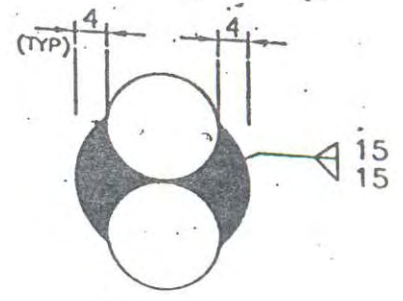
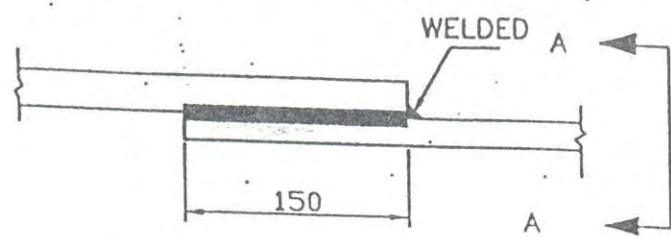


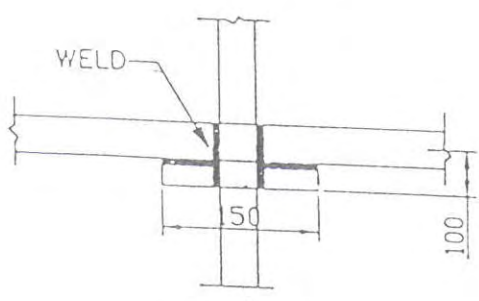
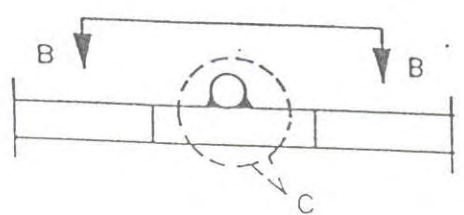
• ROD TO ROD

