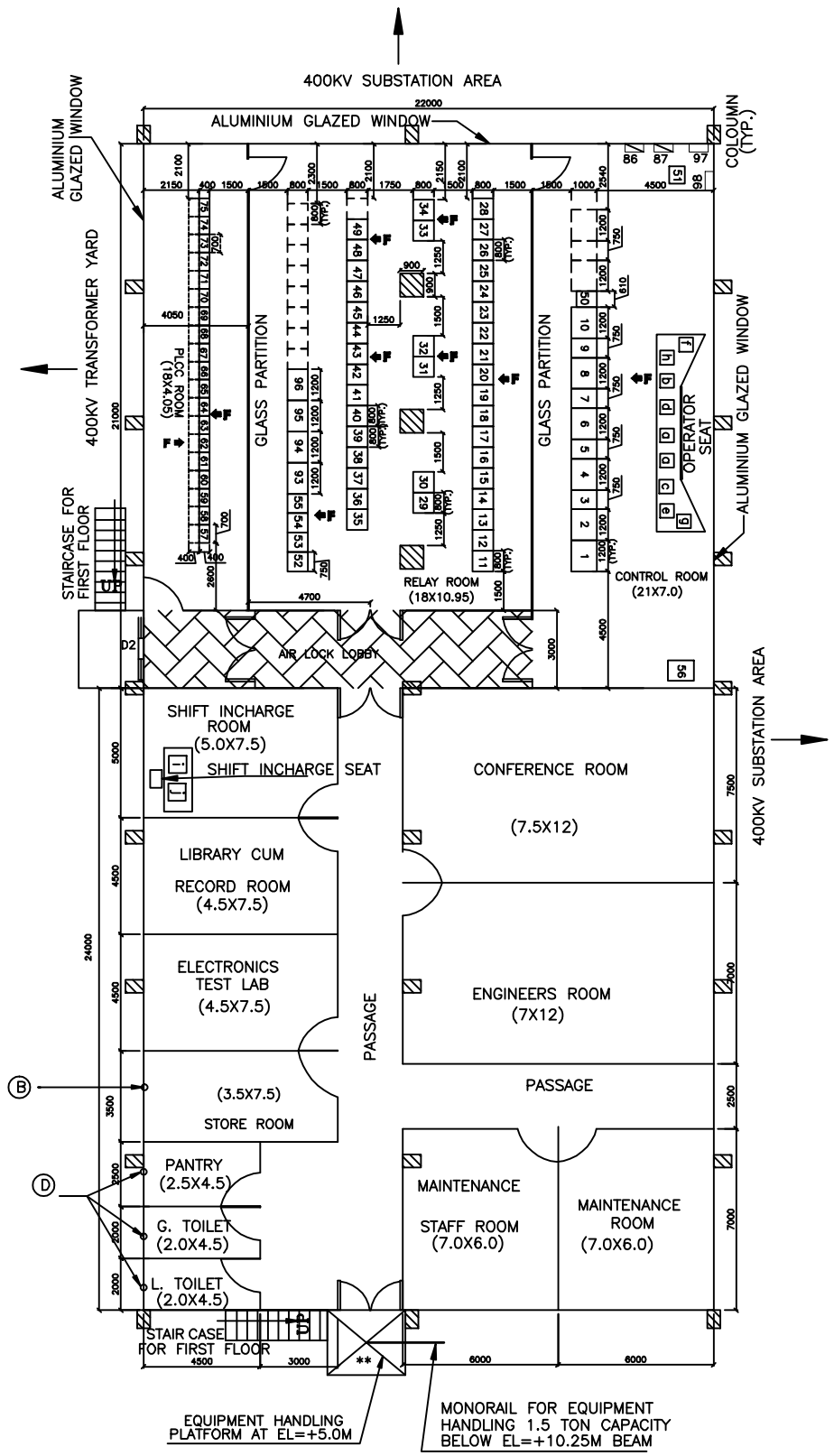
CV	ME	EL	I&C			DEPT.	SCALE 1:600	BHEL/SUB VENDOR DRG NO. TB-3-360-316-009
						SIGN		
						DATE		SHT. No 01 OF 03 REV. 03

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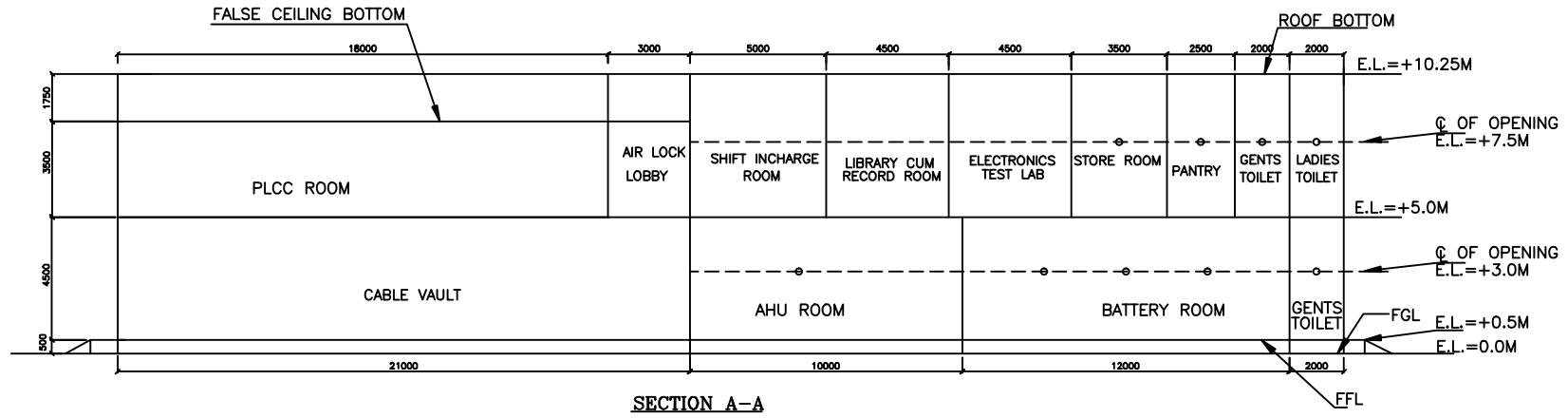
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FIRST ANGLE PROJECTION

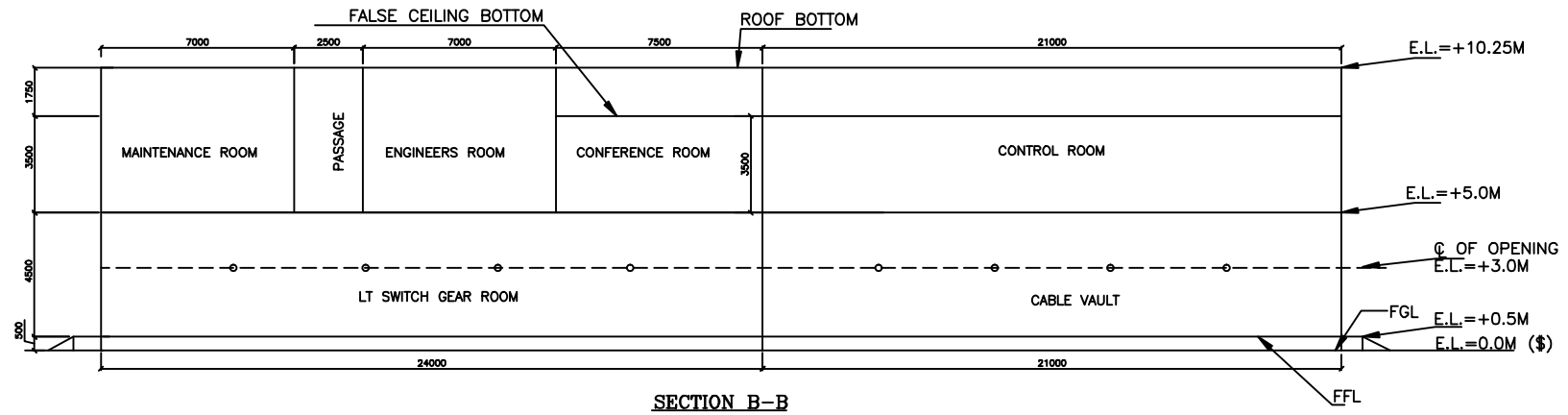
DRG. NO. TB-3-360-316-009



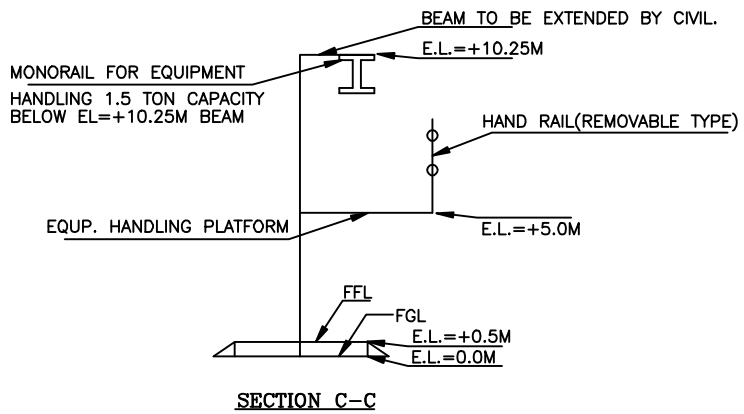
FIRST FLOOR PLAN AT E.L=+5.0M



SECTION A–A



SECTION B–B



SECTION C–C

$= EL=0.0M IS EQUAL TO RL=193.0 M OF UNIT 7&8 SWITCHYARD.

DETAILS OF CIRCULAR OPENING HOLES IN CONTROL ROOM BLDG.

1. Ⓐ – CIRCULAR OPENING ø 700MM FOR PRESSURIZED VENTILATION SYSTEM SHALL BE PROVIDED AT A ELEVATION OF 2500MM (BOTTOM OF OPENING) FROM FFL.
2. Ⓑ – CIRCULAR OPENING ø 550MM FOR EXHAUST FANS SHALL BE PROVIDED AT A ELEVATION OF 2500MM (BOTTOM OF OPENING) FROM FFL.
3. Ⓒ – CIRCULAR OPENING ø 700MM IN AHU ROOM FOR FRESH AIR UNIT SHALL BE PROVIDED AT A ELEVATION OF 2500M(BOTTOM OF OPENING) FROM FFL.
4. Ⓓ – CIRCULAR OPENING ø 400MM FOR EXHAUST FANS SHALL BE PROVIDED AT A ELEVATION OF 2500MM (BOTTOM OF OPENING) FROM FFL.
5. Ⓔ – RECTANGULAR OPENING 200X200MM FOR FRESH AIR SHALL BE PROVIDED AT ELEVATION OF 2500MM (BOTTOM OF OPENING) FROM FFL.

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
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OWNER
RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

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2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER
TATA CONSULTING ENGINEERS LIMITED

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TITLE **CONCEPTUAL CONTROL ROOM BUILDING LAYOUT FOR 400kV S/S AT SURATGARH**

CV	ME	EL	I&C			DEPT.	SCALE 1:600	BHEL/SUB VENDOR DRG NO. TB-3-360-316-009
						SIGN		
						DATE		SHT. No 02 OF 03 REV. 03

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INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

FIRST ANGLE PROJECTION

DRG. NO. TB-3-360-316-009

Sl. No.	Designation	Description	QTY		APPROX W	D	H	Total Width
		400kV CONTROL PANELS						
1	4CP1	400KV INTERCONNECTOR-1 - INTERCONNECTOR-2 Control Panel	**1**	**Nos**	1200	1000	2295	1200
2	4CP2	400KV Bus-1 Reactor - Tie - Bus-2 Reactor Control Panel	**1**	**Nos**	1200	1000	2295	1200
3	4CP3A	400KV BIKANER Line-1 REACTOR Control Panel	**1**	**Nos**	750	1000	2295	*750*
4	4CP3	400KV BIKANER Line-1 - Tie - BIKANER Line-2 Control Panel	**1**	**Nos**	1200	1000	2295	**1200**
5	4CP3B	400KV BIKANER Line-2 REACTOR Control Panel	**1**	**Nos**	750	1000	2295	*750*
6	4CP4	400KV GT-7 - Tie - Bus-II CVT Bay Control Panel	**1**	**No**	1200	1000	2295	**1200**
7	4CP5A	400KV BABAI Line-1 REACTOR Control Panel	**1**	**Nos**	750	1000	2295	*750*
8	4CP5	400KV BABAI Line-1 - Tie - BABAI Line-2 Control Panel	**1**	**Nos**	1200	1000	2295	**1200**
9	4CP5B	400KV BABAI Line-2 REACTOR Control Panel	**1**	**Nos**	750	1000	2295	*750*
10	4CP6	400KV Bus-I CVT - Tie - GT-8 Control Panel	**1**	**No**	1200	1000	2295	**1200**
		400kV PROTECTION PANELS (WITH BCU)						
11, 12	ICRP (Bay-Y1)	400KV INTERCONNECTOR-1 Protection Panel	**2**	**Nos**	800	800	2295	1600
13, 14	ICRP (Bay-Y2)	400KV INTERCONNECTOR-2 Protection Panel	**2**	**Nos**	800	800	2295	1600
15, 16	BRRP (Bay-Y3)	400KV Bus-1 Reactor Protection Panel	**2**	**Nos**	800	800	2295	1600
17	TRP (Bay-Y3Y4)	400KV Tie CB Relay Panel	**1**	**No**	800	800	2295	**800**
18, 19	BRRP (Bay-Y4)	400KV Bus-2 Reactor Protection Panel	**2**	**Nos**	800	800	2295	1600
20, 21	LRRP (Bay-Y5)	400KV BIKANER Line-1 REACTOR Protection Panel	**2**	**Nos**	800	800	2295	*1600*
22, 23	LRP (Bay-Y5)	400KV BIKANER Line-1 Protection Panel	**2**	**Nos**	800	800	2295	**1600**
24	TRP (Bay-Y5Y6)	400KV Tie CB Relay Panel	**1**	**No**	800	800	2295	**800**
25, 26	LRP (Bay-Y6)	400KV BIKANER Line-2 Protection Panel	**2**	**Nos**	800	800	2295	**1600**
27, 28	LRRP (Bay-Y6)	400KV BIKANER Line-2 REACTOR Protection Panel	**2**	**Nos**	800	800	2295	*1600*
29, 30	GTRP (Bay-Y7)	400KV GT-7 CB Relay Panel (With 87 OA/OH)	**2**	**No**	800	800	2295	**1600**
31	TRP (Bay-Y7Y8)	400KV Tie CB Relay Panel	**1**	**No**	800	800	2295	800
32, 33	LRRP (Bay-Y9)	400KV BABAI Line-1 REACTOR Protection Panel	**2**	**Nos**	800	800	2295	*1600*
34, 35	LRP (Bay-Y9)	400KV BABAI Line-1 Protection Panel	**2**	**Nos**	800	800	2295	*1600*
36	TRP (Bay-Y9Y10)	400KV Tie CB Relay Panel	**1**	**No**	800	800	2295	*800*
37, 38	LRP (Bay-Y10)	400KV BABAI Line-2 Protection Panel	**2**	**No**	800	800	2295	*1600*
39, 40	LRRP (Bay-Y10)	400KV BABAI Line-2 REACTOR Protection Panel	**2**	**Nos**	800	800	2295	*1600*
41	TRP (Bay-Y11Y12)	400KV Tie CB Relay Panel	**1**	**No**	800	800	2295	**800**
42, 43	GTRP (Bay-Y12)	400KV GT-8 CB Relay Panel (With 87 OA/OH)	**2**	**No**	800	800	2295	**1600**
44-47	BBRP	400kV BUSBAR PROTECTION	**4**	**Nos**	800	800	2295	3200
48, 49	SAS	SAS PANEL (Aux + Netwroking)	**2**	**Nos**	800	800	2295	1600
		MISC EQUIPMENTS						
50	SP	SYNCHRONISING PANEL	**1**	**Nos**	610	800	2295	610
51	SYNC	SYNCHROSCOPE	**1**	**Nos**	600	675	1045	600
52, 53	DR	400kV DR PANEL	**2**	**Nos**	750	800	2295	1500
54, 55	EMP	400kV ENERGY METERING PANEL (12 EM)	**2**	**Nos**	750	800	2295	1500
56	UPS	UPS	**1**	**Nos**	800	800	1600	800
	PC	PC alongwith Printer for SAS, Relay Parameterisation & DR evaluation: **In Switchyard Control Room:** a. OWS - 2 No. b. Color Laser Jet Printer A3 - 1 No. c. Line Printer - 1 No. d. ABT Metering PC - 1 No. e. ABT Metering Color Laser Jet Printer A4 - 1 No. f. ABT Metering Laptop - 1 No. g. DR Laptop - 1 No. h. DR Color Laser Jet Printer A4 - 1 No. **In Shift In-charge Room:** i. OWS - 1 No. j. Dot Matrix Printer - 1 No. **In Main Control Room:** a. OWS - 1 No. b. OES - 1 No. c. Color Laser Jet Printer A3 - 2 No. d. Line Printer - 1 No. e. Dot Matrix Printer A4 - 1 No. f. Scanner A3 - 1 No.	**1**	**Set**	-	-		
		PLCC EQUIPMENTS (SUPPLY NOT IN SCOPE)						
57 - 68	PLCC	Single Channel PLCC Panel with 4 command Protection Coupler (For 4 Lines)	**12**	**Nos**	700	400	2230	8400
69 - 74	PLCC	Single Channel PLCC Panel with 4 command Protection Coupler (For 2 Future Lines)	**6**	**Nos**	700	400	2230	4200
75	PLCC	EPAX	**1**	**No**	700	400	2200	700

Sl.No.	Description of Panels/Equipments	QTY	APPROX DIMENSION W	D	H
			(dimensions in mm)		
76	415V LT Switchgear	1	11700	1000	2175
77, 78	AUX TRAFO MT (11/0.433 kV, 630 kVA, Dry-Type)	2	1400	3400	2500
79	220V DCDB - 1 & 2	1	7000	800	2400
80	48V DCDB - 1 & 2	1	5000	800	2400
81	MLDB	1	3000	800	1725
82	ELDB	1	2000	800	1725
83, 84	LIGHTING TRAFO (100 kVA, Dry-Type) - LT	2	1000	1000	840
85	WDB	1	1500	800	1725
86	NLP	2	550	225	550
87	ELP	2	550	225	550
88	DLP	1	550	225	550
89, 90	220 V Lead Acid Plante Battery Set (625 AH)	2	5500	850	2100
91, 92	48 V Lead Acid Plante Battery Set (600 AH)	2	1320	760	1500
93, 94	220V CHARGER	2	1200	800	2200
95, 96	48V CHARGER	2	1200	800	2200
97	Fire alarm panel	1	600	200	600
98	ACAN	1	600	250	800

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OWNER
RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

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2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER
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TITLE **CONCEPTUAL CONTROL ROOM BUILDING LAYOUT FOR 400kV S/S AT SURATGARH**

CV	ME	EL	I&C			DEPT.	SCALE 1:600	BHEL/SUB VENDOR DRG NO. TB-3-360-316-009
						SIGN		
						DATE		SHT. No 03 OF 03 REV. 03

