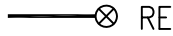


TB-397-316-021

DRAWING NO.

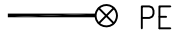
LEGEND

CONNECTION TO GROUND MAT THROUGH RISER



RE

CONNECTION TO ROD ELECTRODE WITH NON- TREATED PIT.



PE

CONNECTION TO PIPE ELECTRODE WITH TREATED EARTH PIT



75x12mm 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 #15 & 16.
- 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  |
| 2A.  | 400KV LINE CVT (WITH LMU)                                      |
| 2B.  | 400KV CVT (WITHOUT LMU)  |
| 03.  | 400KV POST INSULATOR (SOLID CORE TYPE)                         |
| 04.  | 336KV LIGHTNING ARRESTER                                       |
| 05.  | TOWER WITH PEAK  |
| 06.  | CABLE TRENCH   |
| 07.  | PIPE EARTH ELECTRODE WITH TREATED PIT                          |
| 8A.  | ROD ELECTRODE WITHOUT TEST PIT                                 |
| 8B.  | ROD ELECTRODE WITH TEST PIT                                    |
| 09.  | RAIL BONDING   |
| 10A. | BUS REACTOR  |
| 10B. | SWITCHYARD SERVICE TRANSFORMER                                 |
| 11.  | CONTROL AND RELAY PANELS/BATTERY CHARGER/<br>AC DC BOARDS/MLDB |
| 12.  | 400KV WAVE TRAP  |
| 13.  | GATE/FENCE POST  |
| 14.  | TYPICAL ARRANGEMENT OF BOLTED JOINTS                           |
| 15.  | WELDING DETAILS  |
| 16.  | WELDING DETAILS  |

NTPC DRG. No. 9585-001-572-PVE-F-0038	
PROJECT	PATRATU SUPER THERMAL POWER PROJECT EXPANSION PHASE - I (3X800MW)
OWNER	PATRATU VIDYUT UTPADAN NIGAM LTD. (A SUBSIDIARY OF NTPC LTD. IN JV WITH JBVNL)
JOB NO. 87009	STATUS CONTRACT
DISTRIBUTION	
TO	
No. OF	
REV.	DATE
ALTD	CHD
APPD	
QBTGM	BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP NOIDA
DEPT CODE	NAME SIGN DATE
M	CHD NS 18.07.19
	SKS 18.07.19
	AG 18.07.19
TITLE 400 kv - AIS EQUIPMENT EARTHING PHILOSOPHY & DETAILS	
DEPT.	SCALE
SIGN	DRAWING NO.
DATE	TB-397-316-021
	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. CONNECTION TO ALL EQUIPMENT AND TOWERS SHALL BE BY BOLTED JOINTS. CONTACT SURFACES SHALL BE THOROUGHLY CLEANED BEFORE CONNECTIONS. EQUIPMENT BOLTED CONNECTIONS AFTER BEING TESTED AND CHECKED SHALL BE PAINTED WITH ANTI CORROSIVE PAINT/COMPOUND.
3. CONNECTIONS BETWEEN EQUIPMENT EARTHING LEADS AND BETWEEN MAIN EARTHING CONDUCTORS SHALL BE OF WELDED TYPE. FOR RUST PROTECTION THE WELDS SHOULD BE TREATED WITH RED LEAD COMPOUND AND AFTERWARDS THICKLY COATED WITH BITUMEN COMPOUND.  
THE SURFACES TO BE WELDED SHALL BE CLEANED OF DIRT, OIL, GREASE AND OXIDES BEFORE WELDING. ANY OXIDE FILMS THAT MAY HAVE FORMED DURING WELDING MUST BE REMOVED FROM THE WELDED JOINT.
4. EARTHING CONDUCTOR FOR EQUIPMENT SHALL BE OF GALVANISED M.S. OF SIZE 75x12/50x6 mm. THE CONDUCTOR BELOW THE GROUND LEVEL SHALL BE 40 mm DIA BLACK MS ROD.
5. IN THE ATTACHED DRAWINGS GL REPRESENTS GROUND LEVEL.
6. ALL EQUIPMENT STRUCTURES, CABLE TRENCHES & TOWERS SHALL BE EARTHED AT TWO POINTS WITH 75x12 mm. G.S. FLAT EVEN THOUGH THEY ARE SHOWN OR NOT IN THE DRAWING DUE TO CLARITY.
7. 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.
8. EARTHING CONDUCTORS FROM EQUIPMENT STRUCTURES SHALL BE CONNECTED TO THE NEAREST POSSIBLE EARTH MAT RISER. EQUIPMENT EARTHING SHALL BE AS PER IS 3043.
9. ALL JOINTS BETWEEN 40 DIA M.S. ROD AND 75x12 mm. G.S. FLAT SHALL BE BELOW GROUND LEVEL.
10. FOR WELDED JOINTS LOW HYDROGEN CONTENT ELECTRODES SHALL BE USED.
11. METTALIC SHEATHS/SCREENS, AND ARMOUR OF MULTI CORE CABLES SHALL BE EARTHED AT BOTH ENDS. METTALIC SHEATHS AND ARMOUR OF SINGLE CORE CABLES SHALL BE EARTHED AT SWITCHGEAR END ONLY UNLESS OTHERWISE INSTRUCTED BY THE EMPLOYER.
12. EQUIPMENT BOLTED CONNECTIONS AFTER BEING TESTED AND CHECKED SHALL BE PAINTED WITH ANTI CORROSIVE PAINT/COMPOUND.
13. LOCATION OF EARTHING CONDUCTORS/RISERS SHOWN IN THE EARTHING DRAWING MAY CHANGE TO SUIT THE SITE CONDITION.
14. FOR SURGE ARRESTER, EARTHING LEAD FROM SURGE COUNTER TO MAIN EARTH MAT SHALL BE SHORTEST IN LENGTH AS PRACTICALLY AS POSSIBLE.
15. ALL NON CURRENT CARRYING METALIC PARTS SHALL BE EARTHED AT TWO DIFFERENT PLACES.
16. ALL EQUIPMENT DRAWINGS SHOWN ARE INDICATIVE ONLY.
17. WELDING OF EARTHING CONDUCTOR SHALL BE CONNECTED IN VERTICAL PLANE WHEREVER POSSIBLE.
18. ALL GROUND CONNECTIONS SHALL BE MADE BY ELECTRIC ARC WELDING.
19. BENDING OF LARGE DIAMETER CONDUCTORS SHALL BE DONE PREFERABLY BY GAS HEATING.



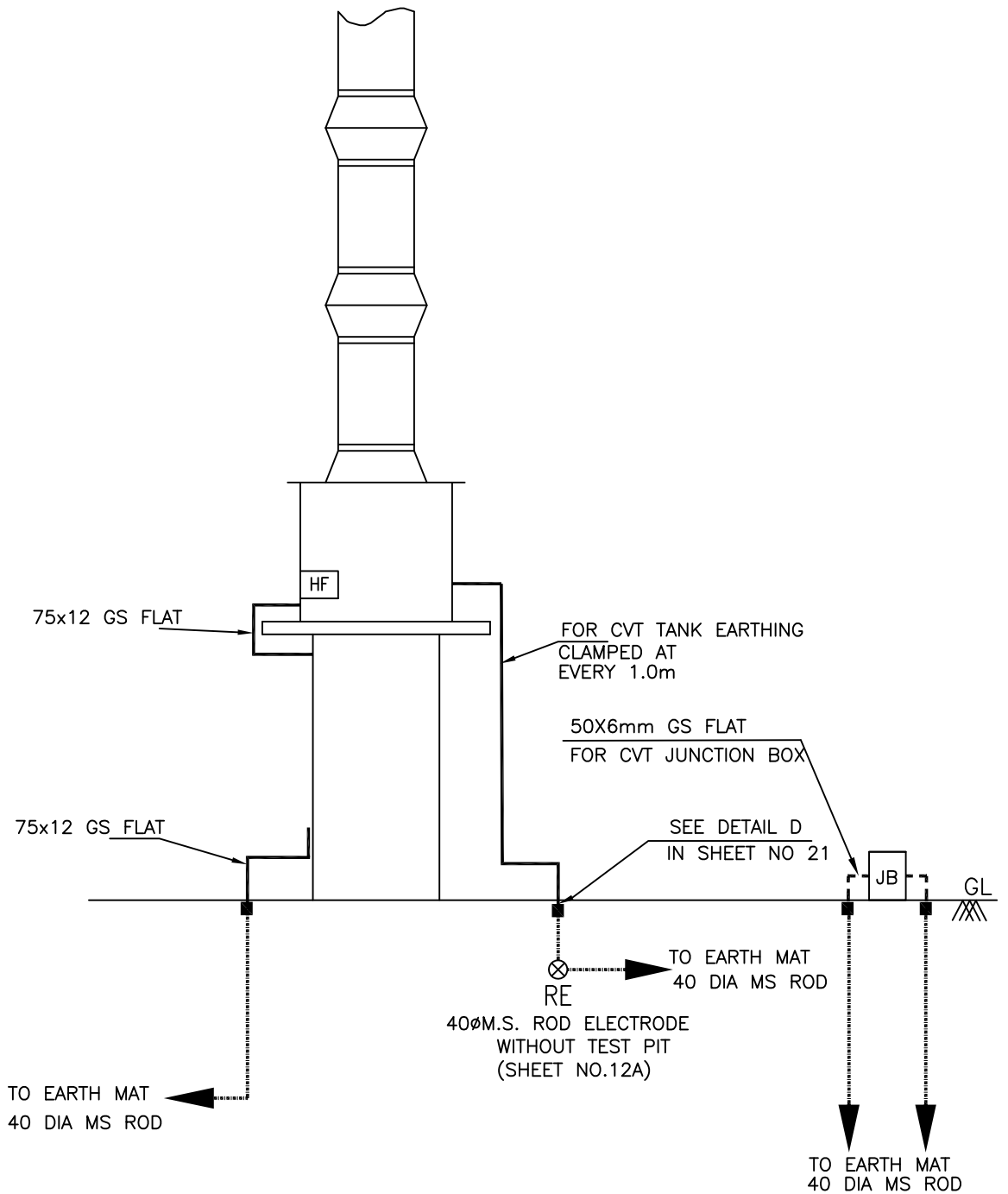
## EQUIPMENT EARTHING DETAILS NOTES

DRG. No.