1. STRAIGHT LAP JOINT/RISER

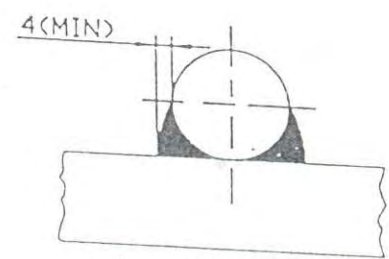


VIEW A-A

2. RIGHT ANGLED JOINT

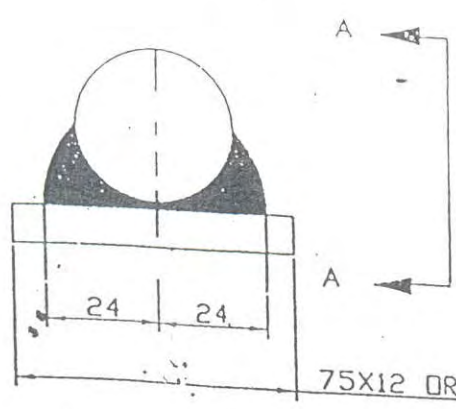


VIEW B-B

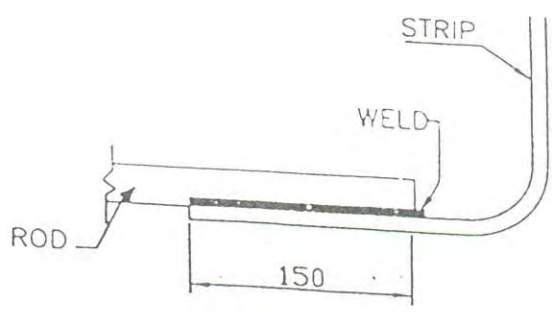