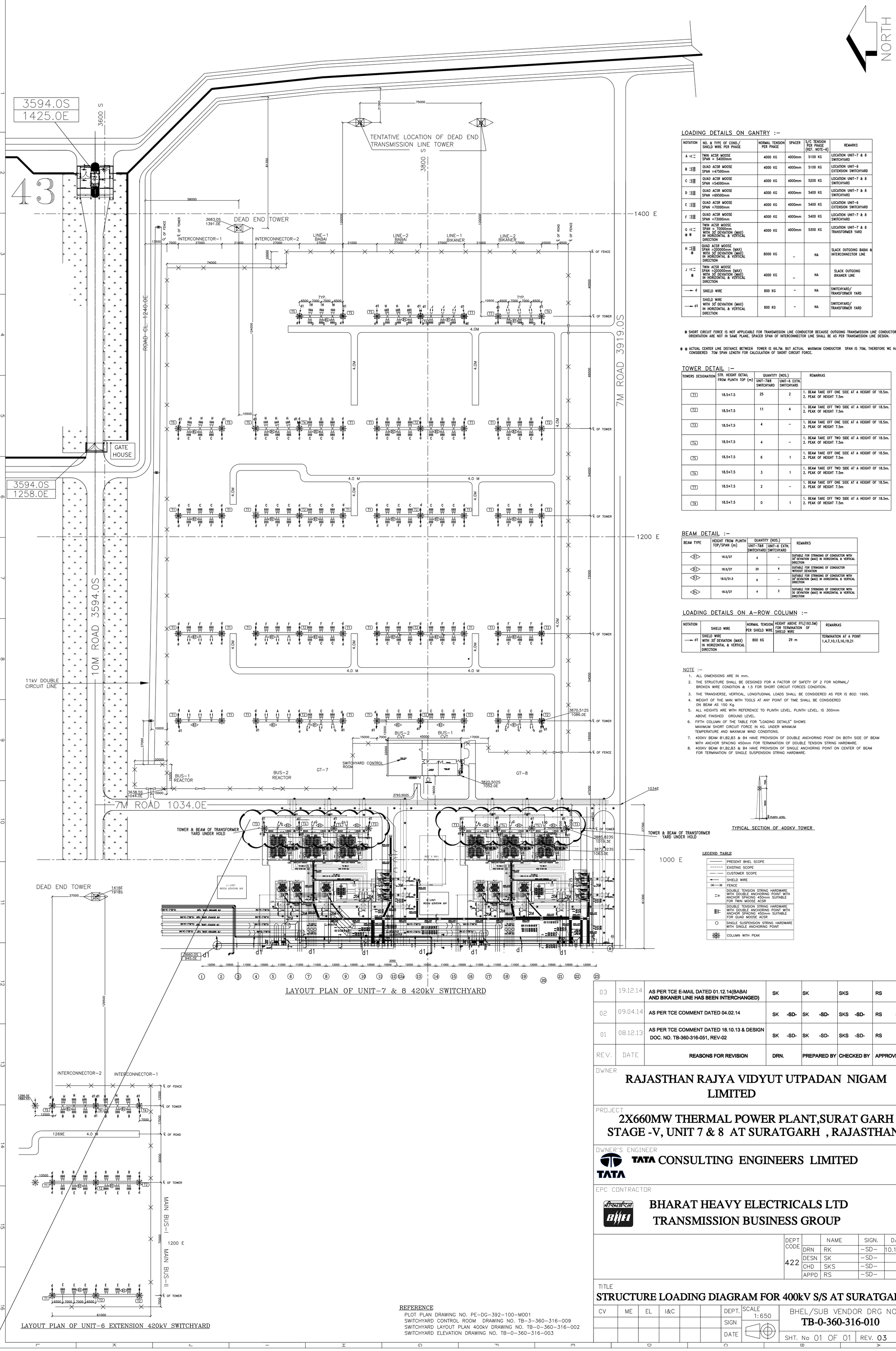
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INVENTORY NO	SIGN. AND DATE	REF. DRG. NO.	COMPUTER FILE NAME

FIRST ANGLE PROJECTION

DRG. NO. **TB-0-360-316-010**



LOADING DETAILS ON GANTRY :-

NOTATION	NO. & TYPE OF COND./ SHIELD WIRE PER PHASE	NORMAL TENSION PER PHASE	SPACER	S/C TENSION PER PHASE (REF. NOTE-6)	REMARKS
A	TWIN ACSR MOOSE SPAN = 54000mm	4000 KG	4000mm	5100 KG	LOCATION UNIT-7 & 8 SWITCHYARD
B	QUAD ACSR MOOSE SPAN =47500mm	4000 KG	4000mm	5100 KG	LOCATION UNIT-6 EXTENSION SWITCHYARD
C	QUAD ACSR MOOSE SPAN =54000mm	4000 KG	4000mm	5200 KG	LOCATION UNIT-7 & 8 SWITCHYARD
D	QUAD ACSR MOOSE SPAN =69500mm	4000 KG	4000mm	5400 KG	LOCATION UNIT-7 & 8 SWITCHYARD
E	QUAD ACSR MOOSE SPAN =70000mm	4000 KG	4000mm	5400 KG	LOCATION UNIT-6 EXTENSION SWITCHYARD
F	QUAD ACSR MOOSE SPAN =73000mm	4000 KG	4000mm	5400 KG	LOCATION UNIT-7 & 8 SWITCHYARD
G **	TWIN ACSR MOOSE SPAN = 70000mm WITH 30° DEVIATION (MAX) IN HORIZONTAL & VERTICAL DIRECTION	4000 KG	4000mm	5300 KG	LOCATION UNIT-7 & 8 TRANSFORMER YARD
H *	QUAD ACSR MOOSE SPAN =200000mm (MAX) WITH 30° DEVIATION (MAX) IN HORIZONTAL & VERTICAL DIRECTION	8000 KG	-	NA	SLACK OUTGOING BABAI & INTERCONNECTOR LINE
J *	TWIN ACSR MOOSE SPAN =200000mm (MAX) WITH 30° DEVIATION (MAX) IN HORIZONTAL & VERTICAL DIRECTION	4000 KG	-	NA	SLACK OUTGOING BIKANER LINE
d	SHIELD WIRE	800 KG	-	NA	SWITCHYARD/ TRANSFORMER YARD
d1	SHIELD WIRE WITH 30° DEVIATION (MAX) IN HORIZONTAL & VERTICAL DIRECTION	800 KG	-	NA	SWITCHYARD/ TRANSFORMER YARD

* SHORT CIRCUIT FORCE IS NOT APPLICABLE FOR TRANSMISSION LINE CONDUCTOR BECAUSE OUTGOING TRANSMISSION LINE CONDUCTOR ORIENTATION ARE NOT IN SAME PLANE. SPACER SPAN OF INTERCONNECTOR LINE SHALL BE AS PER TRANSMISSION LINE DESIGN.

** ACTUAL CENTER LINE DISTANCE BETWEEN TOWER IS 66.7M. BUT ACTUAL MAXIMUM CONDUCTOR SPAN IS 70M, THEREFORE WE HAVE CONSIDERED 70M SPAN LENGTH FOR CALCULATION OF SHORT CIRCUIT FORCE.

TOWER DETAIL :-

TOWERS DESIGNATION	STR. HEIGHT DETAIL FROM PLINTH TOP (m)	QUANTITY (NOS.) UNIT-7&8 SWITCHYARD	QUANTITY (NOS.) UNIT-6 EXTN. SWITCHYARD	REMARKAS
T1	18.5+7.5	25	2	1. BEAM TAKE OFF ONE SIDE AT A HEIGHT OF 18.5m. 2. PEAK OF HEIGHT 7.5m
T2	18.5+7.5	11	4	1. BEAM TAKE OFF TWO SIDE AT A HEIGHT OF 18.5m. 2. PEAK OF HEIGHT 7.5m
T3	18.5+7.5	4	-	1. BEAM TAKE OFF ONE SIDE AT A HEIGHT OF 18.5m. 2. PEAK OF HEIGHT 7.5m
T4	18.5+7.5	4	-	1. BEAM TAKE OFF TWO SIDE AT A HEIGHT OF 18.5m. 2. PEAK OF HEIGHT 7.5m
T5	18.5+7.5	6	1	1. BEAM TAKE OFF ONE SIDE AT A HEIGHT OF 18.5m. 2. PEAK OF HEIGHT 7.5m
T6	18.5+7.5	3	1	1. BEAM TAKE OFF TWO SIDE AT A HEIGHT OF 18.5m. 2. PEAK OF HEIGHT 7.5m
T7	18.5+7.5	2	-	1. BEAM TAKE OFF ONE SIDE AT A HEIGHT OF 18.5m. 2. PEAK OF HEIGHT 7.5m
T8	18.5+7.5	0	1	1. BEAM TAKE OFF TWO SIDE AT A HEIGHT OF 18.5m. 2. PEAK OF HEIGHT 7.5m

BEAM DETAIL :-

BEAM TYPE	HEIGHT FROM PLINTH TOP/SPAN (m)	QUANTITY (NOS.) UNIT-7&8 SWITCHYARD	QUANTITY (NOS.) UNIT-6 EXTN. SWITCHYARD	REMARKS
B1	18.5/27	4	-	SUITABLE FOR STRINGING OF CONDUCTOR WITH 30° DEVIATION (MAX) IN HORIZONTAL & VERTICAL DIRECTION
B2	18.5/27	20	4	SUITABLE FOR STRINGING OF CONDUCTOR WITHOUT DEVIATION
B3	18.5/21.5	6	-	SUITABLE FOR STRINGING OF CONDUCTOR WITH 30° DEVIATION (MAX) IN HORIZONTAL & VERTICAL DIRECTION
B4	18.5/27	4	2	SUITABLE FOR STRINGING OF CONDUCTOR WITH 30 DEVIATION (MAX) IN HORIZONTAL & VERTICAL DIRECTION

LOADING DETAILS ON A-ROW COLUMN :-

NOTATION	SHIELD WIRE	NORMAL TENSION PER SHIELD WIRE	HEIGHT ABOVE FFL(193.5M) FOR TERMINATION OF SHIELD WIRE	REMARKAS
d1	SHIELD WIRE WITH 30° DEVIATION (MAX) IN HORIZONTAL & VERTICAL DIRECTION	800 KG	29 m	TERMINATION AT A POINT 1,4,7,10,13,16,19,21

NOTE :-

1. ALL DIMENSIONS ARE IN mm.
2. THE STRUCTURE SHALL BE DESIGNED FOR A FACTOR OF SAFETY OF 2 FOR NORMAL/ BROKEN WIRE CONDITION & 1.5 FOR SHORT CIRCUIT FORCES CONDITION.
3. THE TRANSVERSE, VERTICAL, LONGITUDINAL LOADS SHALL BE CONSIDERED AS PER IS 802: 1995.
4. WEIGHT OF THE MAN WITH TOOLS AT ANY POINT OF TIME SHALL BE CONSIDERED ON BEAM AS 150 Kg.
5. ALL HEIGHTS ARE WITH REFERENCE TO PLINTH LEVEL. PLINTH LEVEL. IS 300mm ABOVE FINISHED GROUND LEVEL.
6. FIFTH COLUMN OF THE TABLE FOR "LOADING DETAILS" SHOWS MAXIMUM SHORT CIRCUIT FORCE IN KG. UNDER MINIMUM TEMPERATURE AND MAXIMUM WIND CONDITIONS.
7. 400KV BEAM B1,B2,B3 & B4 HAVE PROVISION OF DOUBLE ANCHORING POINT ON BOTH SIDE OF BEAM WITH ANCHOR SPACING 450mm FOR TERMINATION OF DOUBLE TENSION STRING HARDWARE.
8. 400KV BEAM B1,B2,B3 & B4 HAVE PROVISION OF SINGLE ANCHORING POINT ON CENTER OF BEAM FOR TERMINATION OF SINGLE SUSPENSION STRING HARDWARE.

TYPICAL SECTION OF 400KV TOWER

LEGEND TABLE

	PRESENT BHEL SCOPE
	EXISTING SCOPE
	CUSTOMER SCOPE
	SHIELD WIRE
	FENCE
	DOUBLE TENSION STRING HARDWARE WITH DOUBLE ANCHORING POINT WITH ANCHOR SPACING 450mm SUITABLE FOR TWIN MOOSE ACSR
	DOUBLE TENSION STRING HARDWARE WITH DOUBLE ANCHORING POINT WITH ANCHOR SPACING 450mm SUITABLE FOR QUAD MOOSE ACSR
	SINGLE SUSPENSION STRING HARDWARE WITH SINGLE ANCHORING POINT
	COLUMN WITH PEAK

REFERENCE

PLOT PLAN DRAWING NO. PE-DG-392-100-M001
SWITCHYARD CONTROL ROOM DRAWING NO. TB-3-360-316-009
SWITCHYARD LAYOUT PLAN 400kV DRAWING NO. TB-0-360-316-002
SWITCHYARD ELEVATION DRAWING NO. TB-0-360-316-003

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
03	19.12.14	AS PER TCE E-MAIL DATED 01.12.14(BABAI AND BIKANER LINE HAS BEEN INTERCHANGED)	SK	SK	SKS	RS
02	09.04.14	AS PER TCE COMMENT DATED 04.02.14	SK -SD-	SK -SD-	SKS -SD-	RS -SD-
01	08.12.13	AS PER TCE COMMENT DATED 18.10.13 & DESIGN DOC. NO. TB-360-316-051, REV-02	SK -SD-	SK -SD-	SKS -SD-	RS -SD-

OWNER

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	APPD	RS	-SD-	

TITLE

STRUCTURE LOADING DIAGRAM FOR 400kV S/S AT SURATGARH

CV	ME	EL	I&C			DEPT.	SCALE 1:650	BHEL/SUB VENDOR DRG NO. TB-0-360-316-010
						SIGN		
						DATE		SHT. No 01 OF 01 REV. 03

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REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
01	05.09.14	AS PER TCE LETTER DTAED 30.06.14	SK	SK	SKS	RS

OWNER

RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

PROJECT

2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER

TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR

BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP

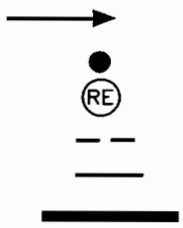
DEPT CODE		NAME	SIGN.	DATE
422	DRN	DM		09.06.14
	DESN	SK	-SD-	
	CHD	SKS	-SD-	
	APPD	RS	-SD-	

TITLE

EQUIPMENT & STRUCTURE EARTHING DETAILS OF 400kV S/S AT SURATGARH

CV	ME	EL	I&C			DEPT.	SCALE 1:600	BHEL/SUB VENDOR DRG NO. TB-4-360-316-011	
						SIGN			
						DATE		NO. OF SHEETS 25	REV. 01

LEGEND



CONNECTION TO GROUND MAT THROUGH RISER.

RISER

ELECTRODE WITH TREATED EARTH PIT

75X12mm GS FLAT

50X10mm GS FLAT

40ømm MS ROD

GENERAL NOTES:

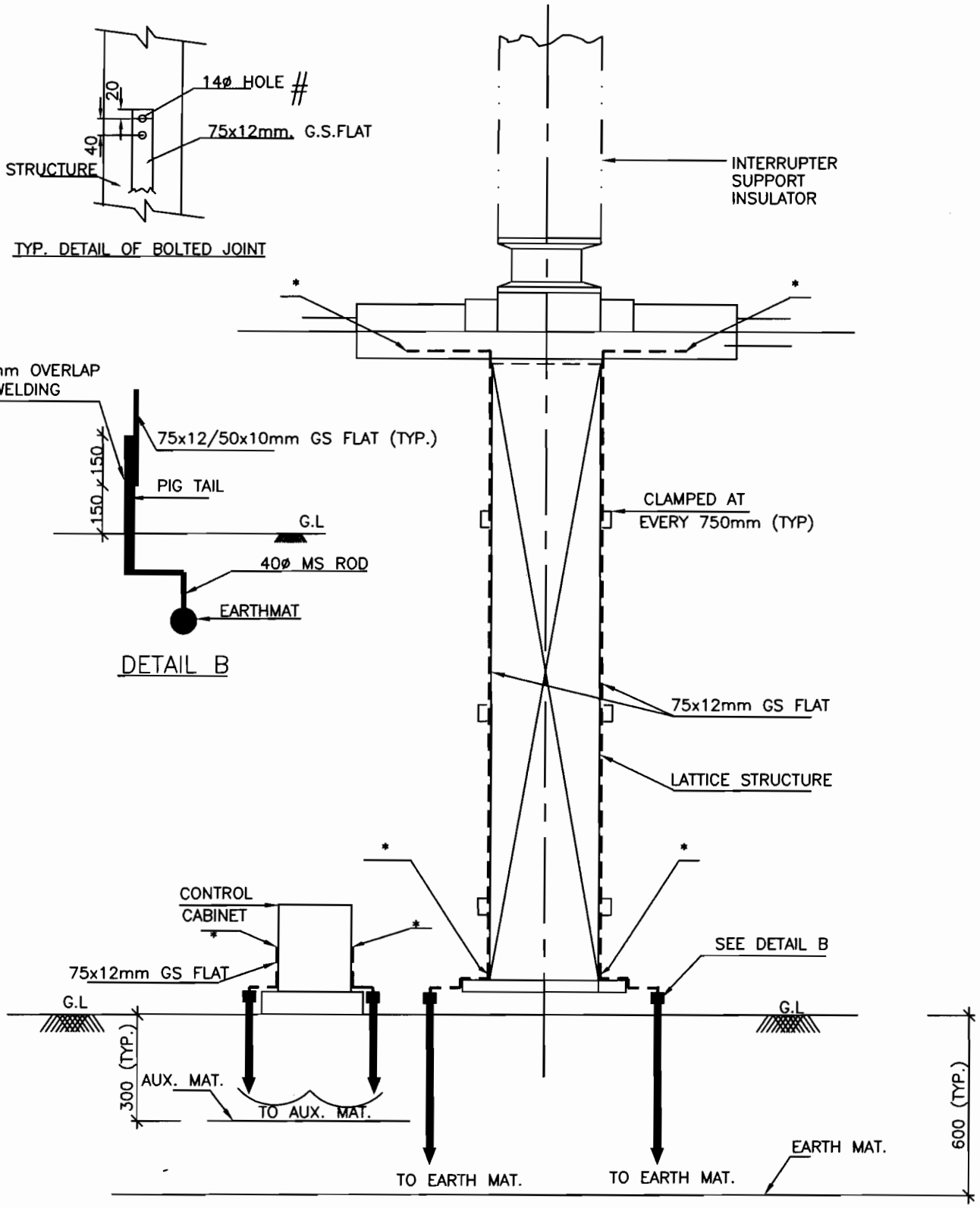
1. EARTH STRIP CLEATED TO LATTICE TYPE STRUCTURE AT AN INTERVAL OF 750mm.
2. ALL ELECTRICAL EQUIPMENTS SHALL BE EARTHED BY TWO SEPARATE AND DISTINCT EARTH CONNECTIONS AND SHALL BE CONNECTED TO DIFFERENT CONDUCTORS OF EARTHING GRID.
3. FOR WELDING DETAILS REFER SHEET # 20,21,22 & 23
4. E/WIRE DOWN CONDUCTOR SHALL BE CLEATED AT AN INTERVAL OF 750mm ALONG WITH STRUCTURE.
5. 40 DIA mm MS ROD RISERS SHOULD BE BROUGHT CLOSE TO EQUIPMENTS FOUNDATION.
6. ALL WELDED CONNECTION SHALL BE MADE BY ELECTRIC ARC WELDING.
7. WHERE EVER THE MAIN MAT CROSSES CABLE TRENCH , DRAIN ETC., EARTH MAT SHALL BE LAID 300mm BELOW THAT.
8. 3 m LONG 40 mm dia. MS ROD SHALL BE USED FOR ROD ELECTRODE.
9. THE MAIN EARTHMAT SHALL BE 600mm BELOW FGL.
10. LIGHTING MAST EARTHING DETAILS SHALL BE SHOWN SEPARATELY ALONGWITH ILLUMINATION SYSTEM.