TB-397-316-021

SHEET No.  
1A

SHEET No.  
2A



NOS.OF RISERS  
 = 2 NOS. PER PHASE  
 + 2 NOS. FOR CVT JUNCTION BOX  
 ROD ELECTRODE = 1 NO. PER CVT



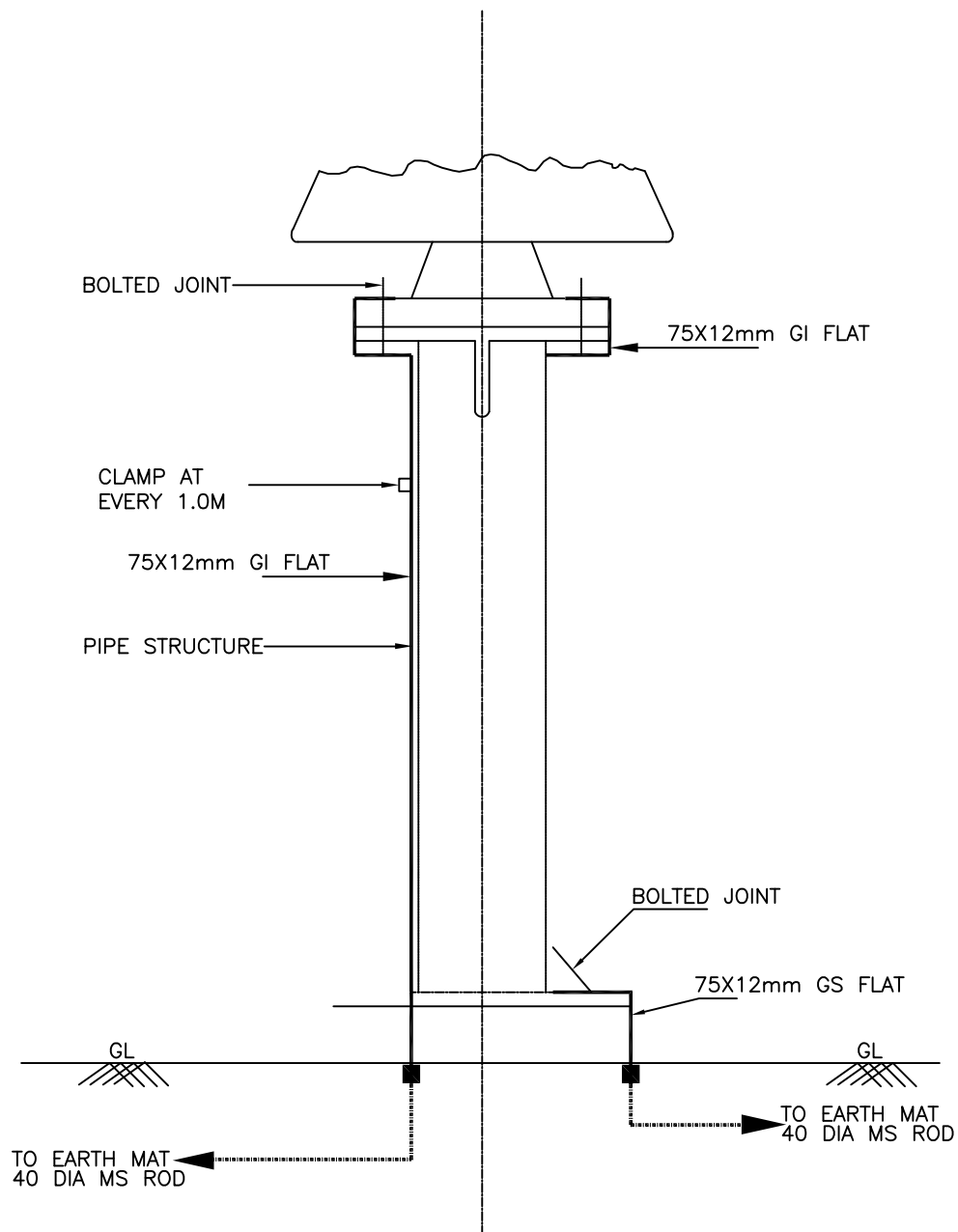
## EQUIPMENT EARTHING DETAILS 400kV CVT (WITHOUT LMU)

COMPUTERREF.NO.

DRG. No.

TB-397-316-021

SHEET No.  
 2B



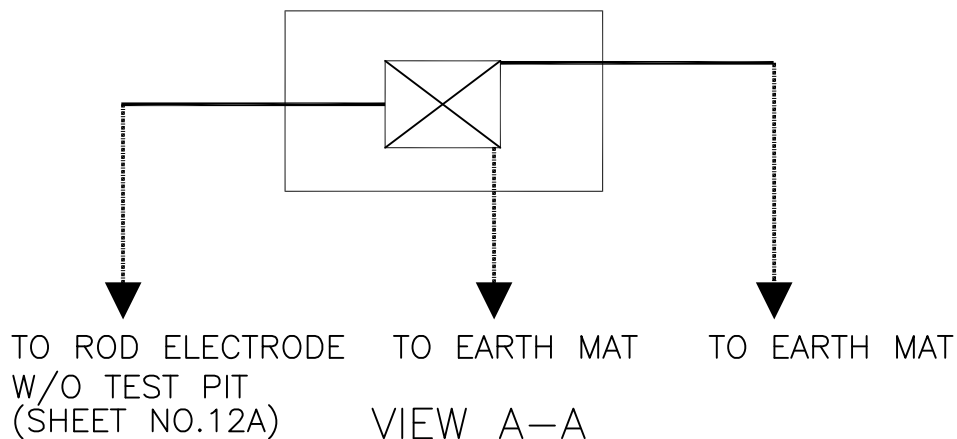
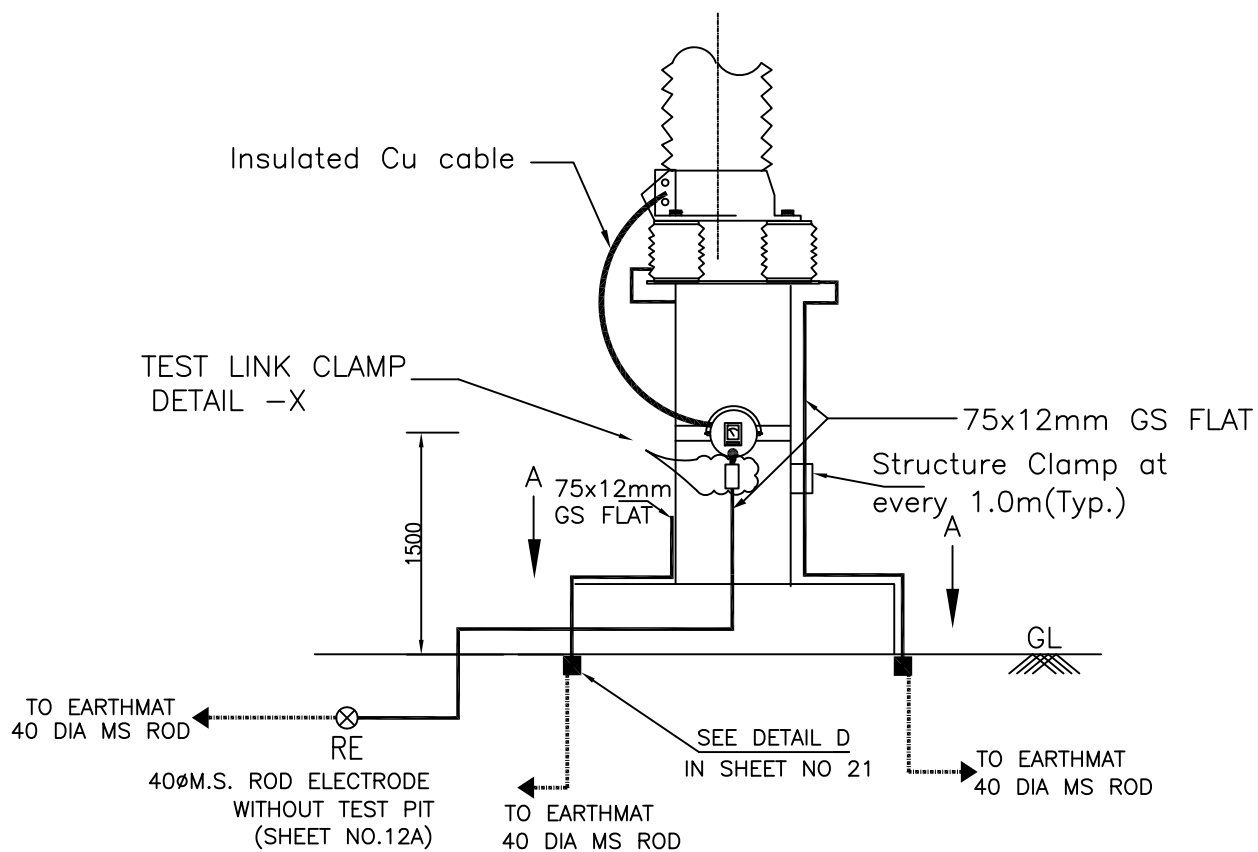
NOS.OF RISERS = 2 NOS.



