







LEGENDS:

	CONNECTION TO GROUND MAT THROUGH RISER
	RE CONNECTION TO ROD ELECTRODE WITH NON- TREATED PIT.
	PE CONNECTION TO 100MM DIA CI PIPE PIPE ELECTRODE WITH TREATED EARTH PIT
	75x10mm GS FLAT
	50x6mm GS FLAT
	40mm DIA MS ROD

GENERAL NOTES:

- 1 EARTH STRIP CLEATED TO LATTICE /PIPE TYPE STRUCTURE AT AN INTERVAL OF 1.0M SUITABLE PROVISION SHALL BE MADE WITH SUPPORT STRUCTURE.
- 2 ALL EARTH STRIPS SHALL BE TAKEN ALONG EDGE OF STRUCTURE. ALL DRAWING SHOWS TYPICAL ARRANGEMENT ONLY.
- 3 ALL STRUCTURES/EQUIPMENTS SHALL BE EARTHED AS SHOWN IN THE FOLLOWING SHEETS.
- 4 BOLT SIZE FOR CONNECTING EARTHING FLAT TO THE EQPT/STRUCTURE SHALL BE TO SUIT RESPECTIVE HOLE SIZE.
- 5 ALL EARTHING SHALL BE DONE IN ACCORDANCE WITH IS:3043 UNLESS OTHERWISE STATED IN TECHNICAL SPECIFICATION
- 6 EACH RISER OF A PARTICULAR EQUIPMENT SHALL BE CONNECTED TO A DIFFERENT EARTHROD (EITHER HORIZONTAL OR VERTICAL CONDUCTORS OF MAIN EARTHMAT).
- 7 FOR WELDING DETAILS REFER SHEET #20 & 21
- 8 E/WIRE DOWN CONDUCTOR SHALL BE CLEATED AT AN INTERVAL OF 2.0 M ALONG WITH STRUCTURE .

SHEET NO. DESCRIPTION

01.	TITLE
1A.	NOTES
02.	400KV SF6 CIRCUIT BREAKER
03.	400KV CVT
04.	400KV POST INSULATOR (SOLID CORE TYPE)
05.	360KV LIGHTNING ARRESTER
06.	MARSHALLING KIOSK
7A.	400KV HORIZONTAL CENTER BREAK ISOLATOR (TYPICAL) WITH ONE EARTH SWITCH
7B.	400KV HORIZONTAL CENTER BREAK ISOLATOR (TYPICAL) WITH TWO EARTH SWITCH
8A.	TOWER WITH PEAK
8B.	TOWER WITHOUT PEAK
09.	400KV CURRENT TRANSFORMER
10.	CABLE TRENCH
11.	PIPE EARTH ELECTRODE WITH TREATED PIT
12A.	ROD ELECTRODE WITHOUT PIT
12B.	ROD EARTH ELECTRODE WITH TEST PIT FOR TOWERS WITH PEAK
13.	RAIL BONDING

SHEET NO. DESCRIPTION

14A.	BUS REACTOR
14B.	LT TRANSFORMER (DRY TYPE)
15.	AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH./E/S MECH. BOX
16.	ALL PANELS/KIOSKS/MBS/BATTERY CHARGER/AC DC BOARDS/MLDB
17.	GATE/FENCE POST
18.	TYPICAL ARRANGEMENT OF BOLTED JOINTS
19.	WELDING DETAILS
20.	WELDING DETAILS

NTPC DRG. No. 9962-001-TB-572-PE-E-189

PROJECT:	PANKI THERMAL POWER STATION (1X660MW)
OWNER:	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD.
REVIEW CONSULTANT:	NTPC LTD. (A GOVERNMENT OF INDIA ENTERPRISE)
CONSULTANT:	DEVELOPMENT CONSULTANTS PVT. LTD. KOLKATA
EPC CONTRACTOR:	BHARAT HEAVY ELECTRICALS LTD.

SUB NO.	
STATUS	
DISTRIBUTION	

BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP
NOIDATITLE
EQUIPMENT EARTHING DETAILS
OF 400kV SWITCHYARD

DEPT. CODE	SCALE	1:100	DRAWING NO.	TB-4-316-401-008
SIGN			SHEET	01 OF 20 REV. 00

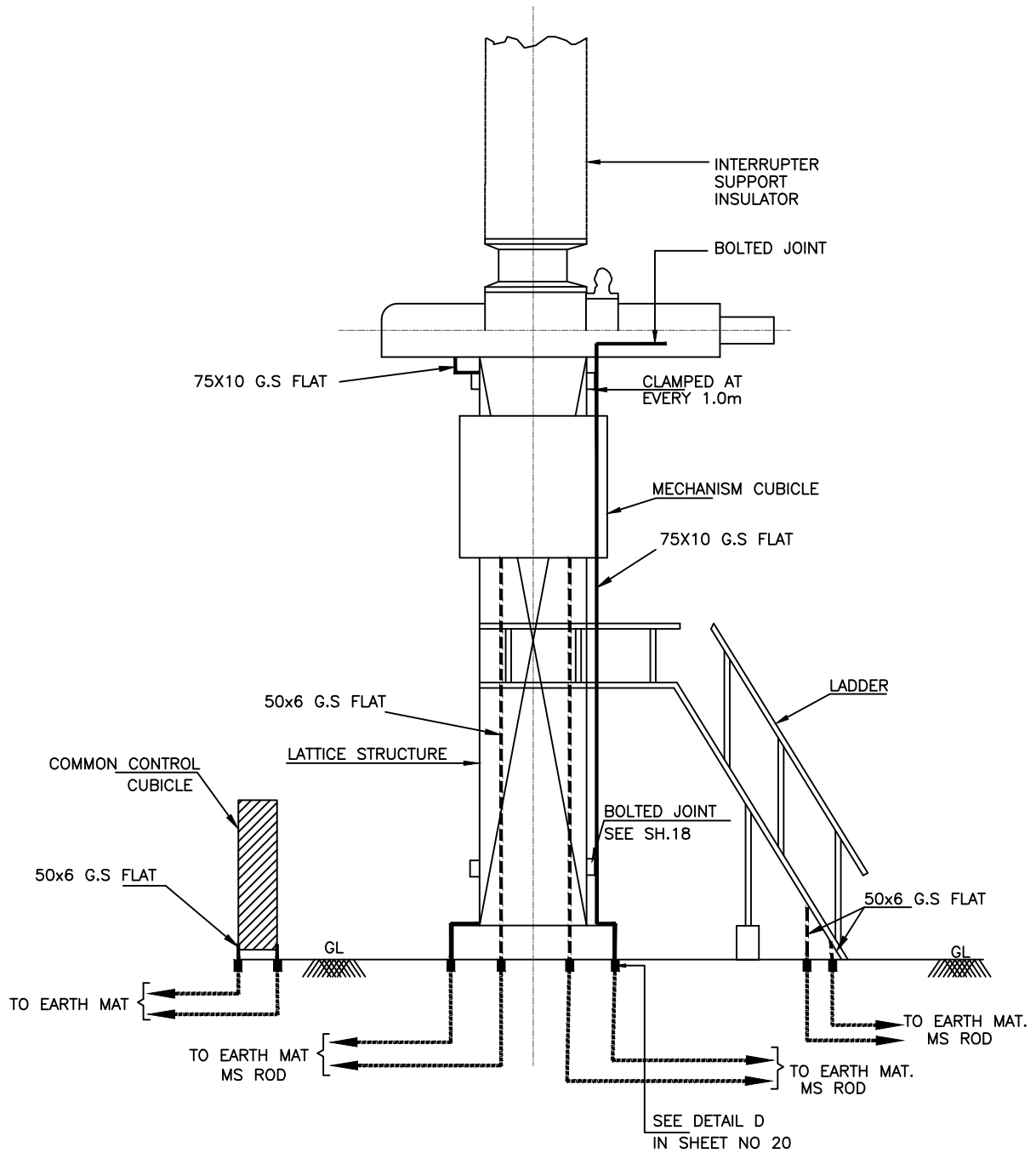
1. RISER FROM THE EARTH GRID SHALL BE 40MM DIAMETER MILD STEEL ROD. RISER SHALL RISE FROM THE GROUND ALONG THE NEAREST EQUIPMENT FOUNDATION/BUILDING COLUMN/WALL TO AVOID ANY OBSTRUCTION TO MOVEMENT OF PERSONNEL.
2. ALL GROUND CONDUCTOR CONNECTIONS BELOW GROUND LEVEL SHALL BE DONE BY ELECTRIC ARC WELDING WITH LOW HYDROGEN CONTENT ELECTRODE. THE CONTACT SURFACES SHALL BE THOROUGHLY CLEANED TO PROVIDE GOOD ELECTRICAL CONTINUITY.
3. THE PROJECTED PORTION OF RISER/PIGTAIL ABOVE GROUND (IF ANY) SHALL BE COATED WITH TWO COATS OF BITUMEN PAINTS (ANTI-CORROSIVE PAINTS) WITH A MINIMUM THICKNESS OF 1 MM AFTER CONNECTION.
4. THE CONNECTIONS BETWEEN THE RISER/PIGTAIL AND EARTHING CONDUCTORS (GALVANISED STEEL FLATS) AND BETWEEN THE EARTHING CONDUCTORS ABOVE GROUND LEVEL SHALL BE MADE BY ELECTRIC ARC WELDING.
5. THE PORTION OF GALVANISED STEEL FLATS, WHICH UNDERGOES WELDING AT SITE, SHALL BE COATED WITH TWO (2) COATS OF COLD GALVANISING ANTI-CORROSIVE PAINT AFTER WELDING.
6. THE EARTHING CONNECTIONS TO EQUIPMENT GROUNDING PADS/TERMINALS AND SOME REMOVABLE STRUCTURES SHALL BE BOLTED TYPE WITH GS BOLTS AND NUTS. THE CONTACT SURFACES SHALL BE THOROUGHLY CLEANED (TO FREE FROM SCALE, PAINT, ENAMEL, GREASE, RUST) BEFORE CONNECTION TO ENSURE GOOD ELECTRICAL CONTACT.
7. EARTHING CONDUCTOR FOR EQUIPMENT SHALL BE OF GALVANISED M.S. OF SIZE 50x6 mm. THE CONDUCTOR BELOW THE GROUND LEVEL SHALL BE 40 mm DIA MS ROD.
8. IN THE ATTACHED DRAWINGS GL REPRESENTS GROUND LEVEL.
9. ALL EQUIPMENT STRUCTURES, CABLE TRENCHES & TOWERS SHALL BE EARTHED AT TWO POINTS WITH 75X10/ 50X6 mm G.S. FLAT EVEN THOUGH THEY ARE SHOWN OR NOT IN THE DRAWING DUE TO CLARITY.
10. ALL JUNCTION BOXES, MECHANISM BOXES, GROUND MOUNTED CONTROL CABINETS, CUBICLES, PANELS, MBs ETC. SHALL BE EARTHED AT TWO POINTS WITH 50x6mm G.S. FLAT BY TWO SEPARATE AND DISTINCT EARTH CONNECTERS.
11. EARTHING CONDUCTORS FROM EQUIPMENT STRUCTURES SHALL BE CONNECTED TO THE NEAREST POSSIBLE EARTH MAT RISER. EQUIPMENT EARTHING SHALL BE AS PER IS 3043.
12. METTALIC SHEATHS/SCREENS, AND ARMOUR OF MULTI CORE CABLES SHALL BE EARTHED AT BOTH ENDS. THE SITE CONDITION.
13. LOCATION OF EARTHING CONDUCTORS/RISERS SHOWN IN THE EARTHING DRAWING MAY CHANGE TO SUIT METTALIC SHEATHS AND ARMOUR OF SINGLE CORE CABLES SHALL BE EARTHED AT SWITCHGEAR END ONLY UNLESS OTHERWISE INSTRUCTED BY THE EMPLOYER.
14. FOR SURGE ARRESTER, EARTHING LEAD FROM SURGE COUNTER TO MAIN EARTH MAT SHALL BE SHORTEST IN LENGTH AS PRACTICALLY AS POSSIBLE.
15. AN ADDITIONAL AUXILIARY GRID OF 1500MMX1500MM COMPRISING OF CLOSELY SPACED(300MMX300MM) 40 DIA CONDUCTORS AT A DEPTH OF 300MM FROM FINISHED GROUND LEVEL SHALL BE PROVIDED BELOW THE OPERATING HANDLE OF ISOLATORS AND EARTH SWITCHES. THIS GRID SHALL BE CONNECTED TO THE MAIN GROUND GRID. THE EARTH CONNECTION TO OPERATING HANDLE SHALL BE MADE OF FLEXIBLE CONNECTION. THE MOM BOX OF THE ISOLATOR TO BE CONNECTED TO THIS AUX. GRID.
16. ALL NON CURRENT CARRYING METALIC PARTS SHALL BE EARTHED AT TWO DIFFERENT PLACES.
17. ALL EQUIPMENT DRAWINGS SHOWN ARE INDICATIVE ONLY.
18. WELDING OF EARTHING CONDUCTOR SHALL BE CONNECTED IN VERTICAL PLANE WHEREVER POSSIBLE.
19. BENDING OF LARGE DIAMETER CONDUCTORS SHALL BE DONE PREFERABLY BY GAS HEATING.
20. GROUND MAT & RISER SHALL BE PAINTED WITH TWO (2) COATS OF RED OXIDE PRIMER & TWO (2) COATS OF BATTLESHIP GREY (SHADE NO. 632 OF IS: 5) SYNTHETIC ENAMEL PAINT.
21. MAIN GROUND MAT SHALL BE BURIED IN GROUND AT A MINIMUM DEPTH OF 1000mm.