VIEW C

3. ROD TO STRIP



75X12 OR 50X6 GI FLAT



VIEW A-A



EQUIPMENT EARTHING DETAILS

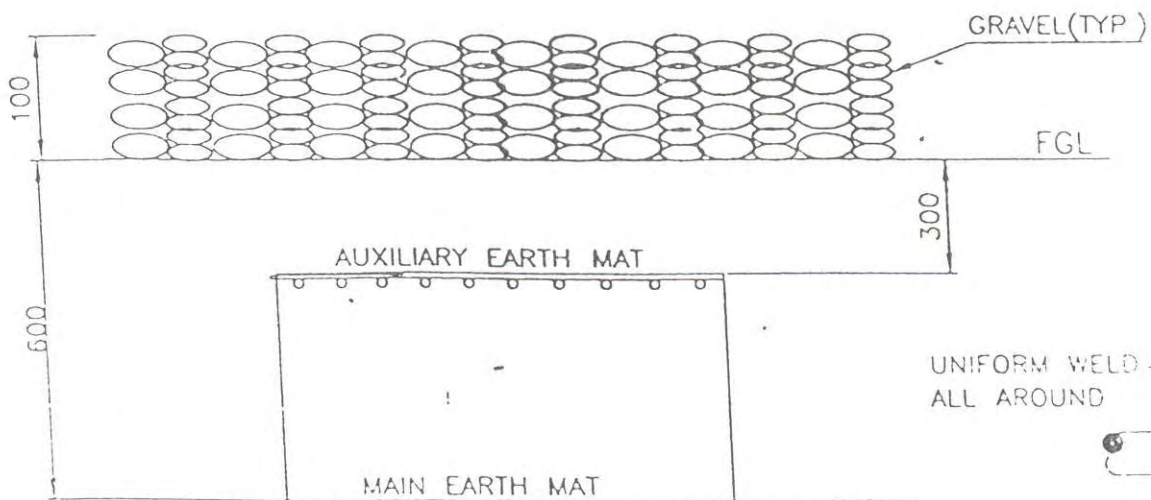
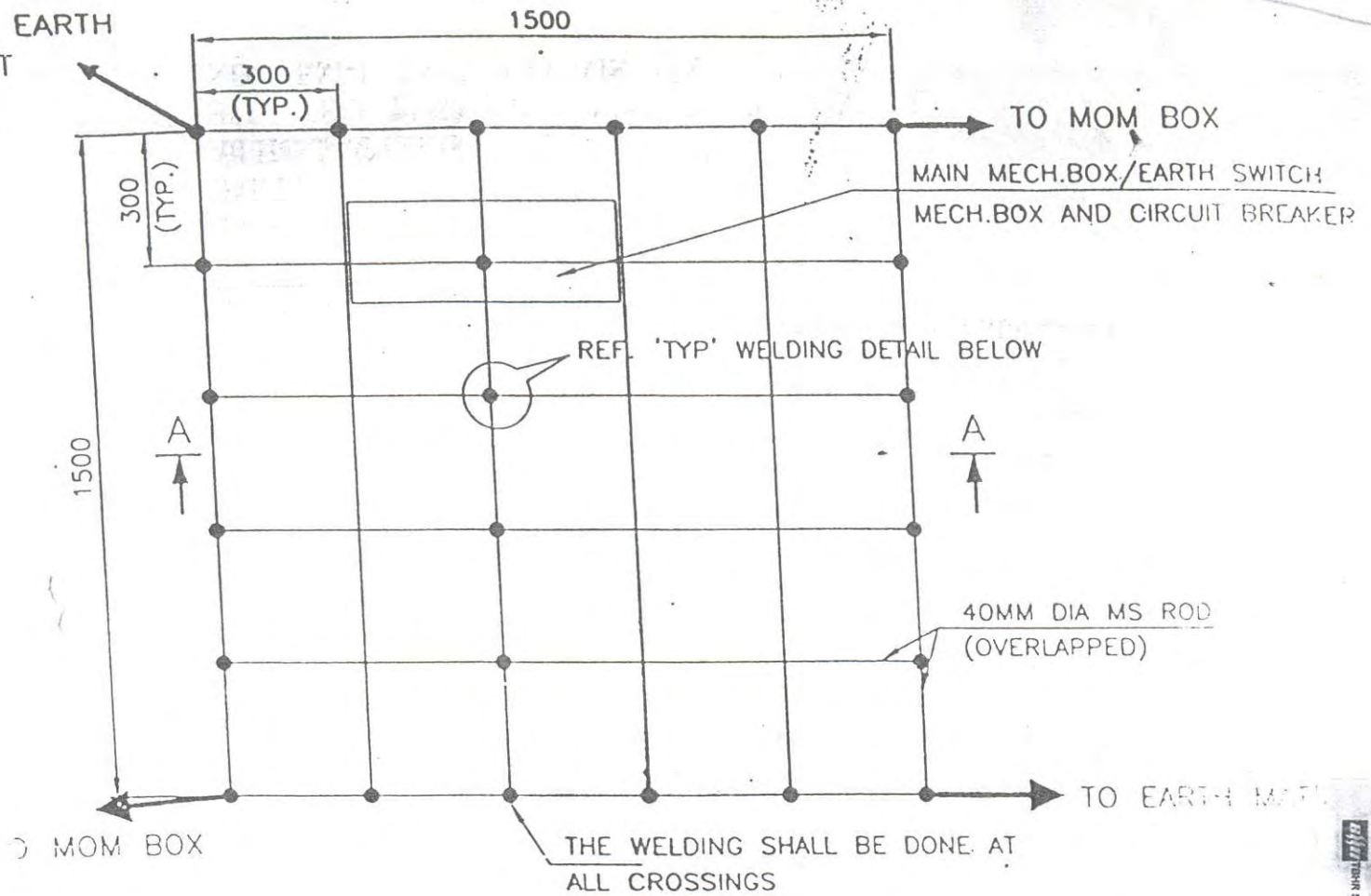
DRG No.