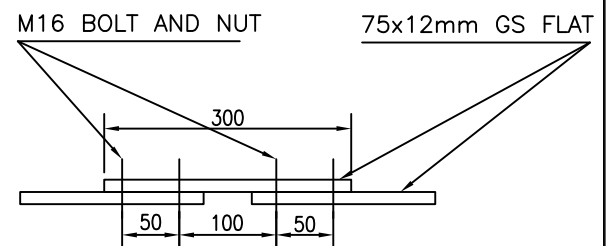
# EQUIPMENT EARTHING DETAILS 400kV POST INSULATOR (SOLID CORE TYPE)

DRG. No. TB-397-316-021

SHEET No.  
03



should be with earth



(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

### 336kV LIGHTNING ARRESTER

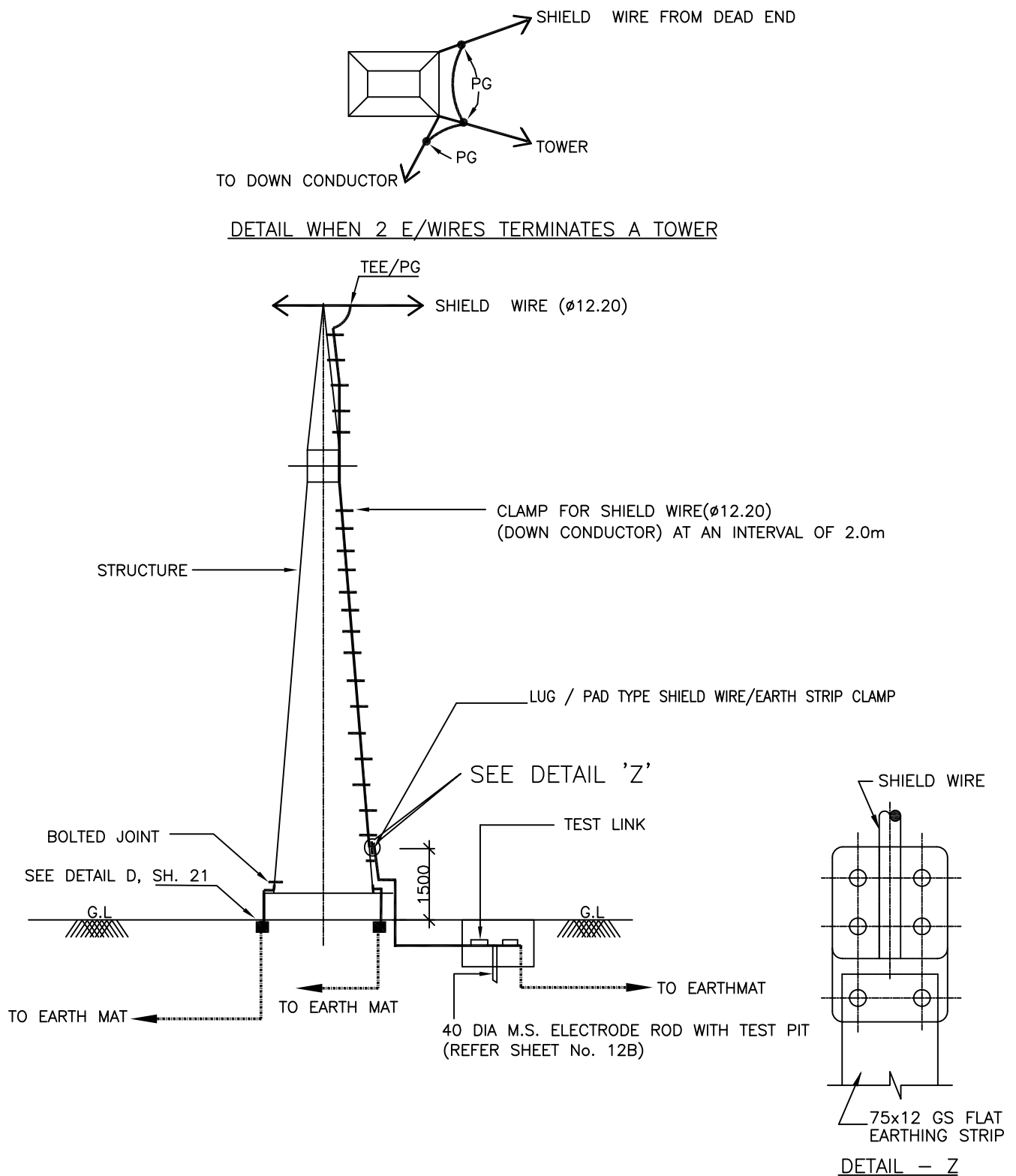
COMPU. DRG. REF.

DRG.NO.

TB-397-316-021

SHEET No.

04



NOTE:

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



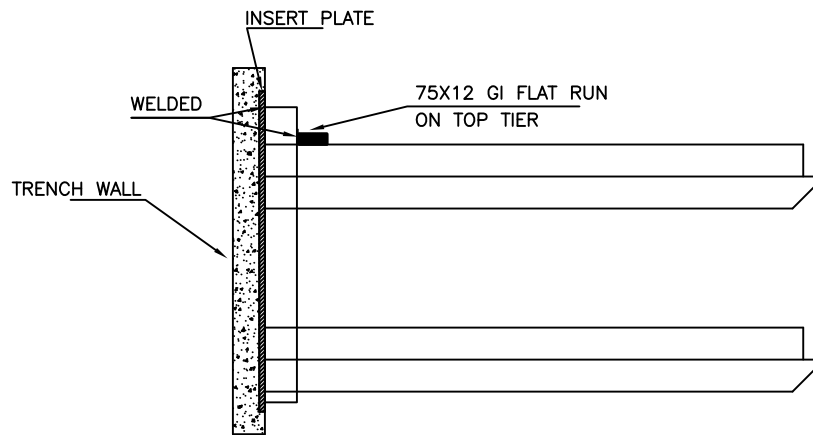
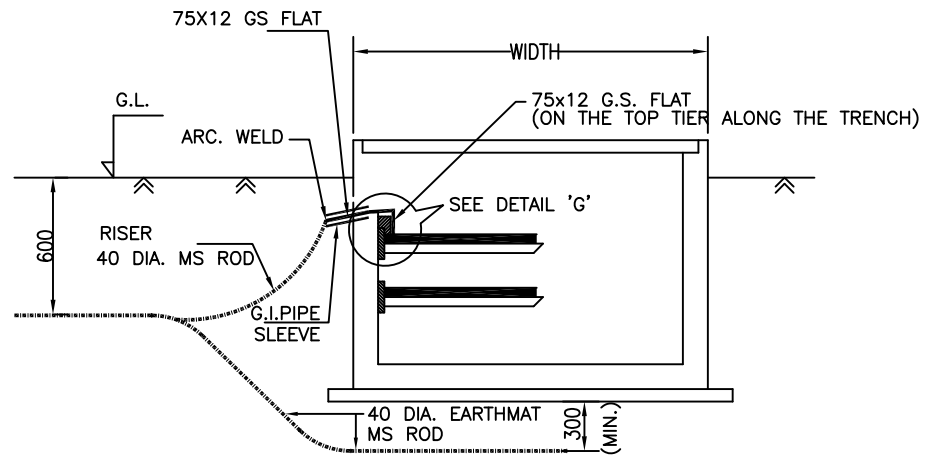
EQUIPMENT EARTHING DETAILS  
TOWER WITH PEAK

COMPUTERREF.NO.

DRG. No.

TB-397-316-021

SHEET No.  
05



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 20M ALONG THE LENGTH OF TRENCH.
2. THE EARTH STRIP (75x12 G.S. FLAT) SHALL BE WELDED/CLEATED TO TOP RACK ALONG THE TRENCH RUN AT EVERY 0.75M.
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