SHEET NO.	DESCRIPTION
02.	400kV SF6 CIRCUIT BREAKER
03.	400KV CVT
04.	400kV POST INSULATOR (SOLID CORE TYPE)
05.	390/120/12kV LIGHTNING ARRESTER
06.	MARSHALLING KIOSK
07.	400/33KV HORIZONTAL CENTER BREAK ISOLATOR WITH ONE EARTH SWITCH
7A.	400/33kV HORIZONTAL CENTER BREAK ISOLATOR WITH TWO EARTH SWITCH
08.	TOWER WITH SHIELD WIRE
09.	400kV CURRENT TRANSFROMER
10.	CABLE TRENCH
11.	DETAIL OF EARTH ELECTRODE IN TREATED EARTH PIT
12.	RAIL BONDING
13.	DRY TYPE LT TRANSFORMER
14.	AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH., E/S MECH. BOX. AND CB CONTROL CABINET
15.	LT SWITCHGEAR/CHARGER/RELAY AND CONTROL PANEL.
16.	400KV SHUNT REACTOR WITHOUT NGR.
16A.	NEUTRAL GROUNDING REACTOR.
17.	FENCE POST
18.	TYPICAL ARRANGEMENT OF BOLTED JOINTS
19.	400kV WAVE TRAP
20.	WELDING DETAILS
21.	WELDING DETAILS
22.	WELDING DETAILS
23.	WELDING DETAILS

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EQUIPMENT & STRUCTURE EARTHING DETAILS

COMPUTERREF.NO.	DRG. No.	REV.	SHEET No.
	TB-4-360-316-011	01	01



NOTE:

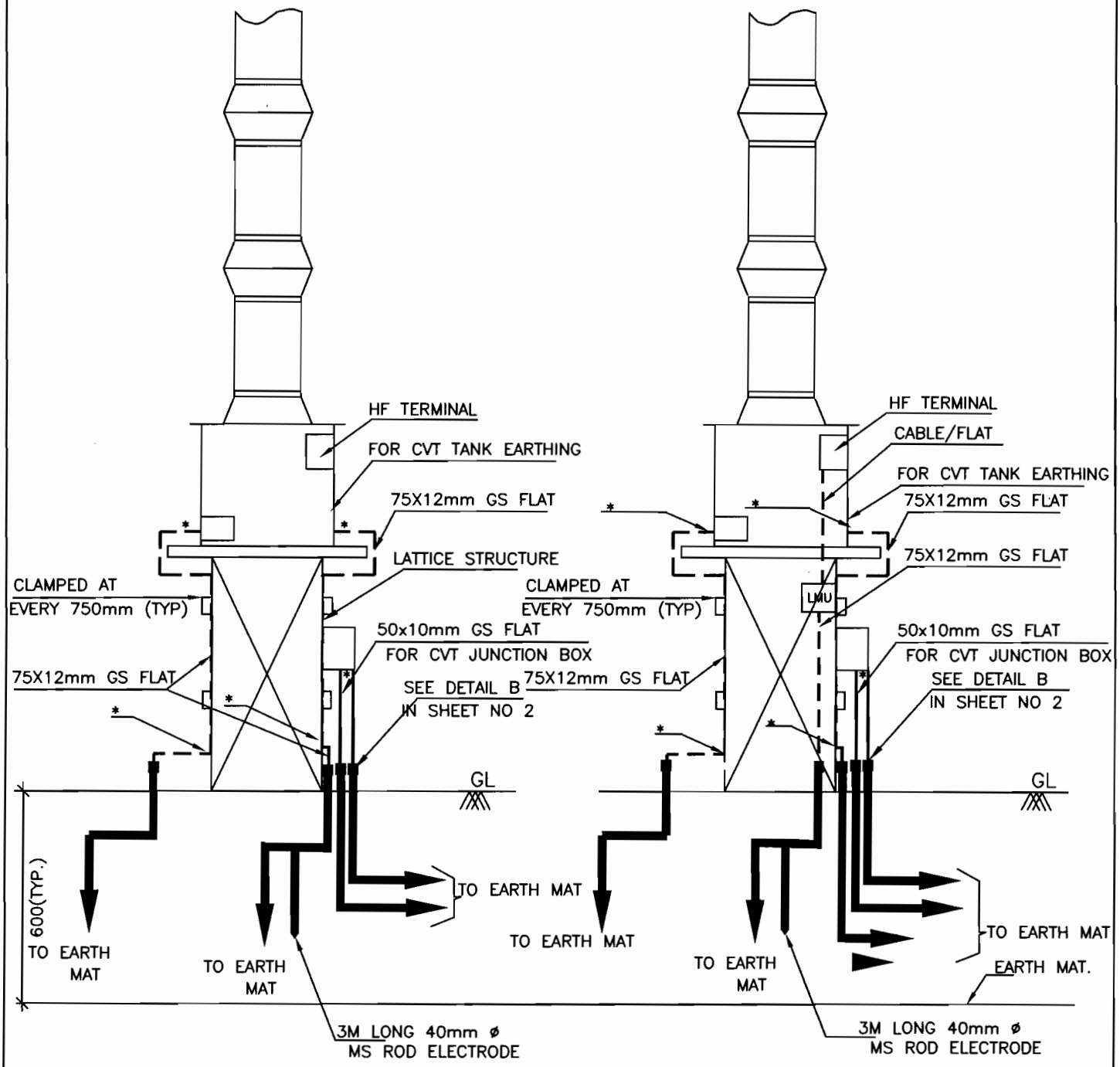
1) # BOLT SIZE AND HOLE SIZE SHALL BE TO SUIT RESPECTIVE EQPT./STRUCTURE.
2) NO. OF RISERS PER CIRCUIT BREAKER =2 NOS./PHASE
3) NO. OF RISERS FOR CONTROL CABINET= 2 NOS.
4) * BOLTED JOINTS
5) AUXILIARY EARTHMAT SHALL BE PROVIDED BELOW CONTROL CABINET OF CB (REFER SHEET NO. 14)

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EQUIPMENT & STRUCTURE EARTHING DETAILS

400kV SF6 CIRCUIT BREAKER

COMPUTERREF.NO.	DRG. No.	TB-4-360-316-011	REV. 01	SHEET No. 2



(CVT WITHOUT LINE MATCHING UNIT CONNECTION) (CVT WITH LINE MATCHING UNIT CONNECTION)

NOTE:

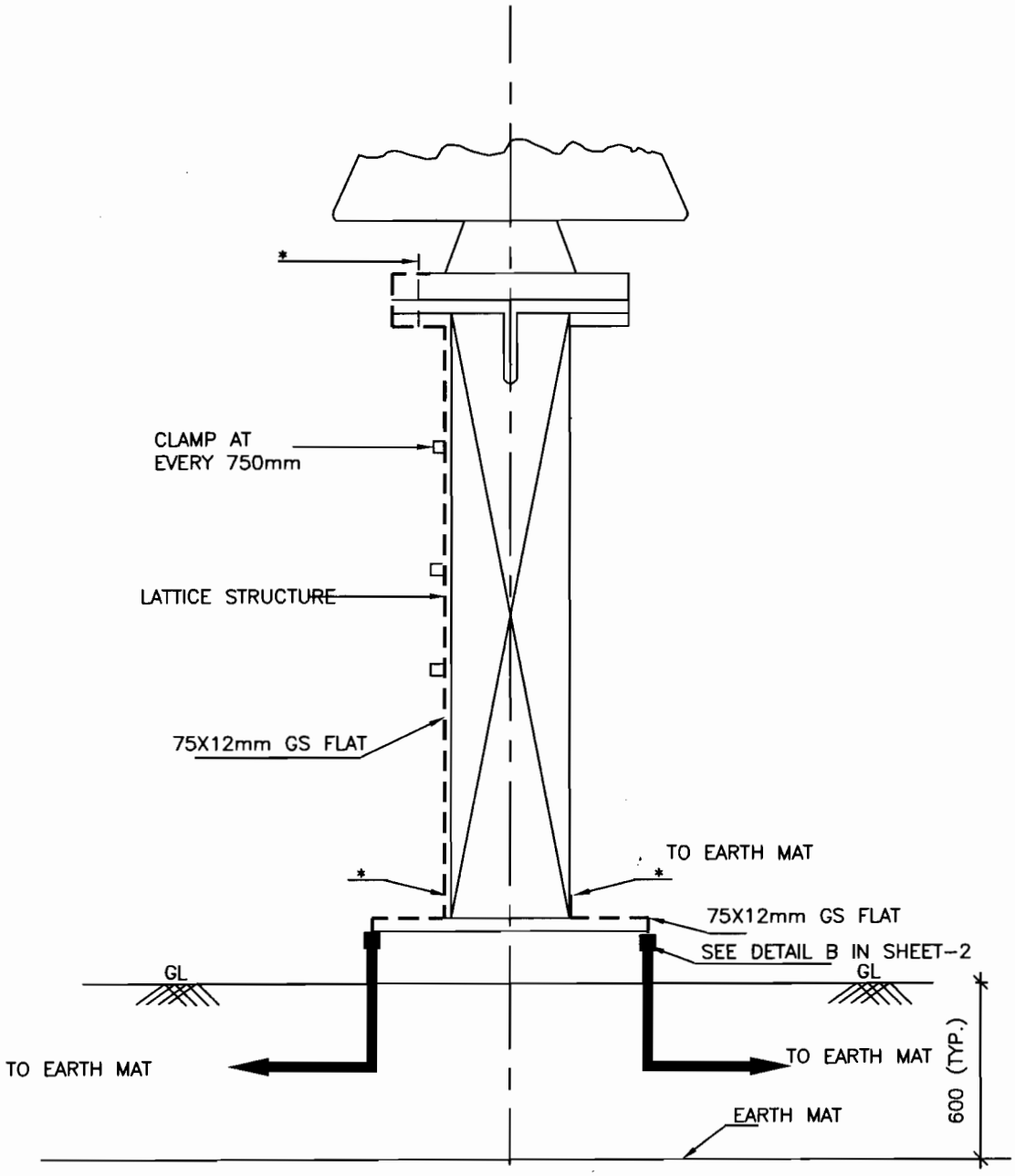
(1) 3M ROD ELECTRODE WITHOUT TREATED EARTH PIT = 1 NOS./PHASE
(2) NO. OF RISERS = 2 NOS PER PHASE FOR CVT WITHOUT LMU.
(3) NO. OF RISERS = 3 NOS PER PHASE FOR CVT WITH LMU.
(4) NO. OF RISERS FOR CVT JUNTION BOX =2 NOS.
(5) * BOLTED JOINTS

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EQUIPMENT & STRUCTURE EARTHING DETAILS

400KV CVT

COMPUTERREF.NO.	DRG. No.	TB-4-360-316-011	REV. 01	SHEET No. 3



NOTE:

(1) NO. OF RISERS = 2 NOS./PHASE

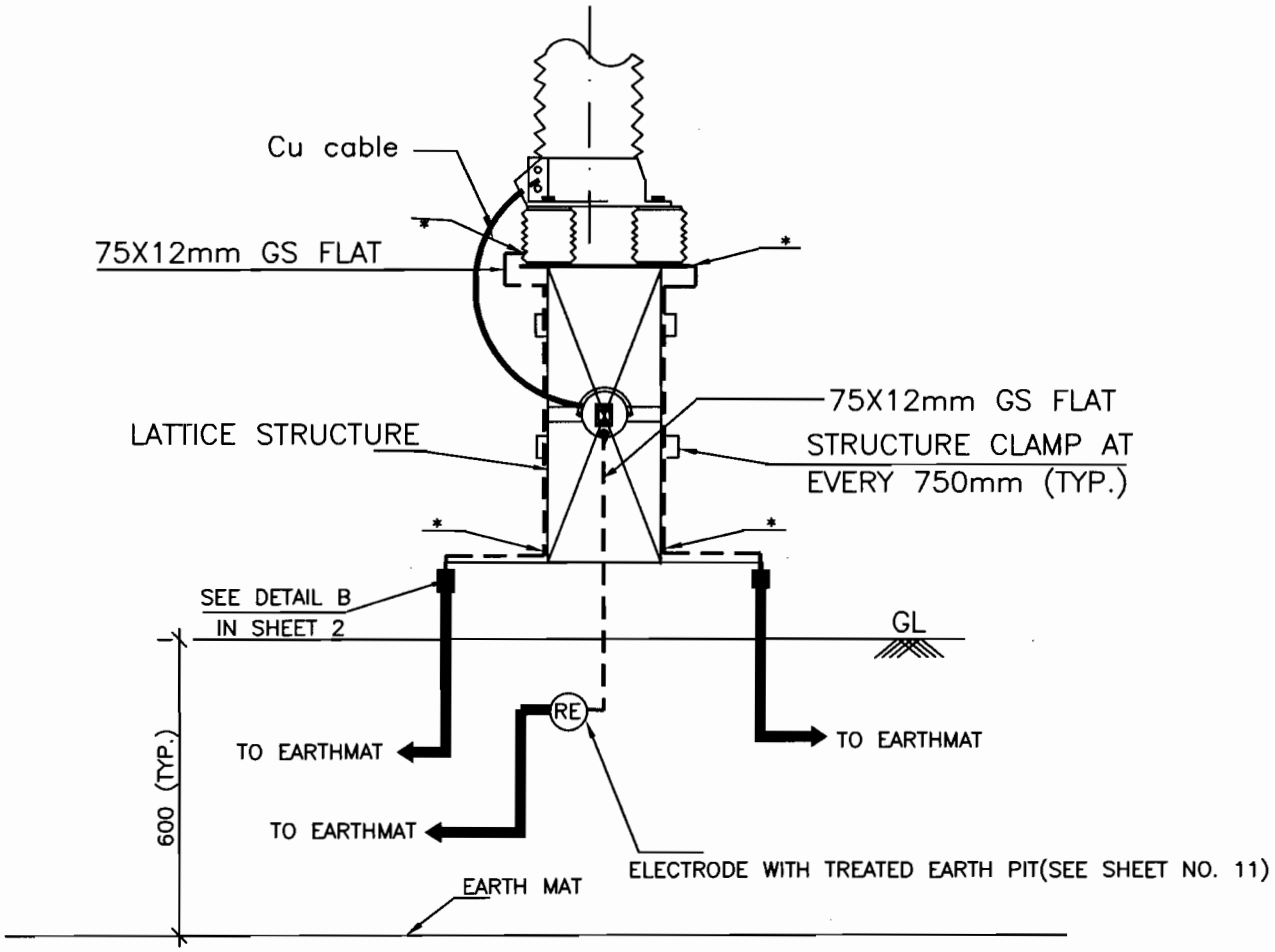
(2) * BOLTED JOINTS.

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BHEL

EQUIPMENT & STRUCTURE EARTHING DETAILS

400KV POST INSULATOR (SOLID CORE TYPE)

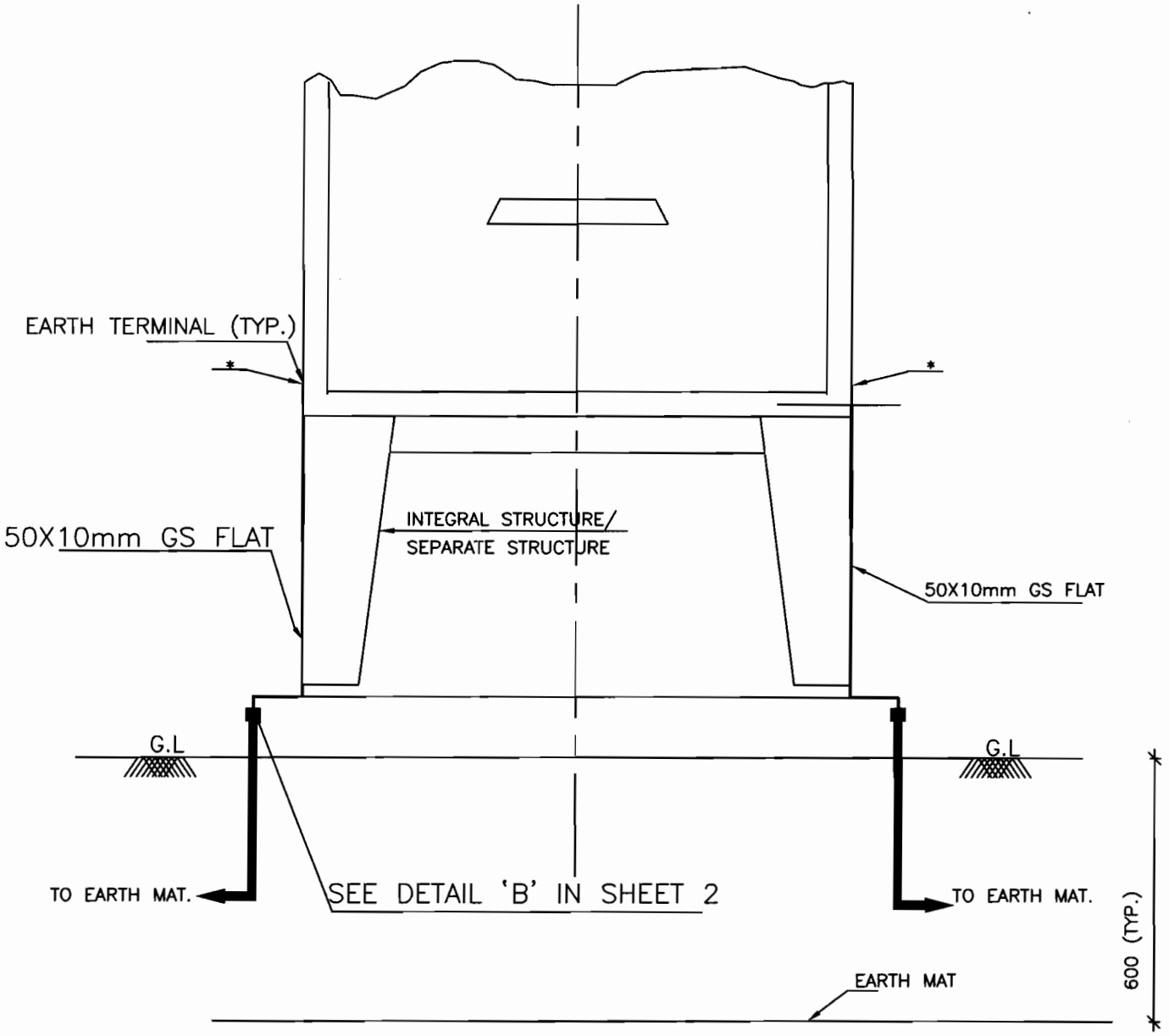
DRG. No.	REV.	SHEET No.
TB-4-360-316-011	01	4



NOTES;

1. LA SHALL BE EARTHED THROUGH EARTH TERMINAL OF SURGE COUNTER
2. NO. OF ELECTRODE WITH TREATED EARTH PIT 1 NO. PER PHASE,
3. * BOLTED JOINTS.
4. NO. OF RISERS= 3 NOS. PER PHASE

BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS LIGHTNING ARRESTER(390/120/12kV)			
COMPU. DRG. REF.	DRG.NO.	TB-4-360-316-011	REV. 01	SHEET No. 5



NOTES;

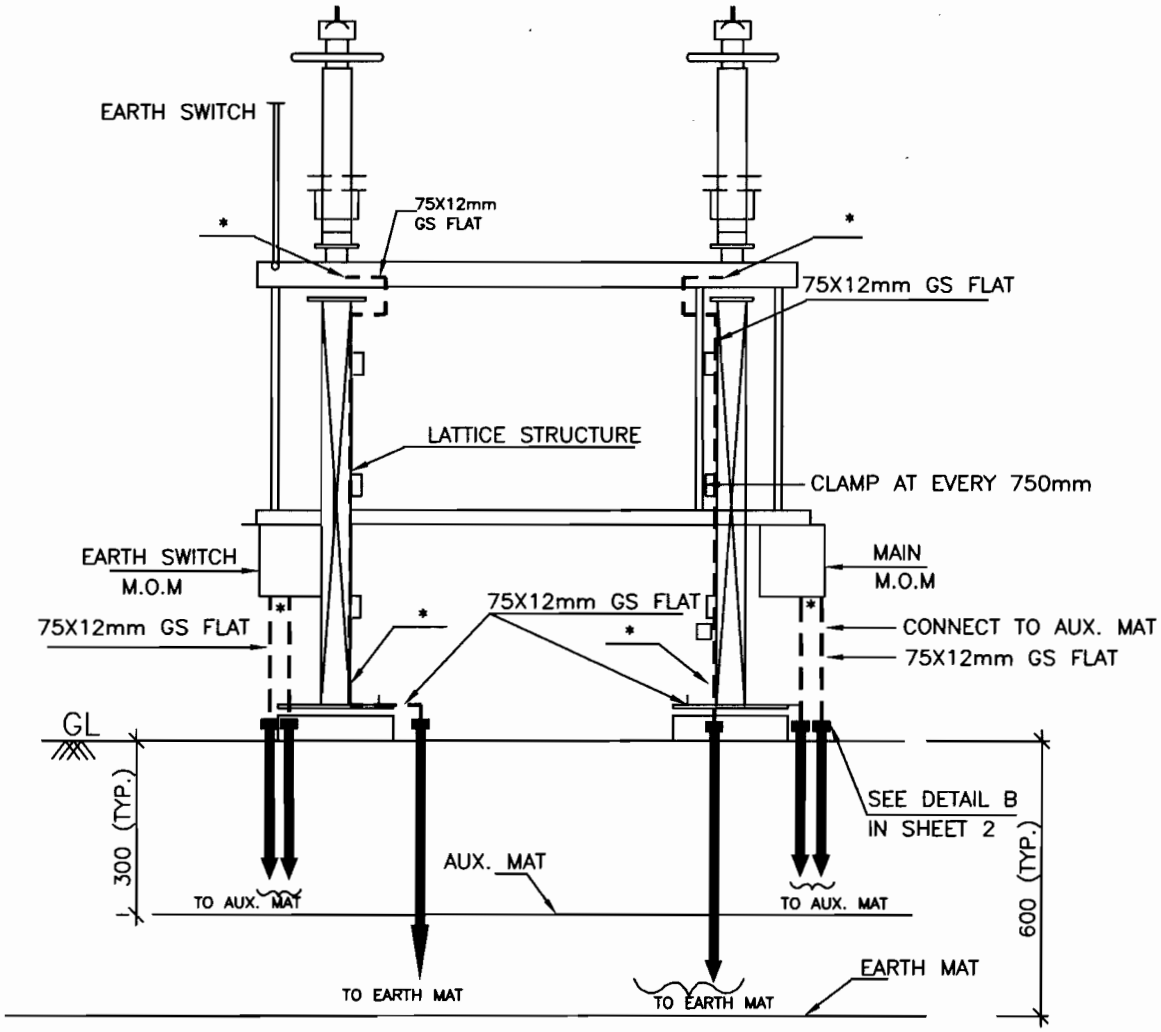
1. NO. OF RISERS= 2NOS.
2. * BOLTED JOINTS.