EQUIPMENT EARTHING DETAILS NOTES

DRG. No. TB-4-316-401-008

SHEET No.
1A



NOTES:

1. NO. OF RISERS FOR CIRCUIT BREAKER = 2 Nos./PHASE
2. NO. OF RISERS FOR MECHANISM CUBICLE = 2 Nos.
3. NO. OF RISERS FOR LADDER = 2 Nos.
4. NO. OF RISERS FOR CONTROL CUBICLE = 2 Nos.



EQUIPMENT EARTHING DETAILS

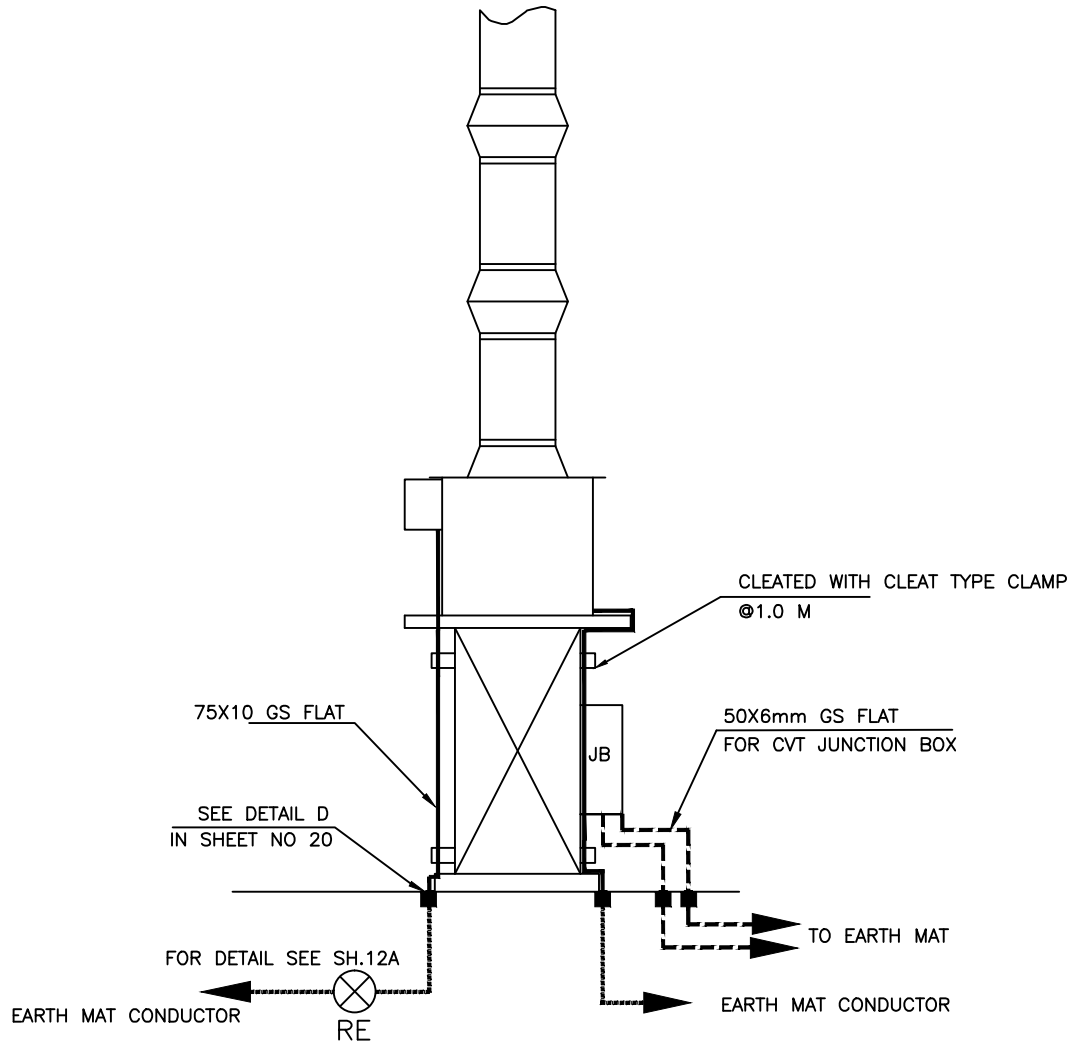
400kV SF6 CIRCUIT BREAKER

COMPUTER REF. NO.

DRG. No.

TB-4-316-401-008

SHEET No.
2



NOTE:

1. NO. OF RISER FOR CVT = 2 Nos.
2. NO. OF RISER FOR CVT JB = 2 Nos. (ONLY IN 'Y' PHASE)
3. NO. OF RISER FOR PIPE ELECTRODE = 1 Nos.



EQUIPMENT EARTHING DETAILS 400kV CVT

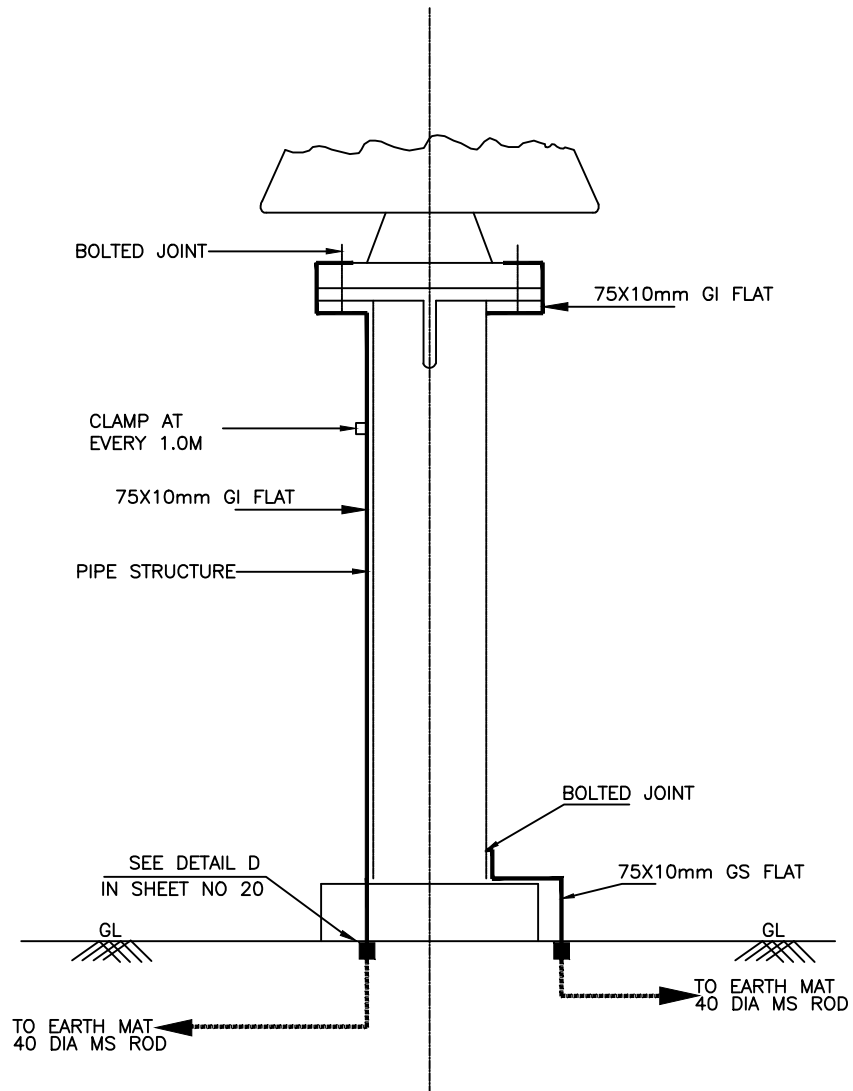
COMPUTERREF.NO.

DRG. No.

TB-4-316-401-008

SHEET No.

3



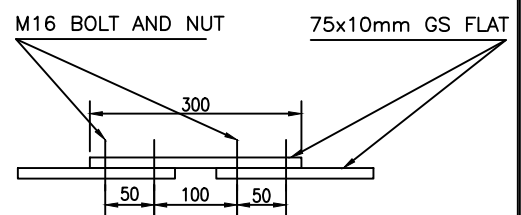
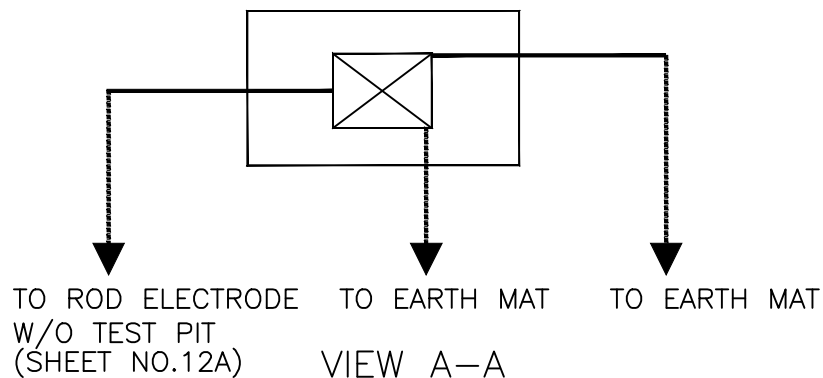
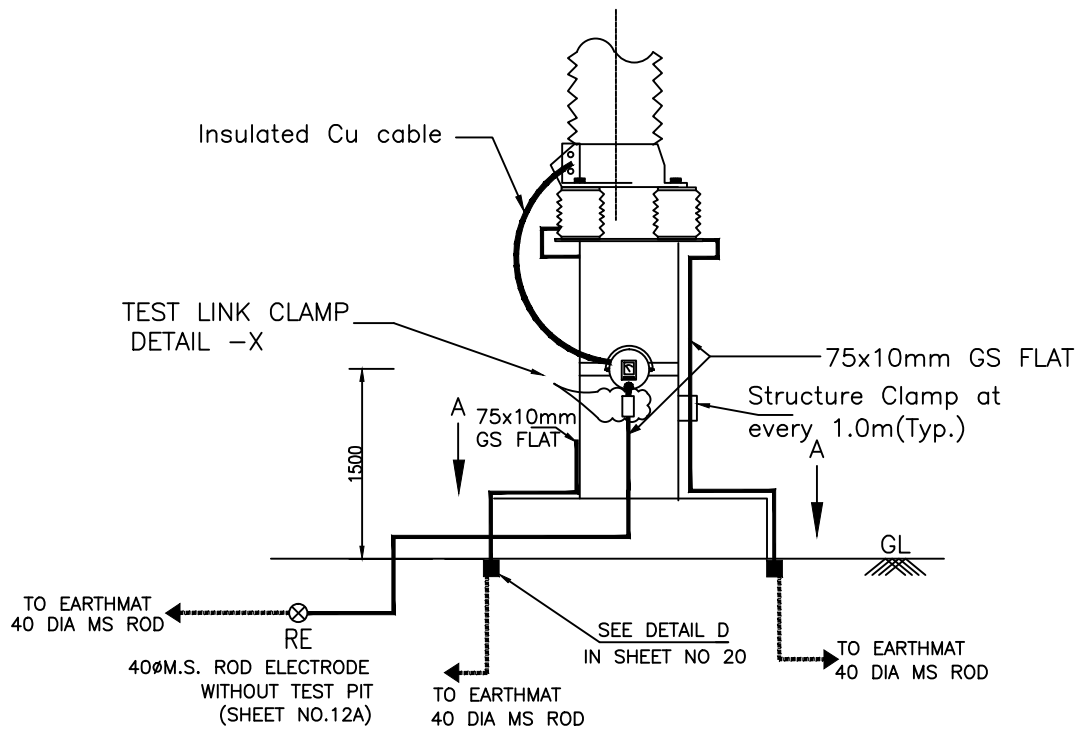
NOS.OF RISERS = 2 NOS.