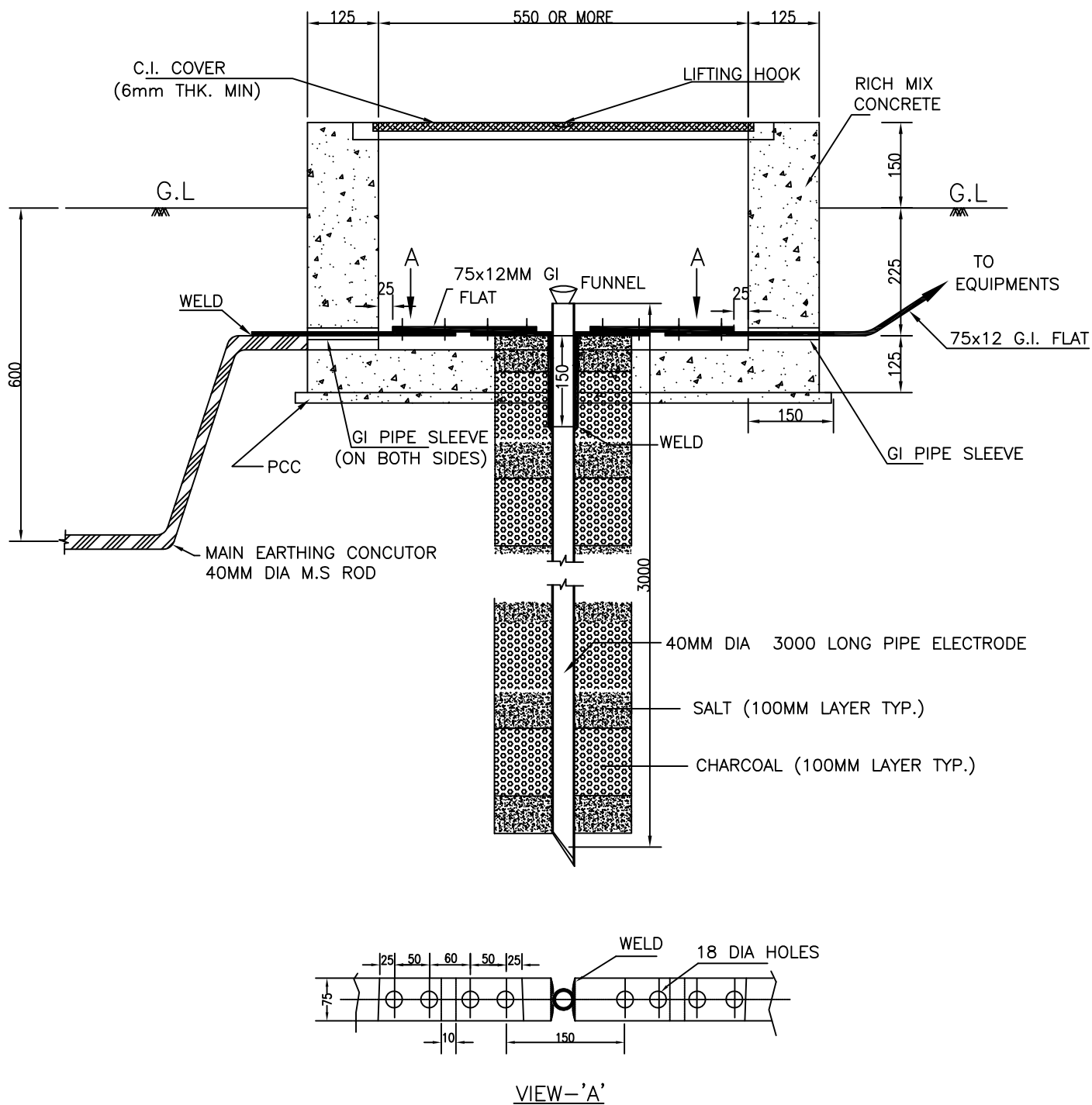
COMPU. DRG. REF.

DRG. NO.

TB-397-316-021

SHEET  
06



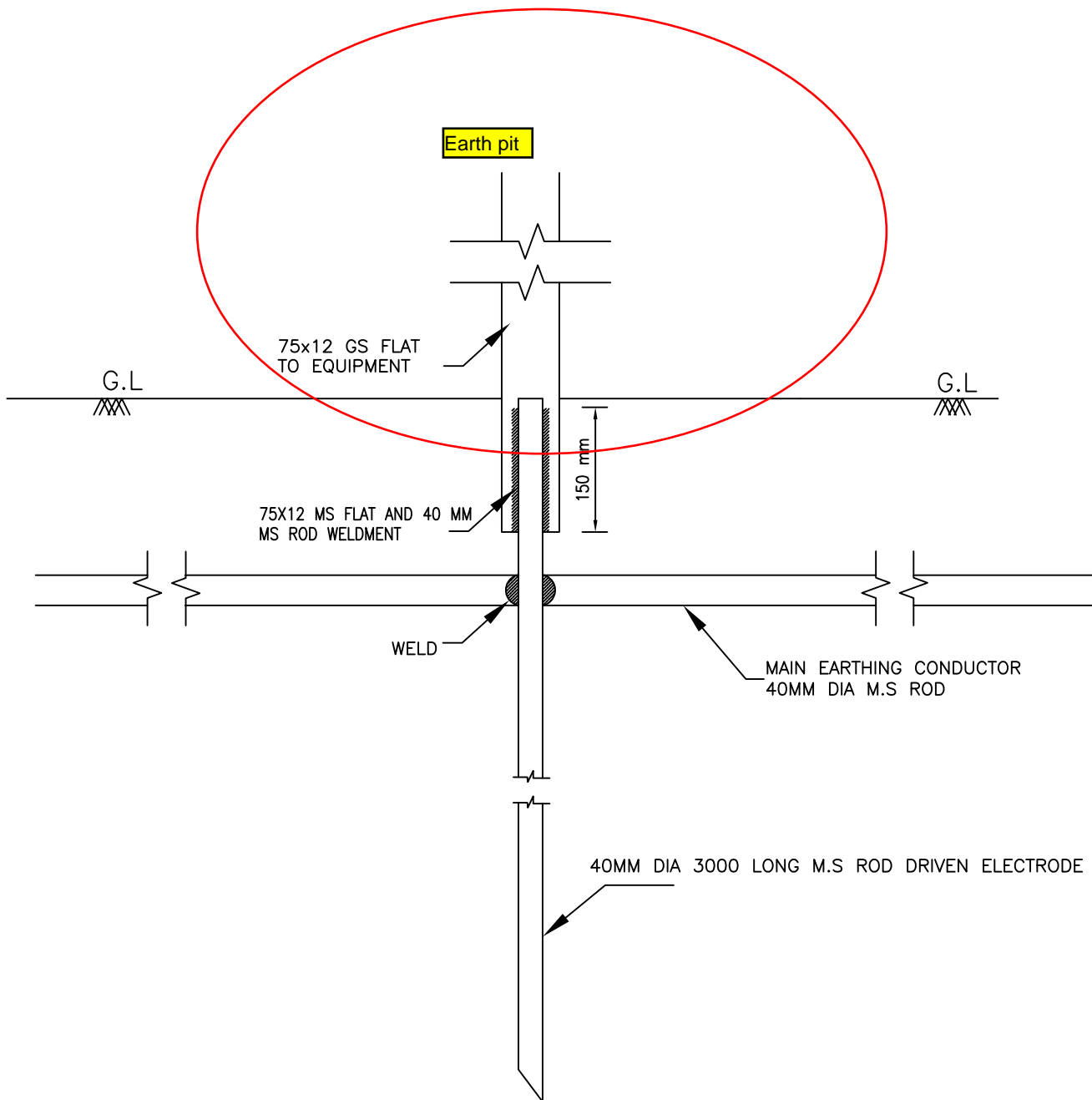


**NOTE:**

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 TRANSFORMER /REACTOR NEUTRAL



# EQUIPMENT EARTHING DETAILS PIPE EARTH ELECTRODE WITH TREATED PIT



APPLICABLE FOR CVT & LA

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.



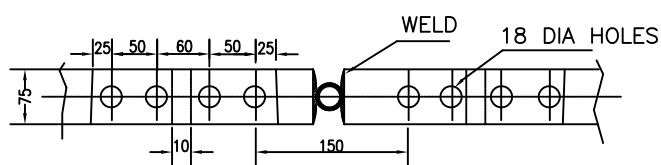
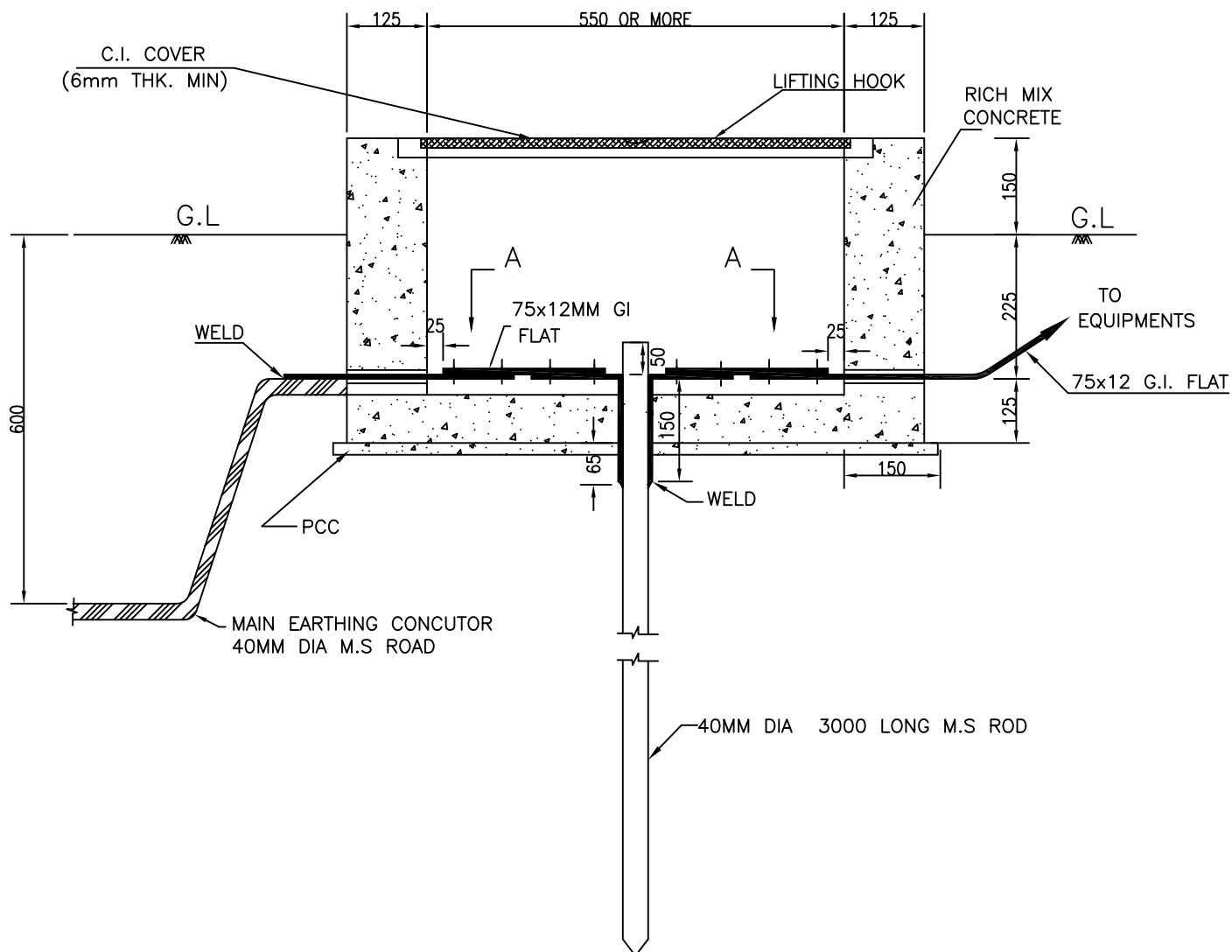
# EQUIPMENT EARTHING DETAILS ROD ELECTRODE WITHOUT PIT (FOR CVT & LA)

COMPU. DRG. REF.