DRG No.

TB-STD-316-Rod Welding

REV. 00

SHEET No. 00



UNIFORM WELD
ALL AROUND



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.



CC MPD DRC REF.

Report No

EQUIPMENT EARTHING DETAILS

AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH. E/S
MECH. BOX & CB (TYP.)

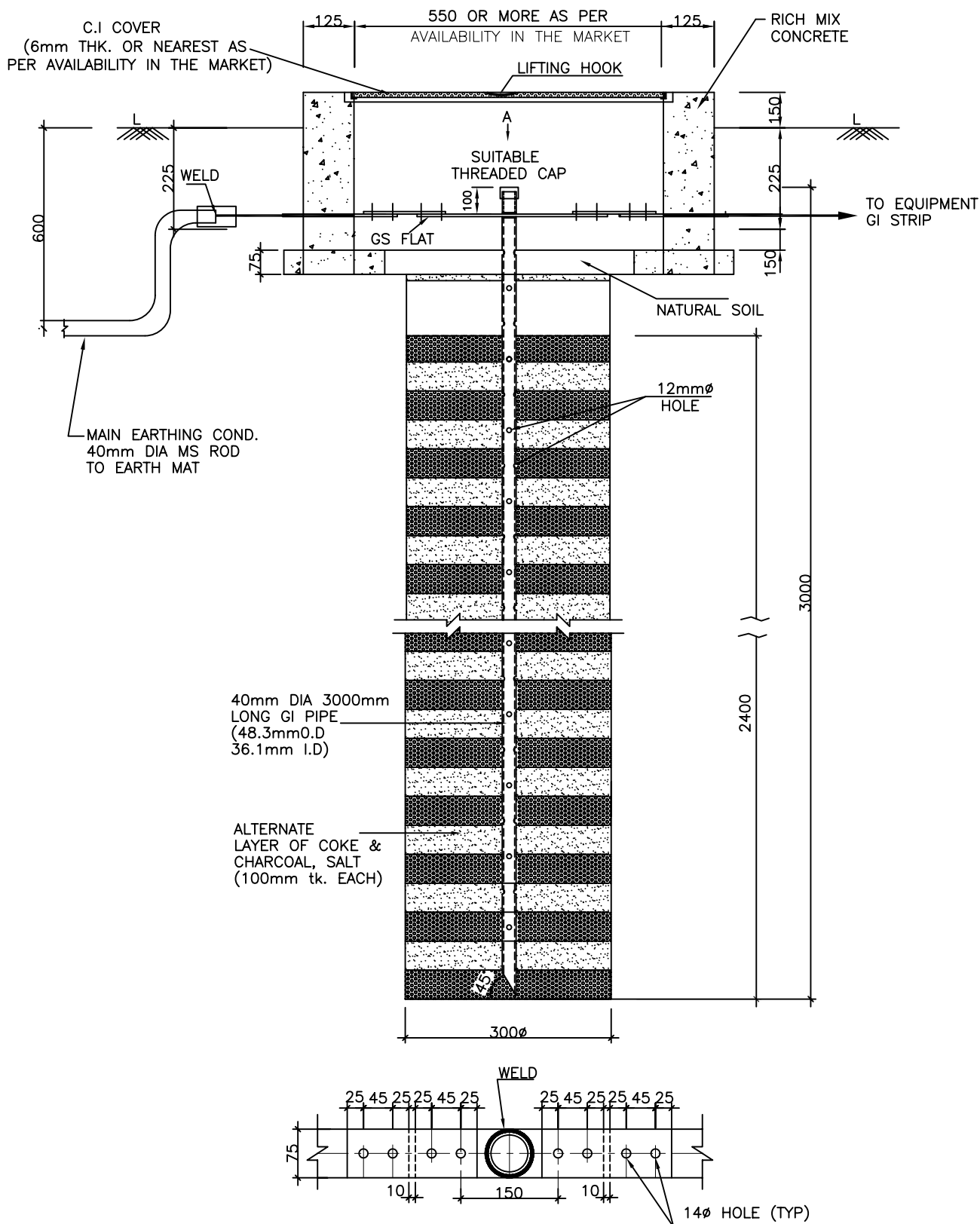
TB-STD-316-Auxiliary Mat.



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 PROTECTION SYSTEM.
3. PIPE SLEEVE ENDS SHALL BE SEALED AFTER COMPRETION OF WORK.



SHEET No.



VIEW-A

NOTE:

1. ALL NUTS,BOLTS AND WASHERS SHALL BE GALVANISED AS PER SPECIFICATION.



EQUIPMENT EARTHING DETAILS
DETAILS OF PIPE EARTH ELECTRODE
IN TREATED EARTH PIT (ET)

COMPUTERREF.NO.

DRG. No.

TB-4-342-316-PIPE ELECTRODE

8.0 EARTHING

8.1 The earthing shall be done in accordance with requirements given hereunder and drawing titled 'Earthing Details' enclosed with the specification. ***The spacing for the main earthmat shall be provided by the owner and the earthmat layout drawings shall be prepared by the contractor based on the spacing provided by the owner. The resistivity of the stone for spreading over the ground shall be considered as 3000 ohm-m.*** The resistivity measurement of stone (to be used for stone spreading) shall also be done by the Contractor to confirm the ***minimum*** resistivity value of stone considered in earth mat design. For measurement purpose, one sample of stones from each source (in case stones are supplied from more than one source) shall be used. The main earthmat shall be laid in the switchyard area in accordance with the approved ***earthmat layout***.

8.2 Neutral points of systems of different voltages, metallic enclosures and frame works associated with all current carrying equipments and extraneous metal works associated with electric system shall be connected to a single earthing system unless stipulated otherwise.

8.3 Earthing and lightning protection system installation shall be in strict accordance with the latest editions of Indian Electricity Rules, relevant Indian Standards and Codes of practice and Regulations existing in the locality where the system is installed.