EQUIPMENT EARTHING DETAILS 400kV POST INSULATOR (SOLID CORE TYPE)

DRG. No. TB-4-316-401-008

SHEET No.
4



(DETAIL -X)

NOTES;

1. LA SHALL BE EARTHED THROUGH EARTH TERMINAL OF SURGE COUNTER
2. NO. OF ROD ELECTRODE : 1 NO.
NO OF RISERS = 3 NOS.
3. TEST LINK SHALL HAVE PROVISION TO BOLT TEST LEAD BEFORE ISOLATING THE MAIN EARTHING CONNECTIONS (AS PER SKETCH ABOVE) = 1NO.



EQUIPMENT EARTHING DETAILS

360kV LIGHTNING ARRESTER

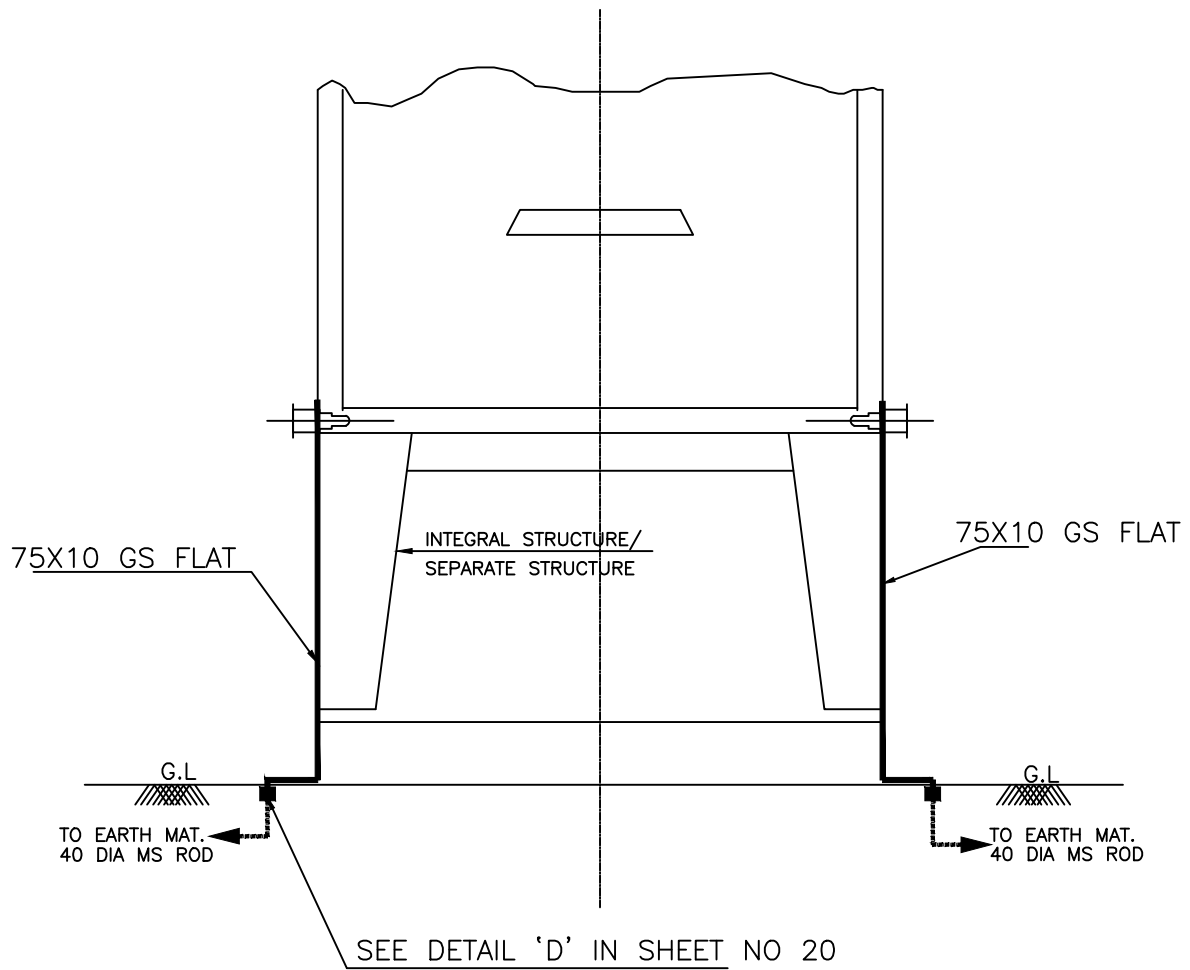
COMPU. DRG. REF.

DRG.NO.

TB-4-316-401-008

SHEET No.

5



NOS.OF RISERS = 2 NOS.



EQUIPMENT EARTHING DETAILS

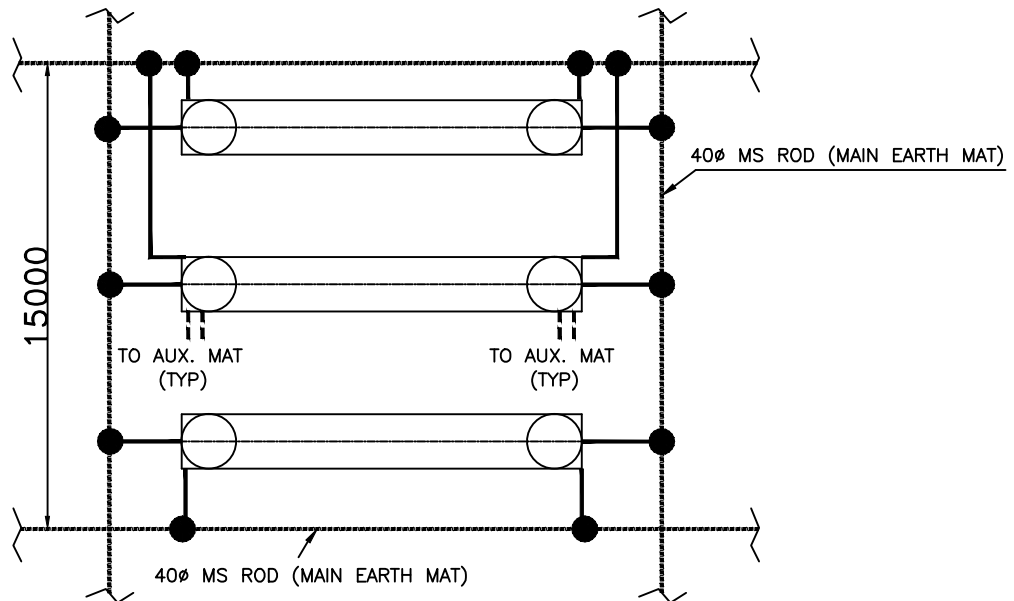
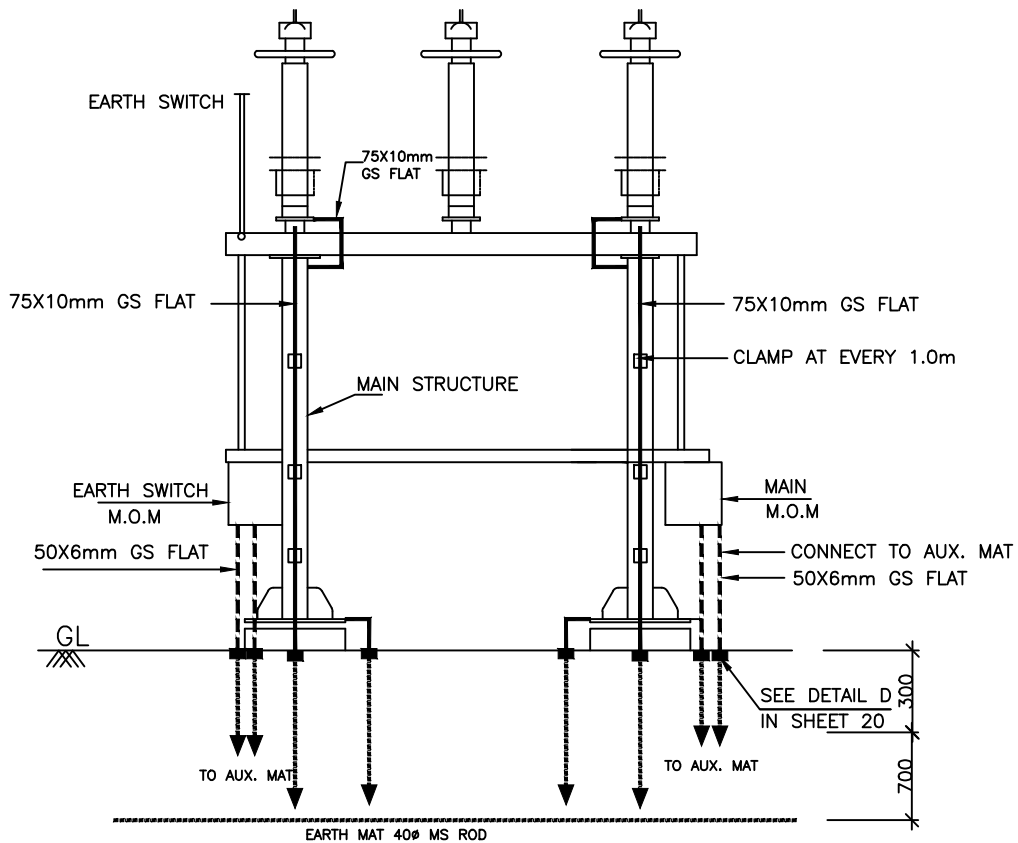
MARSHALLING KIOSK

COMPUTERREF.NO.

DRG. No.

TB-4-316-401-008

SHEET No.
6



NOTES:

1. NO. OF RISER FOR EQUIPMENT = 4 Nos./PHASE
2. NO. OF RISER FOR MECHANISM BOX = 2 Nos./BOX
3. NO. OF AUXILIARY MAT = 1 No./BOX



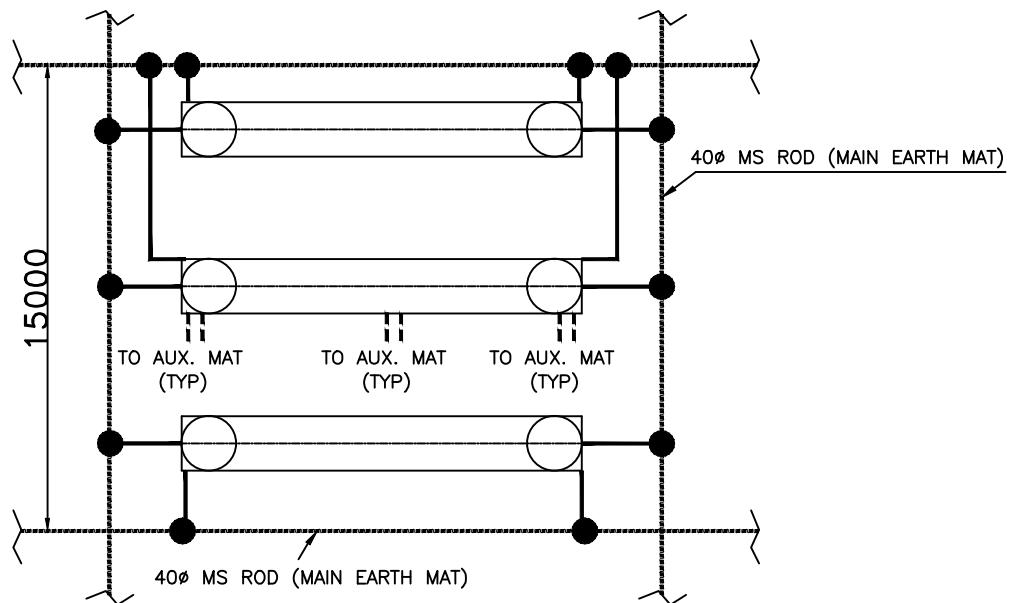
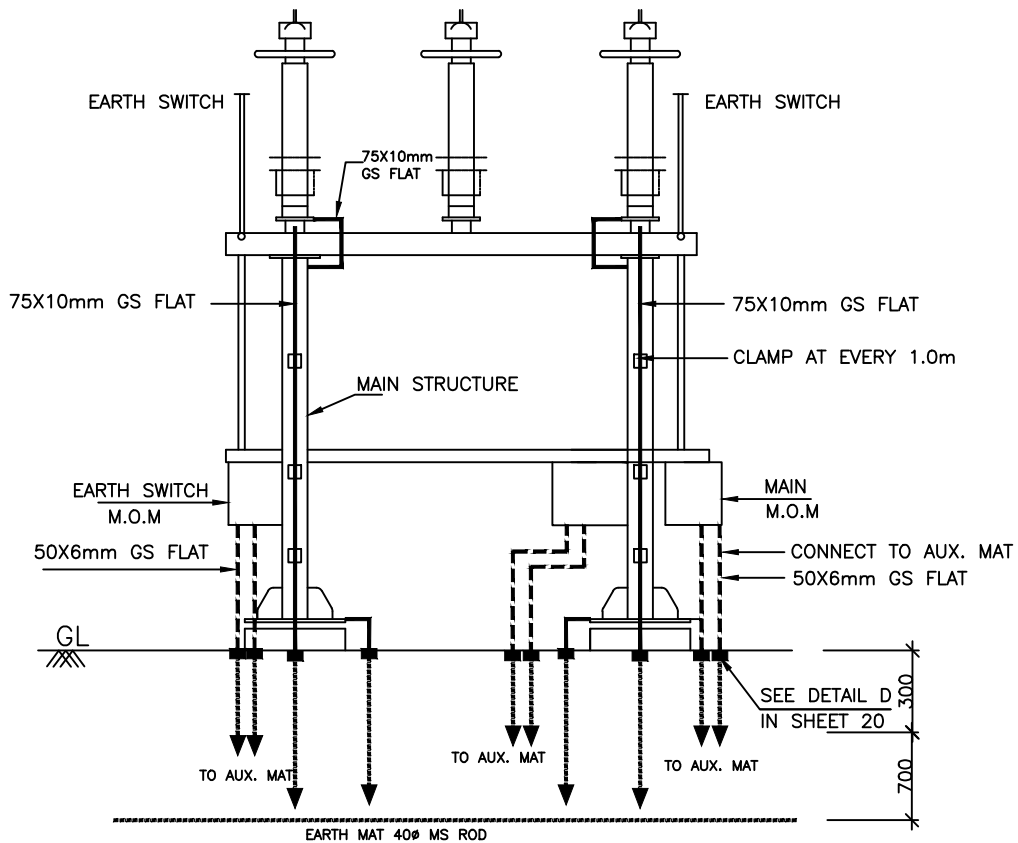
EQUIPMENT EARTHING DETAILS
400kV HORIZONTAL CENTER BREAK
ISOLATOR (TYPICAL) WITH ONE EARTH SWITCH