बीएचईएल BHEL

EQUIPMENT & STRUCTURE EARTHING DETAILS

MARSHALLING KIOSK

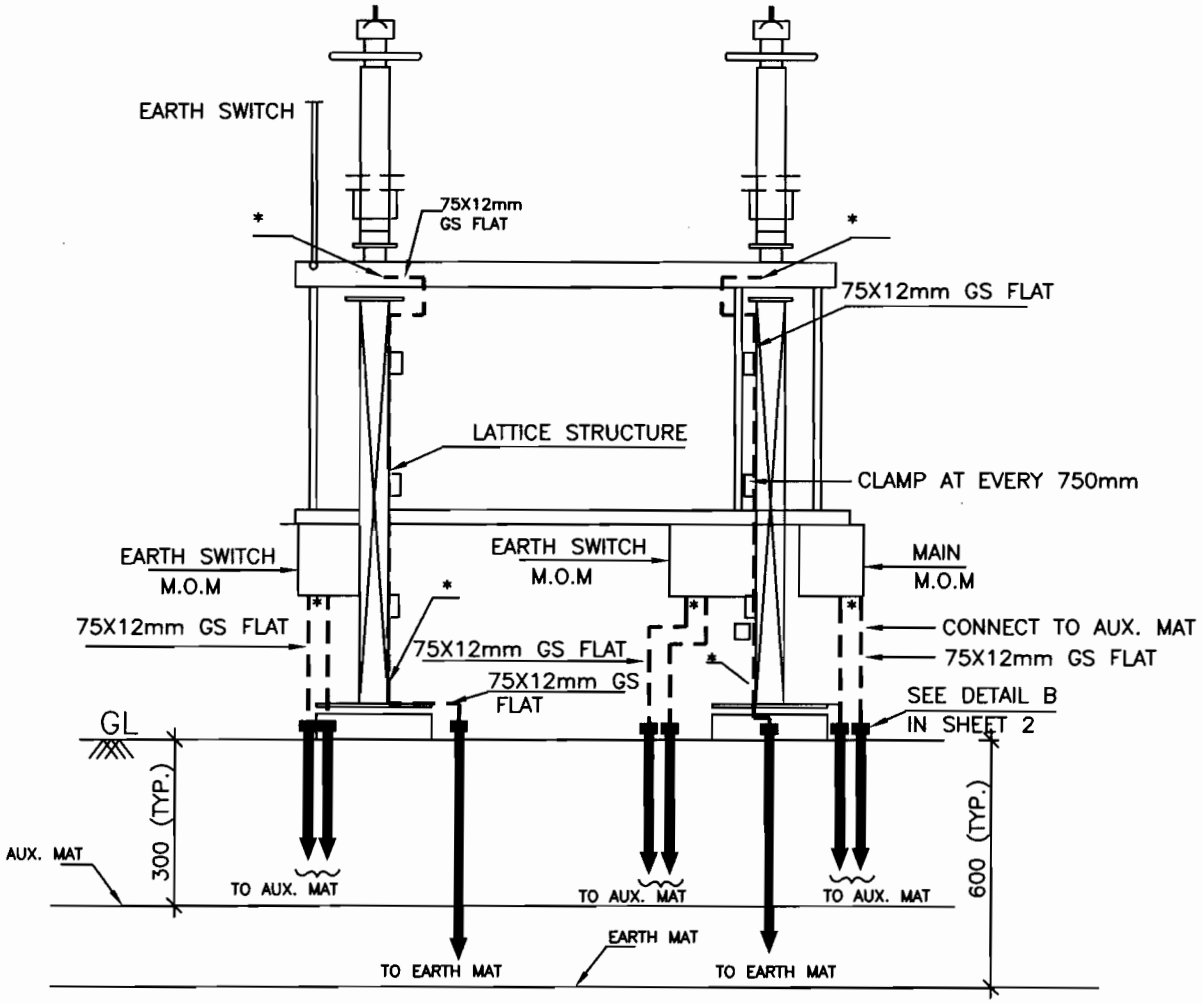
COMPUTERREF.NO.	DRG. No.	TB-4-360-316-011	REV. 01	SHEET No. 6



NOTES

1. AUXILIARY EARTH MAT SHALL BE PROVIDED BELOW EVERY MOM BOX (REFER SHEET 14)
2. NO. OF RISERS FOR ISOLATOR = 2 NOS./PHASE
3. NO. OF RISERS FOR MAIN MECHANISM BOX = 2 NOS.
4. NO. OF RISERS FOR EARTH SWITCH MECHANISM BOX = 2 NOS.
5. * BOLTED JOINTS.

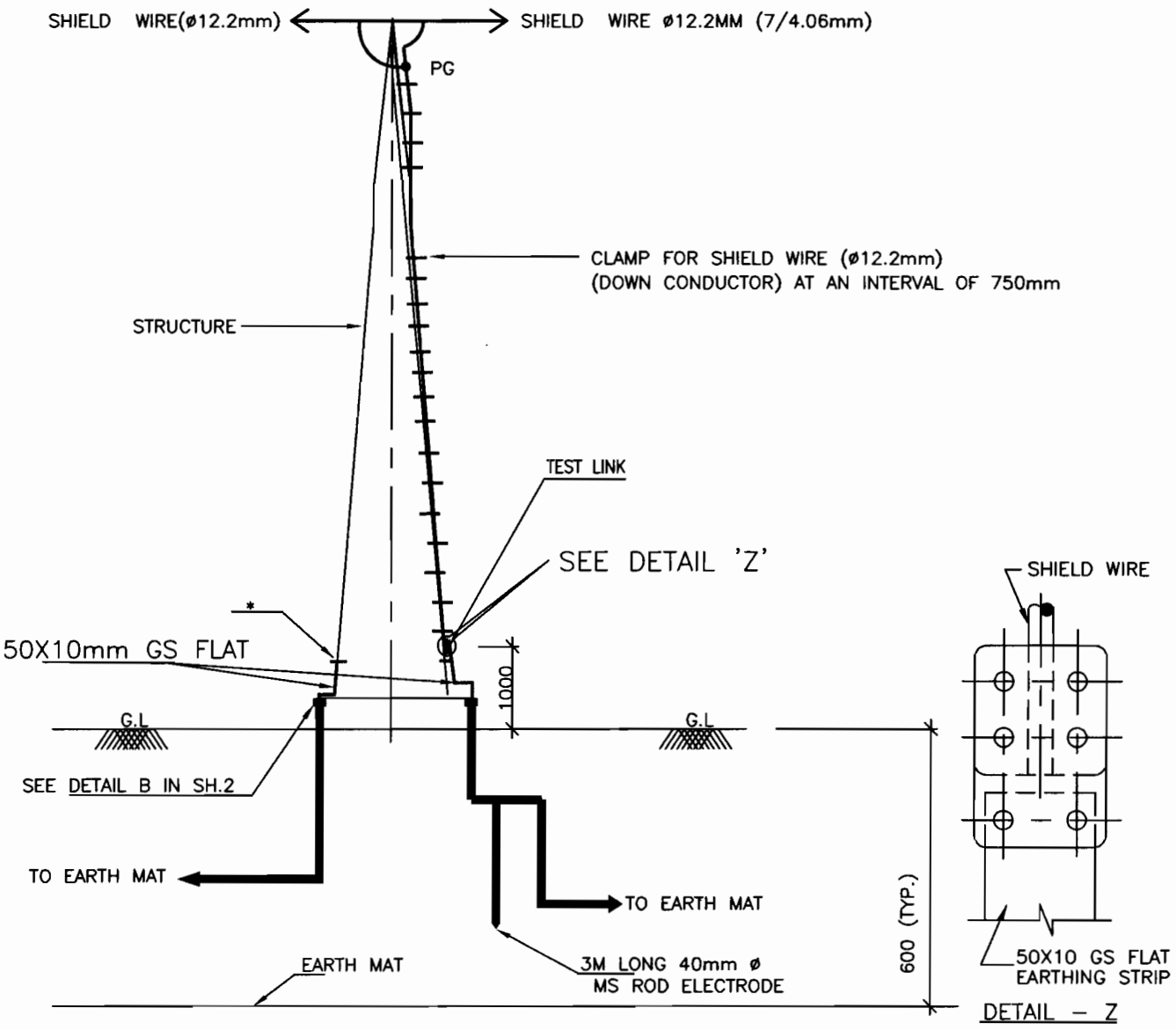
बीएचईएल BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS 400KV/33kV HCB ISOLATOR (TYPICAL) WITH ONE EARTH SWITCH		
COMPUTERREF.NO.	DRG. No. TB-4-360-316-011	REV. 01	SHEET No. 7



NOTES

1. AUXILIARY EARTH MAT SHALL BE PROVIDED BELOW EVERY MOM BOX (REFER SHEET 14)
2. NO. OF RISERS FOR ISOLATOR = 2 NOS./PHASE
3. NO. OF RISERS FOR MAIN MECHANISM BOX = 2 NOS.
4. NO. OF RISERS FOR EARTH SWITCH MECHANISM BOX = 2 NOS.
5. * BOLTED JOINTS.

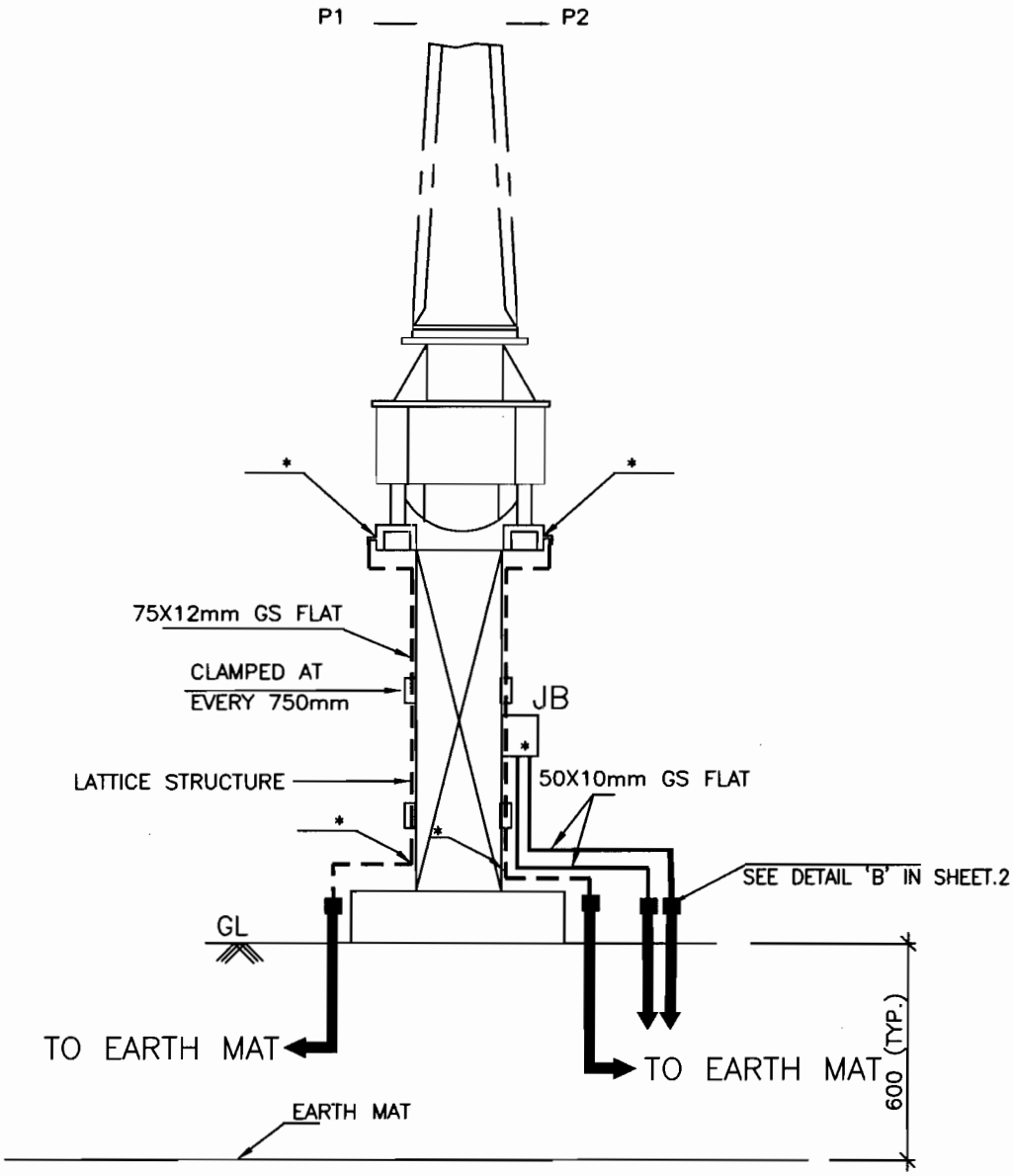
बीएचईएल BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS 400KV/33KV HCB ISOLATOR (TYPICAL) WITH TWO EARTH SWITCH			
COMPUTERREF.NO.	DRG. No.	TB-4-360-316-011	REV. 01	SHEET No. 7A



NOTE:

1. NO. OF 3M ROD ELECTRODE WITHOUT TREATED EARTH PIT : 1 NO. PER TOWER WITH DOWN CONDUCTOR.
2. NO. OF RISERS 2 NOS. / TOWER
3. * BOLTED JOINTS.
4. CLAMP BETWEEN SHIELD WIRE & 50X10MM GS FLAT WILL WORK AS A TEST LINK.

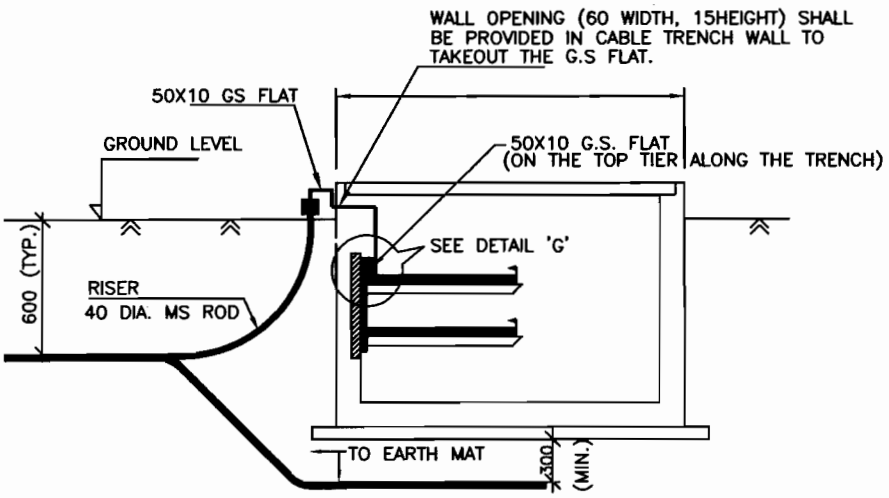
बीएचईएल BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS TOWER WITH SHIELD WIRE			
COMPUTERREF.NO.	DRG. No.	TB–4–360–316–011	REV. 01	SHEET No. 8

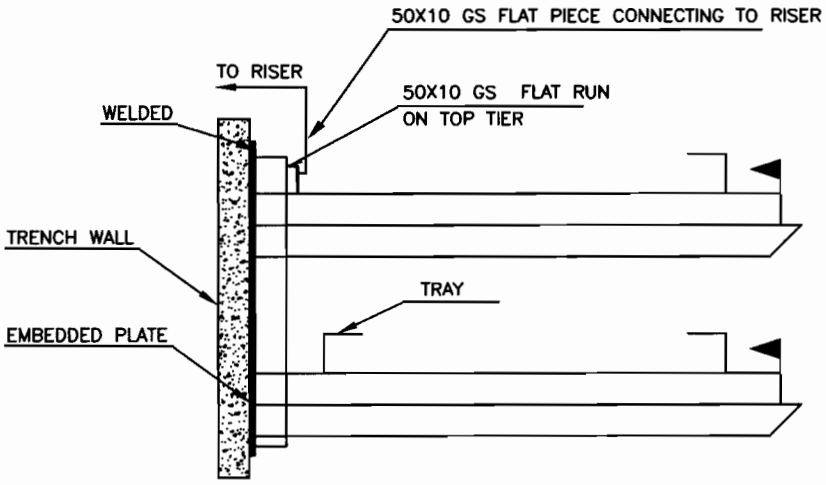


NOTE:

1. NO. OF RISERS=2 NOS./PHASE
2. NO. OF RISERS FOR JUNCTION BOX=2 NOS.
3. * BOLTED JOINTS.

BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS 400KV CURRENT TRANSFORMER			
COMPU. DRG. REF.	DRG.NO.	TB-4-360-316-011	REV. 01	SHEET No. 9





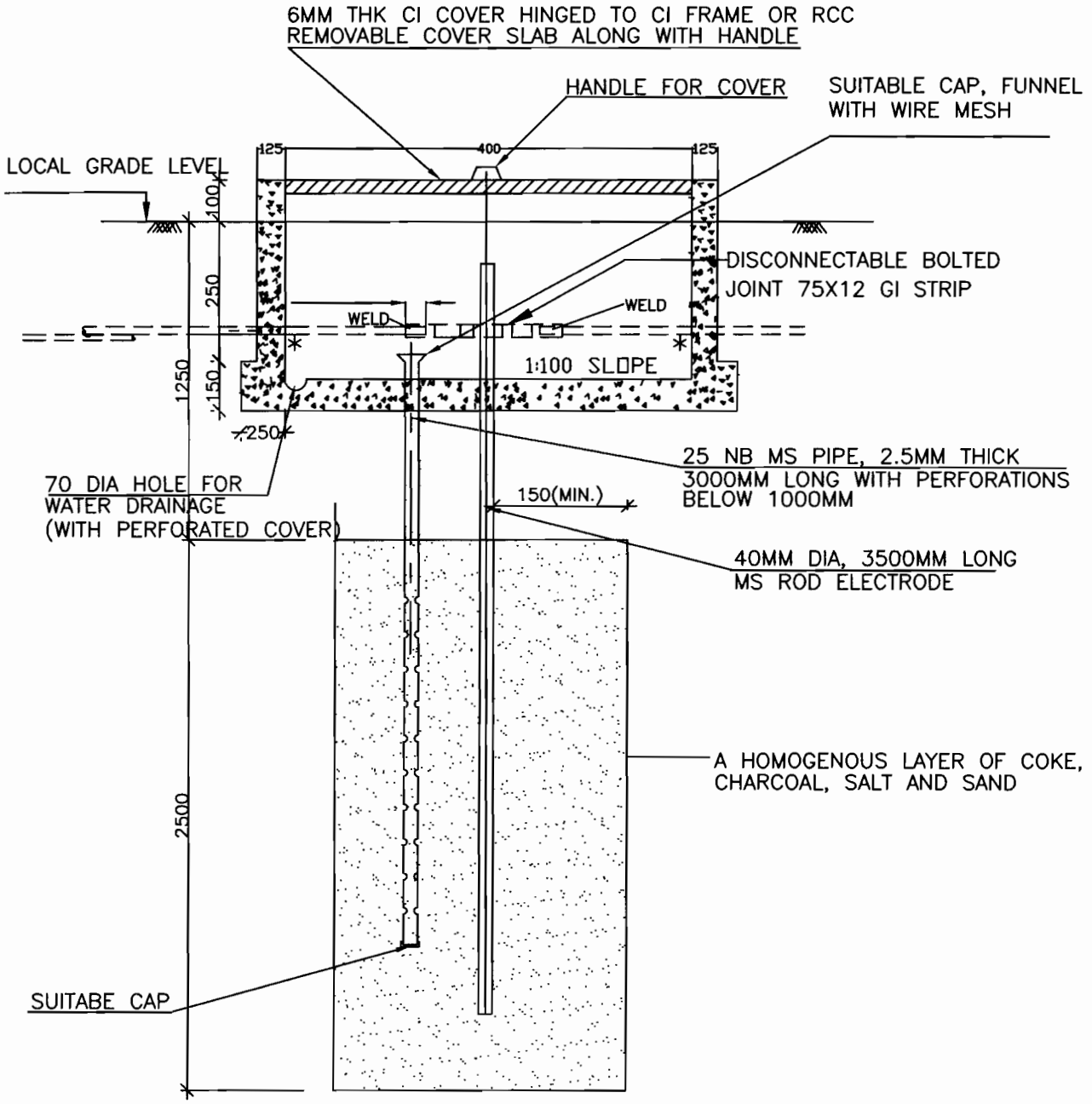
DETAIL 'G'

DETAIL FOR CONNECTING GS FLAT RUNNING ON TOP TIER TRENCH TO RISER.