- a) Code of practice for Earthing IS: 3043
- b) Code of practice for the protection of Building and allied structures against lightning IS: 2309.
- c) Indian Electricity Rules 1956 with latest amendments.
- d) National Electricity Safety code IEEE-

80.

8.4 Details of Earthing System

Sl. No.	Item	Size	Material
a)	Main Earthing Conductor to be buried in ground	40mm dia	Mild Steel rod
b)	Conductor above ground & earthing leads (for equipment)	75x12mm G.S. flat	Galvanised Steel
c)	Conductor above ground & earthing leads (for columns & aux. structures)	75x12mm G.S. flat	Galvanised Steel

d)	Earthing of indoor LT panels, Control panels and out door marshalling boxes, MOM boxes, Junction boxes & Lighting Panels etc.	50x6 mm G.S. flat	Galvanised Steel
e)	Rod Earth Electrode	40mm dia, 3000mm long	Mild Steel
f)	Pipe Earth Electrode (in treated earth pit) as per IS.	100mm dia, 2750mm long	Galvanised steel
g)	Earthing for motors	25x3mm GS flat	Galvanised steel
h)	Earthing conductor along outdoor cable trenches	50x6mm MS flat	Mild steel
l)	Earthing of Lighting Poles	20 mm dia 3000 mm long	Mild steel rod

The sizes of the earthing conductor indicated above are the minimum sizes and indicative. The exact size will be finalized during approval of Engineering drawings.

8.5 Earthing Conductor Layout

8.5.1 Earthing conductors in outdoor areas shall be buried at least 600 mm below finished ground level unless stated otherwise.

8.5.2 Wherever earthing conductor crosses cable trenches, underground service ducts, pipes, tunnels, railway tracks etc., it shall be laid minimum 300 mm below them and shall be circumvented in case it fouls with equipment/structure foundations.

8.5.3 Tap-connections from the earthing grid to the equipment/structure to be earthed shall be terminated on the earthing terminals of the equipment/structure as per "**Standard** Earthing Details –

8.5.4 Earthing conductors or leads along their run on cable trench, ladder, walls etc. shall be supported by suitable welding/cleating at intervals of 750 mm. Wherever it passes through walls, floors etc., galvanised iron sleeves shall be provided for the passage of the conductor and both ends of the sleeve shall be sealed to prevent the passage of water through the sleeves.

8.5.5 Earthing conductor around the building shall be buried in earth at a minimum distance of 1500 mm from the outer boundary of the building. In case high temperature is encountered at some location, the earthing conductor shall be laid minimum 1500 mm away from such location.

8.5.6 Earthing conductors crossing the road shall be laid 300 mm below road or at greater depth to suit the site conditions.