DRG.NO.

TB-397-316-021

SHEET No. 8A



VIEW-'A'

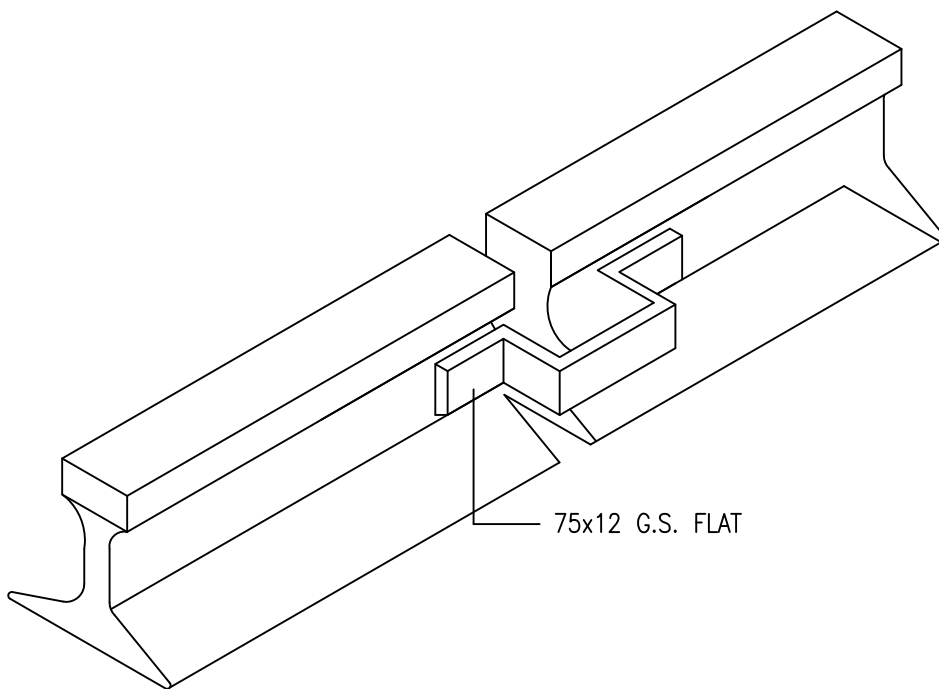
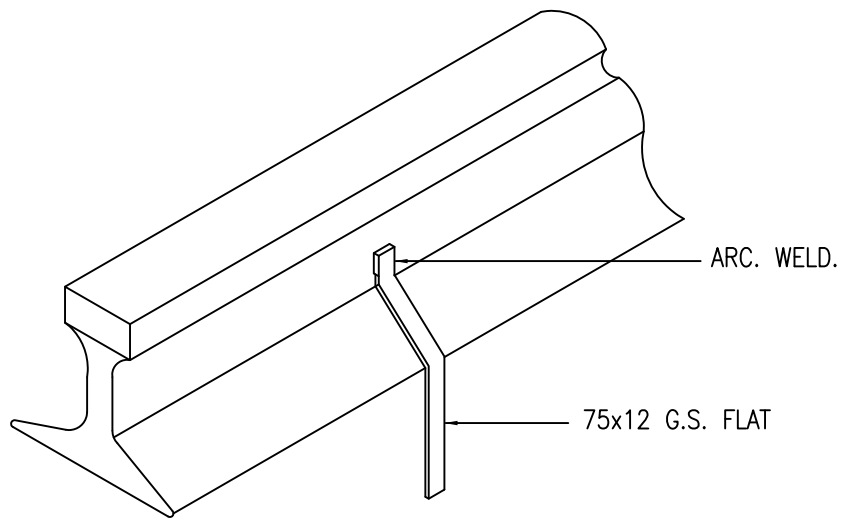
NOTES:-

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 LIGHTNING MASTS & TOWERS WITH PEAK.



# EQUIPMENT EARTHING DETAILS

ROD EARTH ELECTRODE WITH TEST PIT FOR TOWERS WITH PEAK



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

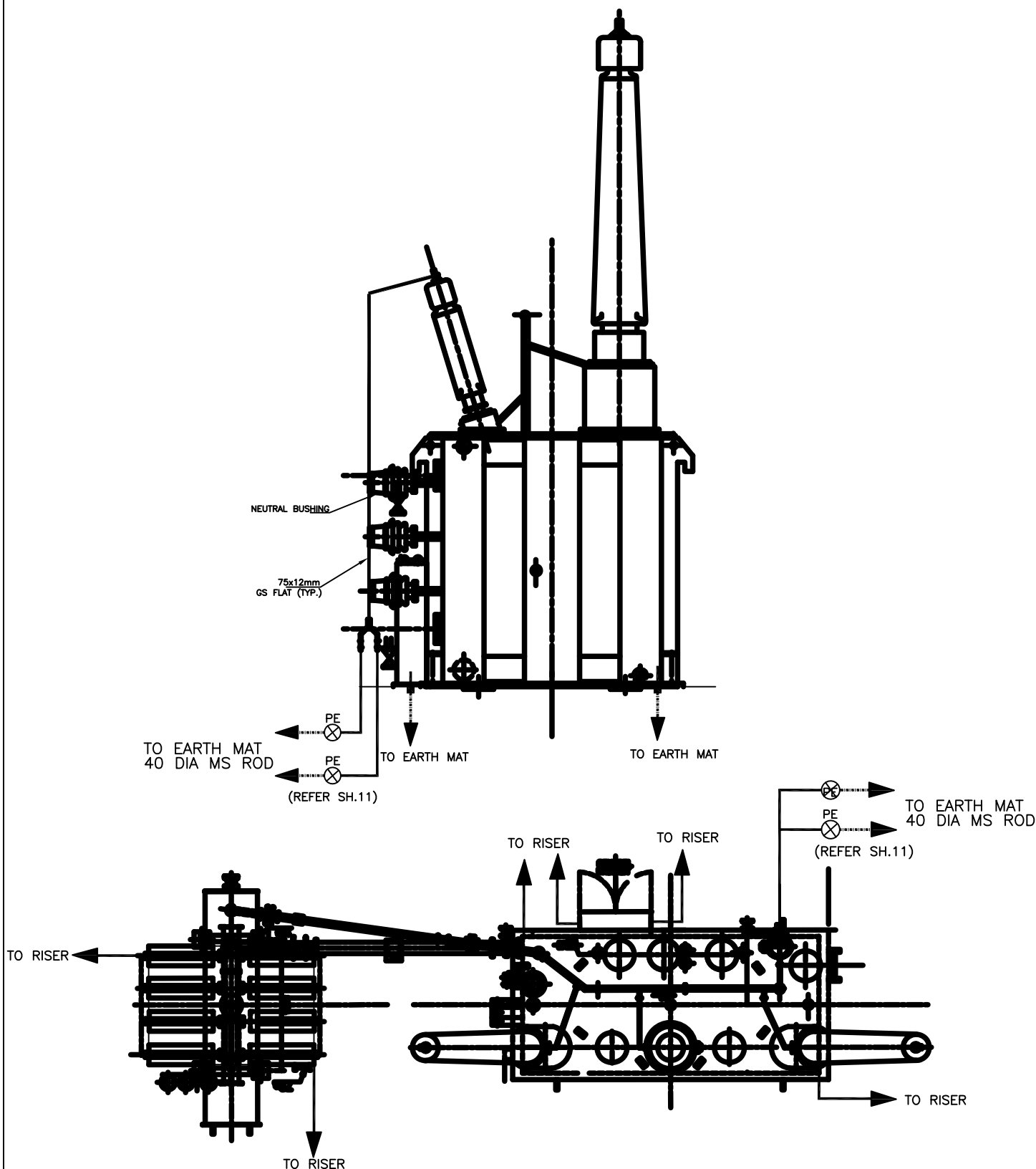
COMPU. DRG. REF.

DRG. NO.

TB-397-316-021

SHEET No.

09



MINIMUM DISTANCE OF 6000MM SHALL BE MAINTAINED BETWEEN TWO TREATED (PIPE) ELECTRODES.

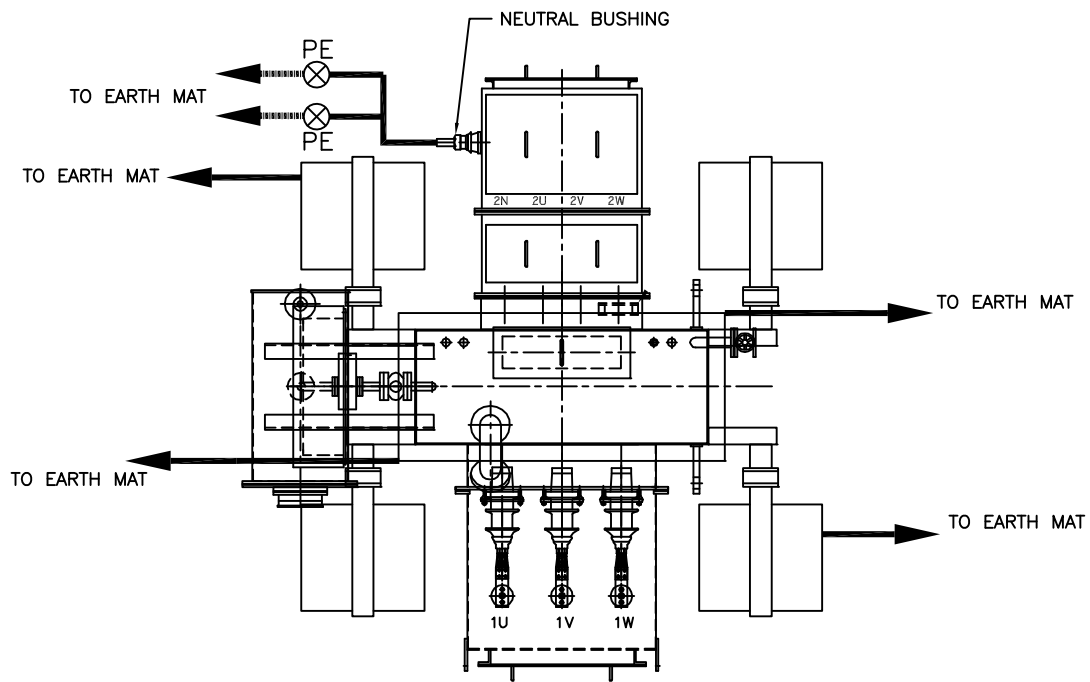
NO. OF PIPE EARTH ELECTRODE WITH TREATED PIT (REFER SHEET NO. 11) = 2 NOS.

NO.OF RISERS = 8 NOS. FOR EARTHING OF FOLLOWING PARTS OF 400KV BUS REACTOR  
(TWO EARTHING STRIPS CAN BE CONNECTED TO ONE RISER)

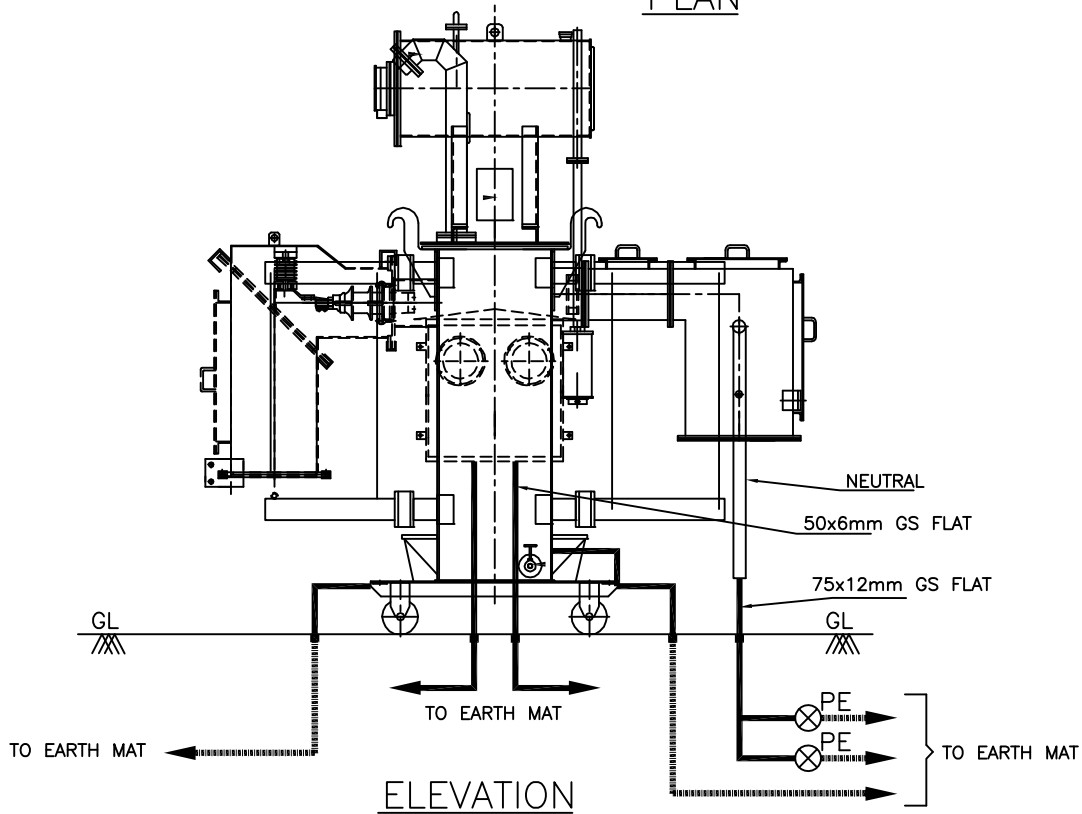
- MAIN TANK – 2 Nos. (75x12 GS FLAT)
- RADIATOR SUPPORT – 2 Nos. (75x12 GS FLAT)
- CONTROL CABINET/MB – 2 Nos. (50x6 GS FLAT)
- NEUTRAL EARTHING – 2 Nos. (75x12 GS FLAT THROUGH PIPE ELECTRODE)



## EQUIPMENT EARTHING DETAILS BUS REACTOR



PLAN



ELEVATION

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 = 6 NOS. FOR EARTHING OF FOLLOWING PARTS OF TRANSFORMER

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

MAIN TANK 2 Nos. (75x12 GS FLAT)

RADIATOR BANK 2 Nos. (75x12 GS FLAT)

MARSHALLING BOX 2 Nos. (50x6 GS FLAT)

NEUTRAL EARTHING 2 Nos. (75x12 GS FLAT THROUGH PIPE ELECTRODE)



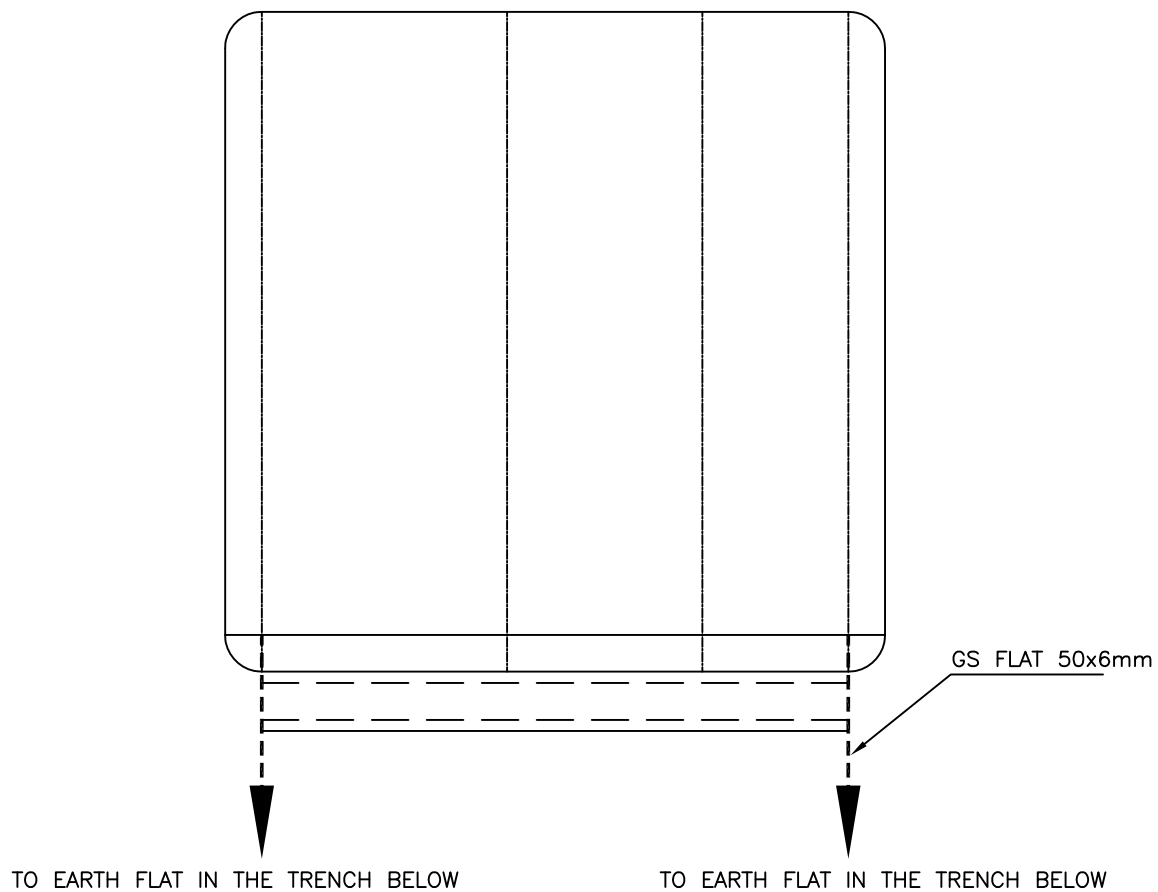
## EQUIPMENT EARTHING DETAILS

### SWITCHYARD SERVICE TRANSFORMER

DRG. No.

TB-397-316-021

SHEET No.  
10B

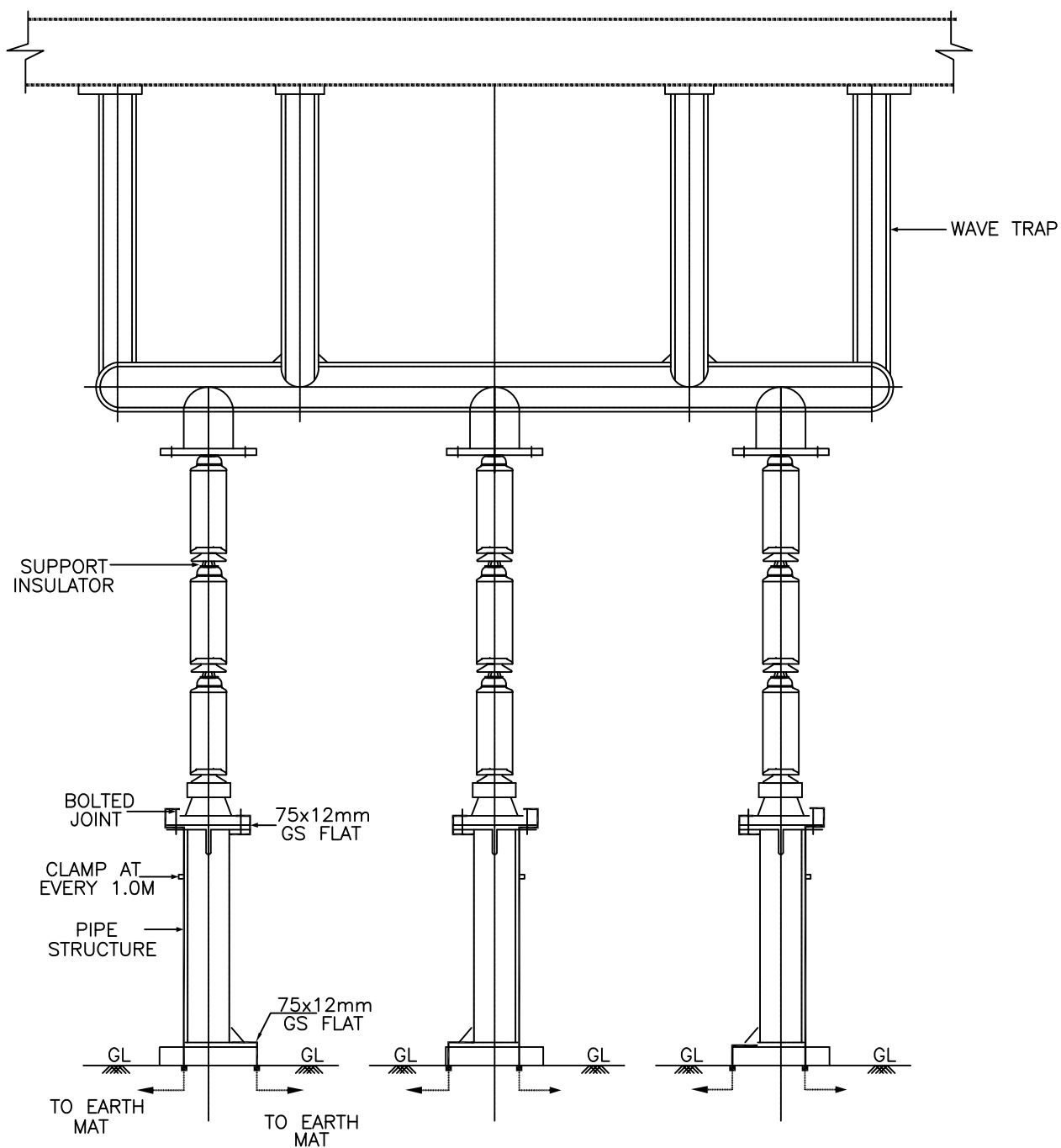


## EQUIPMENT EARTHING DETAILS

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

DRG. No. TB-397-316-021

SHEET No.  
11



NOS.OF RISERS= 2 NOS./STRUCTURE



## EQUIPMENT EARTHING DETAILS 400kV WAVE TRAP

COMPUTERREF.NO.

DRG. No.

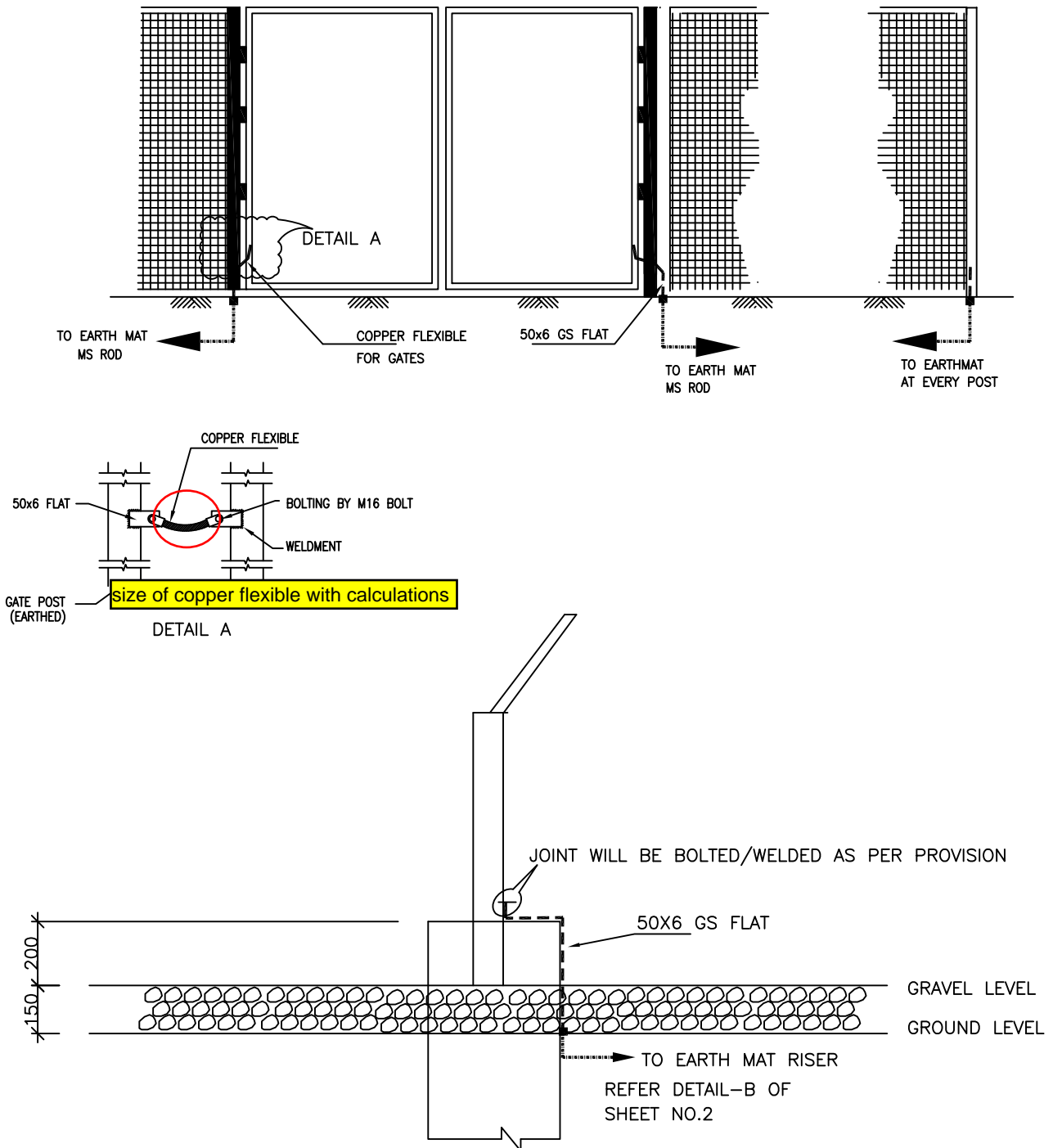
TB-397-316-021

SHEET No.  
12



## FENCE GATE

## FENCE GROUNDING



EVERY POST OF FENCE & GATES SHALL BE CONNECTED TO EARTHING LOOP BY 50X6 MM GS FLAT.  
EARTHING CONDUCTOR SHALL BE BURIED 2000mm OUTSIDE THE SWITCHYARD FENCE.

## FENCE EARTHING

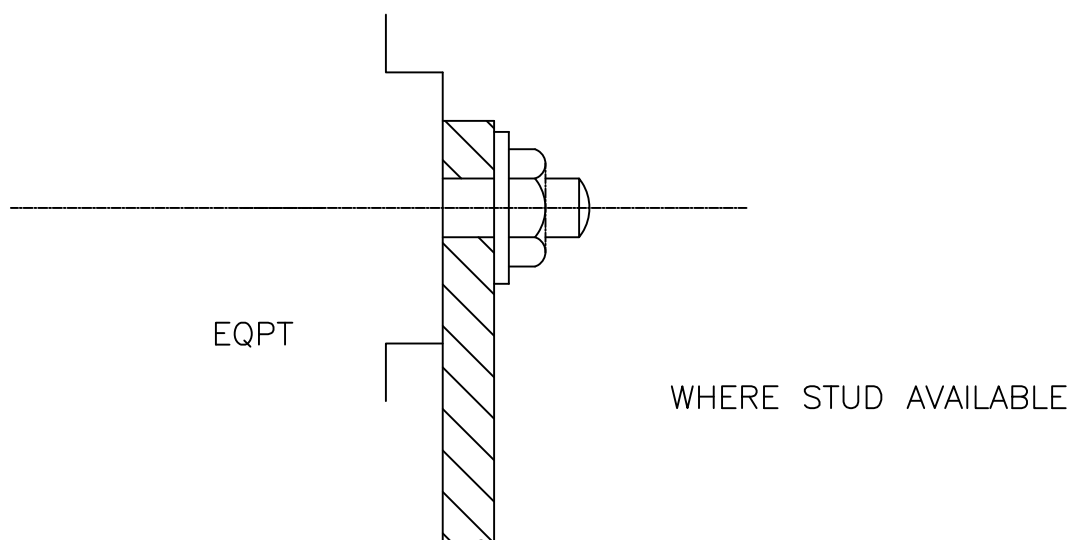


## EQUIPMENT EARTHING DETAILS GATE/FENCE POST

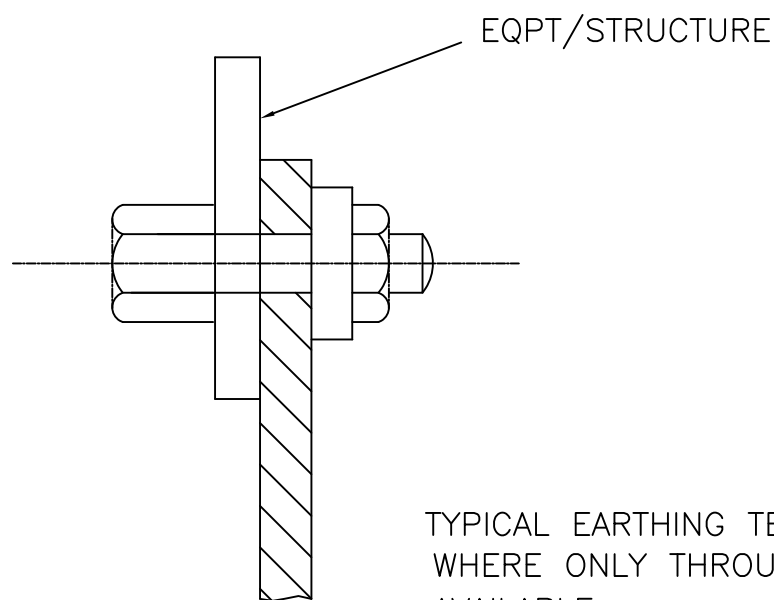
DRG. No.

TB-397-316-021

SHEET No.  
13



TYPICAL EARTHING TERMINAL JOINT



### 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



## EQUIPMENT EARTHING DETAILS

### TYPICAL ARRANGEMENT OF BOLTED JOINTS

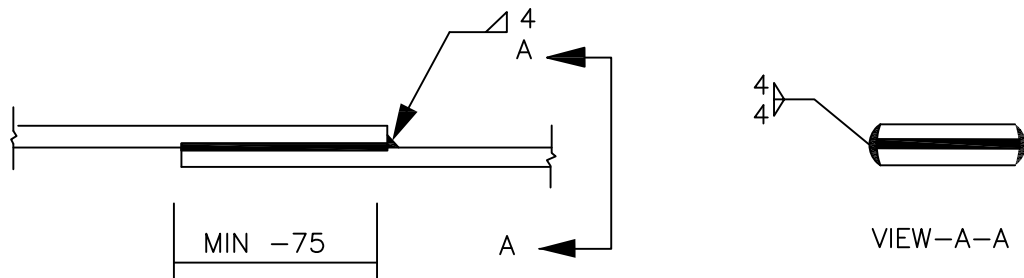
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TB-397-316-021

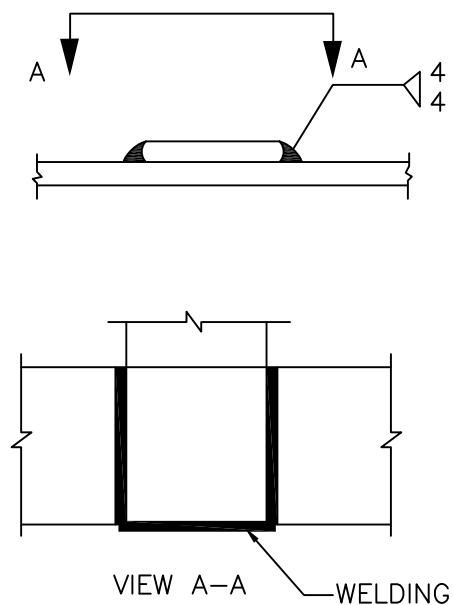
SHEET No.  
14

## STRIP TO STRIP (75x12/50X6 MS FLAT)

### 1. STRAIGHT LAP JOINT/RISER



### 2. CROSS LAP JOINT



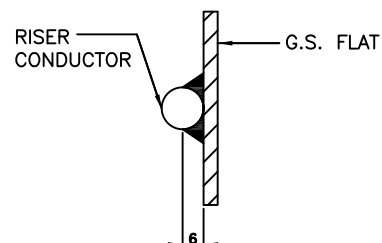
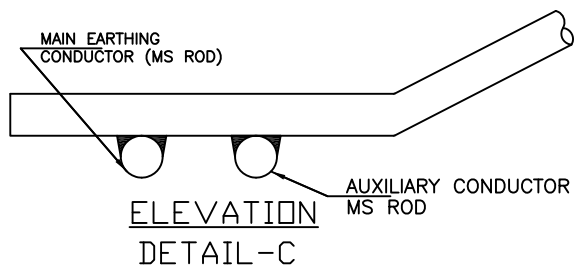
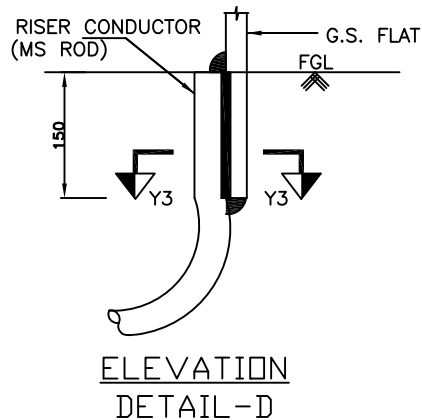
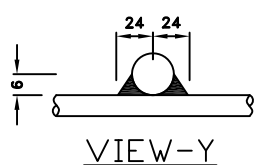
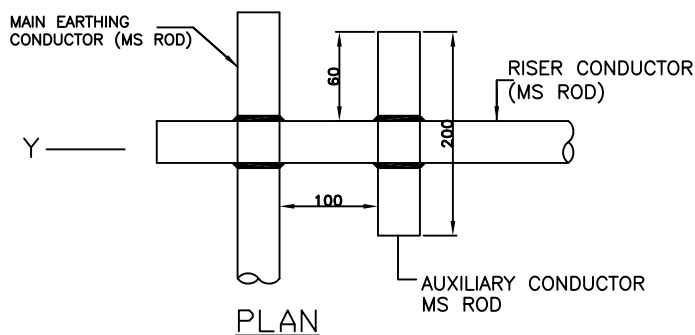
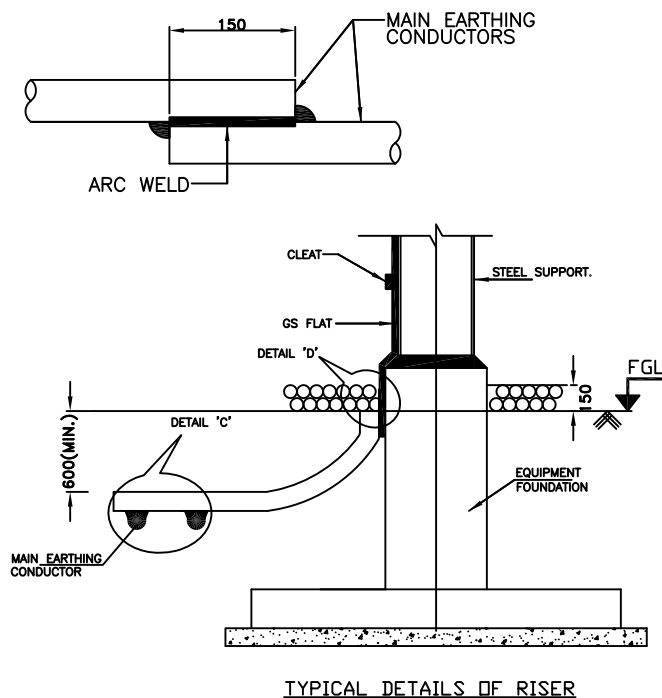
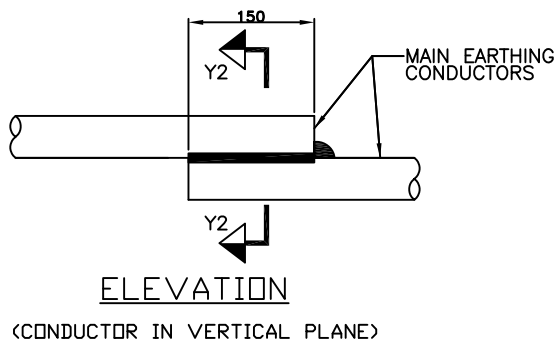
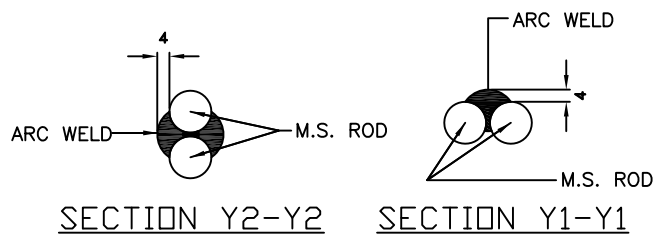
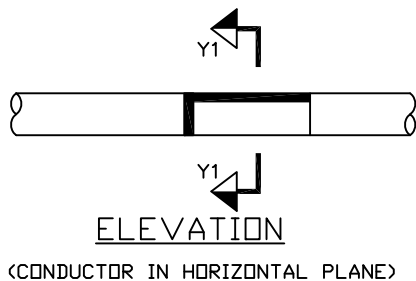
EQUIPMENT EARTHING DETAILS  
WELDING DETAILS

COMPUTERREF.NO.

DRG. No.

TB-397-316-021

SHEET No.  
15



**TYPICAL OVERLAPPING JOINT OF TWO CONDUCTORS**



# **EQUIPMENT EARTHING DETAILS** **WELDING DETAILS**