COMPUTERREF.NO.

DRG. No.

TB-4-316-401-008

SHEET No.
7A



NOTES:

1. NO. OF RISER FOR EQUIPMENT = 4 Nos./PHASE
2. NO. OF RISER FOR MECHANISM BOX = 2 Nos./BOX
3. NO. OF AUXILIARY MAT = 1 No./BOX



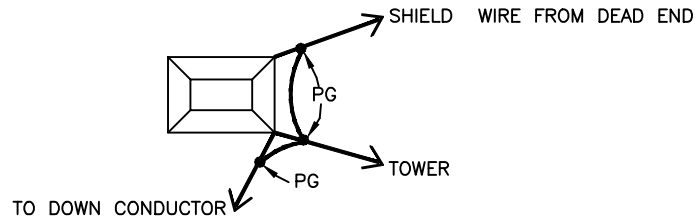
EQUIPMENT EARTHING DETAILS
400kV HORIZONTAL CENTER BREAK
ISOLATOR (TYPICAL) WITH TWO EARTHSWITCH

COMPUTERREF.NO.

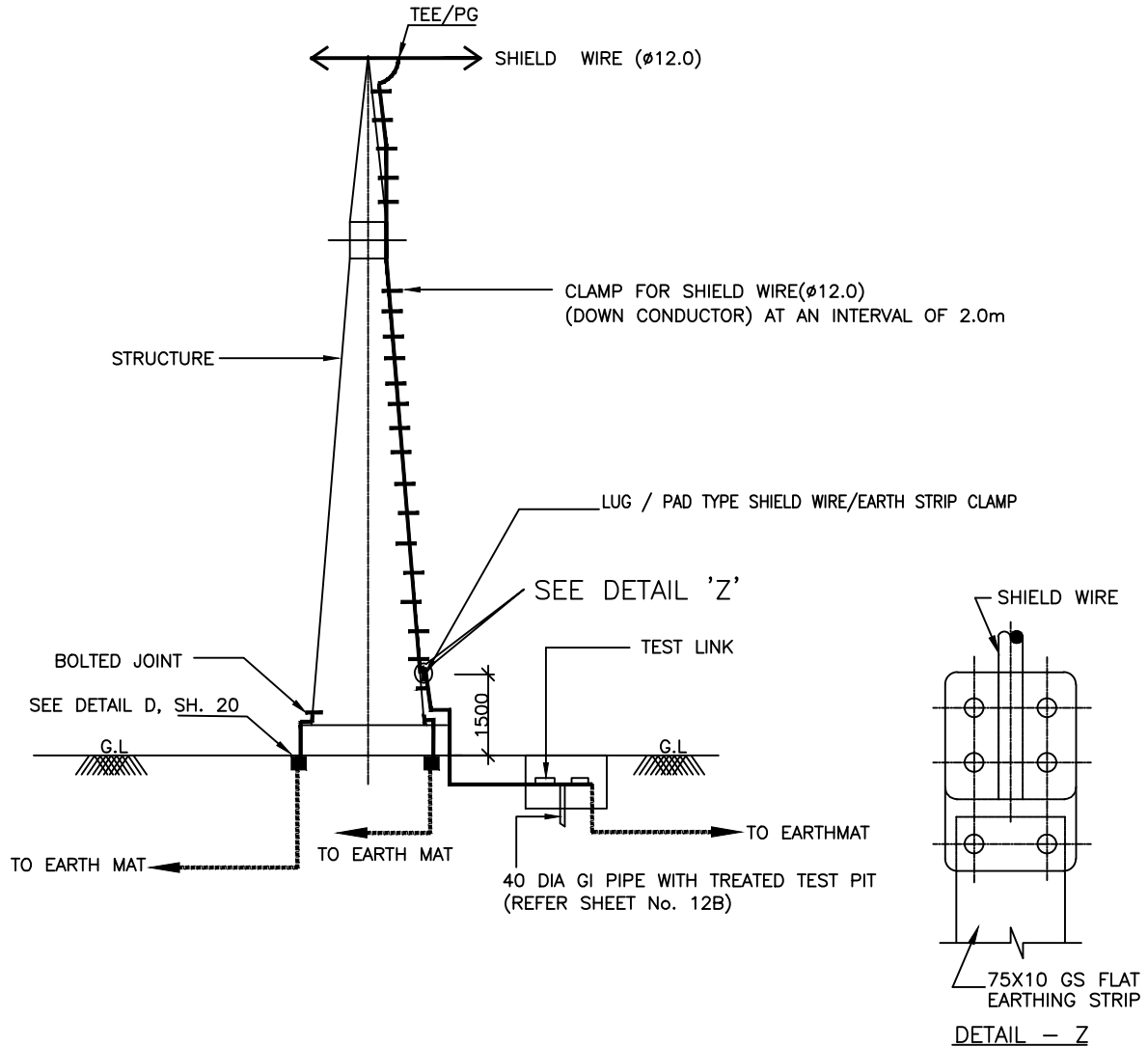
DRG. No.

TB-4-316-401-008

SHEET No.
7B



DETAIL WHEN 2 E/WIRES TERMINATES A TOWER



NOTE:

1. TWO EARTHING STRIP SHALL BE CONNECTED TO ONE RISER.
2. NO. OF GI PIPE ELECTRODE : 1 NO. PER TOWER WITH DOWN CONDUCTOR.
3. NO. OF RISERS = 2 NOS.



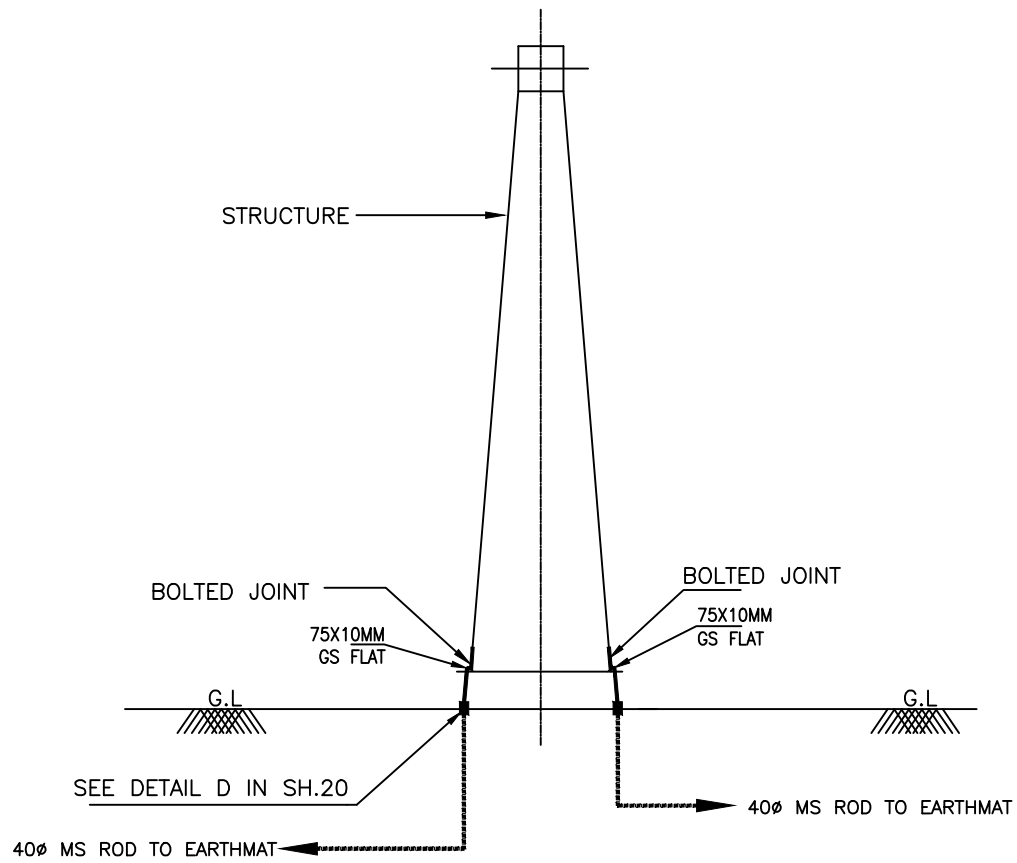
EQUIPMENT EARTHING DETAILS
TOWER WITH PEAK

COMPUTERREF.NO.

DRG. No.

TB-4-316-401-008

SHEET No.
8A



NOS.OF RISERS = 2 NOS. PER TOWER



EQUIPMENT EARTHING DETAILS

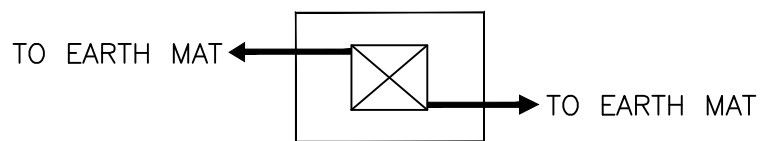
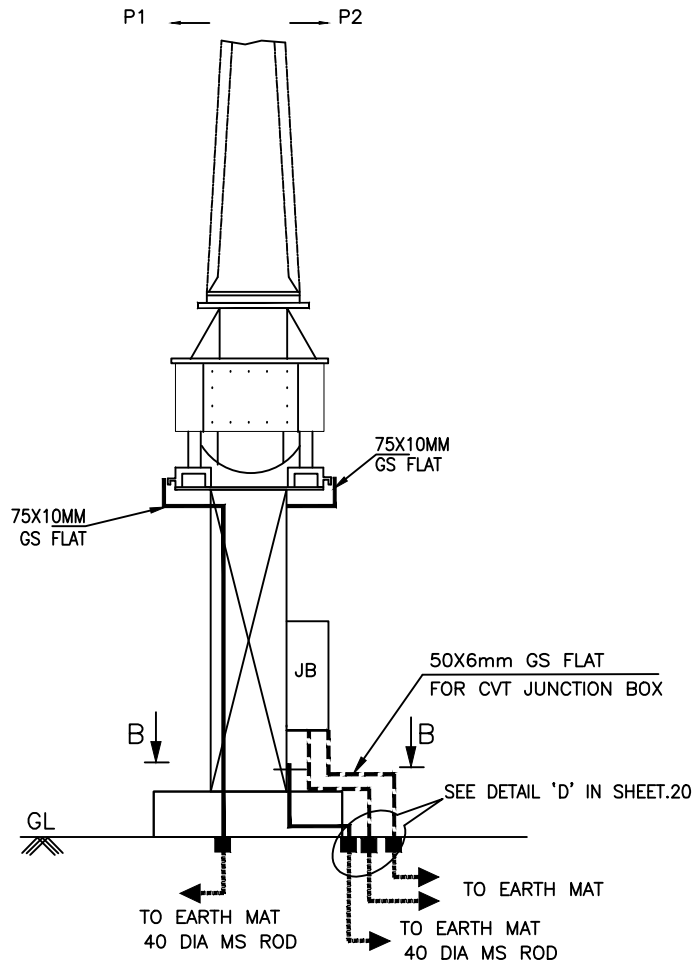
TOWER WITHOUT PEAK

COMPUTERREF.NO.