NOTE:

1. ALL TRENCHES SHALL BE EARTHED AT AN INTERVAL OF 10M ALONG THE LENGTH OF TRENCH.
2. THE EARTH STRIP (50X10 G.S. FLAT) SHALL RUN ON THE TOP TIER ALONG THE CABLE TRENCHES & WELDED TO EACH OF THE RACK AT EVERY 1.5M INTERVAL.
3. WHERE THE CABLE RACKS ARE PROVIDED ON BOTH SIDES OF THE TRENCH, BOTH SIDES SHALL BE EARTHED.

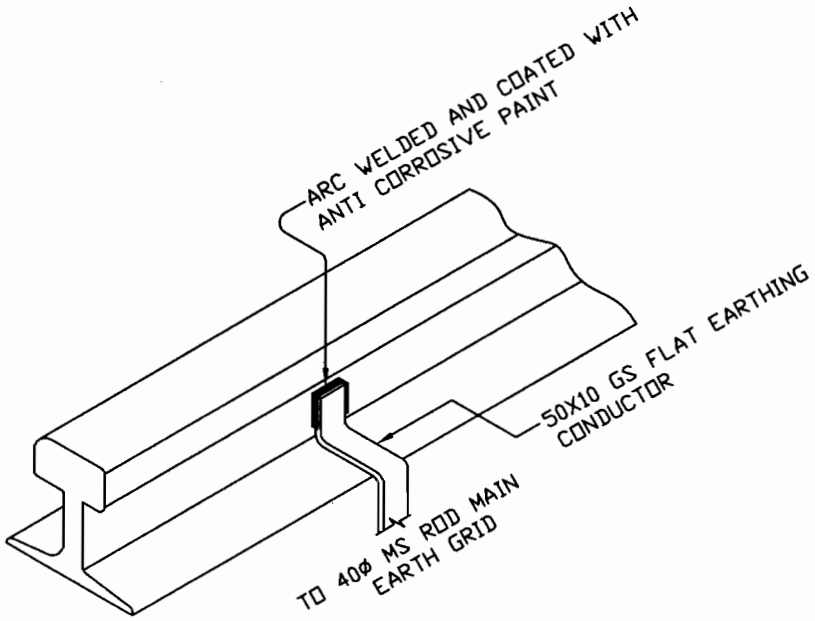
BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS CABLE TRENCH		
COMPU. DRG. REF.	DRG. NO. TB-4-360-316-011	REV. 01	SHEET 10



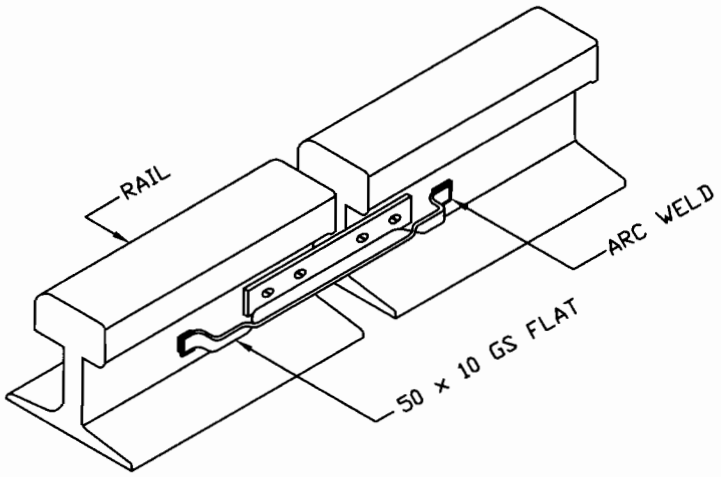
* WALL OPENING (90 WIDTH, 20 HEIGHT) SHALL BE PROVIDED IN WALL TO TAKEOUT THE G.S FLAT.

TEST PIT (AS PER IS-3043)

BHEL	DETAIL OF EARTH ELECTROD IN TREATED EARTH PIT		
COMPU. DRG. REF.	DRG. NO. TB-4-360-316-011	REV. 01	SHEET No. 11



RAIL EARTHING

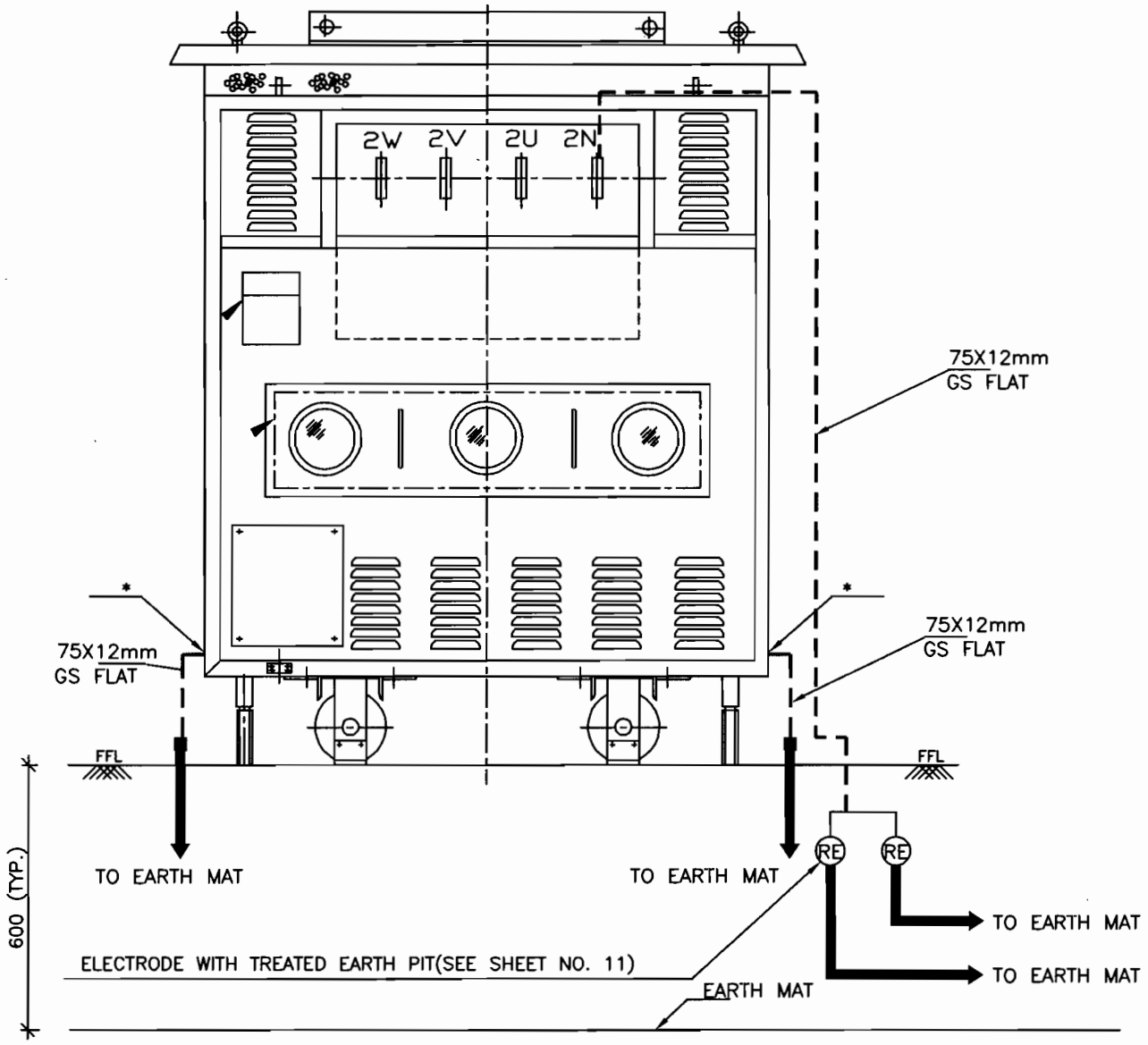


RAIL BONDING

NOTE:–

1. RAILWAY TRACKS WITHIN SWITCHYARD AREA SHALL BE EARTHED AT A SPACING OF 30 m AND ALSO AT BOTH ENDS.

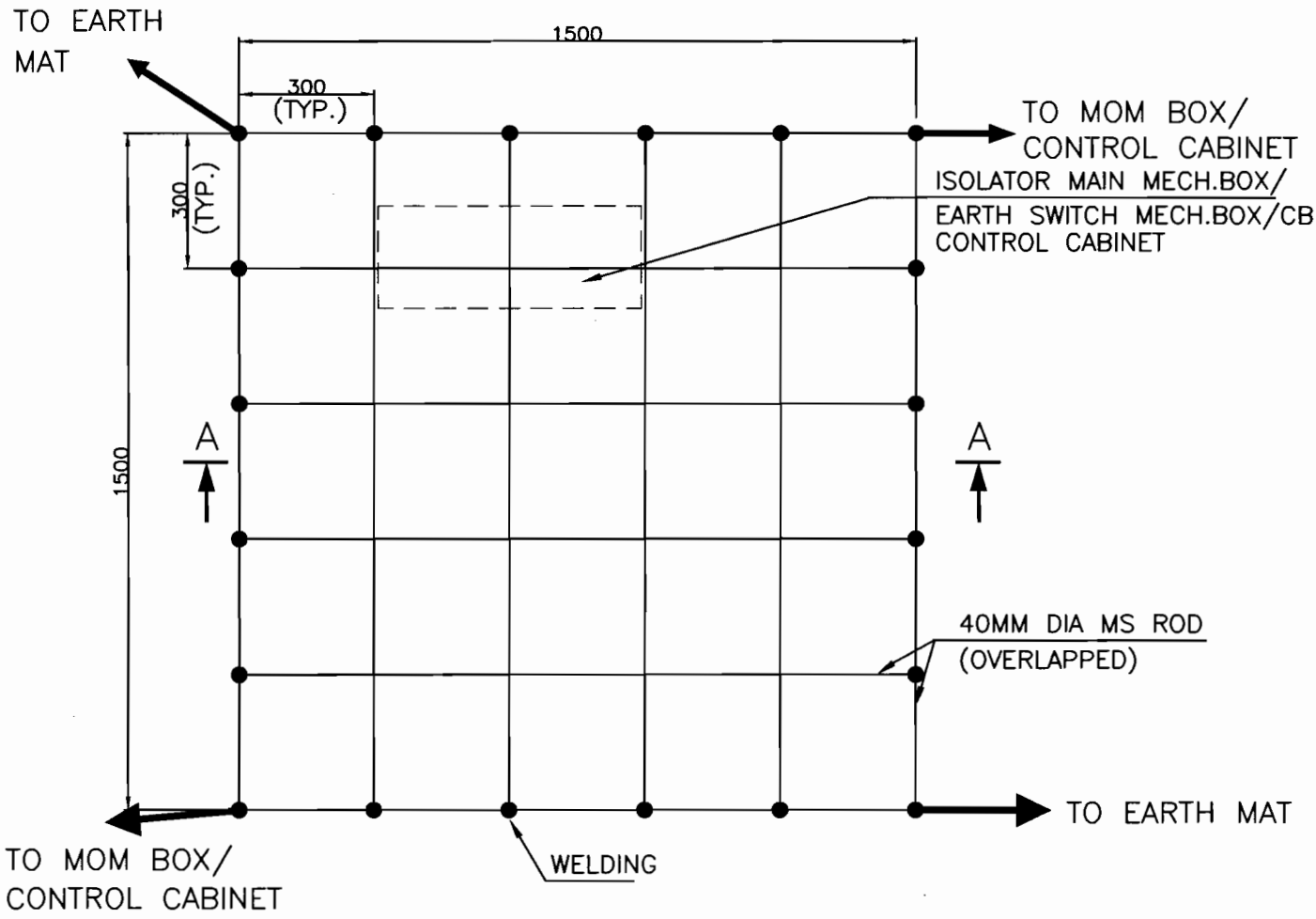
BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS RAIL BONDING		
COMPU. DRG. REF.	DRG. NO. TB–4–360–316–011	REV. 01	SHEET No. 12

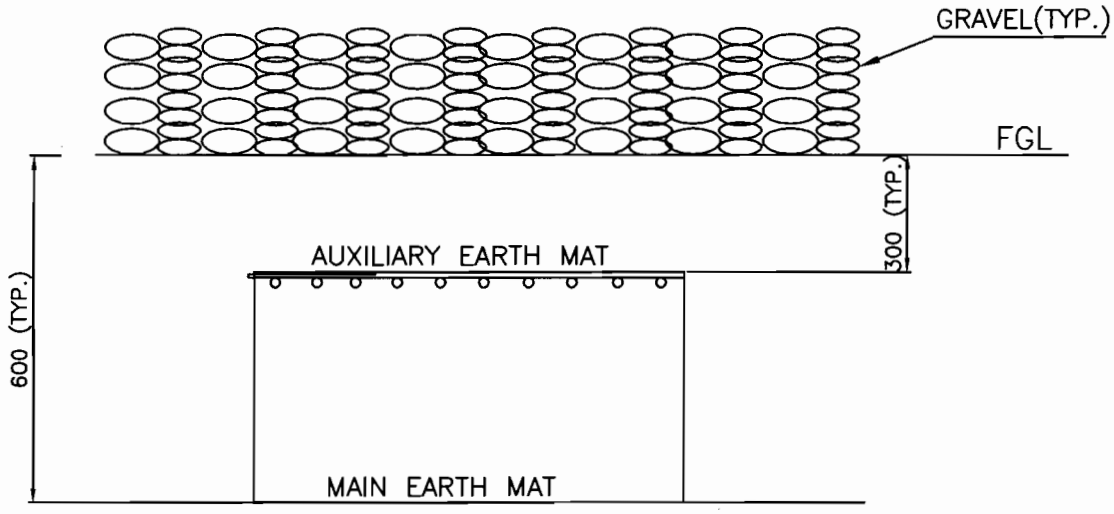


NOTE:

1. NO. OF RISERS FOR TRANSFORMER BODY = 2 NOS.
2. NO. OF EARTH ELECTRODE WITH TREATED EARTH PIT FOR NEUTRAL = 2 NOS.
3. NO. OF RISER FOR EARTH ELECTRODE = 2 NOS.
4. MINIMUM DISTANCE OF 7000MM SHALL BE MAINTAINED BETWEEN TWO ELECTRODE WITH TREATED EARTH PIT.
5. * BOLTED JOINTS.

बीएचईएल BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS DRY TYPE LT TRANSFORMER		
	DRG. No. TB-4-360-316-011	REV. 01	SHEET No. 13



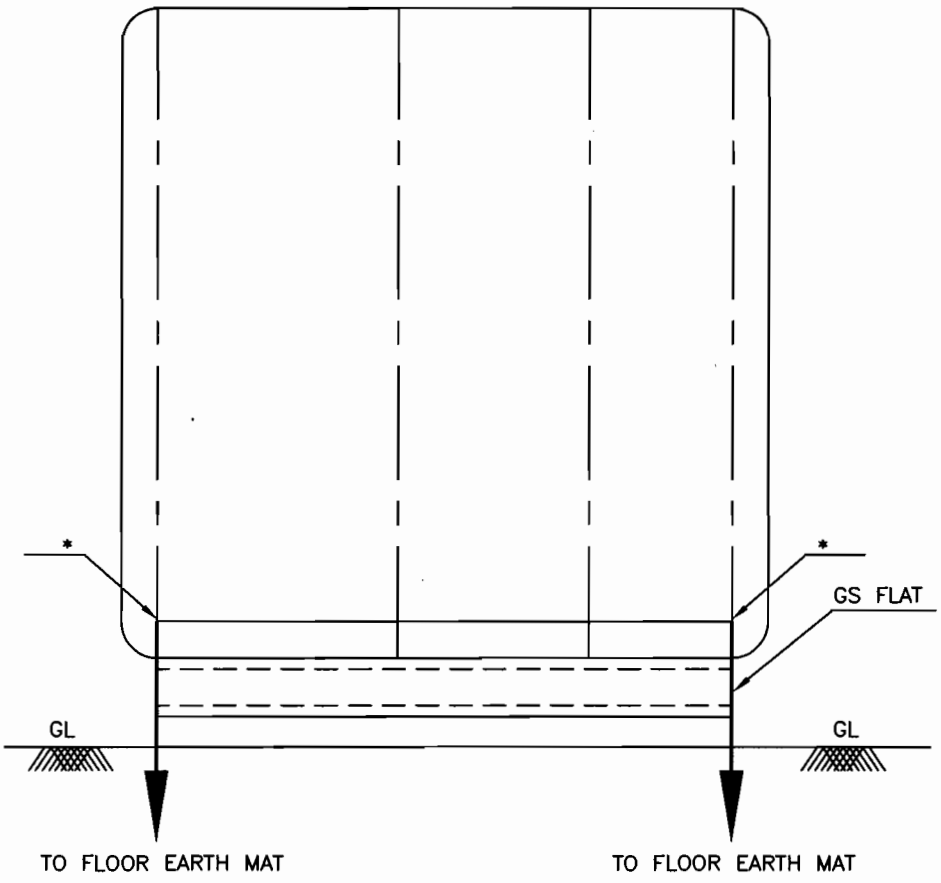


SECTION AA

NOTE:

AUX. EARTH MAT SHALL BE SO POSITIONED THAT THE FOOT OF THE OPERATOR ALWAYS LIE OVER THE AUX. EARTH MAT AREA WHILE ATTENDING / OPERATING THE MECH. BOX THE CABLE TRENCH ROUTING SHALL BE PLANNED ACCORDINGLY.

BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH.,E/S MECH. BOX AND CB CONTROL CABINET	
COMPU. DRG. REF.	Report No. TB-4-360-316-011 REV. 01	SHEET No. 14



EQUIPMENT	FLAT SIZE
LT SWITCHGEAR	75X12 mm GS FLAT
CHARGER	75X12 mm GS FLAT
RELAY & CONTROL PANELS	50X10 mm GS FLAT

NOTE:

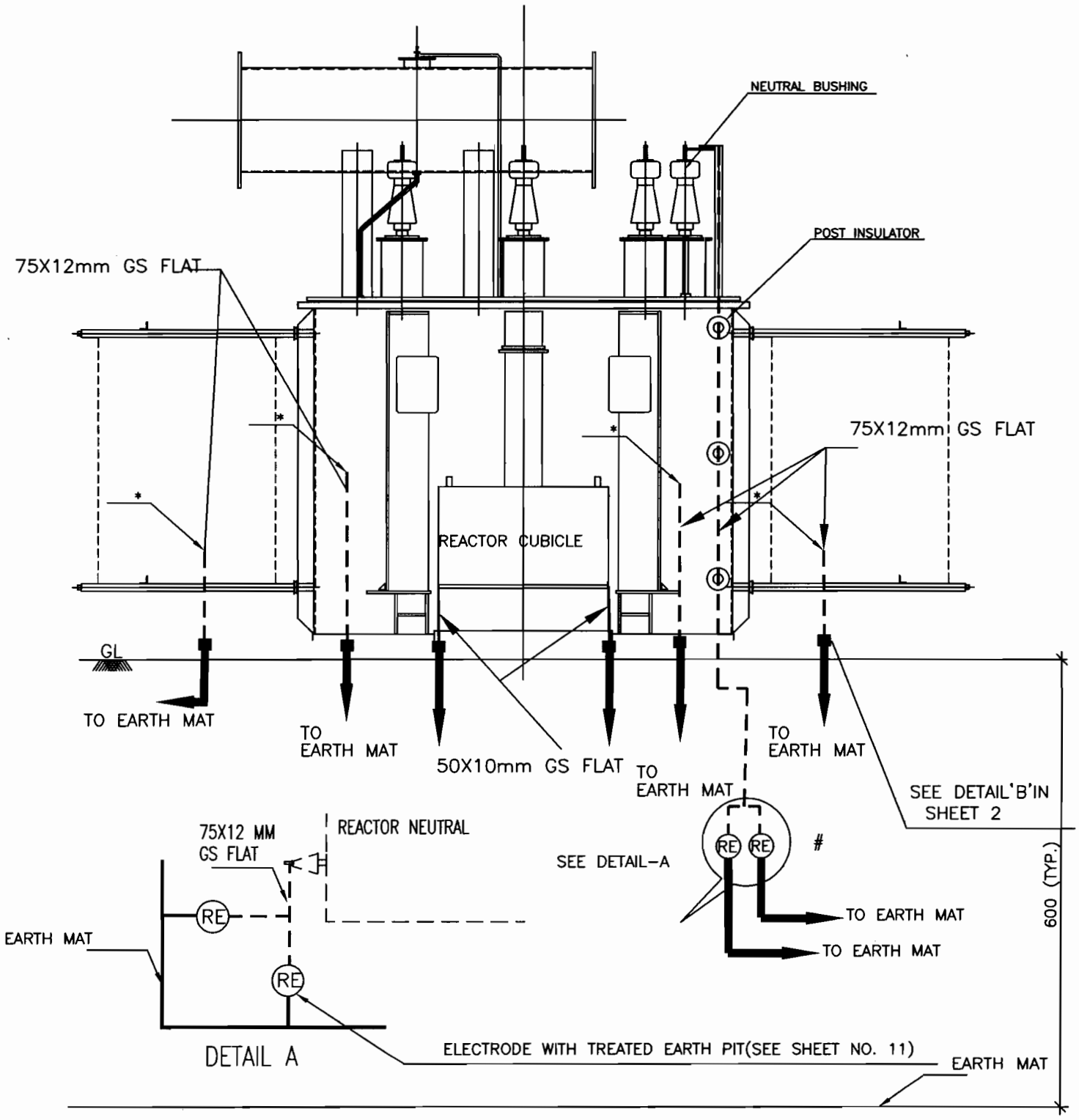
1. * BOLTED JOINTS.