8.5.7 Earthing conductors embeded in the concrete shall have approximately 50 mm concrete cover.

8.6 Equipment and Structure Earthing

- 8.6.1 Earthing pads shall be provided for the apparatus/equipment at accessible position. The connection between earthing pads and the earthing grid shall be made by two short earthing leads (one direct and another through the support structure) free from kinks and splices. In case earthing pads are not provided on the item to be earthed, same shall be provided in consultation with Owner.
- 8.6.2 Whether specifically shown in drawings or not, steel/RCC columns, metallic stairs etc. shall be connected to the nearby earthing grid conductor by two earthing leads. Electrical continuity shall be ensured by bonding different sections of hand-rails and metallic stairs.
- 8.6.3 Metallic pipes, conduits and cable tray sections for cable installation shall be bonded to ensure electrical continuity and connected to earthing conductors at regular interval. Apart from intermediate connections, beginning points shall also be connected to earthing system.
- 8.6.4 Metallic conduits shall not be used as earth continuity conductor.
- 8.6.5 Wherever earthing conductor crosses or runs along metallic structures such as gas, water, steam conduits, etc. and steel reinforcement in concrete it shall be bonded to the same.
- 8.6.6 Light poles, junction boxes on the poles, cable and cable boxes/glands, lockout switches etc. shall be connected to the earthing conductor running alongwith the supply cable which inturn shall be connected to earthing grid conductor at a minimum two points whether specifically shown or not.
- 8.6.7 Railway tracks within switchyard area shall be earthed at a spacing of 30m and also at both ends.
- 8.6.8 Earthing conductor shall be buried 2000 mm outside the switchyard fence. All the gates and every alternate post of the fence shall be connected to earthing grid.
- The stone spreading shall also be done 2000 mm outside switchyard fence. The criterion for stone spreading shall be followed in line with requirement specified elsewhere in the specification
- 8.6.9 Flexible earthing connectors shall be provided for the moving parts.
- 8.6.10 All lighting panels, junction boxes, receptacles fixtures, conduits etc. shall be grounded in compliance with the provision of I.E. rules
- 8.6.11 A continuous ground conductor of 16 SWG GI wire shall be run all along each conduit run. The conductor shall be connected to each panel ground bus. All junction boxes, receptacles, switches, lighting fixtures etc. shall be connected to this 16 SWG ground conductor.
- 8.6.12 50mm x 6mm MS flat shall run on the top tier and all along the cable trenches and the same shall be welded to each of the racks. Further this flat shall be

earthed at both ends and at an interval of 30 mtrs. The M.S. flat shall be finally painted with two coats of Red oxide primer and two coats of Post Office red enamel paint.

- 8.6.13 A 40 mm dia, 3000 mm long MS earth electrode with test link, CI frame and cover shall be provided to connect down conductor of **surge arrester, capacitive voltage transformer**, lightning mast and towers with peak.

8.7 Jointing

- 8.7.1 Earthing connections with equipment earthing pads shall be bolted type. Contact surfaces shall be free from scale, paint, enamel, grease, rust or dirt. Two bolts shall be provided for making each connection. Equipment bolted connections, after being checked and tested, shall be painted with anti corrosive paint/compound.

- 8.7.2 Connection between equipment earthing lead and main earthing conductors and between main earthing conductors shall be welded type. For rust protections, the welds should be treated with red lead and afterwards coated with two layers bitumen compound to prevent corrosion.

- 8.7.3 Steel to copper connections shall be brazed type and shall be treated to prevent moisture ingress.

- 8.7.4 Resistance of the joint shall not be more than the resistance of the equivalent length of the conductor.

- 8.7.5 All ground connections shall be made by electric arc welding. All welded joints shall be allowed to cool down gradually to atmospheric temperature before putting any load on it. Artificial cooling shall not be allowed.

- 8.7.6 Bending of earthing rod shall be done preferably by gas heating.

- 8.7.7 All arc welding with large dia. conductors shall be done with low hydrogen content electrodes.

- 8.7.8 The 75x12mm GS flat shall be clamped with the equipment support structures at 1000mm interval.

8.8 Power Cable Earthing

Metallic sheaths and armour of all multi core power cables shall be earthed at both equipment and switchgear end. Sheath and armour of single core power cables shall be earthed at switchgear end only.

8.9 Specific Requirement for Earthing Systems

- 8.9.1 Each earthing lead from the neutral of the power transformer/Reactor shall be directly connected to two pipe electrodes in treated earth pit (as per IS) which in turn, shall be buried in Cement Concrete pit with a cast iron cover hinged to a cast iron frame to have an access to the joints. All accessories associated with transformer/reactor like cooling banks, radiators etc. shall be connected to the

earthing grid at minimum two points.

- 8.9.2 Earthing terminal of each lightning arrester & capacitor voltage transformer shall be directly connected to rod earth electrode which in turn, shall be connected to station earthing grid.
- 8.9.3 Auxiliary earthing mat comprising of 40mm dia M.S. rods closely spaced (300 mm x 300 mm) conductors shall be provided at depth of 300mm from ground level below the operating handles of the M.O.M. Box of the isolators. M.O.M. boxes shall be directly connected to the auxiliary earthing mat.