DRG. No.

TB-4-316-401-008

SHEET No.
8B



View B-B

NOS.OF RISERS

= 2 NOS. PER PHASE FOR CT
+ 2 NOS. FOR CT JB



EQUIPMENT EARTHING DETAILS 400kV CURRENT TRANSFORMER

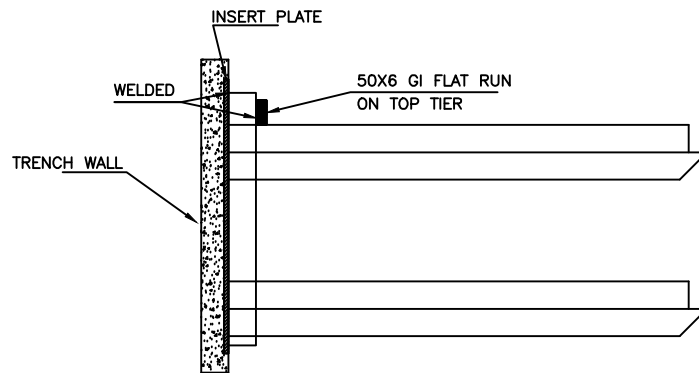
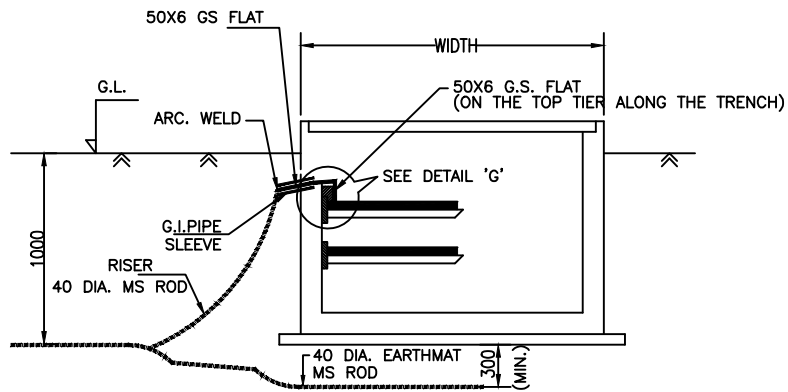
COMPU. DRG. REF.

DRG.NO.

TB-4-316-401-008

SHEET No.

9



DETAIL 'G'

DETAIL FOR CONNECTING GI FLAT RUNNING
ON TOP TIER TRENCH TO EMBEDDED PLATE.

NOTE:

1. RISERS SHALL BE PROVIDED AT AN INTERVAL OF 10M ALONG THE LENGTH OF TRENCH.
2. THE EARTH STRIP (50X6 G.S. FLAT) SHALL BE WELDED/CLEATED TO TOP RACK ALONG THE TRENCH RUN AT EVERY 1.5M.
3. WHERE THE CABLE RACKS ARE PROVIDED ON BOTH SIDES OF THE TRENCH, BOTH SIDES SHALL BE EARTHED AS PER ABOVE.
4. CABLE & CABLE TRAY EARTHING SHALL BE DONE AS PER SPECIFICATION.



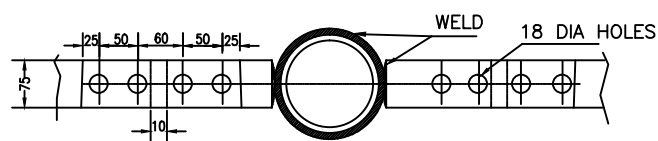
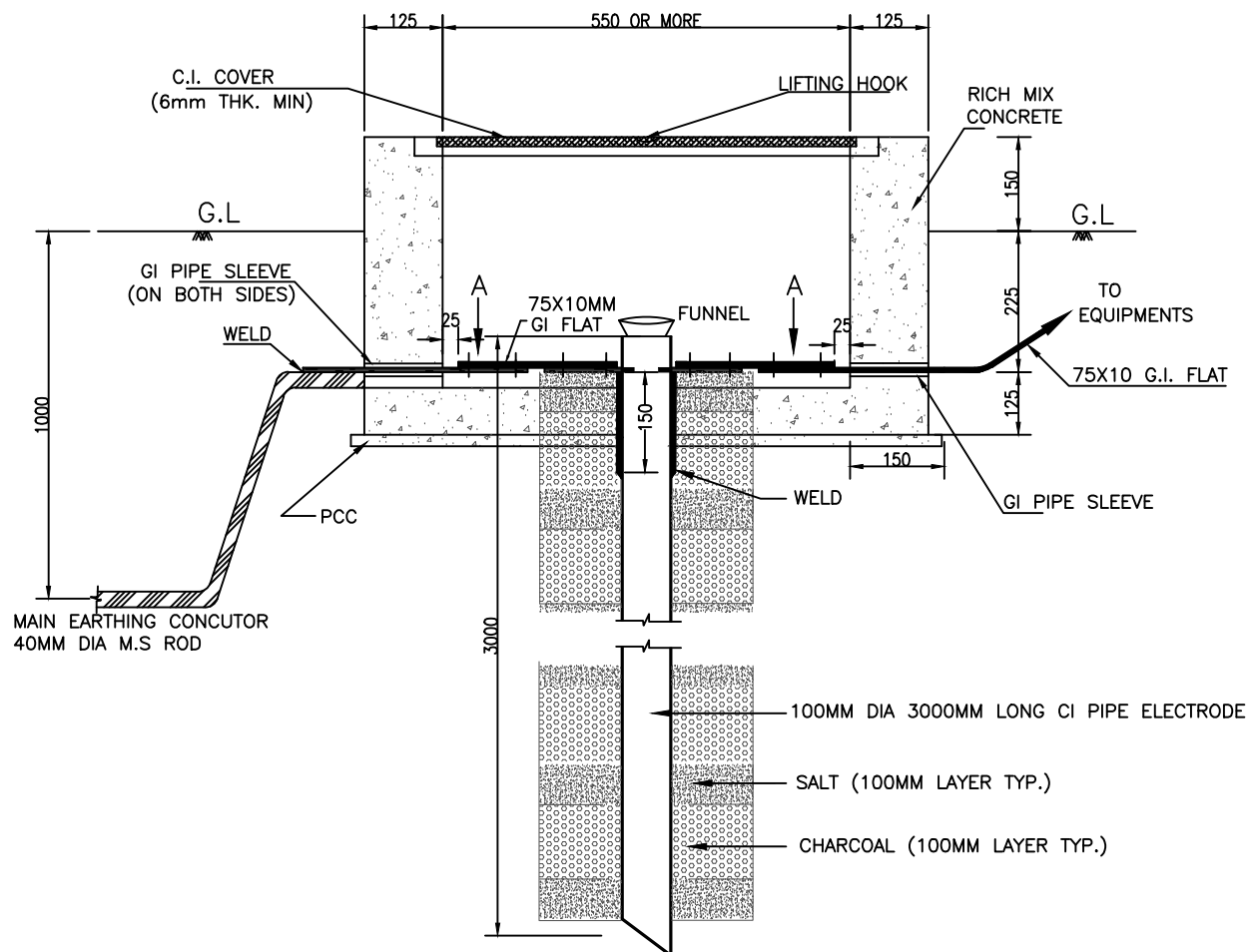
EQUIPMENT EARTHING DETAILS CABLE TRENCH

COMPU. DRG. REF.

DRG. NO.

TB-4-316-401-008

SHEET
10



VIEW-'A'

NOTE:

1. SUPPLY OF FIXING BOLTS NUTS & WASHERS FOR GI FLAT EARTHING CONDUCTOR IS ALSO FORMS PART OF THE SCOPE.
2. TO BE USED FOR CONNECTING REACTOR/ TRANSFORMER NEUTRAL.



EQUIPMENT EARTHING DETAILS PIPE EARTH ELECTRODE WITH TREATED PIT

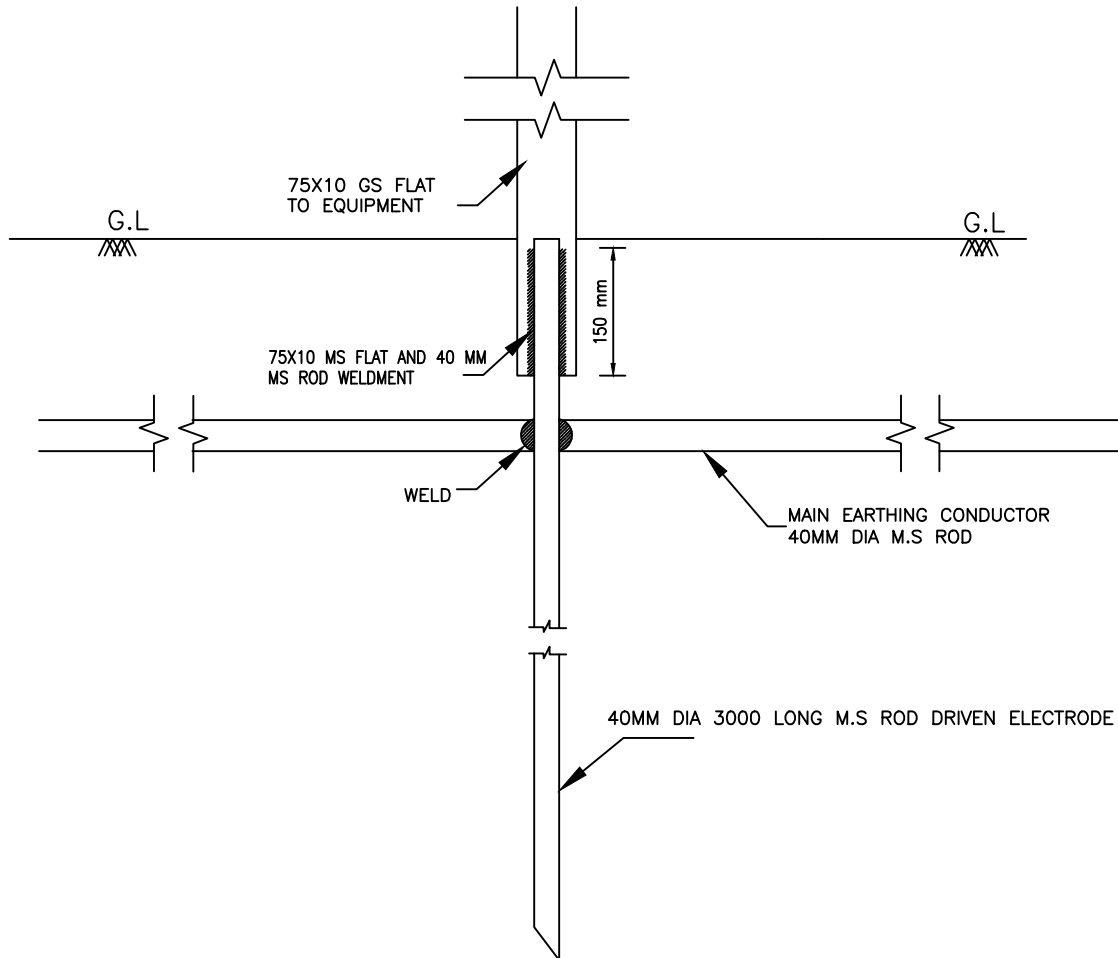
COMPU. DRG. REF.

DRG. No.

TB-4-316-401-008

SHEET No.

11



NOTES:-

1. SUPPLY OF FIXING BOLTS NUTS & WASHERS FOR GI FLAT EARTHING CONDUCTOR IS ALSO FORMS PART OF THE SCOPE.
2. ALL NUTS, BOLTS & WASHERS SHALL BE GALVANISED.
3. TO BE USED FOR CVT, LA, FENCE & CRB CORNERS.



EQUIPMENT EARTHING DETAILS
ROD ELECTRODE WITHOUT PIT

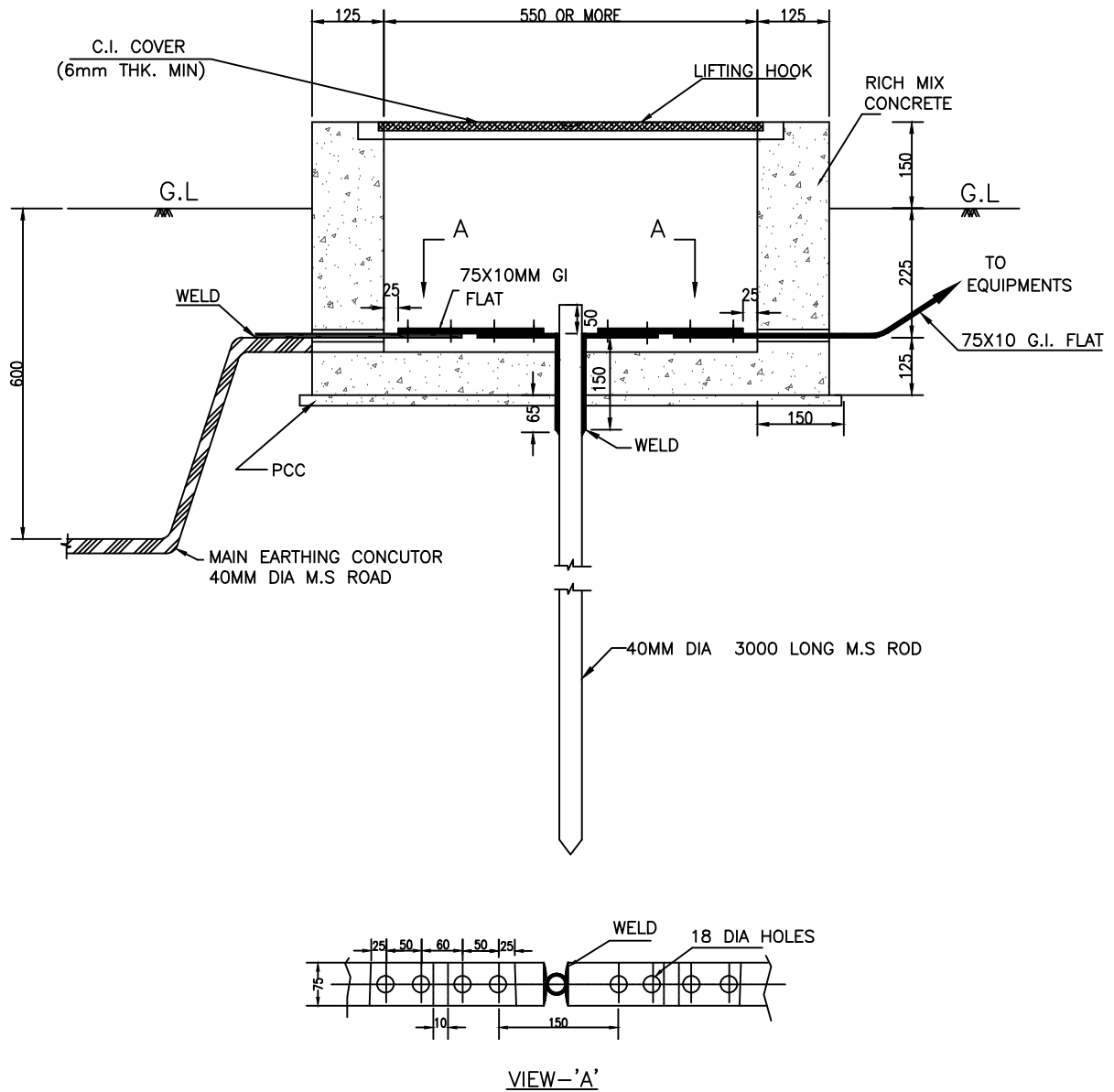
COMPU. DRG. REF.

DRG.NO.

TB-4-316-401-008

SHEET No.

12A



NOTES:-

1. SUPPLY OF FIXING BOLTS NUTS & WASHERS FOR GI FLAT EARTHING CONDUCTOR IS ALSO FORMS PART OF THE SCOPE.
2. TO BE USED FOR CONNECTING DOWN CONDUCTOR OF TOWERS WITH PEAK & INTERCONNECTION POINTS OF SWYD. EARTH GRID TO MAIN PLANT GRID.



EQUIPMENT EARTHING DETAILS

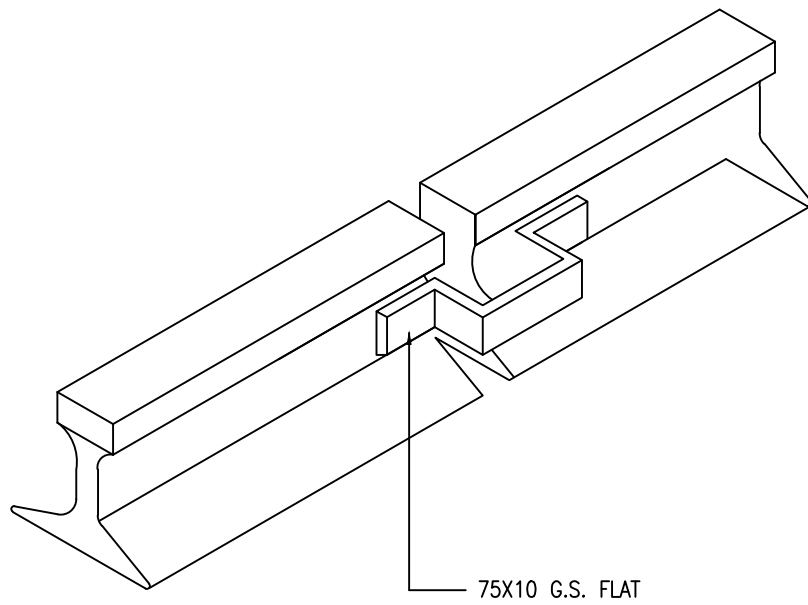
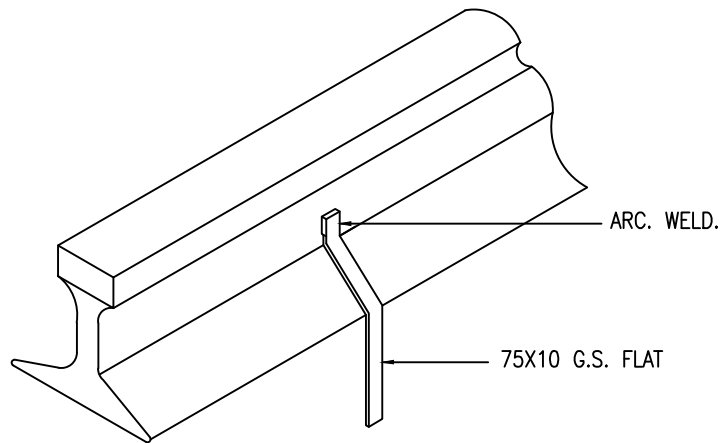
ROD EARTH ELECTRODE WITH TEST PIT

COMPU. DRG. REF.

DRG. No.

TB-4-316-401-008

SHEET No.
12B



NOTE:—

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



EQUIPMENT EARTHING DETAILS RAIL BONDING

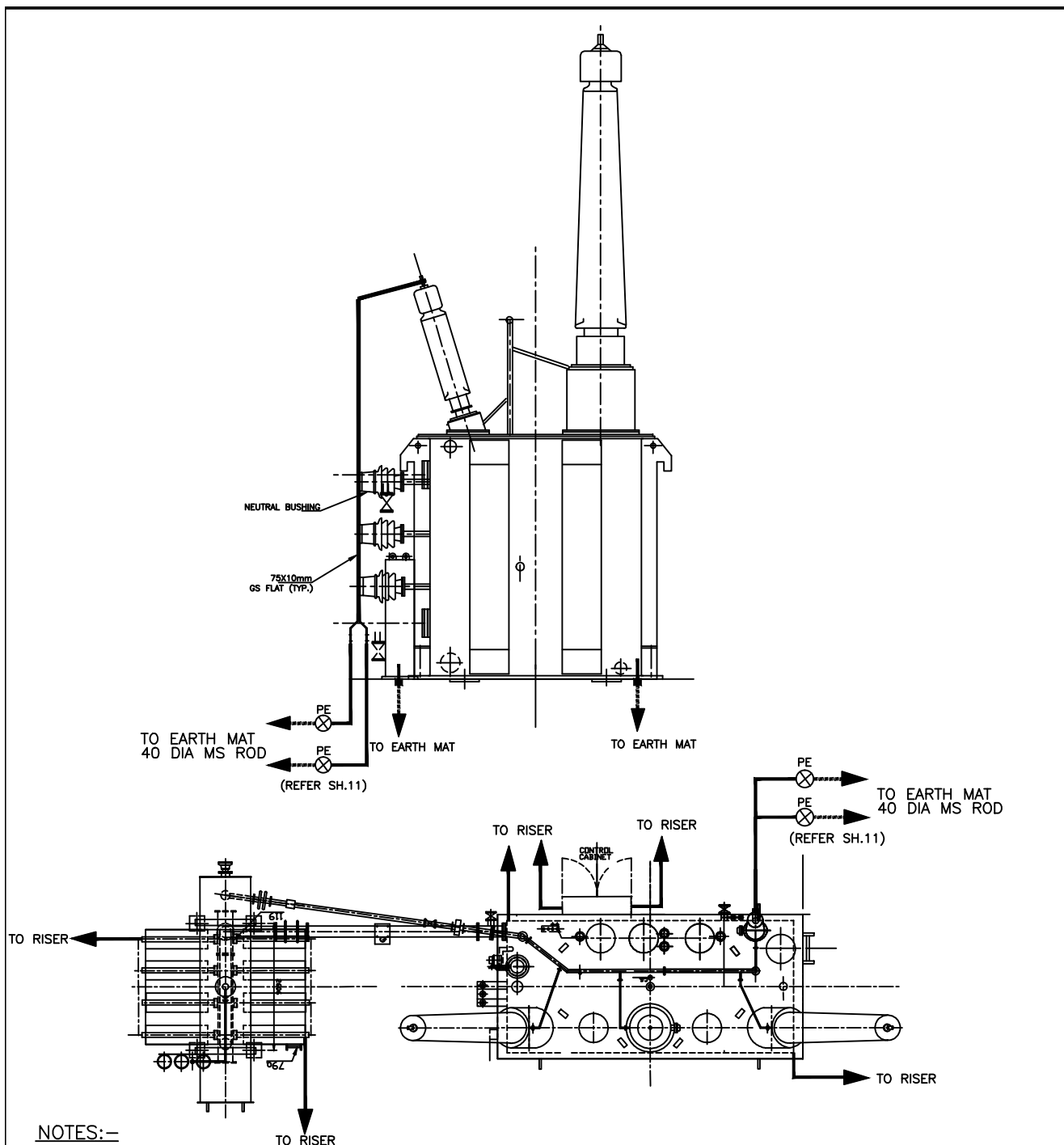
COMPU. DRG. REF.

DRG. NO.

TB-4-316-401-008

SHEET No.

13



NOTES:-

- MINIMUM DISTANCE OF 6000MM SHALL BE MAINTAINED BETWEEN TWO TREATED (PIPE) ELECTRODES.
 NO. OF PIPE EARTH ELECTRODE WITH TREATED PIT (REFER SHEET NO. 11) = 2 NOS.
 NO.OF RISERS = 8 NOS. FOR EARTHING OF FOLLOWING PARTS OF 400KV BUS REACTOR
 (TWO EARTHING STRIPS CAN BE CONNECTED TO ONE RISER)
- | | |
|--------------------|---|
| MAIN TANK | - 2 Nos. (75X10 GS FLAT) |
| RADIATOR SUPPORT | - 2 Nos. (75X10 GS FLAT) |
| CONTROL CABINET/MB | - 2 Nos. (50x6 GS FLAT) |
| NEUTRAL EARTHING | - 2 Nos. (75X10 GS FLAT THROUGH PIPE ELECTRODE) |



EQUIPMENT EARTHING DETAILS

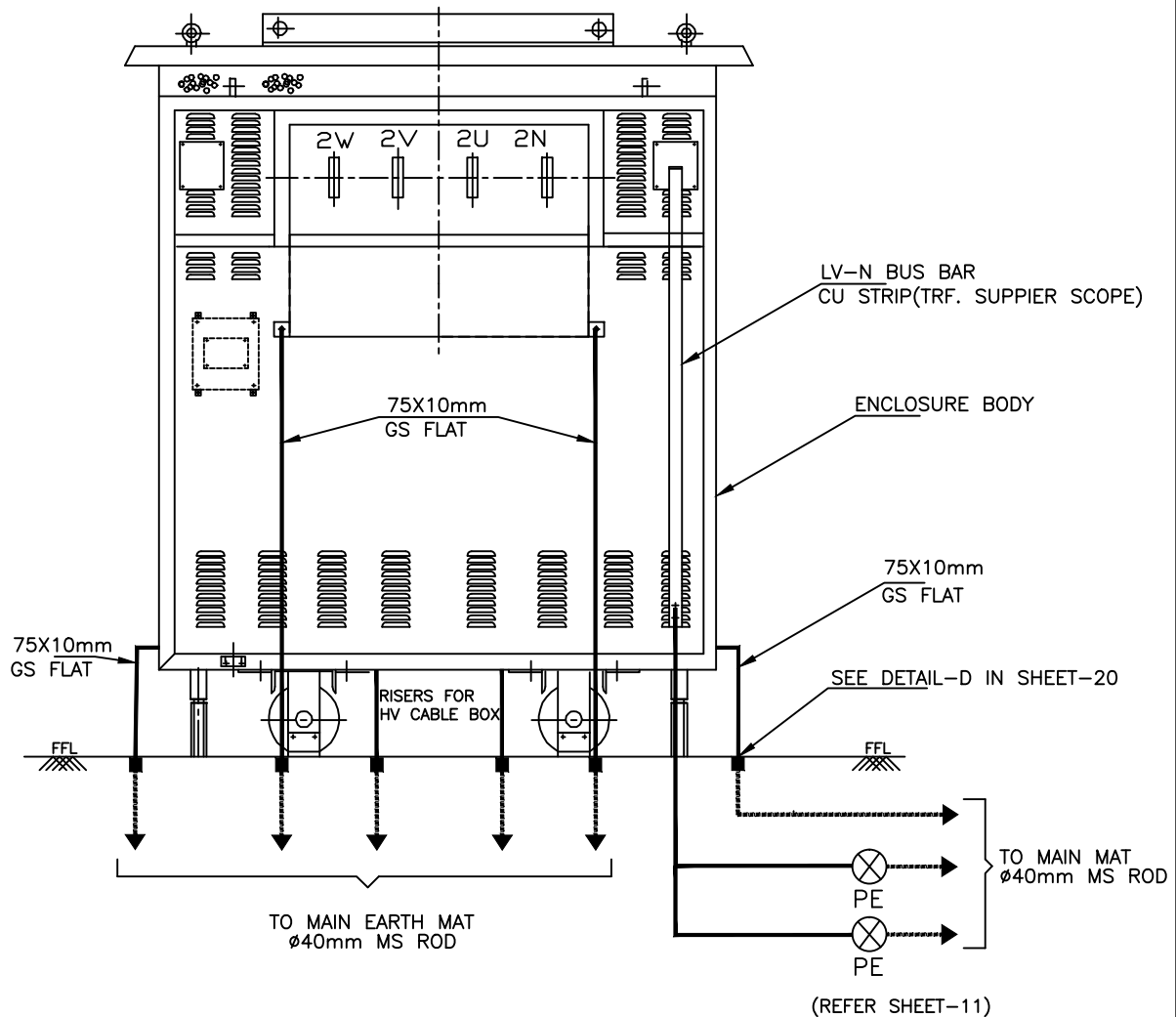
BUS REACTOR

COMPU. DRG. REF.

DRG. NO.

TB-4-316-401-008

SHEET
14A



NOTES:-

MINIMUM DISTANCE OF 6000MM SHALL BE MAINTAINED BETWEEN TWO TREATED (PIPE) ELECTRODES.
ELECTRODES TO BE INSTALLED OUTSIDE THE CRB AND ROUTING OF EARTH CONDUCTOR THROUGH BUILDING/
TRENCH SHALL BE DONE AS PER SITE CONDITIONS.

NO.OF PIPE EARTH ELECTRODE WITH TREATED PIT (REFER SHEET NO. 11) = 2 NOS.

NO.OF RISERS = 8 NOS. FOR EARTHING OF FOLLOWING PARTS OF TRANSFORMER

(TWO EARTHING STRIPS CAN BE CONNECTED TO ONE RISER):

TRANSFORMER ENCLOSURE	2 Nos. (75X10 GS FLAT)
LV CABLE BOX	2 Nos. (75X10 GS FLAT)
HV CABLE BOX	2 Nos. (75X10 GS FLAT)
NEUTRAL EARTHING	2 Nos. (75X10 GS FLAT THROUGH PIPE ELECTRODE)



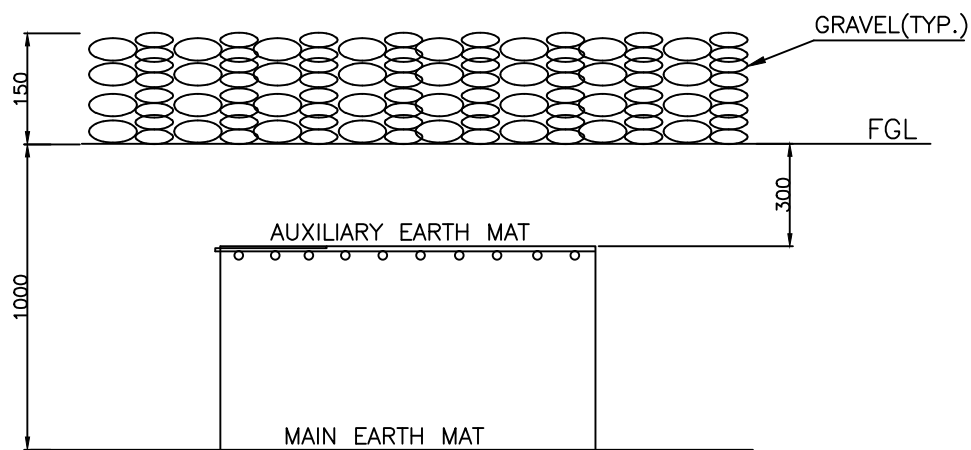
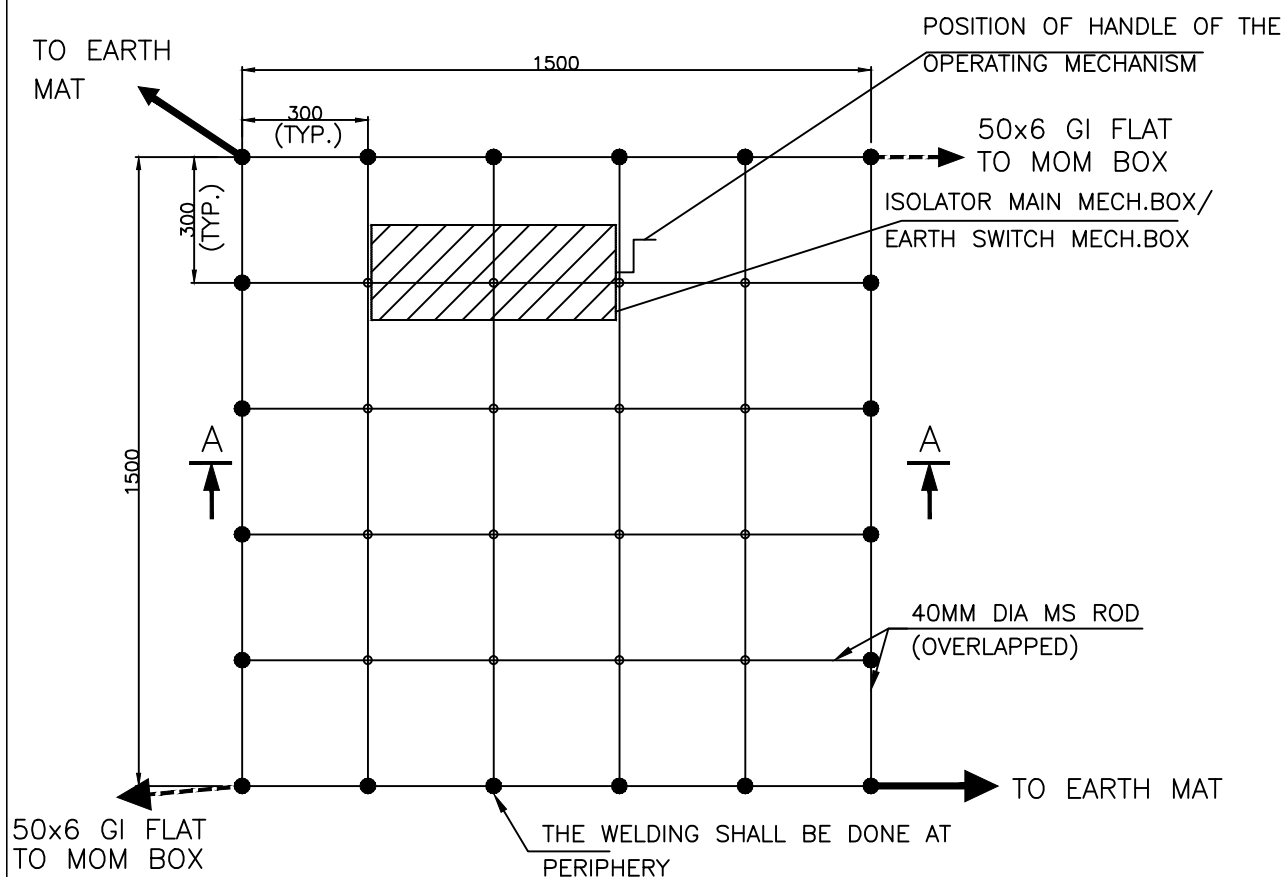
**EQUIPMENT EARTHING DETAILS
LT TRANSFORMER (DRY TYPE)**

DRG. No.

TB-4-316-401-008

REV. 01

SHEET No.
14B



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.



EQUIPMENT EARTHING DETAILS

AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH., E/S MECH. BOX

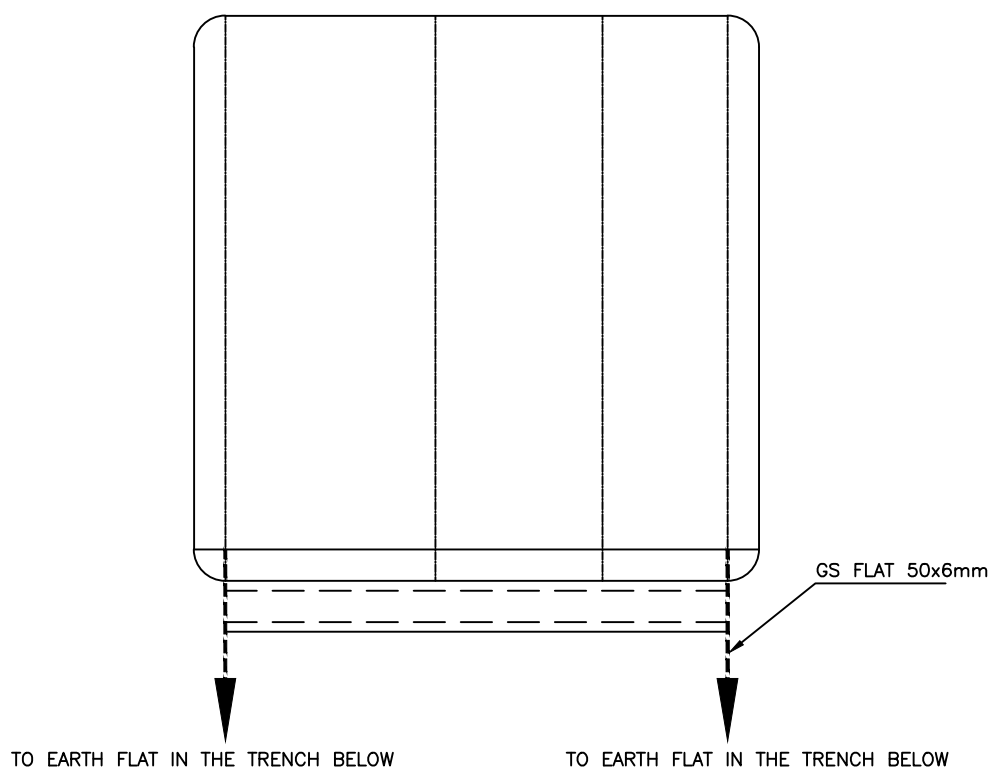
COMPU. DRG. REF.

Report No.

TB-4-316-401-008

SHEET No.

15



EQUIPMENT EARTHING DETAILS

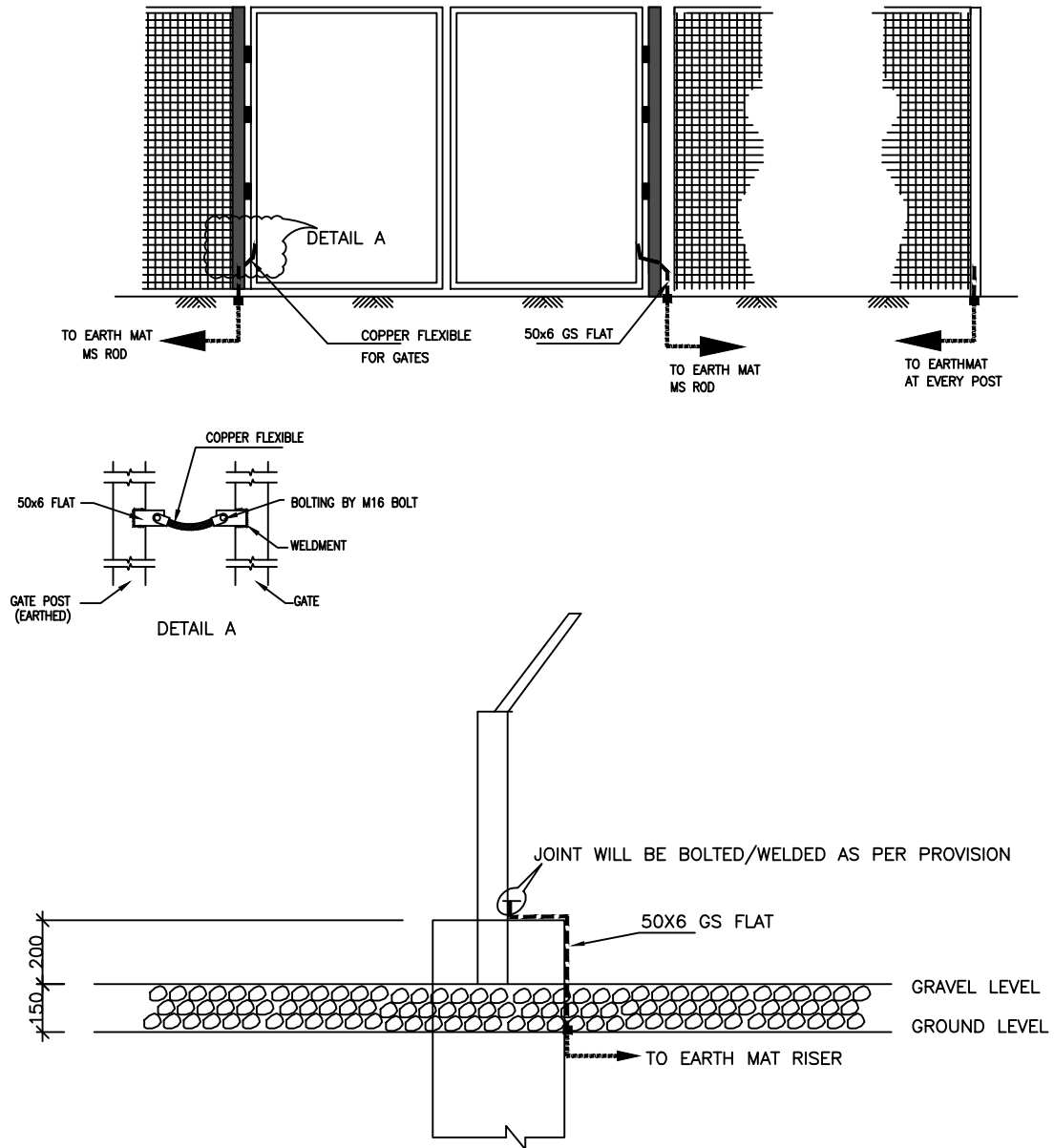
ALL PANELS/KIOSKS/MBs/BATTERY CHARGER/AC DC BOARDS/MLDB

DRG. No. TB-4-316-401-008

SHEET No.
16

FENCE GATE

FENCE GROUNDING



NOTES:

FENCE SHALL BE CONNECTED TO EARTH MAT BY 50X6 MM GS FLAT AT AN INTERVAL OF EVERY 10m.
 EARTHING CONDUCTOR SHALL BE BURIED 2000mm OUTSIDE THE SWITCHYARD FENCE.
 FENCE GATE SHALL BE SEPARATELY GROUNDED WITH FLEXIBLE CONNECTION TO PERMIT MOVEMENT

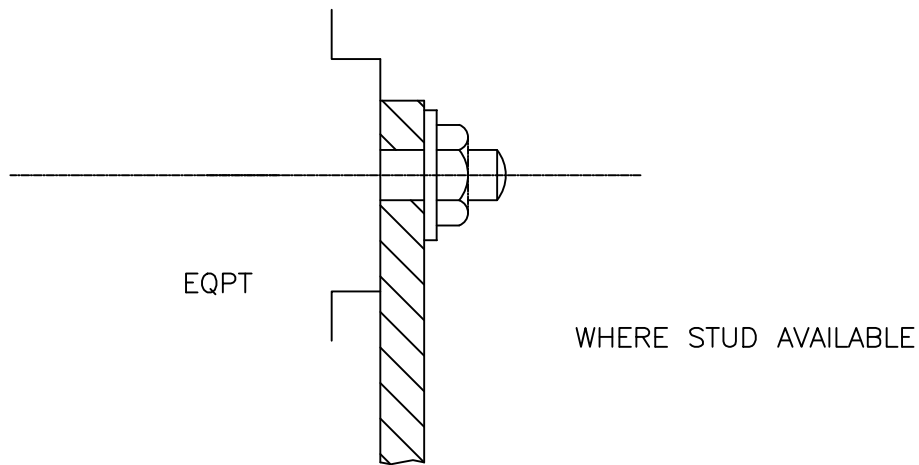


EQUIPMENT EARTHING DETAILS GATE/FENCE POST

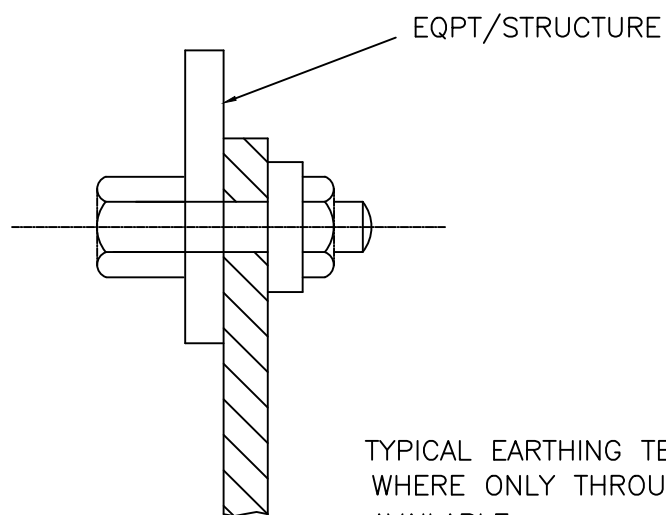
DRG. No.

TB-4-316-401-008

SHEET No.
17



TYPICAL EARTHING TERMINAL JOINT



TYPICAL EARTHING TERMINAL JOINT
WHERE ONLY THROUGH HOLE IS
AVAILABLE

NOTES:

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



EQUIPMENT EARTHING DETAILS
TYPICAL ARRANGEMENT OF BOLTED JOINTS

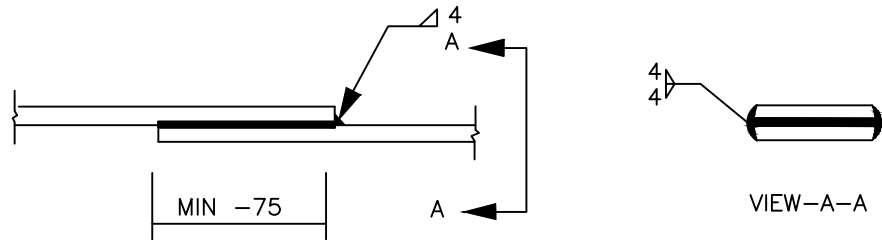
DRG. No.

TB-4-316-401-008

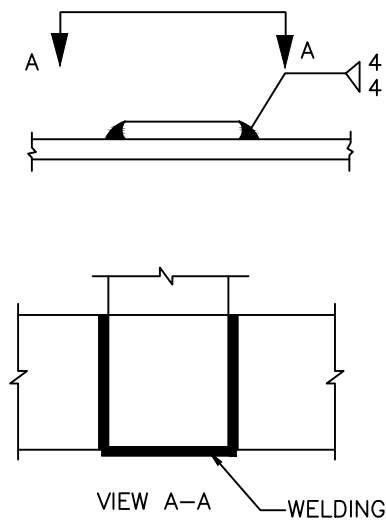
SHEET No.
18

STRIP TO STRIP (75X10/50X6 MS FLAT)

1. STRAIGHT LAP JOINT/RISER



2. CROSS LAP JOINT



EQUIPMENT EARTHING DETAILS

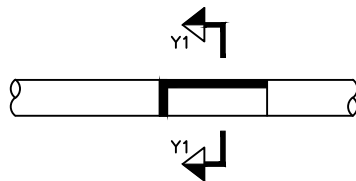
WELDING DETAILS

COMPUTERREF.NO.

DRG. No.

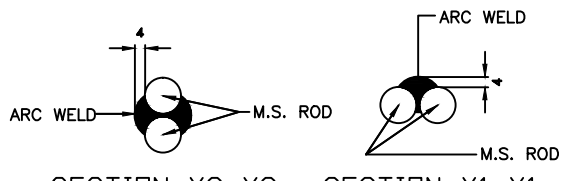
TB-4-316-401-008

SHEET No.
19



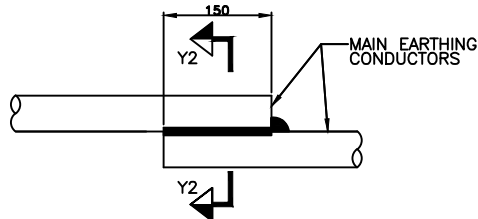
ELEVATION

(CONDUCTOR IN HORIZONTAL PLANE)



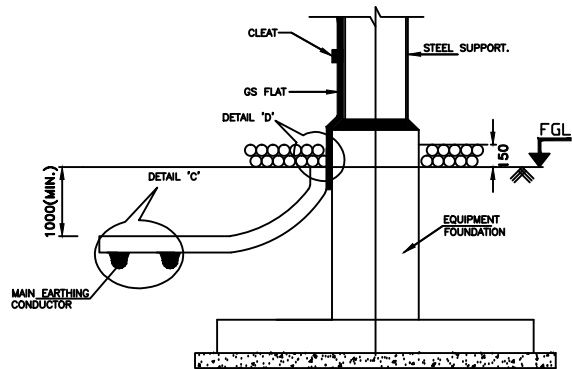
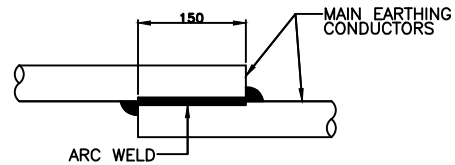
SECTION Y2-Y2

SECTION Y1-Y1

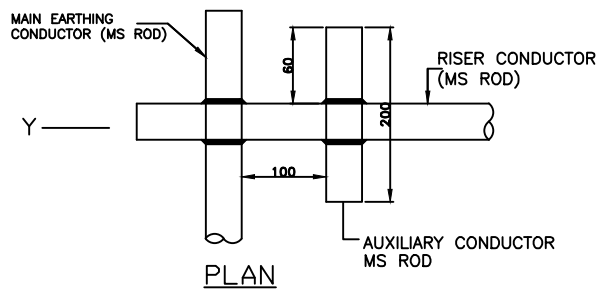


ELEVATION

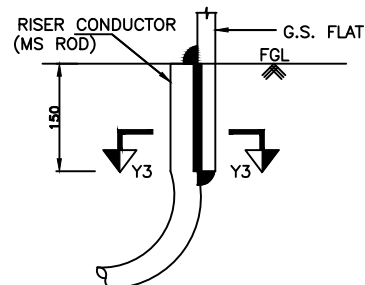
(CONDUCTOR IN VERTICAL PLANE)



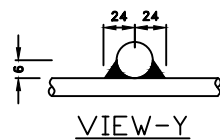
TYPICAL DETAILS OF RISER



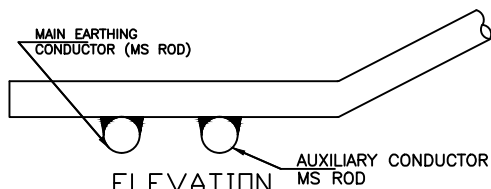
PLAN



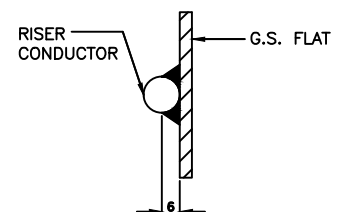
ELEVATION
DETAIL-D



VIEW-Y



ELEVATION
DETAIL-C



SECTION Y3-Y3

TYPICAL OVERLAPPING JOINT OF TWO CONDUCTORS



EQUIPMENT EARTHING DETAILS

WELDING DETAILS

COMPUTERREF.NO.

DRG. No.

TB-4-316-401-008

SHEET No.

20