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EQUIPMENT & STRUCTURE EARTHING DETAILS

LT SWITCHGEAR / CHARGER / RELAY & CONTROL PANEL

DRG. No.	REV.	SHEET No.
TB-4-360-316-011	01	15



NOTE:

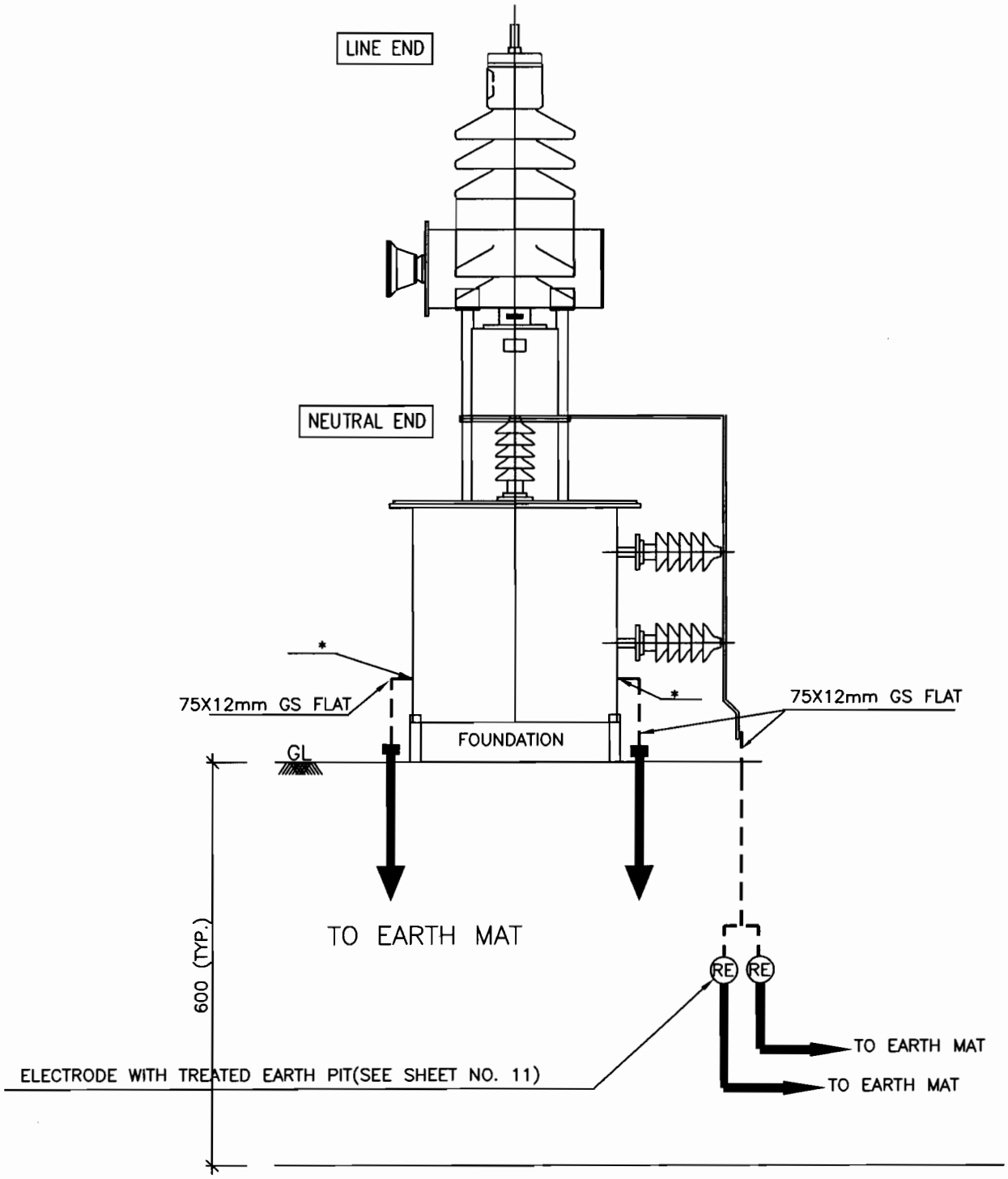
1. MINIMUM DISTANCE OF 7000mm SHALL BE MAINTAINED BETWEEN TWO ELECTRODE WITH TREATED EARTH PIT.
2. NO. OF RISERS FOR MAIN TANK = 2 NOS.
3. NO. OF RISERS FOR TREATED EARTH ELECTRODE = 2 NOS.
4. NO. OF RISERS FOR RADIATOR = 2 NOS.
5. * BOLTED JOINTS.
6. NO. OF RISER FOR REACTOR CUBICLE=2 NOS.
7. #=NOT REQUIRED FOR SHUNT RECATOR WITH NGR, IT MEANT THAT SHUNT REACTOR WITH NGR SHALL BE EARTHED AT NGR .

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EQUIPMENT & STRUCTURE EARTHING DETAILS

SHUNT REACTOR WITHOUT NGR

COMPU. DRG. REF.	DRG. NO.	TB-4-360-316-011	REV. 01	SHEET 16

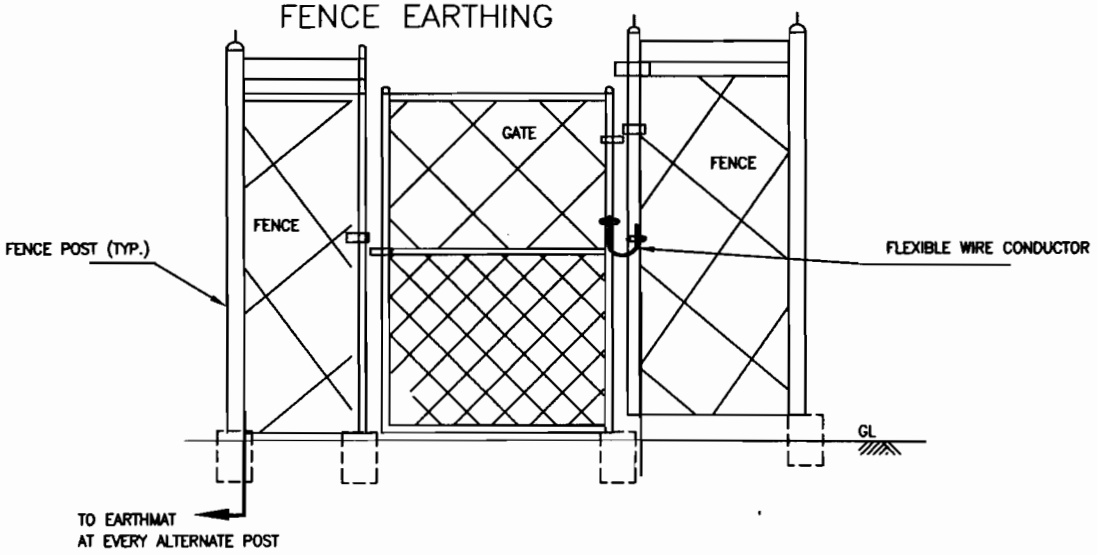


NOTE:

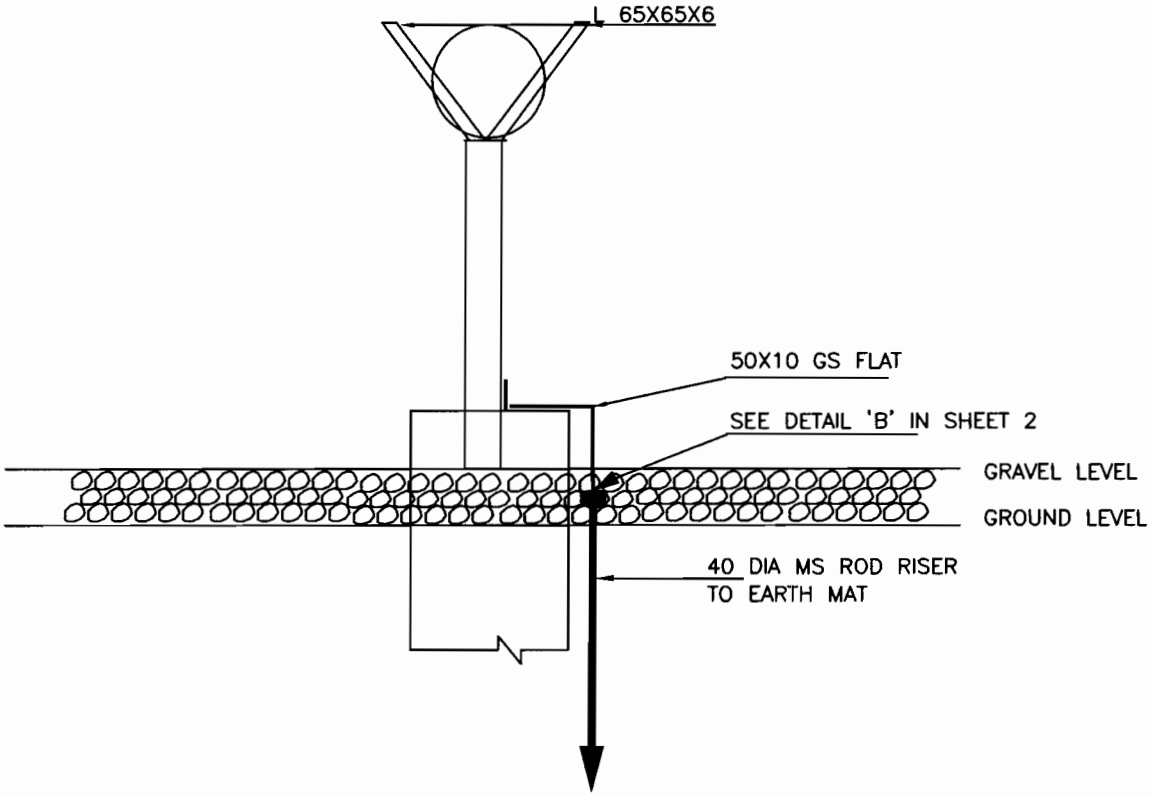
1. NO. OF RISERS FOR NGR BODY = 2 NOS.
2. NO. OF EARTH ELECTRODE WITH TREATED EARTH PIT FOR NEUTRAL = 2 NOS.
3. NO. OF RISER FOR EARTH ELECTRODE = 2 NOS.
4. MINIMUM DISTANCE OF 7000MM SHALL BE MAINTAINED BETWEEN TWO ELECTRODE WITH TREATED EARTH PIT.
5. * BOLTED JOINTS.

बीएचईएल BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS OF NEUTRAL GROUNDING REACTOR		
COMPU. DRG. REF.	DRG.NO. TB-4-360-316-011	REV. 01	SHEET No. 16A

FENCE EARTHING

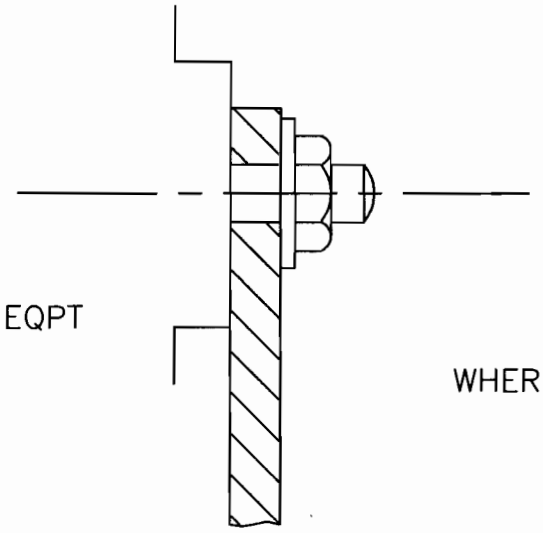


EVERY ALTERNATE FENCE POSTS SHALL BE EARTHED BY 50X10 MM GS FLAT.



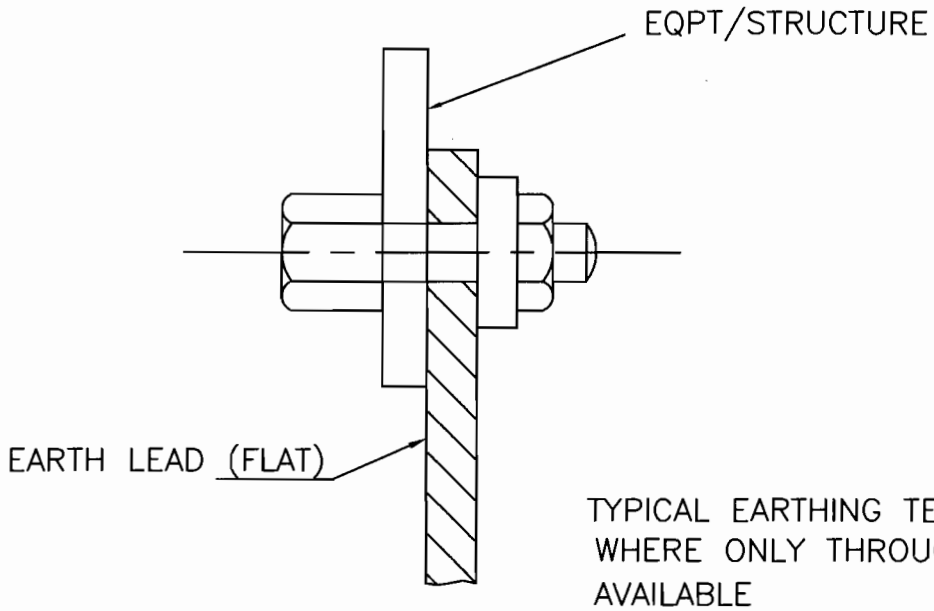
FENCE EARTHING

BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS FENCE POST		
	DRG. No. TB-4-360-316-011	REV. 01	SHEET No. 17



WHERE STUD AVAILABLE

TYPICAL EARTHING TERMINAL JOINT

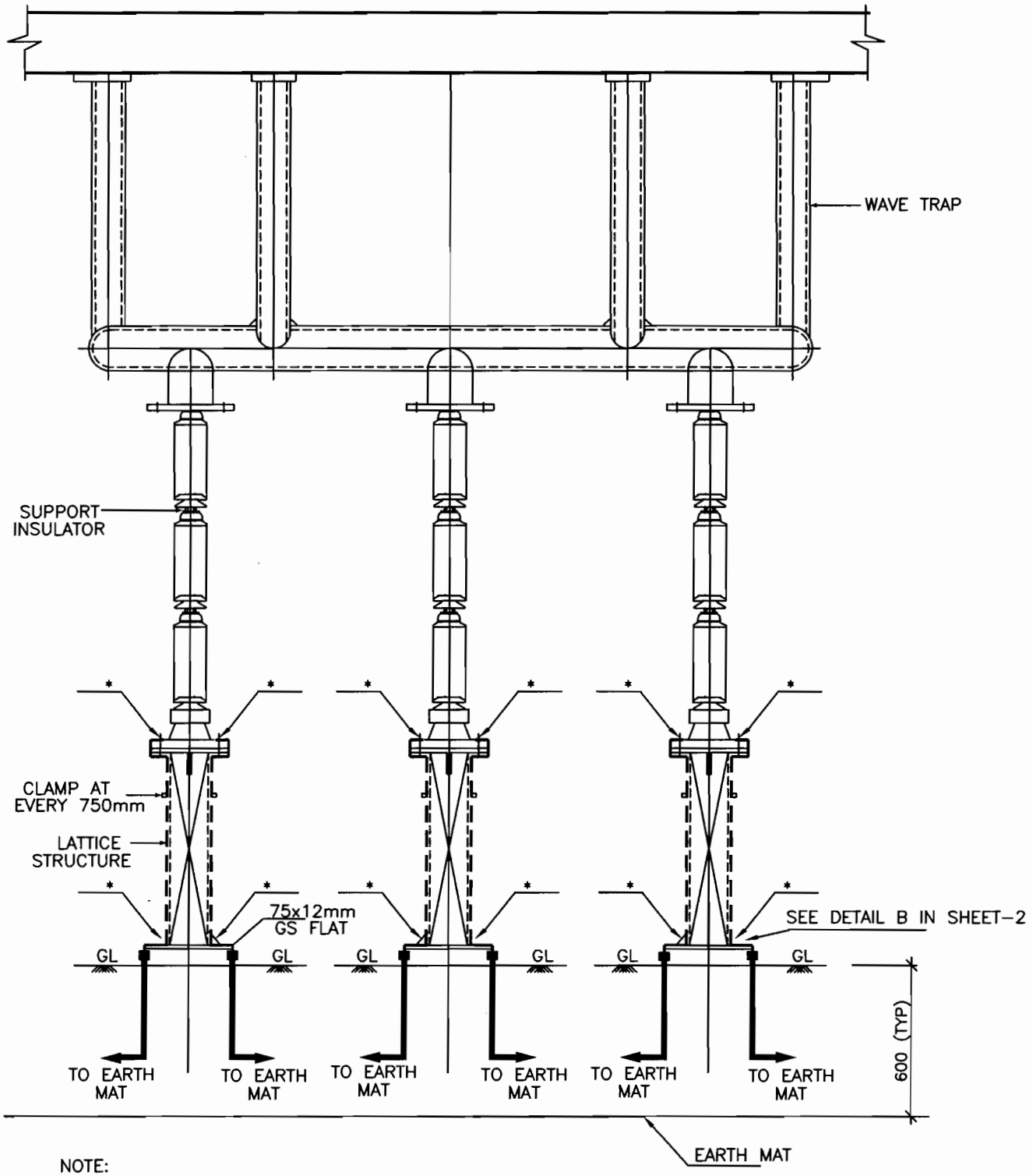


TYPICAL EARTHING TERMINAL JOINT WHERE ONLY THROUGH HOLE IS AVAILABLE

NOTE

1. THIS IS GENERAL TYPICAL BOLTING ARRANGEMENT APPLICABLE TO ALL PANELS, EQUIPMENT,ETC,WHERE BOLTING ARRANGEMENT IS PROVIDED.
2. IN CASE EARTHING TERMINAL COMPRISES ONLY A TAPPED HOLE SUITABLE BOLT/ SCREW WITH WASHER MAY BE USED FOR EARTHING CONDUCTOR TERMINATION

BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS TYPICAL ARRANGEMENT OF BOLTED JOINTS		
	DRG. No. TB-4-360-316-011	REV. 01	SHEET No. 18



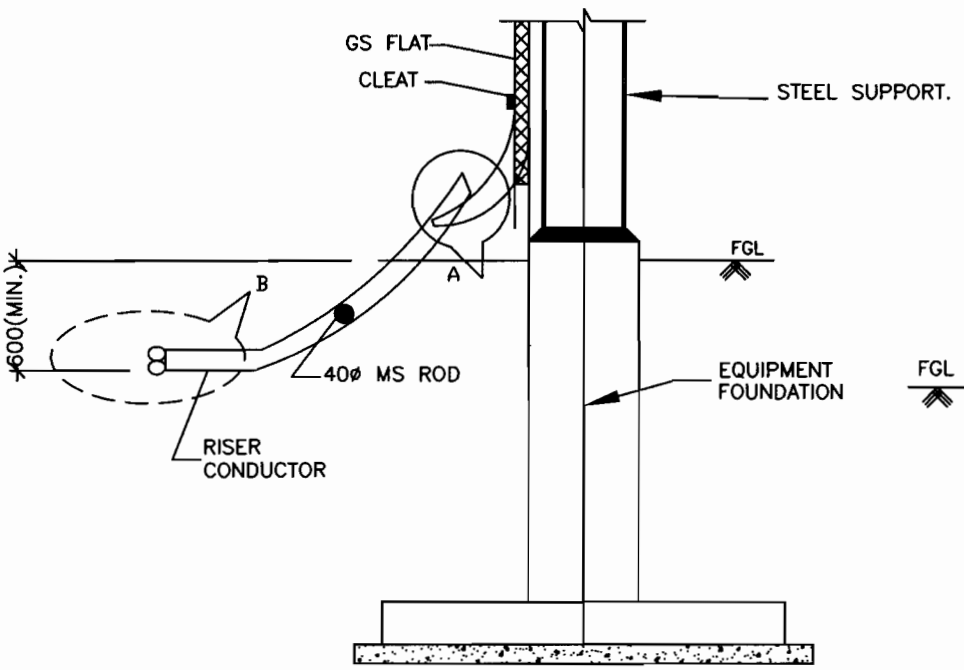
NOTE:

1. NO. OF RISERS : 6 NOS. PER PHASE.
2. * BOLTED JOINTS.

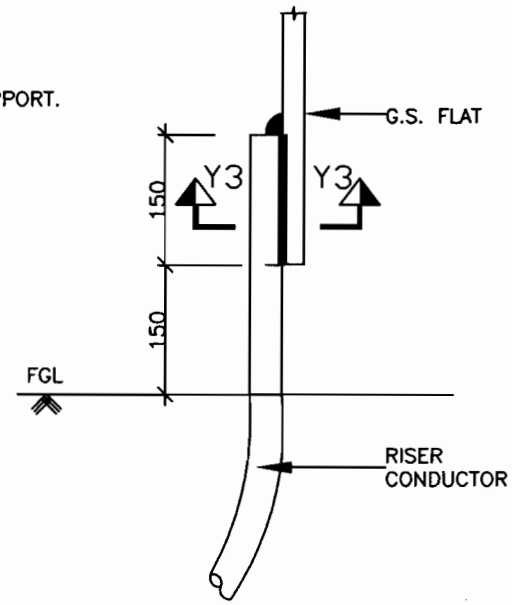
EQUIPMENT & STRUCTURE EARTHING DETAILS

400kV WAVE TRAP

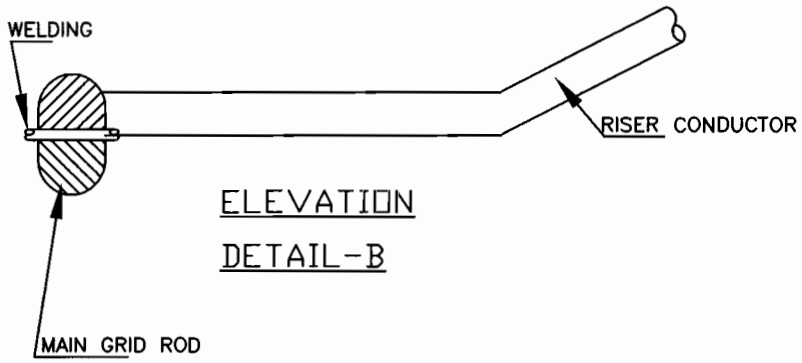
COMPUTERREF.NO.	DRG. No.	REV.	SHEET No.
	TB-4-360-316-011	01	19



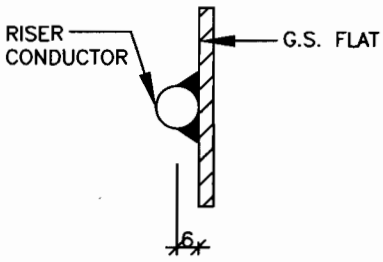
TYPICAL DETAILS OF RISER



ELEVATION
DETAIL-A

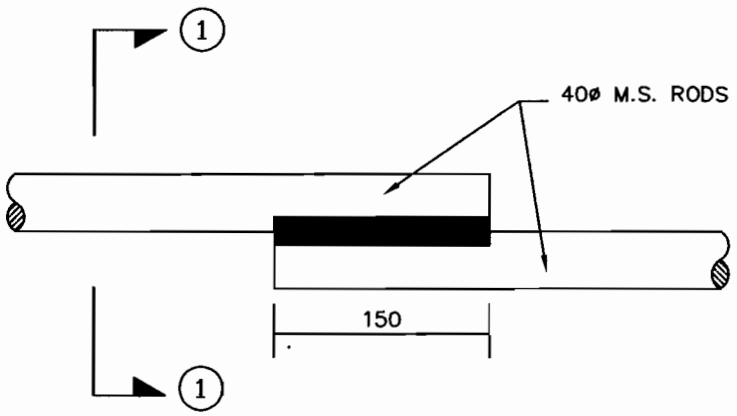


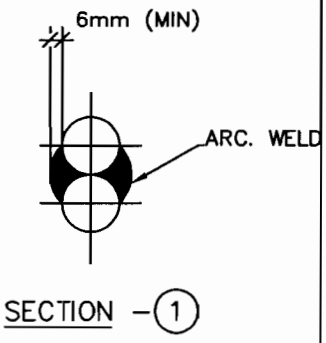
ELEVATION
DETAIL-B



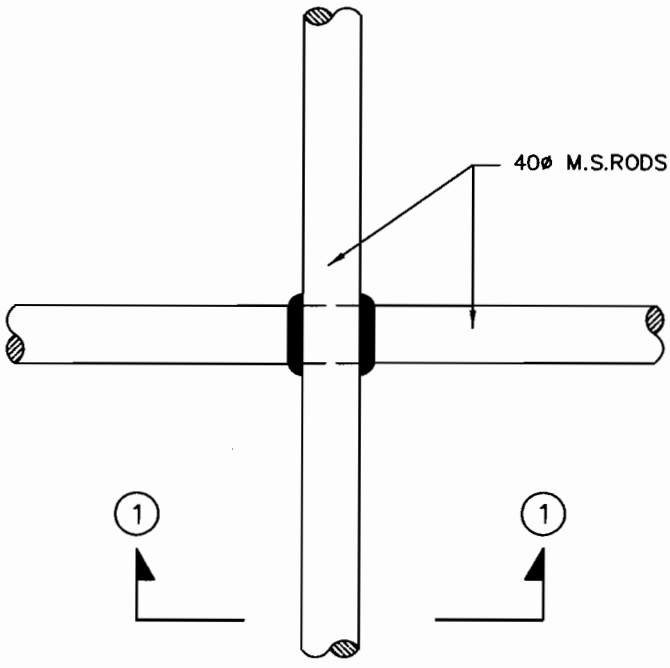
SECTION Y3-Y3

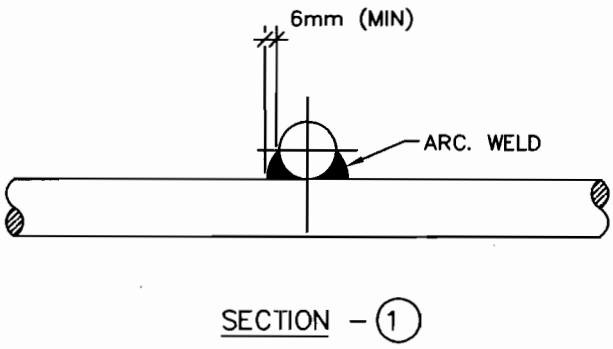
BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS WELDING DETAILS			
COMPUTERREF.NO.	DRG. No.	TB-4-360-316-011	REV. 01	SHEET No. 20





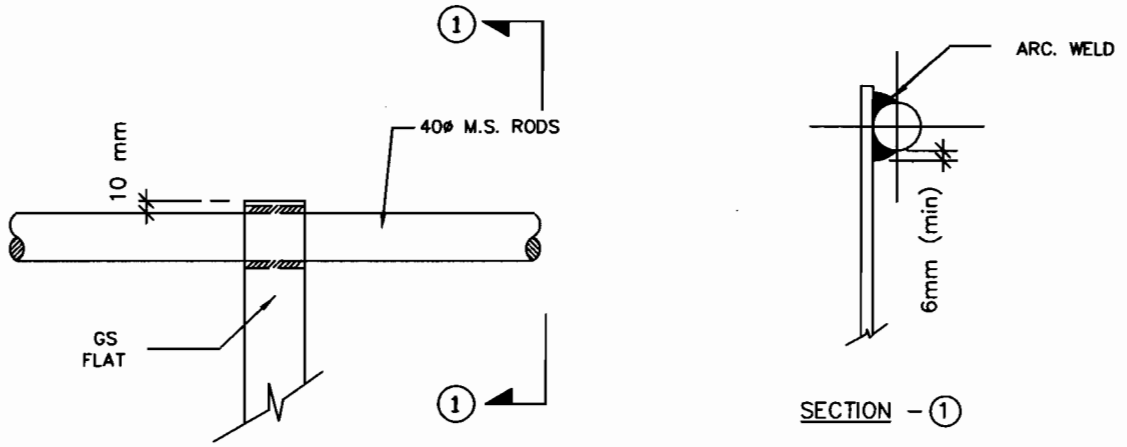
LAP JOINT
BETWEEN M.S. RODS





CROSS JOINT
BETWEEN M.S. RODS

बीएचईएल BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS WELDING DETAILS		
COMPUTERREF.NO.	DRG. No. TB–4–360–316–011	REV. 01	SHEET No. 21

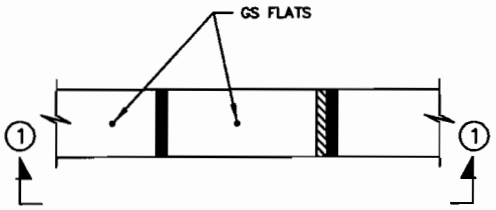


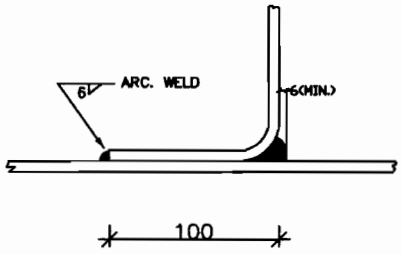
CROSS JOINT
BETWEEN M.S. ROD & GS FLATS



STRIP TO STRIP STRAIGHT LAP JOINT

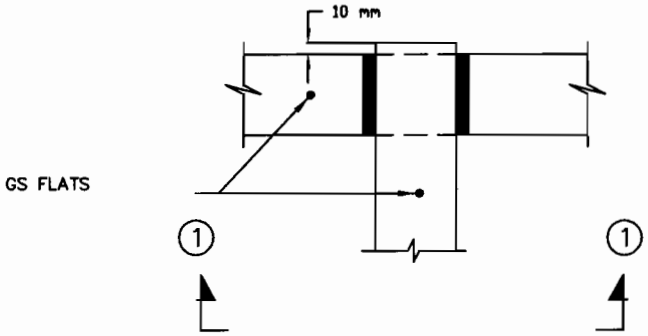
BHEL	EQUIPMENT & STRUCTURE EARTHING DETAILS WELDING DETAILS			
COMPUTERREF.NO.	DRG. No.	TB–4–360–316–011	REV. 01	SHEET No. 22

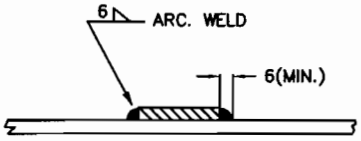




SECTION – (1)

ANGULAR JOINT
BETWEEN GS FLATS





SECTION – (1)

CROSS JOINT
BETWEEN GS FLATS

EQUIPMENT & STRUCTURE EARTHING DETAILS

WELDING DETAILS

COMPUTERREF.NO.	DRG. No.	REV.	SHEET No.
	TB-4-360-316-011	01	23

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

DRAWING No. TB-3-360-316-016

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COMPUTER DRG. PATH NAME :

REF. DRG. No.

SIGN. & DATE

INVENTORY No.

NOTE :–

1. ALL DIMENSIONS ARE IN mm.
2. SYSTEM FAULT LEVEL FOR 11kV SYSTEM IS 44kA FOR 3 SECOND.
3. LA , BUS POST INSULATOR , ISOLATOR AND TOWER /BEAM STRUCTURE SHALL BE LATTICE TYPE.
4. PROTECTION AGAINST DIRECT LIGHTNING STROKE FOR 11kV SWITCHYARD SHALL BE BY 7/9 SWG SHIELD WIRE(OVERALL DIA. 10.98 MM).
5. TENSION INSULATOR STRING SHALL CONSIST OF 1 NO. ANTI FOG TYPE DISC (ELECTRO MECHANICAL STRENGTH OF DISC IS 120kN AND CREEPAGE DISTANCE OF OF INDIVIDUAL DISC IS 430MM).
6. THE 11kV TOWER AND BEAM STRUCTURE SHALL BE DESIGNED FOR A FACTOR OF SAFETY OF 2 FOR NORMAL/BROKEN WIRE CONDITION & 1.5 FOR SHORT CIRCUIT FORCES CONDITION.
7. THE TRANSVERSE, VERTICAL, LONGITUDINAL LOADS SHALL BE CONSIDERED AS PER IS 802: 1995.
8. 11KV BEAM B5 HAS PROVISION OF SINGLE ANCHORING POINT ON ONE SIDE OF BEAM FOR TERMINATION OF SINGLE TENSION STRING HARDWARE. SUSPENSION STRING HARDAWRE ANCHORING IS NOT APPLICABLE FOR BEAM B5.

TABLE –1 :BILL OF MATERIAL OF SWITCHYARD EQUIPMENTS

ITEM CODE	DESCRIPTION	SYMBOL	QUANTITIES IN NOS.	
			POWER PLANT SIDE	RIVER WATER PUMP SIDE
1	12kV , 1 PHASE LIGHTNING ARRESTER ,10kA, CLASS–3		6	6
2	33kV, 630A, 50kA FOR 3S, 3–PH HCB ISOLATORS(MECHANICALLY GANGED MOTOR OPERATED) WITH 1 E/S (MANUALLY OPERATED),		2	2
3	33kV BUS POST INSULATOR 1 PHASE CUM 11kV CABLE SEALING END 1 PHASE		6(BPI)+6(CSE)*	6(BPI)+6(CSE)*

NOTE *=11kV CABLE AND CABLE SEALING END SHALL BE IN BHEL PEM SCOPE OF SUPPLY

TABLE 2:. MINIMUM CLEARANCE TABLE (IN AIR)

S. NOS.	DESCRIPTION	UNIT	11kV	33kV
1.	PHASE TO PHASE	mm	280	320
2.	PHASE TO EARTH	mm	140	320
3.	MINIMUM DISTANCE OF THE LOWEST EARTH PART OF INSULATOR SUPPORTING LIVE CONDUCTORS FROM GROUND	mm	2550	2550
4.	SECTION CLEARANCE	mm	3000	3000
5.	PLINTH HEIGHT FROM GROUND LEVEL	mm	300	300
6.	MINIMUM LIVE PART TO GROUND CLEARANCE	mm	3800	3800

TABLE–4: LOADING DETAILS ON GANTRY :–

NOTATION	NO. & TYPE OF COND./ SHIELD WIRE PER PHASE	NORMAL TENSION PER PHASE	S/C TENSION PER PHASE	REMARKS
K** →	SINGLE ZEBRA CONDUCTOR SPAN = 100000mm(MAX) WITH 30 DEVIATION (MAX) IN HORIZONTAL & VERTICAL DIRECTION	500 KG	NA	SLACK OUTGOING IIkV LINE
→ d1	SHIELD WIRE WITH 30° DEVIATION (MAX) IN HORIZONTAL & VERTICAL DIRECTION	400 KG	NA	–

** SHORT CIRCUIT FORCE IS NOT APPLICABLE FOR TRANSMISSION LINE CONDUCTOR BECAUSE OUTGOING TRANSMISSION LINE CONDUCTOR ORIENTATION ARE NOT IN SAME PLANE.

TABLE–3: SYSTEM PARAMETERS

S. NOS.	DESCRIPTION	UNIT	11kV	33kV
1.	NOMINAL SYSTEM VOLTAGE	kV	11	33
2.	HIGHEST SYSTEM VOLTAGE	kV	12	36
3.	BASIC IMPULSE LEVEL	kVP	75	170
4.	POWER FREQUENCY WITHSTAND	kVrms	28	70
5.	CREEPAGE DISTANCE (MINIMUM)	mm/kV	31	31

LEGEND

	PRESENT BHEL SCOPE
– – – – –	SHIELD WIRE
	FENCE
	TENSION STRING INSULATOR
	COLUMN WITH PEAK
	GATE

TABLE .5: TOWER DETAIL

TOWERS DESIGNATION	STR. HEIGHT DETAIL FROM PLINTH TOP (m)	QUANTITY (NOS.)		REMARKAS
		POWER PLANT SIDE	RIVER WATER PUMP SIDE	
T9	6+1.8	2	2	1. BEAM TAKE OFF ONE SIDE AT A HEIGHT OF 6.0m. 2. PEAK OF HEIGHT 1.8m
T10	6+1.8	1	1	1. BEAM TAKE OFF TWO SIDE AT A HEIGHT OF 6.0m. 2. PEAK OF HEIGHT 1.8m

TABLE–6: BEAM DETAIL

BEAM TYPE	HEIGHT FROM PLINTH TOP/SPAN (m)	QUANTITY (NOS.)		REMARKS
		POWER PLANT SIDE	RIVER WATER PUMP SIDE	
B5	6/6	2	2	SUITABLE FOR STRINGING OF CONDUCTOR WITH 30 DEVIATION (MAX) IN HORIZONTAL & VERTICAL DIRECTION

REFERENCE

1. SINGLE LINE DIAGRAM FOR 400 kV SURATGARH SUBSTATION – DRG. TB–1–360–510–001
2. PLOT PLAN DRAWING NO. PE–DG–392–100–M001
3. LAYOUT OF TRANSFORMER YARD DRAWING NO. PE–DG–392–100–E001
4. LAYOUT OF 400kV SWITCHYARD DRAWING NO. TB–0–360–316–002
5. STRUCTURE LOADING DIAGRAM DRAWING NO. TB–0–360–316–010

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY

OWNER
RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

PROJECT
2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER
TATA **TATA CONSULTING ENGINEERS LIMITED**

EPC CONTRACTOR
BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP

DEPT CODE		NAME	SIGN.	DATE
422	DRN	MS		17.07.14
	DESN	SK		
	CHD	SKS		
	APPD	RS		

TITLE
LAYOUT PLAN AND ELEVATION OF 11kV S/S AT SURATGARH

CV	ME	EL	I&C			DEPT.	SCALE 1:600
						SIGN	
						DATE	

BHEL/SUB VENDOR DRG NO.
TB-3-360-316-016

SHT. No 01 OF 03 REV. 00

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRAWING NO. TB-3-360-316-016

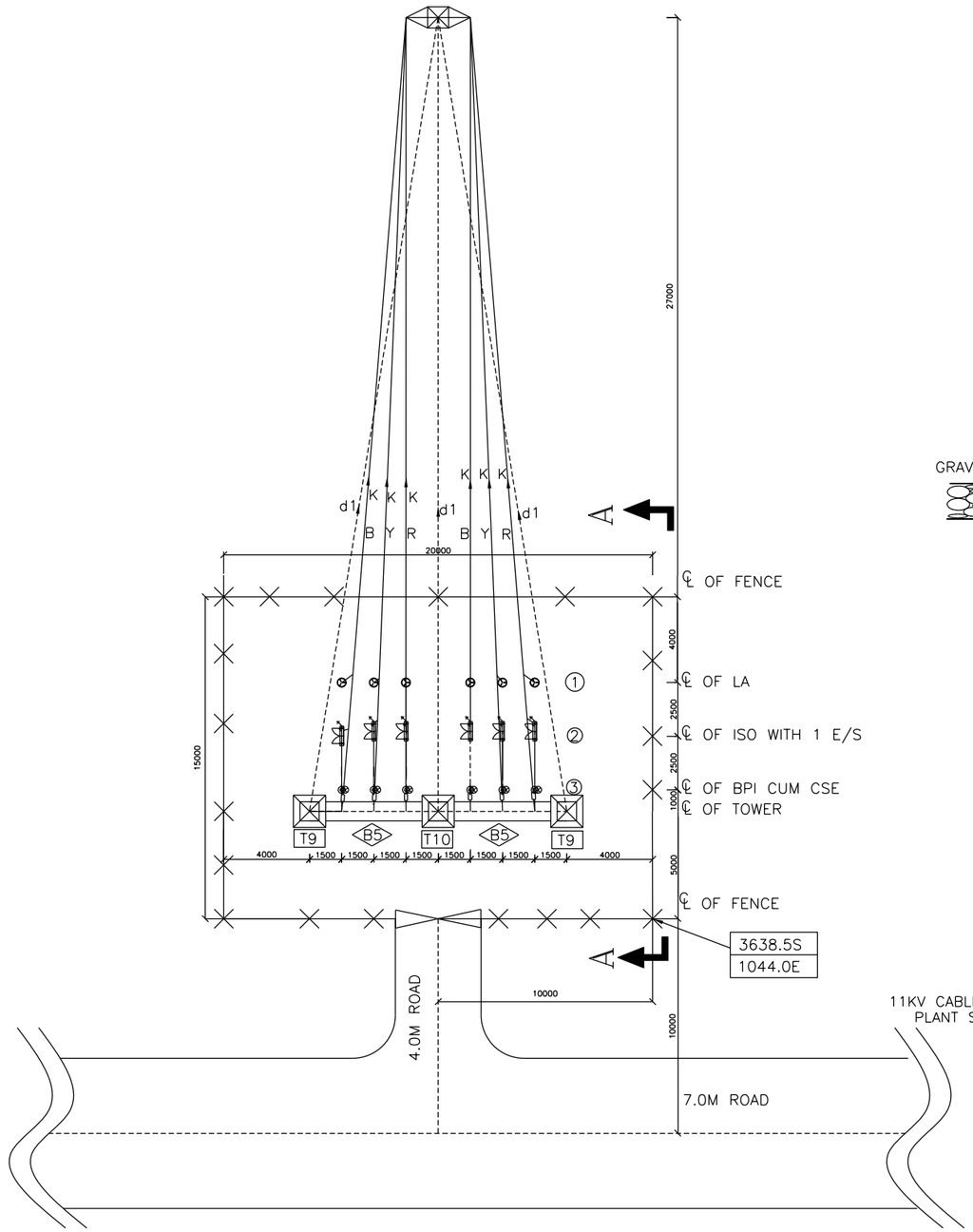
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COMPUTER DRG. PATH NAME :

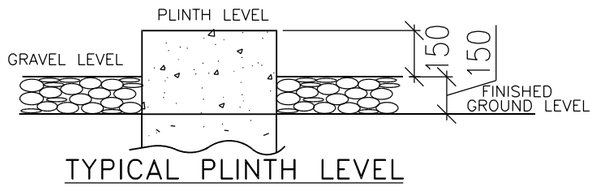
REF. DRG. No.

SIGN. & DATE

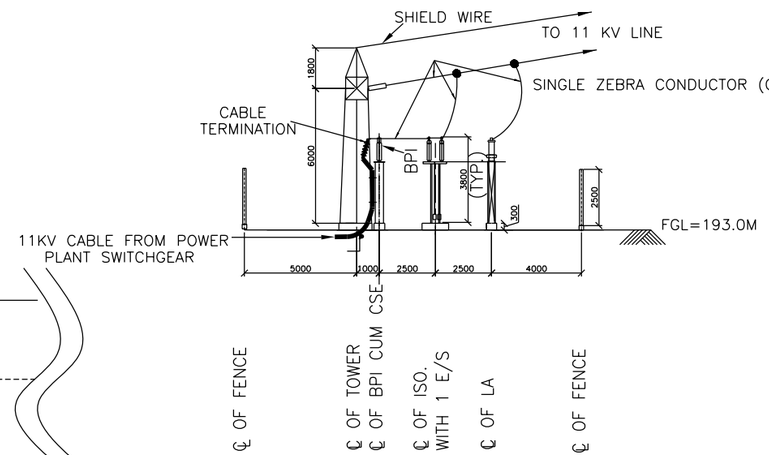
INVENTORY No.



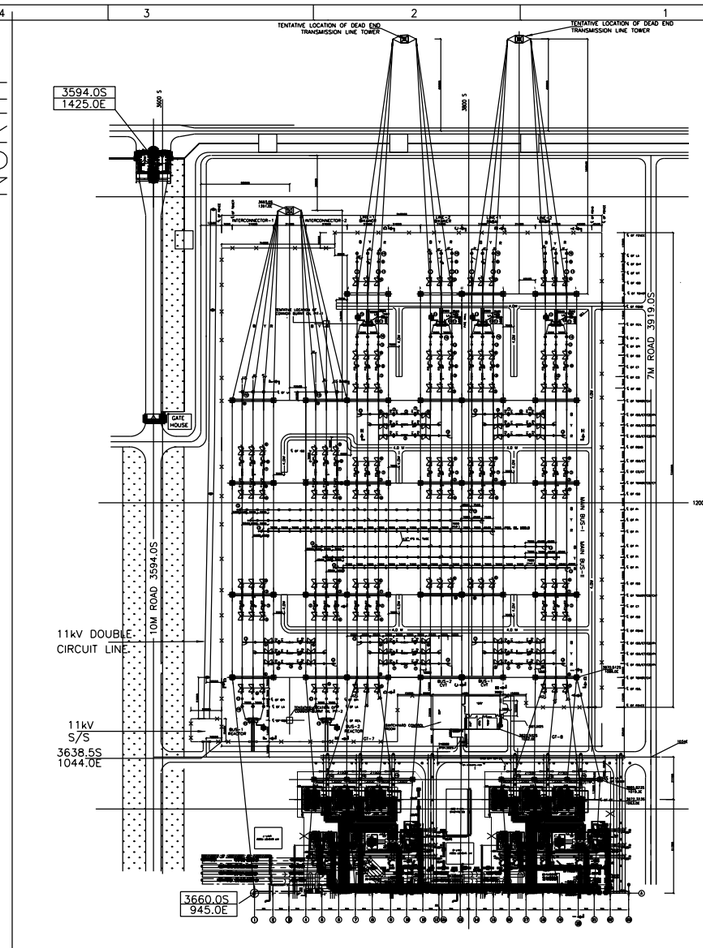
11kV SWITCHYARD AT POWER PLANT END



TYPICAL PLINTH LEVEL



SECTION A–A



KEY PLAN

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY

OWNER
RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

PROJECT
2X660MW THERMAL POWER PLANT,SURAT GARH
STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER
TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR
BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP

DEPT CODE		NAME	SIGN.	DATE
422	DRN	MS		17.07.14
	DESN	SK		
	CHD	SKS		
	APPD	RS		

TITLE
LAYOUT PLAN AND ELEVATION OF
11kV S/S AT SURATGARH

CV	ME	EL	I&C	DEPT.	SCALE 1:600
				SIGN	
				DATE	

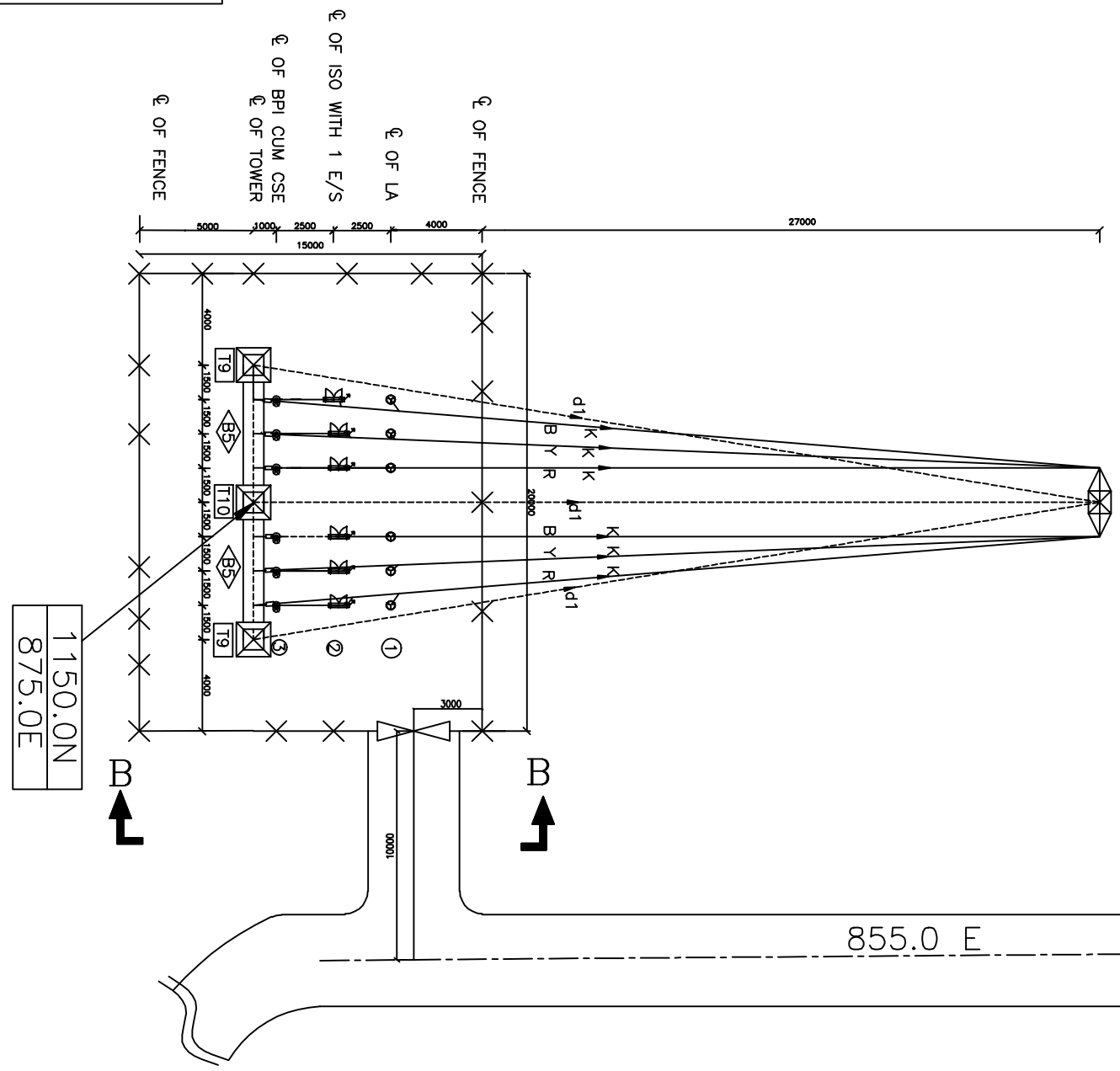
BHEL/SUB VENDOR DRG NO.
TB-3-360-316-016

SHT. No 02 OF 03 REV. 00

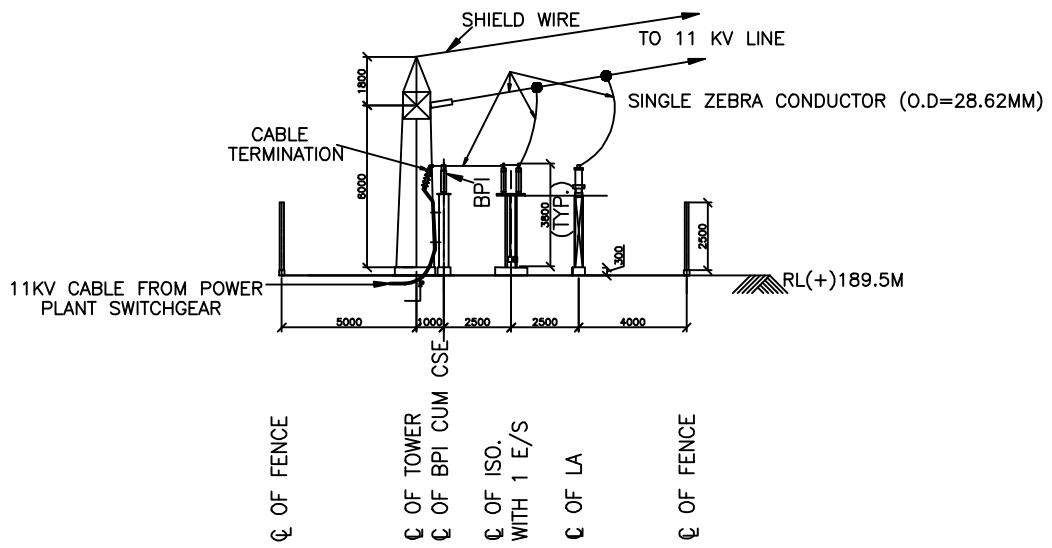
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DRAWING No. TB-3-360-316-016

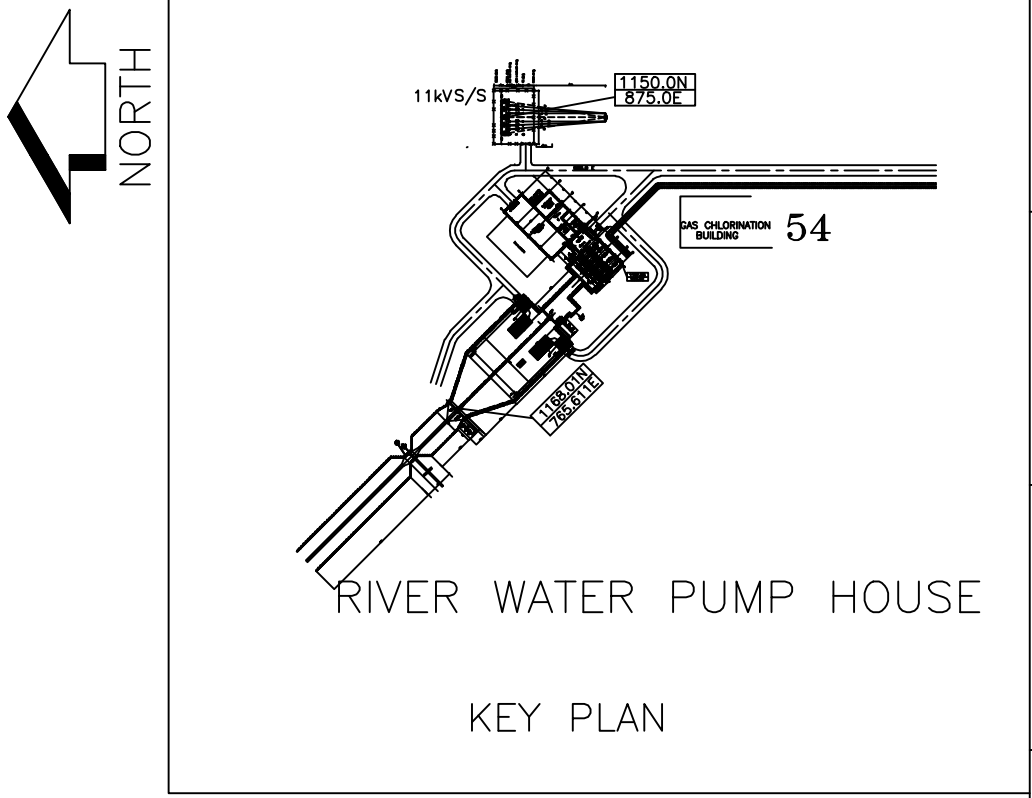
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11kV SWITCHYARD AT RIVER WATER PUMP SIDE

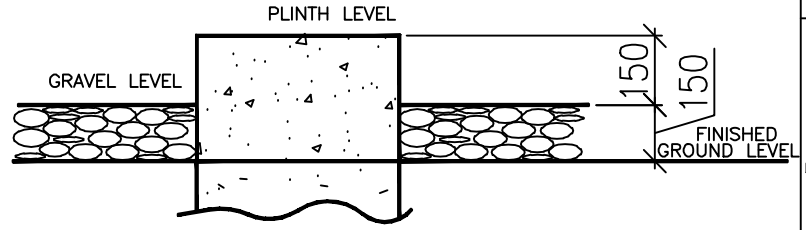


SECTION B–B



RIVER WATER PUMP HOUSE

KEY PLAN



TYPICAL PLINTH LEVEL

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY

OWNER
RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

PROJECT
2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER
TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR
BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP

DEPT CODE		NAME	SIGN.	DATE
422	DRN	MS		17.07.14
	DESN	SK		
	CHD	SKS		
	APPD	RS		

TITLE
LAYOUT PLAN AND ELEVATION OF 11kV S/S AT SURATGARH

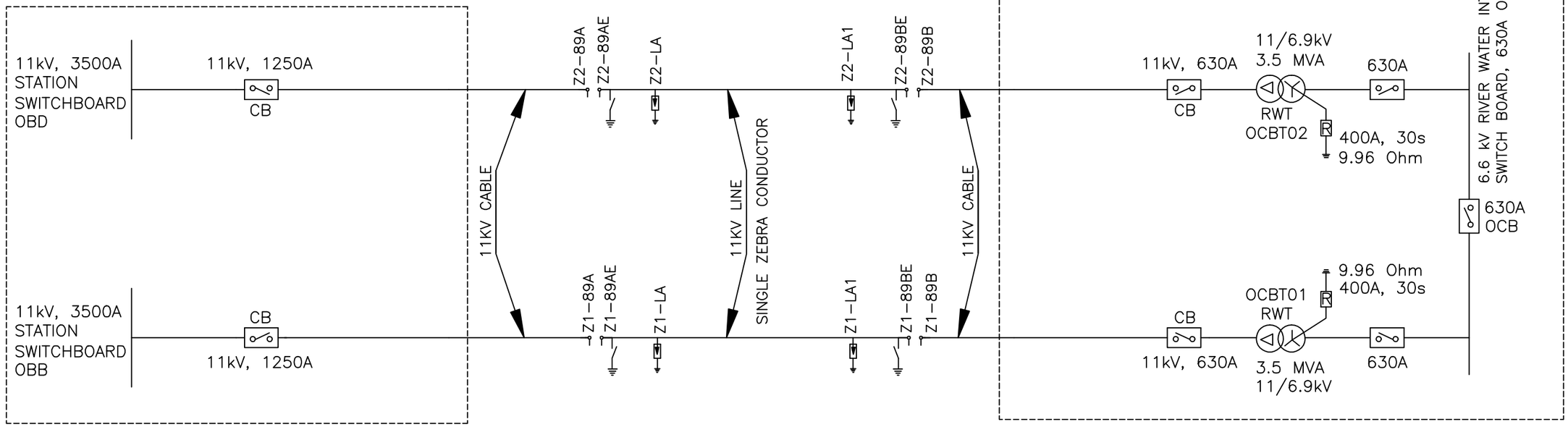
CV	ME	EL	I&C			DEPT.	SCALE 1:600	BHEL/SUB VENDOR DRG NO. TB-3-360-316-016
						SIGN		
						DATE		SHT. No 03 OF 03 REV. 00

COMPUTER DRG. PATH NAME :
INVENTORY No. | SIGN. & DATE | REF. DRG. No.

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

FIRST ANGLE PROJECTION

DRG. NO. TB-3-360-510-001A



POWER PLANT SIDE
11kV SWITCHGEAR (BHEL PEM SCOPE)

RIVER WATER PUMP HOUSE SIDE
11kV SWITCHGEAR (BHEL PEM SCOPE)

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NOTES : –

01) SYSTEM FAULT LEVEL OF 11KV SYSTEM IS 44kA FOR 3 SEC.

02) 11kV SYSTEM IS EARTHED THROUGH NEUTRAL GROUNDING RESISTOR IN 11kV MV SWITCHBOARD.

03) CREEPAGE: 31mm/kV.

04) 11kV CABLES AND CABLE SEALING SHALL BE IN BHEL PEM SCOPE OF SUPPLY.

REFRENCE : –

01) 11kV SWITCHGEAR DRAWING NO. PE–DG–392–565–E001

SYSTEM PARAMETER

S. NOS.	DESCRIPTION	UNIT	
1.	NOMINAL SYSTEM VOLTAGE	kV	11
2.	HIGHEST SYSTEM VOLTAGE	kV	12
3.	FULL WAVE IMPULSE WITHSTAND	kVP	75
4.	ONE MINIUTE POWER FREQUENCY WITHSTAND VOLTAGE	kVrms	28
5.	SWITCHING IMPULSE WITHSTAND VOLTAGE	kVP	NA
6.	MINIMUM PHASE TO PHASE CLEARANCE	MM	280
7.	MINIMUM PHASE TO EARTH CLEARANCE	MM	140
8.	MINIMUM SECTIONAL CLEARANCE	MM	3000
9.	MINIMUM LIVE PART TO GROUND CLEARANCE	MM	3800

BILL OF QUANTITY (MAIN EQUIPMENT)

S.L.	ITEM DESCRIPTION	kV	QTY.	SYMBOL
1	LIGHTNING ARRESTER, 1–PH. 10kA CLASS–3	12	12	
2	630A, 3–PH , 50kA FOR 3 SEC, HCB ISOLATOR (MECHANICALLY GANGED MOTOR OPERATED) WITH 1E/S (MANUALLY OPERATED).	33	04	

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
02	02.09.14	AS PER TCE LETTER DATED 22.05.14	RK	SK	SKS	RS
01	07.03.14	AS PER TCE LETTER DATED 19.08.13	RK–SD–	SK–SD–	SKS–SD–	RS–SD–

OWNER
RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

PROJECT
2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER
TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR
BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP

DEPT CODE		NAME	SIGN.	DATE
422	DRN	RK	–SD–	10.05.13
	DESN	SK	–SD–	
	CHD	SKS	–SD–	
	APPD	AS	–SD–	

TITLE
SINGLE LINE DIAGRAM FOR 11kV LINES AT SURATGARH

CV	ME	EL	I&C			DEPT.	SCALE NTS	BHEL/SUB VENDOR DRG NO. TB-3-360-510-001A
						SIGN		
						DATE		SHT. No 01 OF 01 REV. 02

COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO