







Clause No.	TECHNICAL REQUIREMENTS			
	ANNEXURE-I			
1.00.00	EARTHING NOTES			
1.00.01	GENERAL			
	Earthing of operating boxes, cubicles shall be done by 50 X 6 mm GS flat while cable trenches and structure by 75 X 12 mm GS flat.			
1.00.02	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 systems unless stipulated otherwise.			
1.00.03	Earthing 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.			
1.00.04	<del>Bolts and nuts required for earthing all main equipment structures and for connecting with earthing system as explained in Cl. 1.00.02 above shall be in the scope of the Contractor.</del>			
2.00.00	DETAILS OF EARTHING SYSTEM			
	Item	Size	Material	
	Main Earthing conductor	40mm dia rod	Mild steel	
	Conductor above ground & earthing leads (for equipment)	75 x 12/ G.S. Flat 50 x 6 mm	Galvanized steel	
	Rod Electrode	40mm dia, 3000mm	Mild steel	
	G.I. Earthwire	7/8 SWG	GI	
3.00.00	EARTHING CONDUCTOR LAYOUT			
3.00.01	Earthing conductors in outdoor areas shall be burried atleast 600mm below finished grade level unless stated otherwise.			
3.00.02	Minimum 6000mm or higher spacing between rod electrodes shall be provided based on the earthmat design calculations.			
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Clause No.	TECHNICAL REQUIREMENTS				
3.00.03	Wherever earthing conductors cross cable trenches, underground service ducts, pipes, tunnels, railway tracks etc., it shall be laid atleast 300mm below them and shall be re-routed in case it fouls with equipment/structure foundations.				
3.00.04	Tap connections from the earthing grid to the equipment/structure to be earthed, shall be terminated on the earthing terminals of the equipment/structure, if the equipment is available at the time of laying the grid. Otherwise, "earth insert" with temporary wooden cover or "earth riser" shall be provided near the equipment foundation/pedestal for future connections to the equipment earthing terminals.				
3.00.05	Earthing conductor along their run on cable trench ladder columns, beams, walls, etc. shall be supported by suitable welding/cleating at intervals of 750mm. Earthing conductors along cable trenches shall be on the wall nearer to the equipment. Wherever it passes through walls, floors etc. galvanized iron sleeves shall be provided for the passage of the conductor. Both ends of the sleeves shall be sealed to prevent the passage of water through the sleeves.				
3.00.06	Earthing conductor around the building shall be buried in earth at a minimum distance of 1500mm from the outer boundary of the building. In case high temperature is encountered at some location, the earthing conductor shall be laid minimum 1500mm away from such location.				
3.00.07	In outdoor areas, tap connections shall be brought 300mm above ground level for making connections in future, in case equipment is not available at the time of grid installations.				
3.00.08	Earthing conductors crossing the road shall be either installed in hume pipes or laid at greater depth to suit the site conditions.				
3.00.09	Earthing conductors embedded in the concrete fibre shall have approximately 50mm concrete cover.				
4.00.00	EQUIPMENT AND STRUCTURE EARTHING				
4.00.01	The connection between earthing pads and the earthing grid shall be made by short and direct earthing leads 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 engineer.				
4.00.02	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.				
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Clause No.	TECHNICAL REQUIREMENTS			
4.00.03	Metallic conduits shall not be used as earth continuity conductor.			
4.00.04	A separate earthing conductor shall be provided for earthing lighting fixtures, lighting poles, receptacles, switches, junction boxes, lighting conduits, etc.			
4.00.05	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.			
4.00.06	<del>Cable and cable boxes/glands, lockout switches etc. shall be connected to the earthing conductor running along with the supply cable which, in turn, shall be connected to earthing grid conductor at minimum two points, whether specifically shown or not.</del>			
4.00.07	Railway tracks within switchyard area shall be bonded across fish plates and connected to earthing grid at several locations.			
4.00.08	Earthing conductor shall be buried 2000mm outside the switchyard fence. Every post of the fence and gates shall be connected to earthing loop by one lead.			
4.00.09	Flexible earthing connectors shall be provided where flexible conduits are connected to rigid conduits to ensure continuity.			
4.00.10	Equipment earthing (Riser & welding of two conductors) shall be done as per enclosed sketch. Drg. No. 9561-572-POE-A -015.			
5.00.00	<b>JOINTING</b>			
5.00.01	Earthing connections with equipment earthing pads shall be of bolted type. Contact surfaces shall be free from scales, 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.			
5.00.02	Connection between equipment earthing lead and between main earthing conductors shall be welded/brazed type. For rust protections, the welds should be treated with red lead and afterwards thickly coated with bitumen compound to prevent corrosion.			
5.00.03	Steel to copper connections shall be brazed type and shall be treated to prevent moisture ingress.			
5.00.04	Resistance of the joint shall not be more than the resistance of the equivalent length of the conductor.			
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Clause No.	TECHNICAL REQUIREMENTS	
5.00.05	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.	
5.00.06	Bending of large diameter rod/thick conductor shall be done preferably by gas heating.	
5.00.07	All arc welding with large diameter conductors shall be done with low hydrogen content electrodes.	
6.00.00	<b>POWER CABLE EARTHING</b> <del>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.</del>	
7.00.00	<b>SPECIFIC REQUIREMENT FOR EARTHING SYSTEMS</b>	
7.00.01	Earthing terminal of each surge arrester, capacitor voltage transformer and lightning down conductors shall be directly connected to rod electrode which in turn, shall be connected to station earthing grid.	
7.00.02	Earthing mat comprising of closely spaced (300mm x 300mm) conductors shall be provided below the operating handles of the isolators.	
8.00.00	<b>SPECIFIC REQUIREMENTS FOR LIGHTNING PROTECTION SYSTEM</b>	
8.00.01	Conductors of the lightning protection system shall not be connected with the conductors of the safety earthing system above ground level.	
8.00.02	Down conductors shall be cleated on the structures at 2000mm interval.	
8.00.03	Connection between each down conductor and rod electrodes shall be made via test joint located approximately 150mm above ground level.	
8.00.04	Lightning conductors shall not pass through or run inside G.I. conduits.	
8.00.05	Lightning protection system installation shall be in strict accordance with the latest editions of Indian Electricity Rules, Indian Standards and Codes of practice and Regulations existing in the locality where the system is installed.	
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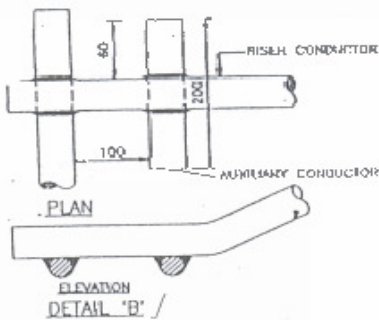
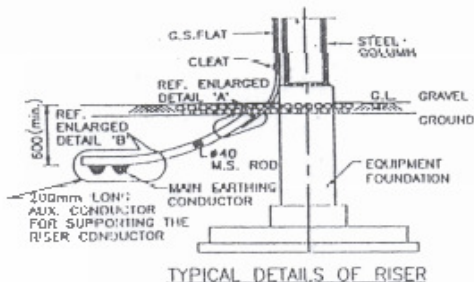
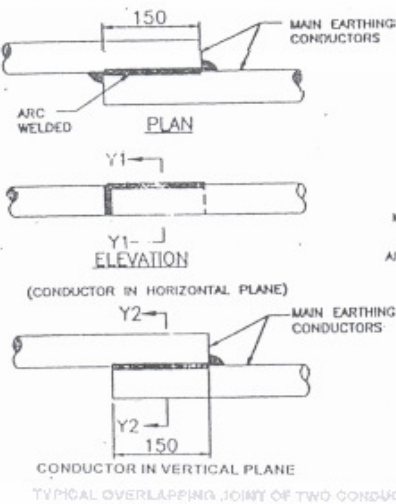
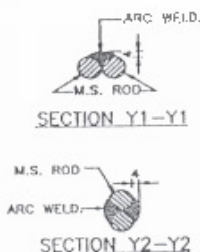
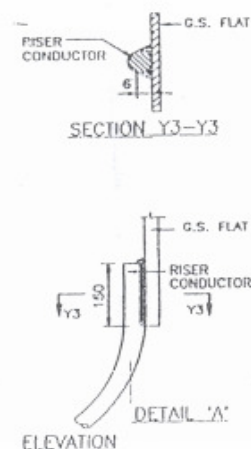
Clause No.	TECHNICAL REQUIREMENTS				
A.	<b>PROCEDURE FOR NON DESTRUCTIVE TESTING</b>				
	a)	<b>LIQUID PENETRANT EXAMINATION OF WELDED JOINTS</b>			
		<b>Evaluation of indications:</b>			
		Relevant indications are those which result from mechanical discontinuities. Rounded indications or indications which are circular or elliptical with the length less than three times the width.			
		Linear indications are those indications in which the length is more than three times the width.			
	Any questionable or doubtful indications, shall be retested to verify whether or not actual defects are present.				
	Localised surface imperfections, such as may occur from machining marks, surface conditions, may procedure similar indications which are not relevant to the detection of unacceptable discontinuities.				
b)	<b>Acceptance Standards</b>				
	All surfaces to be examined shall be free of				
	linear indications;				
	four or more rounded defects with any dimensions more than 1.6mm in a line separated by 1.16 inch (1.6mm) or less (edge to edge).				
c)	<b>Defect removal and repair:</b>				
	Unacceptable imperfections shall be removed and re-examination made to assure the complete removal. Whenever a defect is removed and subsequent repair by welding is not required, the excavated area shall be blended into the surrounding surface so as to avoid sharp notches, crevices or corners. Where welding is required after removal of a defect, the area shall be cleaned and welding performed in accordance with a qualified welding procedure. Completed repairs shall be re-examined by the method originally used for detection of the defect.				
d)	<b>Treatment of imperfections believed non-relevant:</b>				
	Any indication of an imperfection which is believed to be non-relevant shall be regarded as a defect unless, on re-evaluation, it is shown by re-examination by the same method or by the use of other non-destructive methods and/or by surface conditioning that no unacceptable defect is present.				
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Clause No.	TECHNICAL REQUIREMENTS								
B.	e)	<b>Examination of areas from which defects have been removed:</b>							
		After a defect is thought to have been removed and prior to making weld repairs, the area shall be examined by suitable methods to ensure the defect has been eliminated.							
	f)	Re-examination of repaired area:							
		After repairs are made, the repaired areas shall be blended.							
	<b>RADIOGRAPHIC EXAMINATION OF WELDED JOINTS</b>								
	Radiographic examination shall cover minimum 10% of weld seam and acceptance standard for visual examination and Radiography shall be as follows:								
	Any of the following imperfections shall not be acceptable:								
	i)	Cracks							
	ii)	Zone of incomplete fusion or penetration, which exceed 10% of the weld length of the joint. In longitudinal or transverse butt weld, where full penetration is intended by the weld procedure, some lack of penetration is acceptable. The total length of weld with lack of penetration shall not exceed 10% of the overall weld length. At no place, shall weld penetration be less than 90% of the thickness of the material. Continuous occurrence of lack of penetration is permitted, but shall not exceed 50mm in any 500mm length of weld.							
	iii)	Inadequate weld dimensions, Root Cavity (shrinkage) and incompletely filled groove greater than 10% effective throat thickness.							
iv)	Excess penetration shall be permitted provided it does not exceed 25% of the wall thickness or 4mm whichever is smaller.								
v)	Weld reinforcement:								
	Build up in excess of 25% of the effective throat thickness shall be dressed. Any reinforcement shall be substantially symmetrical about the centreline of the weld and shall be of smooth contour blending smoothly at the toes with the parent material.								
vi)	Undercutting and overlapping greater than 10% effective throat thickness.								
vii)	Elongated cavities and/or worm holes exceeding 3mm dia or equivalent area in length provided the limitations on porosity are met with.								
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Clause No.	TECHNICAL REQUIREMENTS			
	<p>viii) Copper, tungsten or oxide inclusions greater than <math>t/4</math> or 3mm dia or its equivalent area, whichever is smaller.</p> <p>ix) Crater pipes exceeding 25% effective throat thickness or 3mm whichever is smaller.</p> <p>x) Porosity:</p> <p>Scattered porosity not exceeding 0.5% by volume is acceptable. In general, the size of the pores shall not exceed 0.8mm dia, but occasional 1.6mm dia pores may be acceptable, provided the following limits are not exceeded:</p> <p>Where pore size is 0.4mm or less, upto 150t pores may be permitted in 1000mm sq. area or radiograph.</p> <p>Where pore size is 0.8 mm dia or less, upto 19t pores may be permitted in 1000mm sq. area or radiograph.</p> <p>Where pore sizes are generally 0.8mm dia or less, but occasional 1.6mm dia pores are present, upto 9t of 0.8mm dia may be permitted in 1000mm sq. area of radiograph, provided the number of pores upto 1.6mm in dia does not exceed it.</p> <p>However, visible surface porosity &gt; 1mm dia is not acceptable.</p> <p><b>Note:</b></p> <p>In all cases, t = thickness of the thinnest section of the weld under examination.</p> <p>Unacceptable weld defects shall be repaired in accordance with the original welding procedure. All repairs shall be 100% inspected in accordance with original testing procedure.</p>			
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Clause No.	TECHNICAL REQUIREMENTS			
	<div><div>Erection Drawings to be submitted by the Contractor</div><div><div>1. Single line diagram</div><div>2. Switchyard layout (Plan &amp; Section)</div><div>3. Equipment &amp; Foundation Cable trench layout</div><div>4. Structural Arrangement Drawing</div><div>5. Earthmat Layout</div><div>6. Composite G.A. Drawing</div><div>7. Clearance Diagram</div><div>8. Cable Trench Section</div><div>9. Equipment Earthing details</div><div>10. Welding Details</div><div>11. All Design Calculations</div><div>12. G.A. of Clamps and Connectors Drawings</div><div>13. G.A. and Part Drawing of Insulator String and Hardware</div><div>14. G.A. and Schematics of all Marshalling Kiosks and cabinets</div><div>15. Data Sheets and Drawings of all Other Miscellaneous Items</div></div></div>			
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<p>Clause No.</p>	<p>TECHNICAL REQUIREMENTS</p>				
	<div>  <p>PLAN</p> <p>ELEVATION DETAIL 'B' /</p> </div> <div>  <p>TYPICAL DETAILS OF RISER</p> </div> <div>  <p>PLAN</p> <p>ELEVATION</p> <p>(CONDUCTOR IN HORIZONTAL PLANE)</p> <p>CONDUCTOR IN VERTICAL PLANE</p> <p>TYPICAL OVERLAPPING JOINT OF TWO CONDUCTORS</p> </div> <div>  <p>SECTION Y1-Y1</p> <p>SECTION Y2-Y2</p> </div> <div>  <p>SECTION Y3-Y3</p> <p>ELEVATION</p> <p>DETAIL 'A'</p> </div> <div> <p>NOTE : WELDING OF EARTHING CONDUCTOR SHALL BE CONDUCTED IN VERTICAL PLANE WHEREVER POSSIBLE</p> </div> <div> <p>EQUIPMENT EARTHING DETAILS</p> <p>STANDARD DRAWING</p> </div>				
<p>RIHAND STPP-III SWITCHYARD EXTN. PKG.</p>	<p>BID DOC. NO.: CS-1240-572D-2</p>	<p>TECHNICAL SPECIFICATIONS</p>	<p>PART-II SECTION-VI</p>	<p>Page E13-19 of 19</p>	

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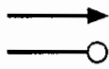
REF. DRG. NO. TB-4-359-316-161

SIGN & DATE

INVENTORY NO.

REV.	DATE	ALTERED	REV.	DATE	ALTERED RJ	REV.	DATE	ALTERED RJ	-SD-
		CHECKED	01	21.08.13	CHECKED MS/DKM	00	01.07.13	CHECKED MS/DKM	-SD-
		APPD			APPD RS			APPD RS	-SD-
					JOB No. 82004				

### LEGEND



CONNECTION TO GROUND MAT THROUGH RISER.

CONNECTION TO ROD ELECTRODE WITH TREATED PIT.

### 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 TWO EARTHING STRIPS CAN BE CONNECTED TO ONE RISER.
- 7 EACH RISER OF A PARTICULAR EQUIPMENT SHALL BE CONNECTED TO A DIFFERENT EARTHROD (EITHER HORIZONTAL OR VERTICAL CONDUCTORS OF MAIN EARTHMAT).
- 8 FOR WELDING DETAILS REFER SHEET #20 & 21
- 9 E/WIRE DOWN CONDUCTOR SHALL BE CLEATED AT AN INTERVAL OF 2.0 M ALONG WITH STRUCTURE NO HOLES IN STRUCTURE IS ALLOWED FOR THIS PURPOSE

### SHEET NO. DESCRIPTION

01. TITLE
- 1A. NOTES
02. 400kV & 132kV SF6 CIRCUIT BREAKER
03. 400kV CVT
04. 400kV & 132kV POST INSULATOR (SOLID CORE TYPE)
05. 390kV & 120kV LIGHTNING ARRESTER
06. MARSHALLING KIOSK
- 7A. 400kV HORIZONTAL CENTER BREAK ISOLATOR WITH ONE EARTH SWITCH (TYPICAL)
- 7B. 132kV HORIZONTAL CENTER BREAK ISOLATOR WITH ONE EARTH SWITCH (TYPICAL)
- 7C. 132kV HORIZONTAL CENTER BREAK ISOLATOR WITH TWO EARTH SWITCH (TYPICAL)
- 7D. 132kV HORIZONTAL CENTER BREAK ISOLATOR WITHOUT EARTH SWITCH (TYPICAL)
08. TOWER WITHOUT PEAK
09. 400kV & 132kV CURRENT TRANSFORMER
10. CABLE TRENCH
11. PIPE EARTH ELECTRODE WITH TEST PIT
12. ROD EARTH ELECTRODE WITH TEST PIT

### SHEET NO. DESCRIPTION

13. RAIL BONDING
14. IBT TRANSFORMER
15. AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH.E/S MECH. BOX
16. CONTROL AND RELAY PANELS
17. BUS REACTOR.
18. GATE/FENCE POST
19. TYPICAL ARRANGEMENT OF BOLTED JOINTS
20. WELDING DETAILS
21. WELDING DETAILS

NTPC DRAWING NO. 1240-572D-PYE-F-161

### CUSTOMER



एन टी पी सी लिमिटेड  
NTPC Limited  
(A Government of India Enterprise)

### PROJECT :

RIHAND STPP STAGE III  
400/132kV SWITCHYARD EXTENSION PACKAGE



BHARAT HEAVY ELECTRICALS LTD.  
TRANSMISSION PROJECTS DIVISION  
NEW DELHI

DEPT CODE	NAME	SIGN	DATE
DRM	RK		
CHD	SK		
APPD	DKM/RS		

### TITLE

EQUIPMENT EARTHING PHILOSOPHY & DETAILS

DEPT.	SCALE
SIGN	
DATE	

DRAWING NO.  
TB-4-359-316-161

SHEET 01 OF 21 | REV. 01

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 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 THE EQUIPMENTS 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, OPERATING MECHANISAM BOXES, GROUND MOUNTED CONTROL CABINETS SHALL BE EARTHED AT TWO POINTS WITH 50x6mm G.S. FLAT BY TWO SEPARATE AND DISTINCT EARTH CONNECTERS.
8. EARTHING CONDUCTORS FROM EQUIPMEMT 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 GRAVEL 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 EARTHMAT 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.

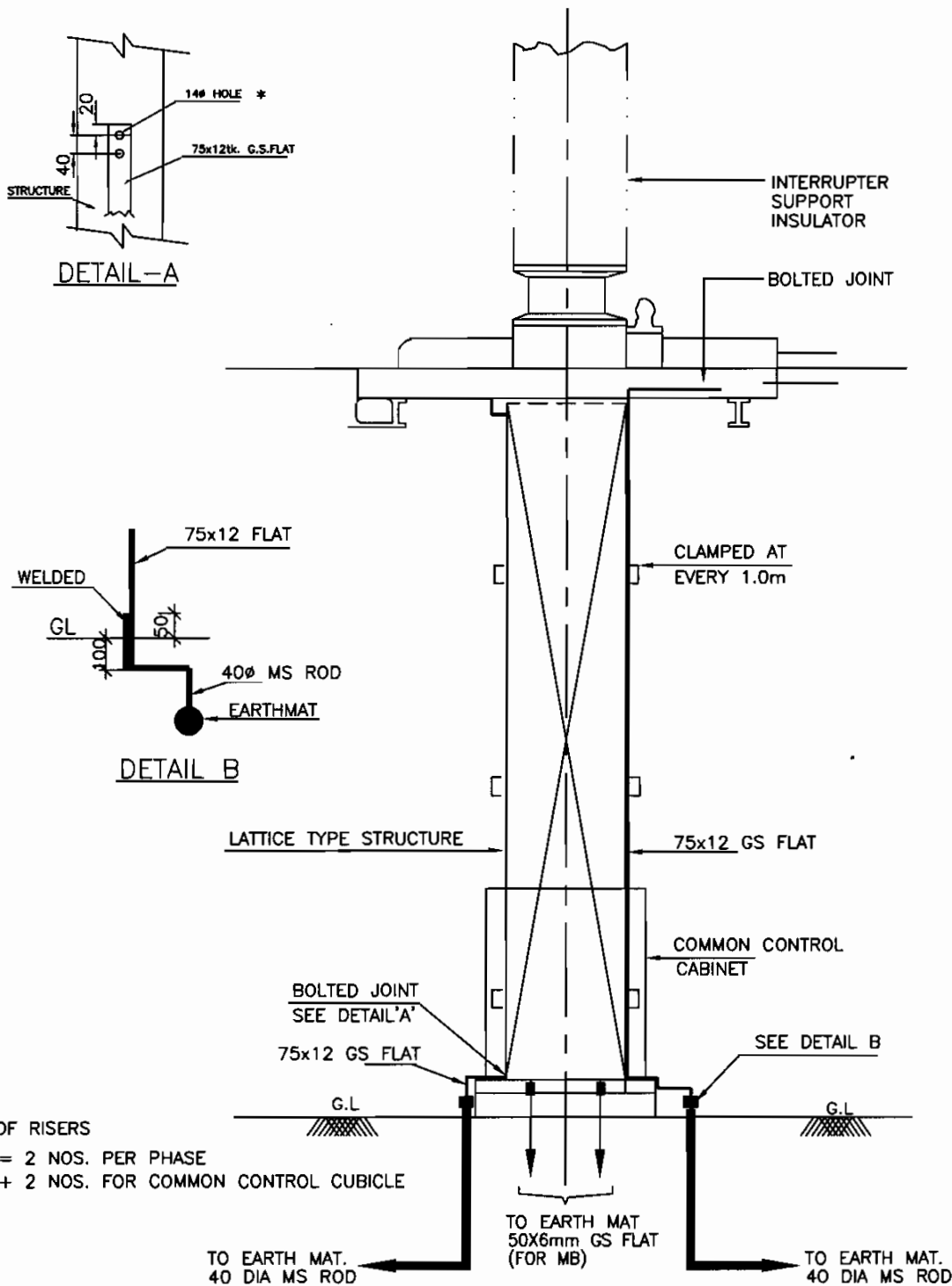


## EQUIPMENT EARTHING DETAILS NOTES

DRG. No.

TB-4-359-316-161

SHEET No.  
1A



NOTE:

1) \* BOLT SIZE AND HOLE SIZE SHALL BE TO SUIT RESPECTIVE EQPT./STRUCTURE.



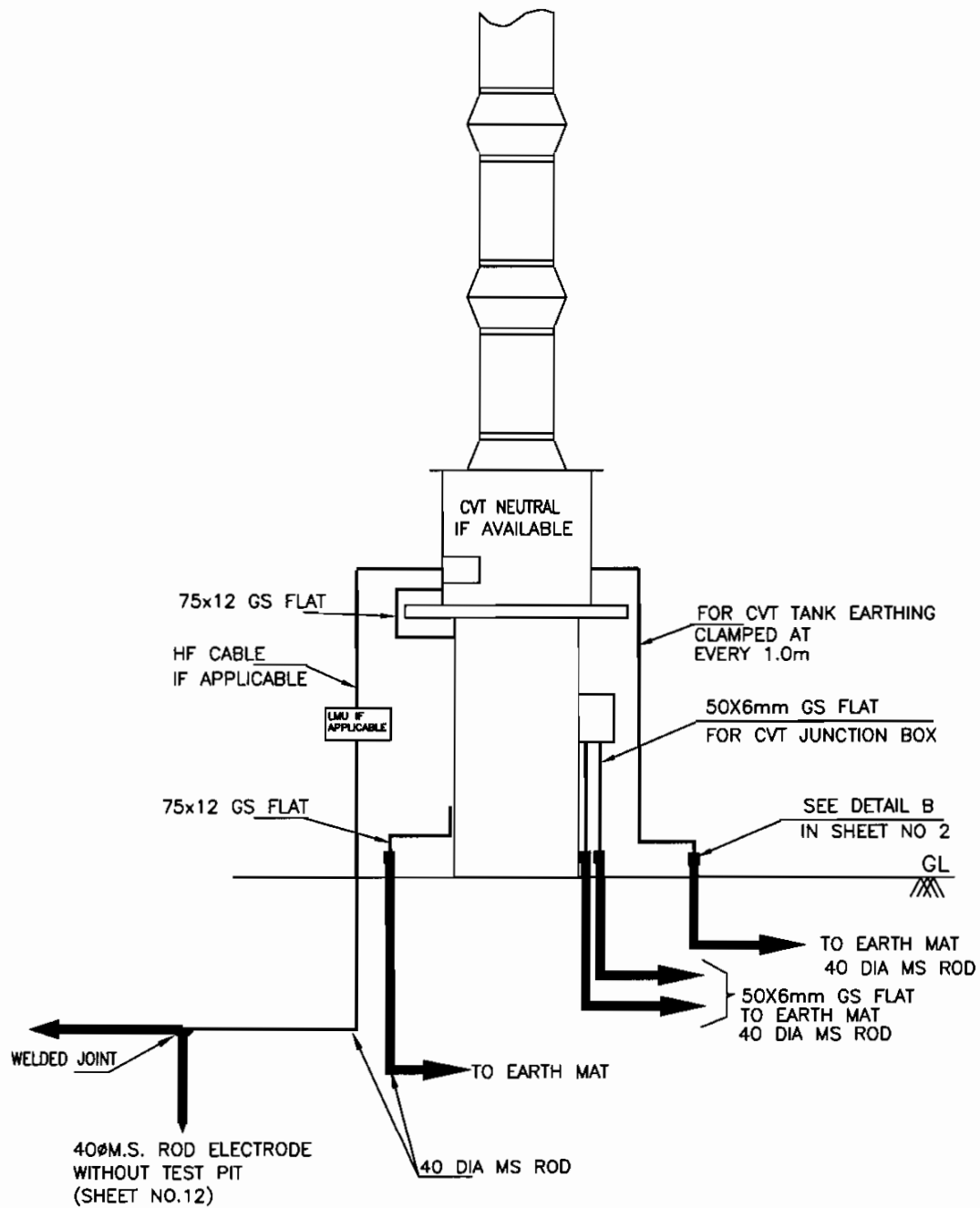
# EQUIPMENT EARTHING DETAILS 400kV & 132kV SF6 CIRCUIT BREAKER

COMPUTERREF.NO.

DRG. No.

TB-4-359-316-161

SHEET No.  
2



NOS.OF RISERS

= 2 NOS. PER PHASE

+ 2 NOS. FOR CVT JUNCTION BOX

ROD ELECTRODE = 1 NO. PER CVT IF NEUTRAL IS CONNECTED TO GROUND VIA LMU



## EQUIPMENT EARTHING DETAILS

400kV CVT

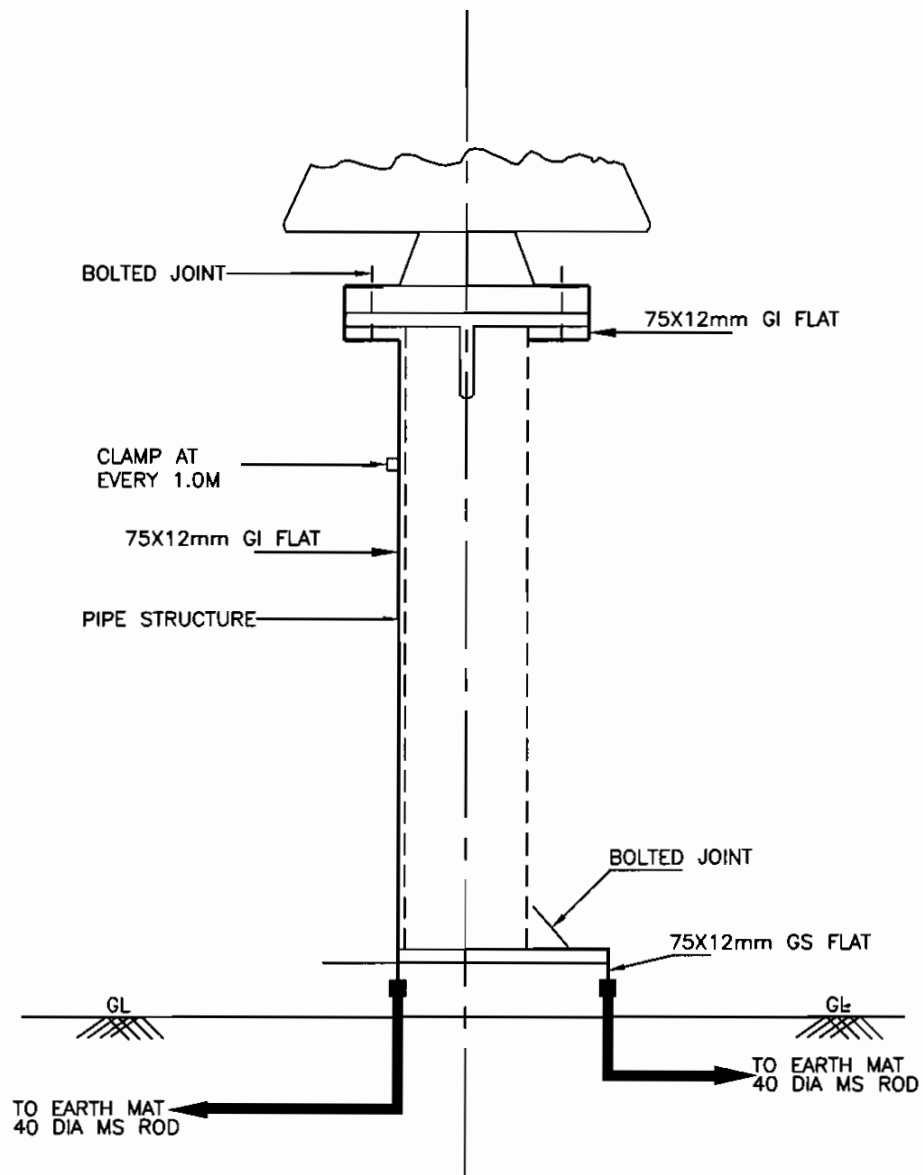
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SHEET No.

3



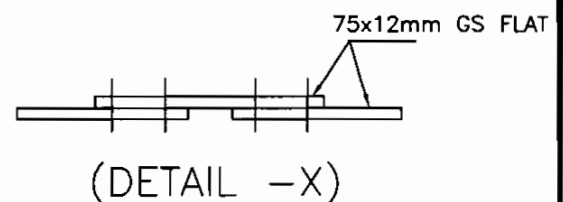
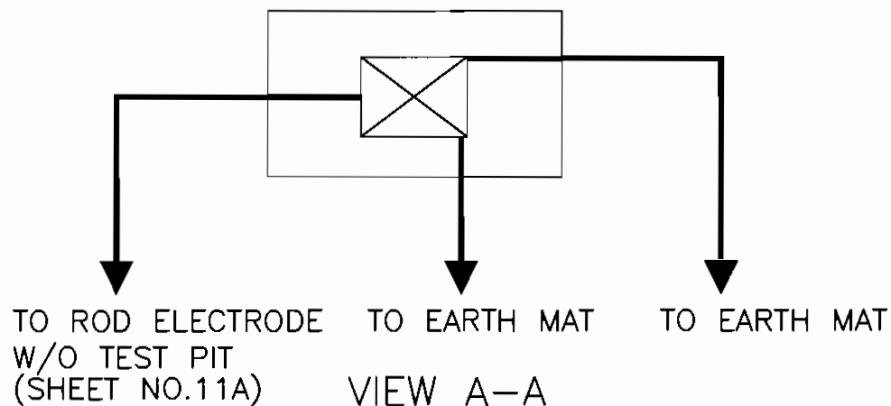
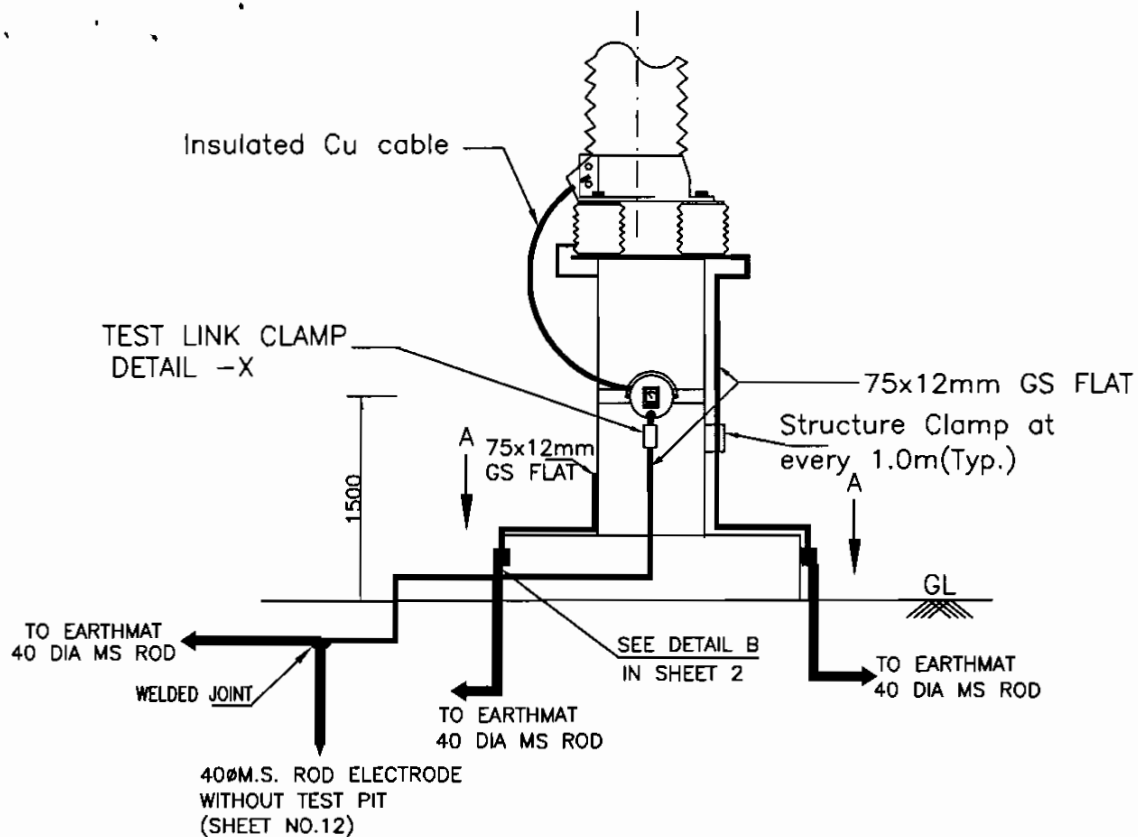
NOS.OF RISERS = 2 NOS.



# EQUIPMENT EARTHING DETAILS 400kV & 132kV POST INSULATOR (SOLID CORE TYPE)

DRG. No. TB-4-359-316-161

SHEET No.  
4



#### NOTES;

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



## EQUIPMENT EARTHING DETAILS

### LIGHTNING ARRESTER(390kV & 120kV)

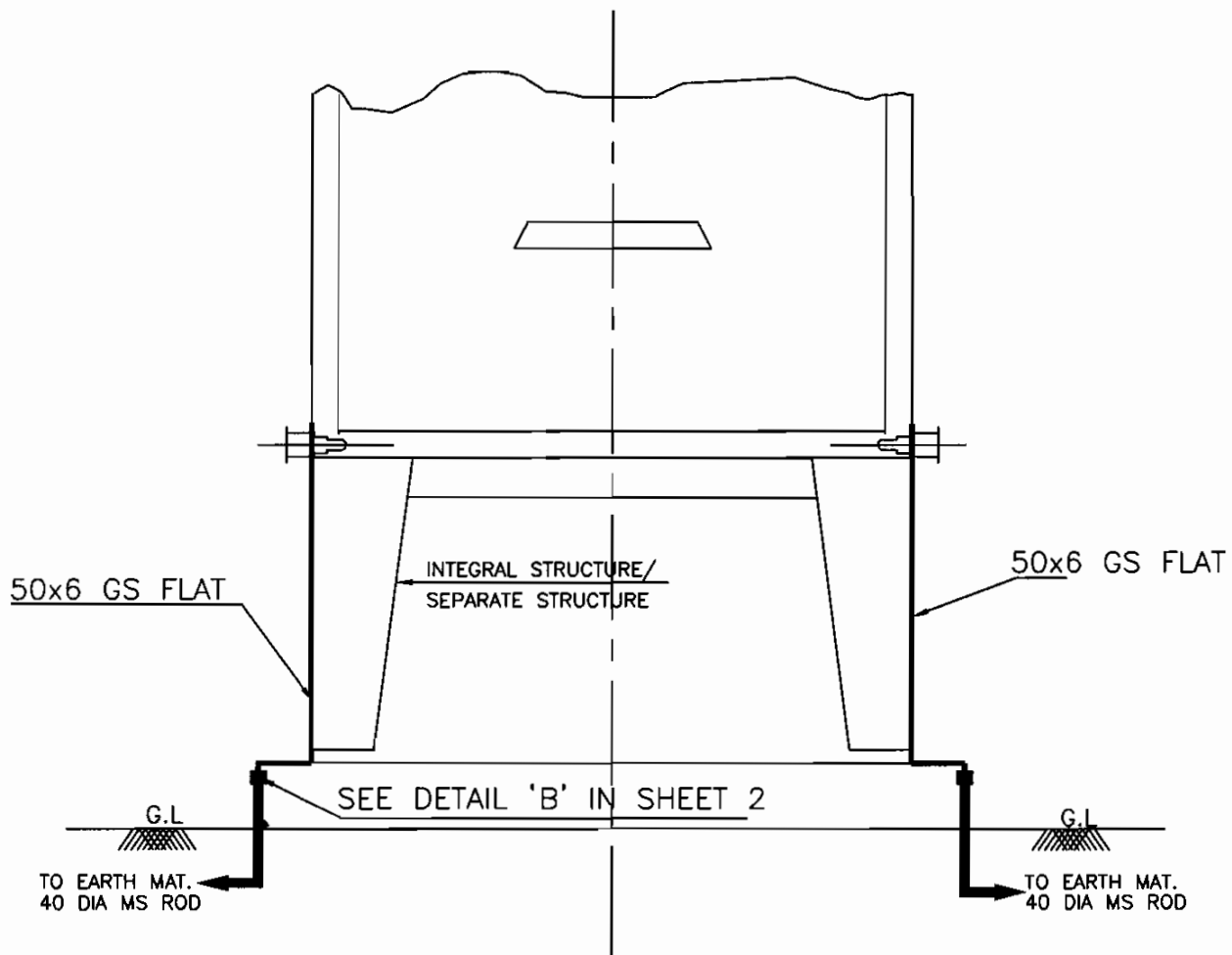
COMPU. DRG. REF.

DRG.NO.

TB-4-359-316-161

SHEET No.

5



NOS.OF RISERS = 2 NOS.



# EQUIPMENT EARTHING DETAILS MARSHALLING KIOSK

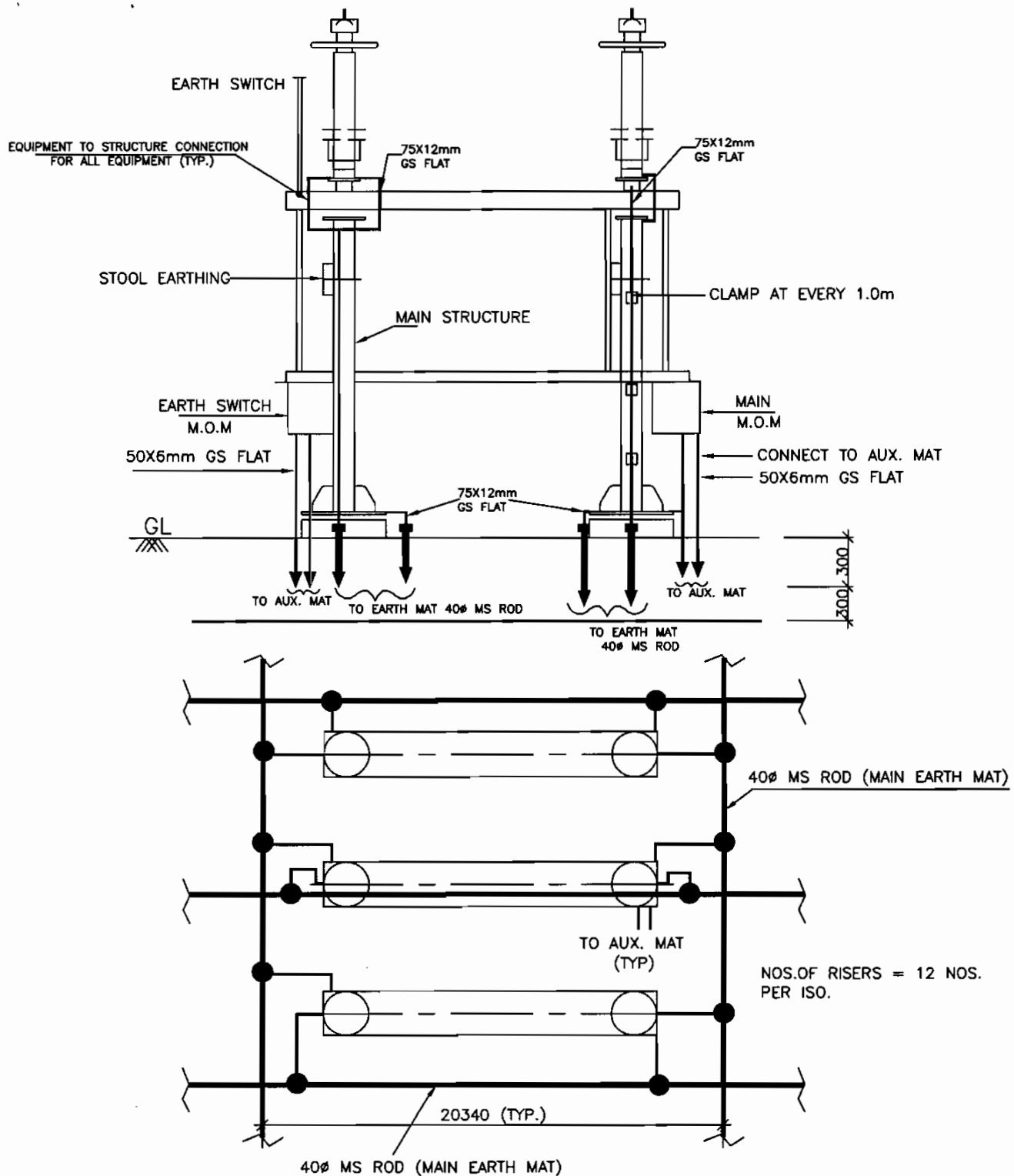
COMPUTERREF.NO.

DRG. No.

TB-4-359-316-161

SHEET No.  
6





#### NOTES

1. AUXILIARY EARTH MAT SHALL BE PROVIDED BELOW EVERY MOM BOX (REFER SHEET 15)

● RISER



## EQUIPMENT EARTHING DETAILS

400KV HORIZONTAL CENTER BREAK  
ISOLATOR (TYPICAL) WITH ONE EARTHSWITCH

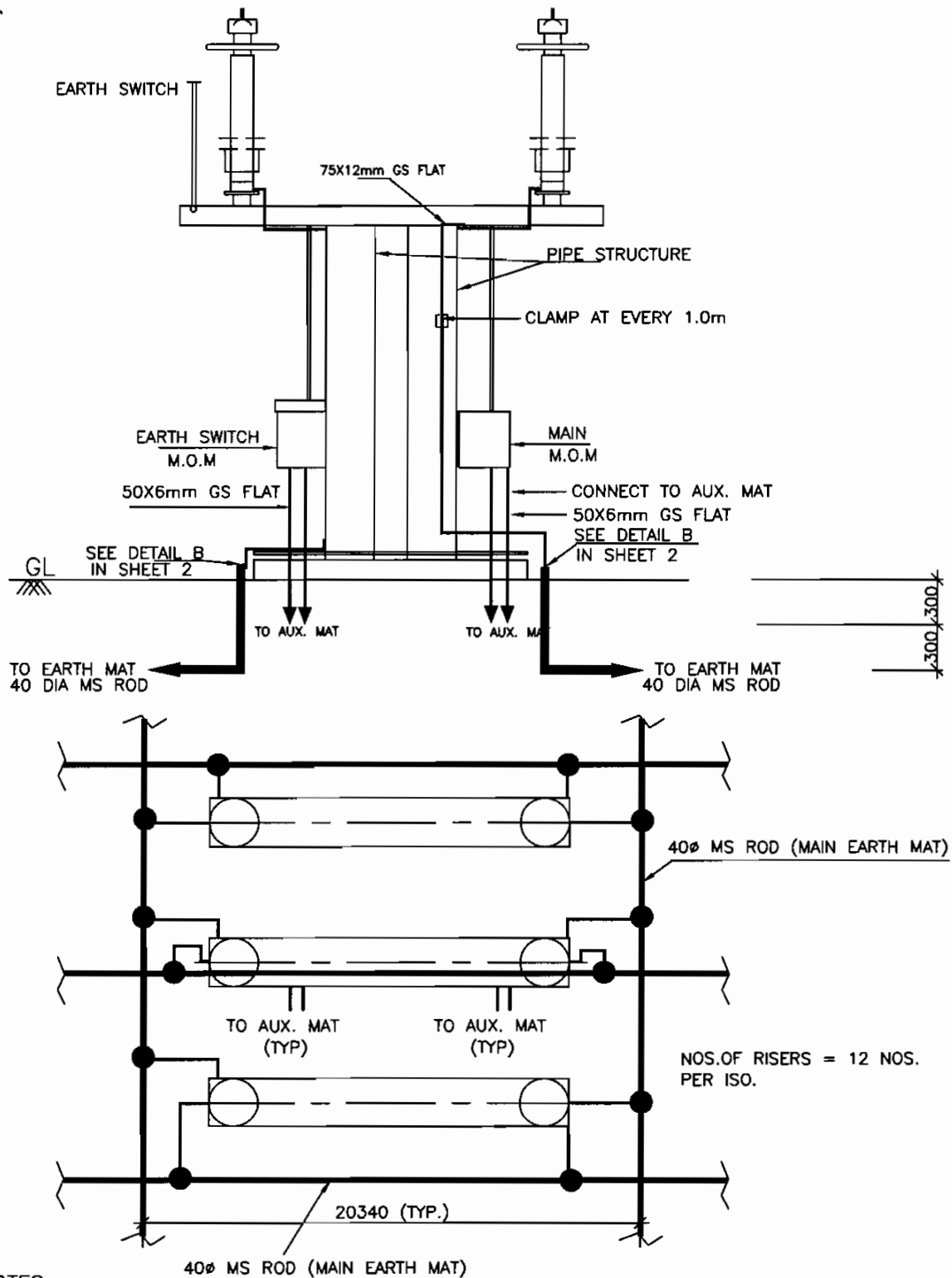
COMPUTERREF.NO.

DRG. No.

TB-4-359-316-161

REV. 00

SHEET No.  
7A



#### NOTES

- AUXILIARY EARTH MAT SHALL BE PROVIDED NEAR EVERY MOM BOX (REFER SHEET 15)
- RISER



## EQUIPMENT EARTHING DETAILS

### HORIZONTAL CENTER BREAK 132kV

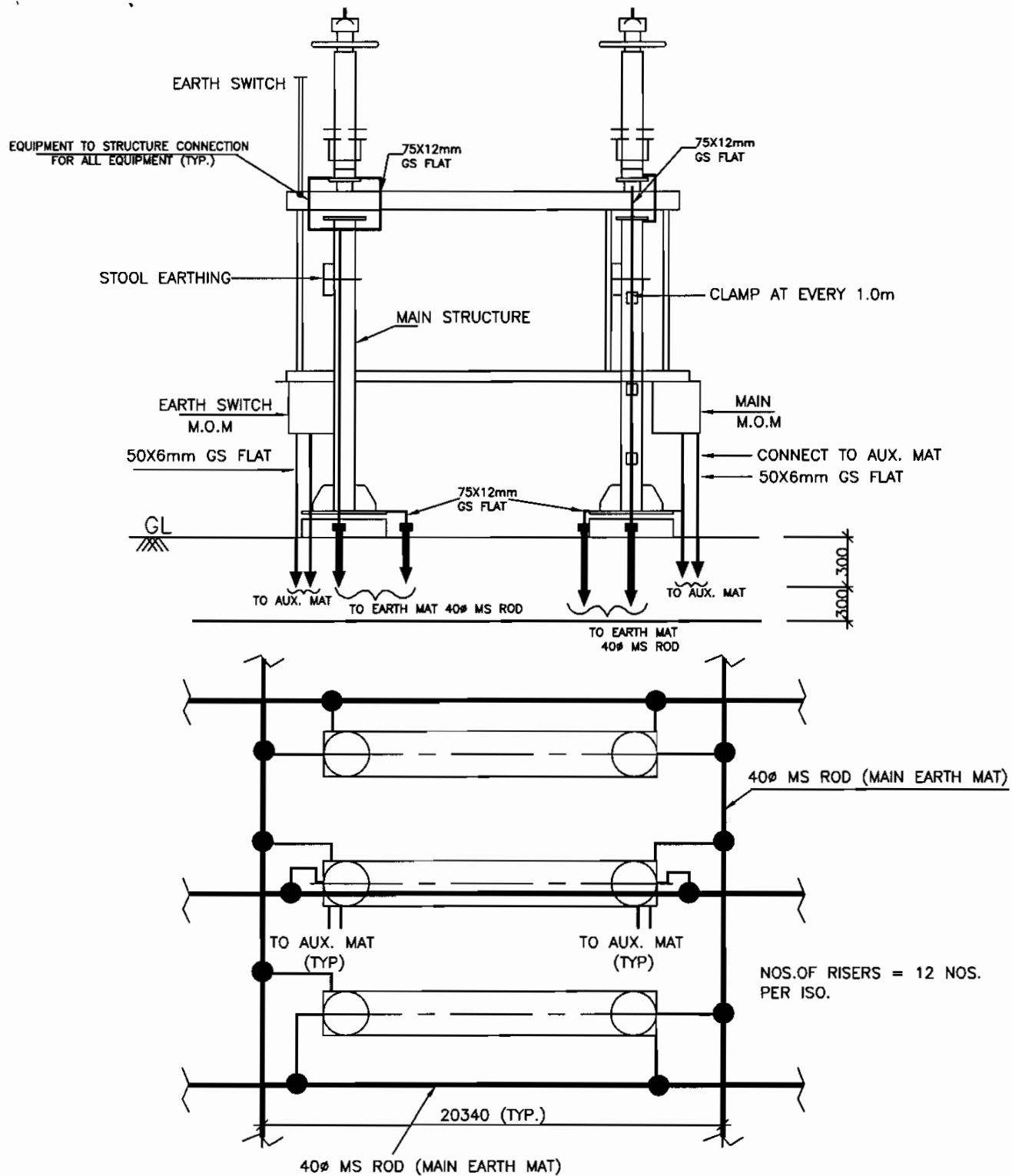
### ISOLATOR WITH ONE EARTHSWITCH

COMPUTERREF.NO.

DRG. No.

TB-4-359-316-161

SHEET No.  
7B



#### NOTES

1. AUXILIARY EARTH MAT SHALL BE PROVIDED BELOW EVERY MOM BOX (REFER SHEET 15)

● RISER



## EQUIPMENT EARTHING DETAILS

### 400KV HORIZONTAL CENTER BREAK ISOLATOR (TYPICAL) WITH ONE EARTHSWITCH

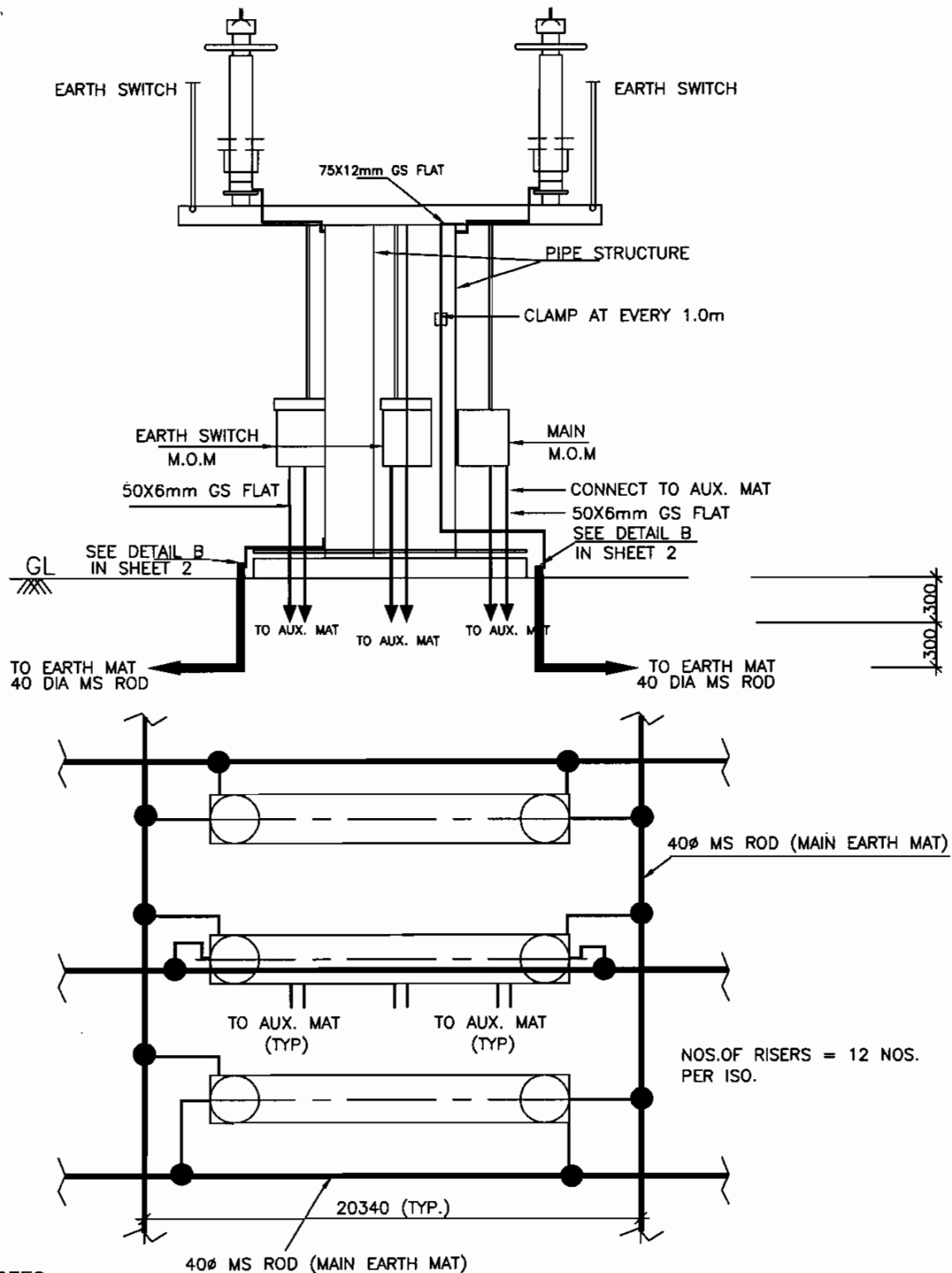
COMPUTERREF.NO.

DRG. No.

TB-4-359-316-161

REV. 00

SHEET No.  
7A



#### NOTES

1. AUXILIARY EARTH MAT SHALL BE PROVIDED NEAR EVERY MOM BOX (REFER SHEET 15)

● RISER



## EQUIPMENT EARTHING DETAILS

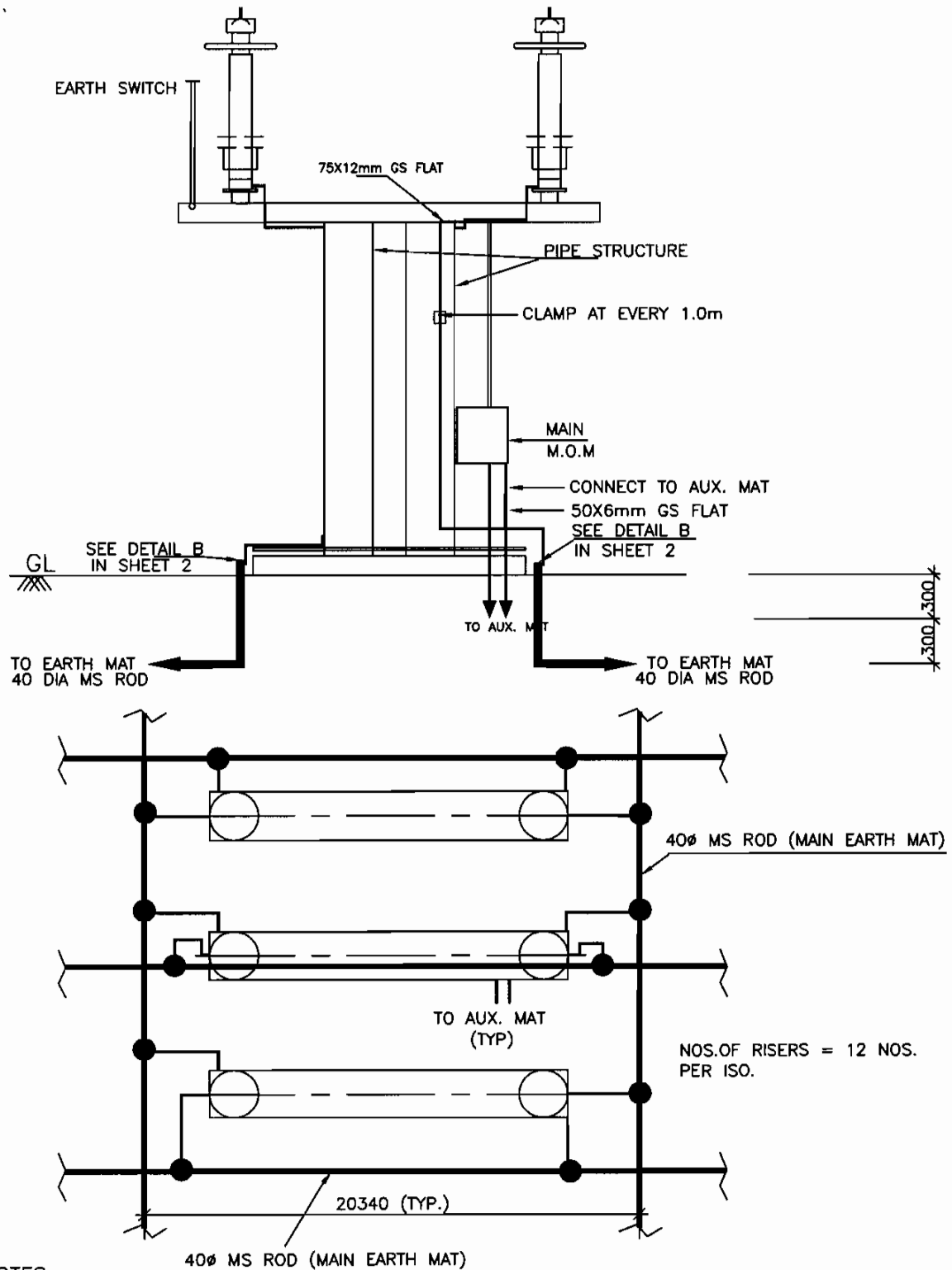
### HORIZONTAL CENTER BREAK 132kV ISOLATOR WITH TWO EARTHSWITCHES

COMPUTERREF.NO.

DRG. No.

TB-4-359-316-161

SHEET No.  
7C



#### NOTES

1. AUXILIARY EARTH MAT SHALL BE PROVIDED NEAR EVERY MOM BOX (REFER SHEET 15)

● RISER



## EQUIPMENT EARTHING DETAILS

### HORIZONTAL CENTER BREAK 132kV

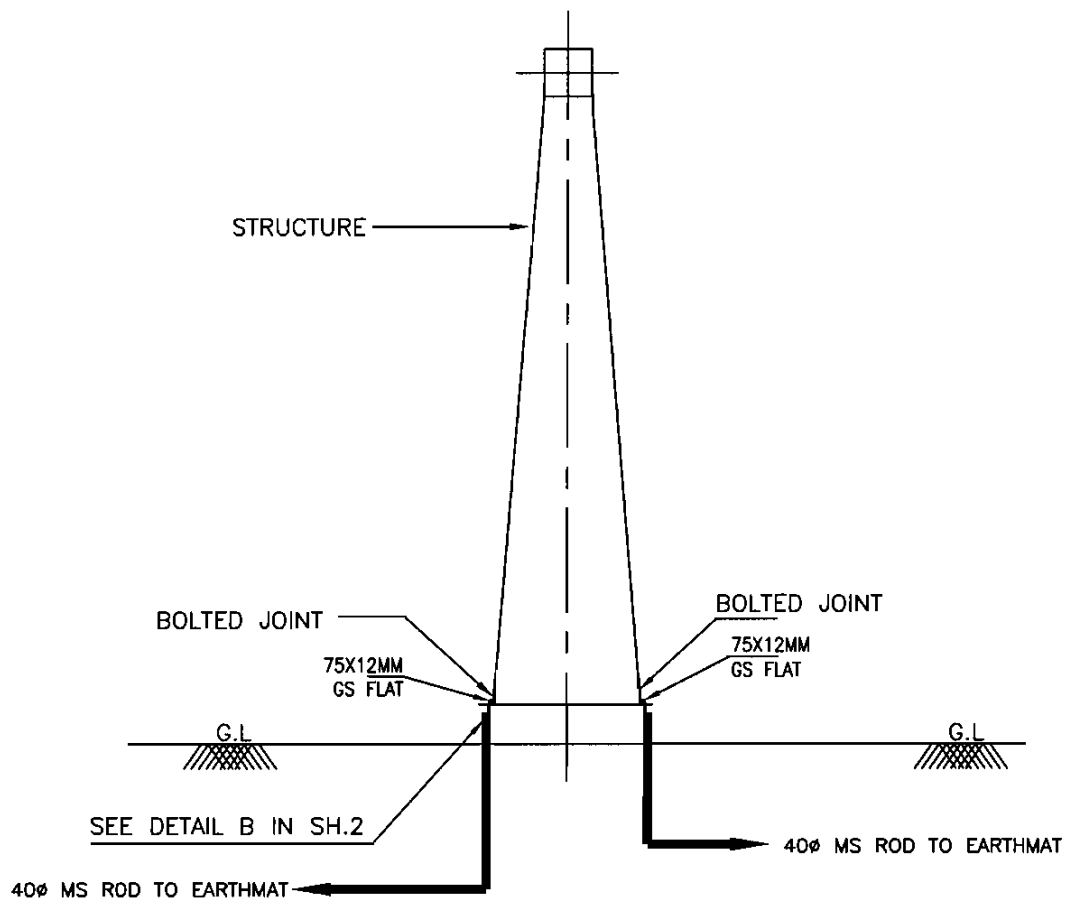
### ISOLATOR WITHOUT EARTHSWITCH

COMPUTERREF.NO.

DRG. No.

TB-4-359-316-161

SHEET No.  
7D



NOS.OF RISERS = 2 NOS. PER TOWER



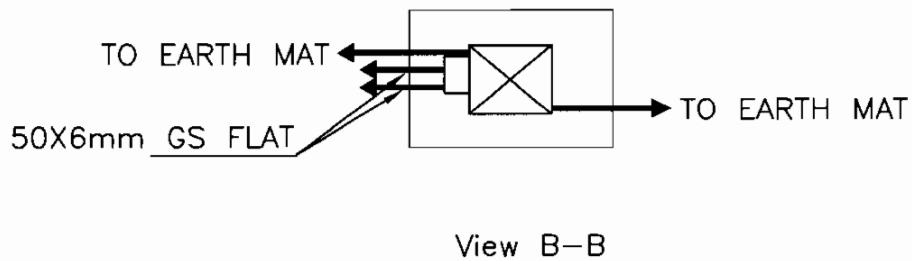
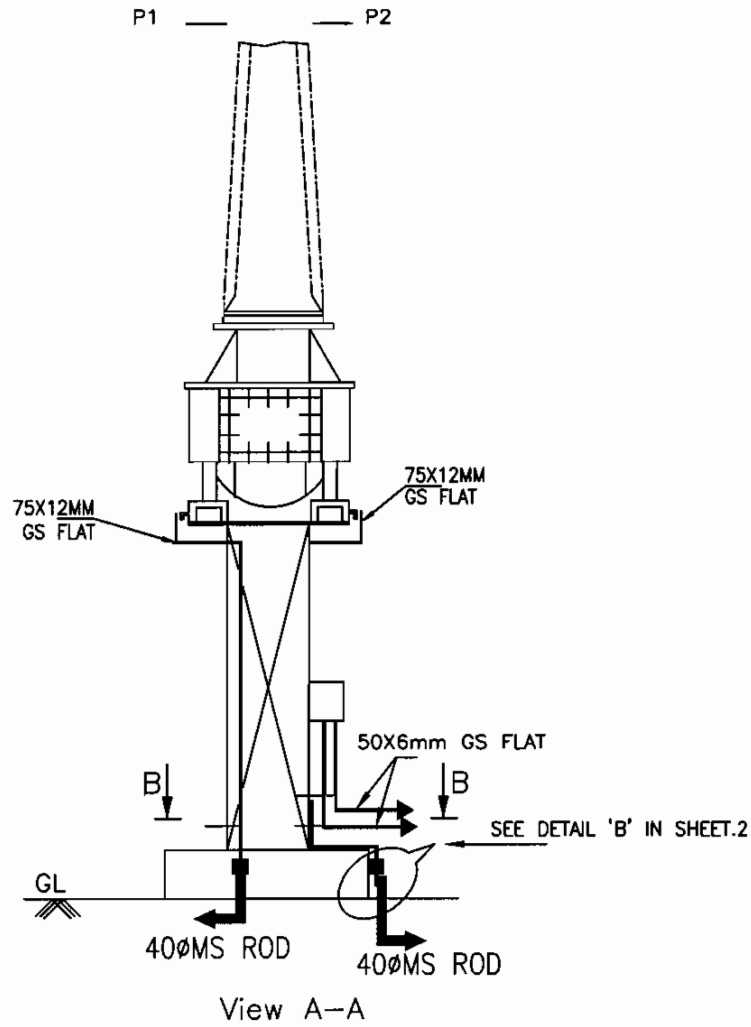
# EQUIPMENT EARTHING DETAILS TOWER WITHOUT PEAK

COMPUTERREF.NO.

DRG. No.

TB-4-359-316-161

SHEET No.  
8



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



# EQUIPMENT EARTHING DETAILS 400kV & 132kV Current Transformer

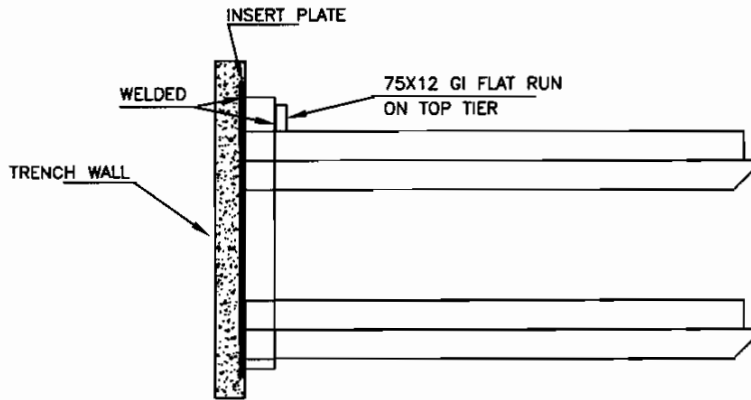
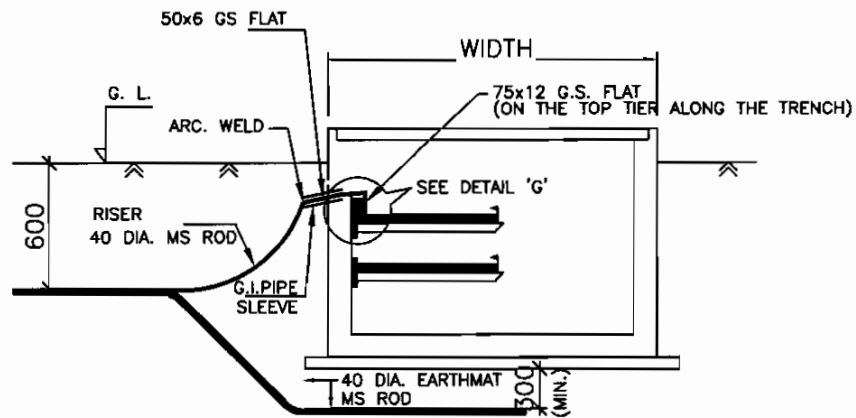
COMPU. DRG. REF.

DRG.NO.

TB-4-359-316-161

REV. 00

SHEET No.  
 9



DETAIL 'G'

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

NOTE:

1. ALL TRENCHES SHALL BE EARTHED AT AN INTERVAL OF 30M ALONG THE LENGTH OF TRENCH & FREE ENDS.
2. THE EARTH STRIP (75x12 G.S. FLAT) SHALL BE WELDED TO TOP RACK ALONG THE TRENCH RUN & CONTROL ROOM AT EVERY 2M INTERVAL.
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

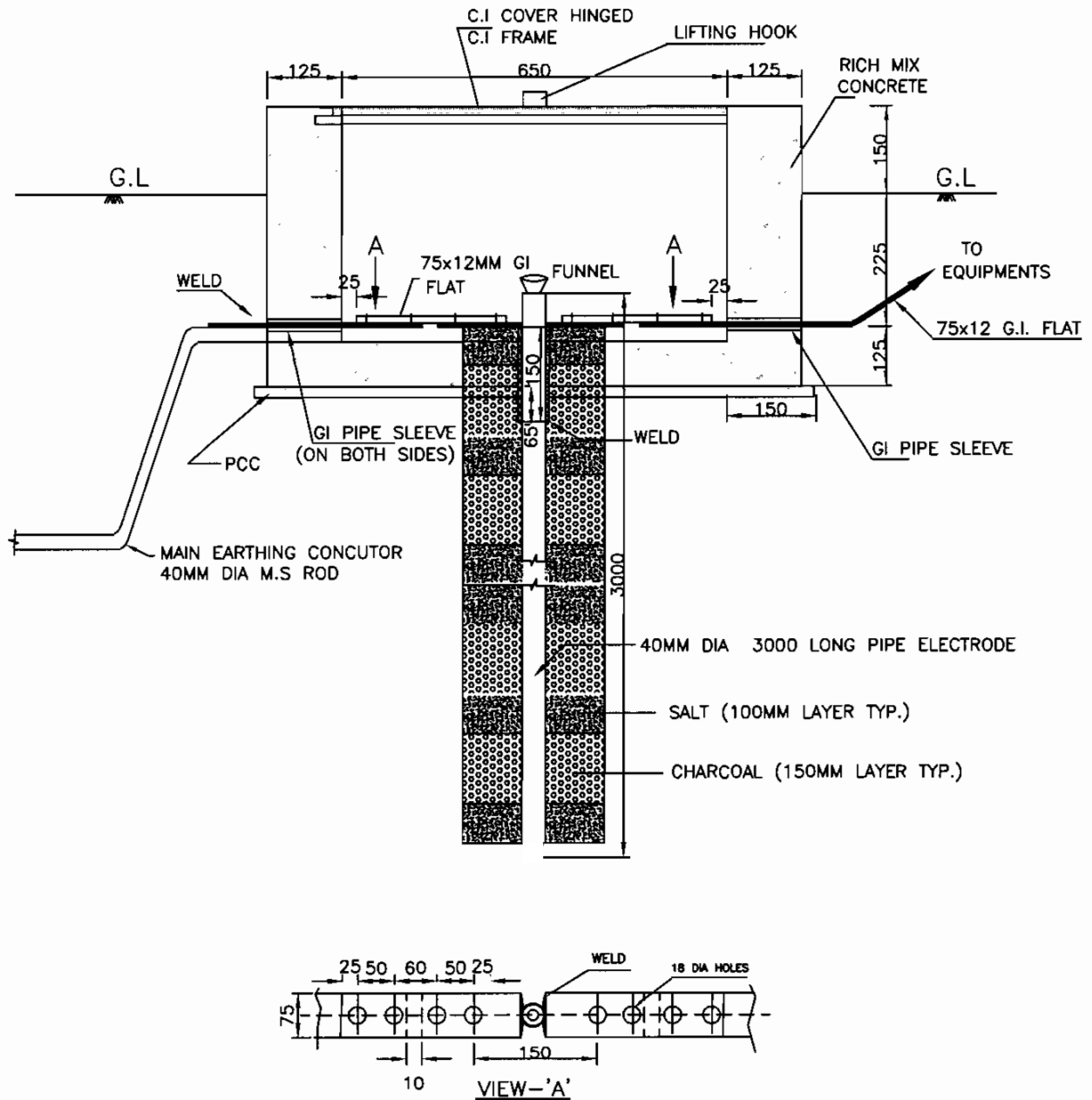
COMPU. DRG. REF.

DRG. NO.

TB-4-359-316-161

SHEET  
10





**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

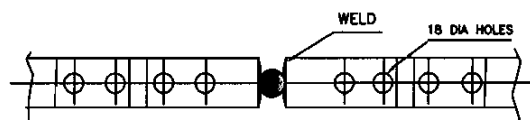
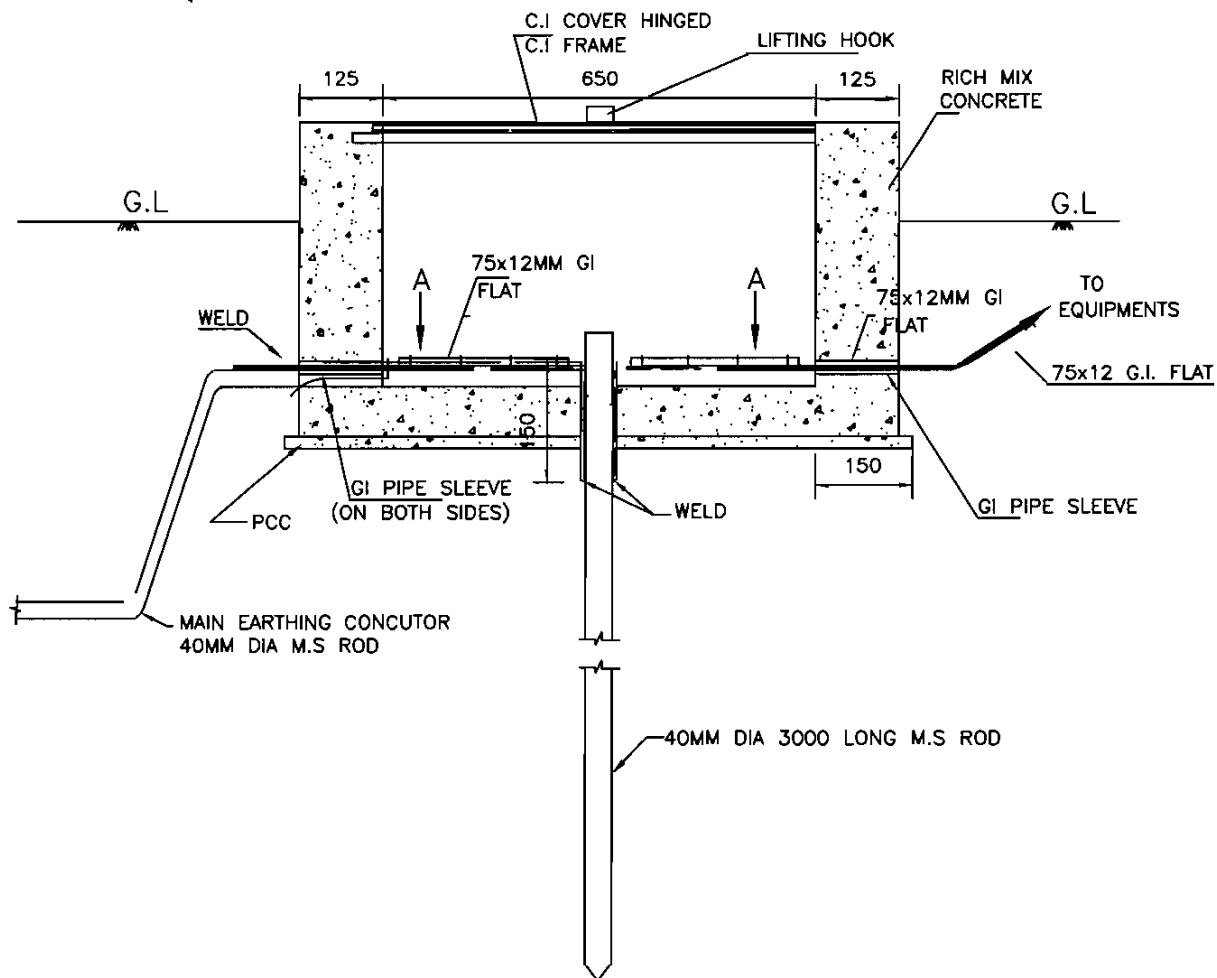
COMPU. DRG. REF.

DRG. No.

TB-4-359-316-161

SHEET No.

11



VIEW-'A'

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 EARTH ELECTRODE WITH TEST PIT

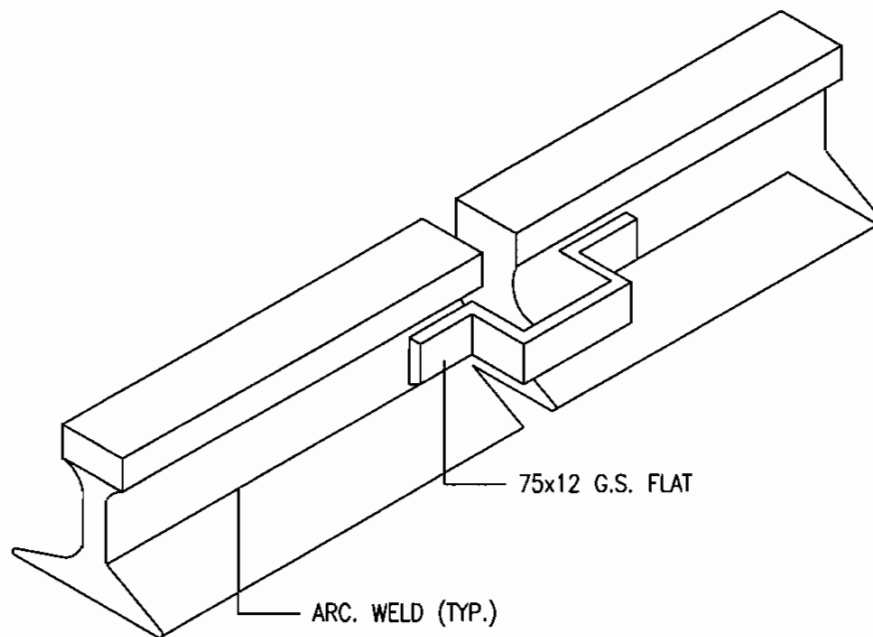
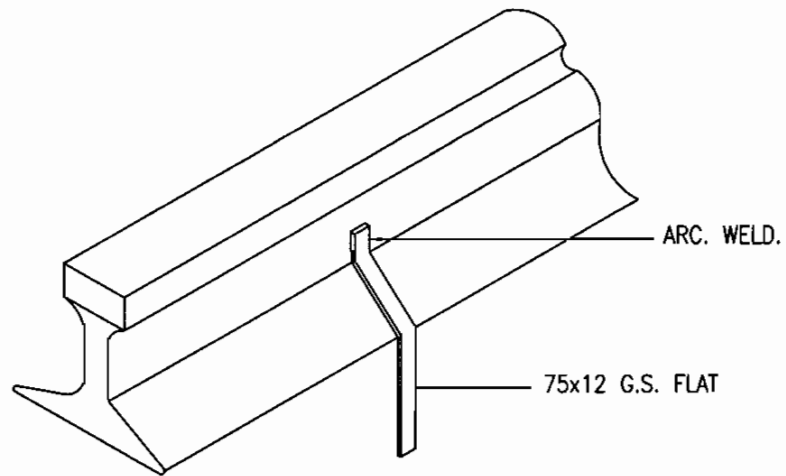
COMPU. DRG. REF.

DRG. No.

TB-4-359-316-161

SHEET No.

12



NOTE:—

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



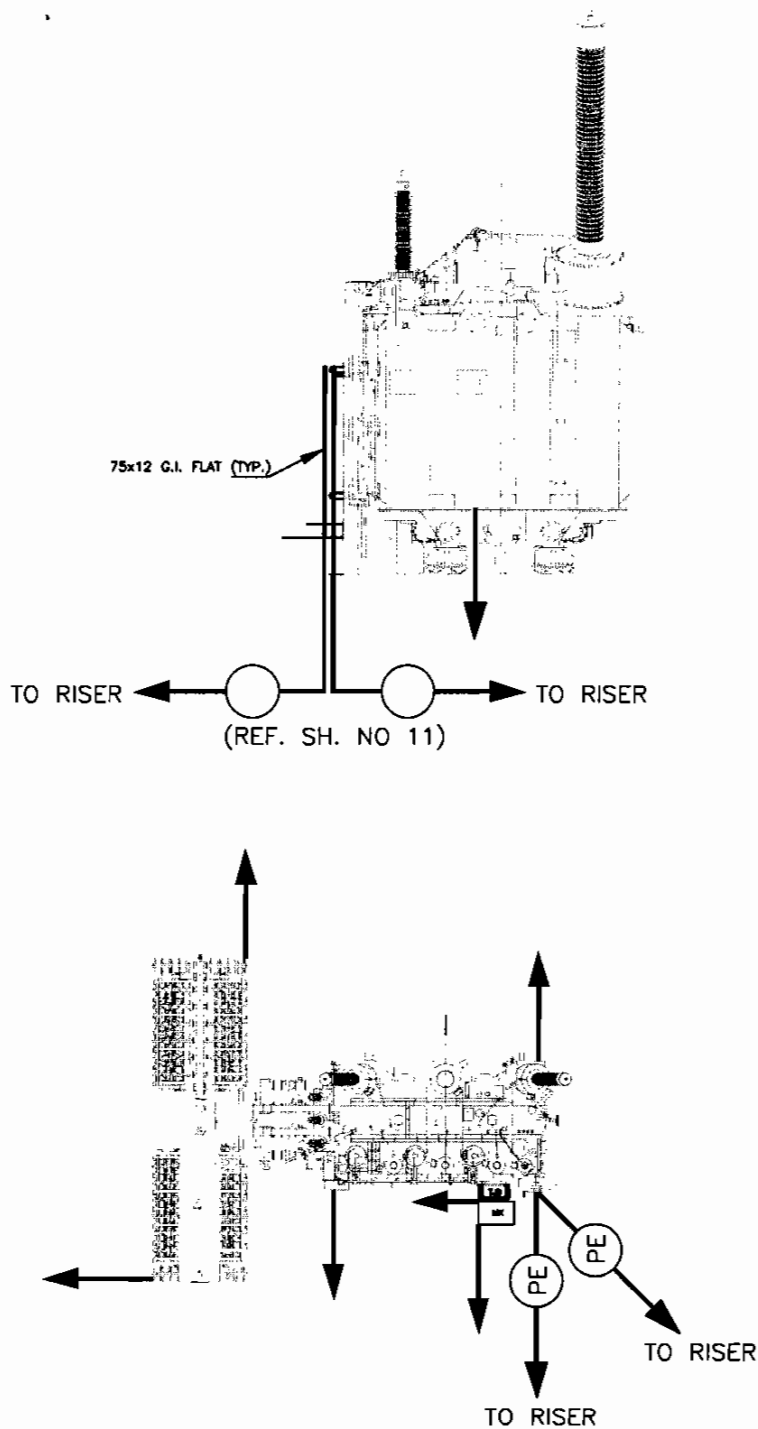
## EQUIPMENT EARTHING DETAILS RAIL BONDING

COMPU. DRG. REF.

DRG. NO.

TB-4-359-316-161

SHEET No.  
13



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 IBT TRANSFORMER BY 75X12 GI FLAT (TWO EARTHING STRIPS CAN BE CONNECTED TO ONE RISER):

MAIN TANK	2 Nos.
RADIATOR BANK	2 Nos.
MARSHALLING BOX	2 Nos.
NEUTRAL EARTHING	2 Nos.



## EQUIPMENT EARTHING DETAILS TRANSFORMER

COMPU. DRG. REF.

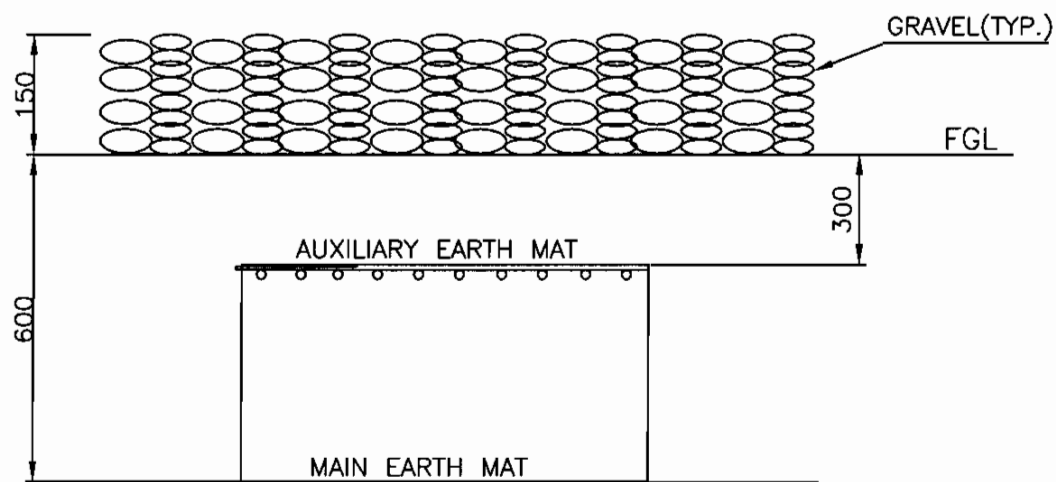
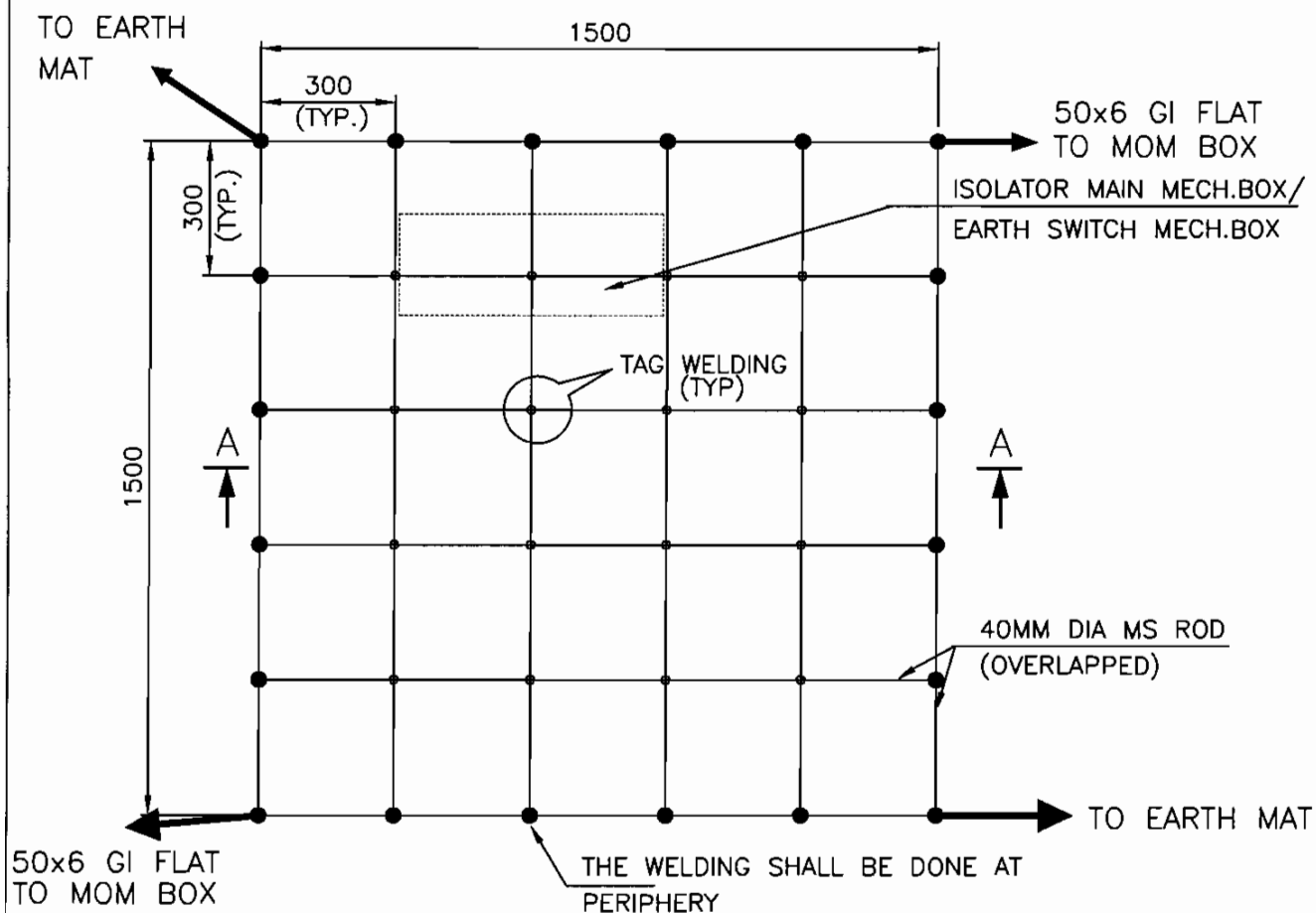
D:\RAIWAT\MURADNAGAR\EQ-ERTH\SH26

Report No.

TB-4-359-161

SHEET No.

14



### 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

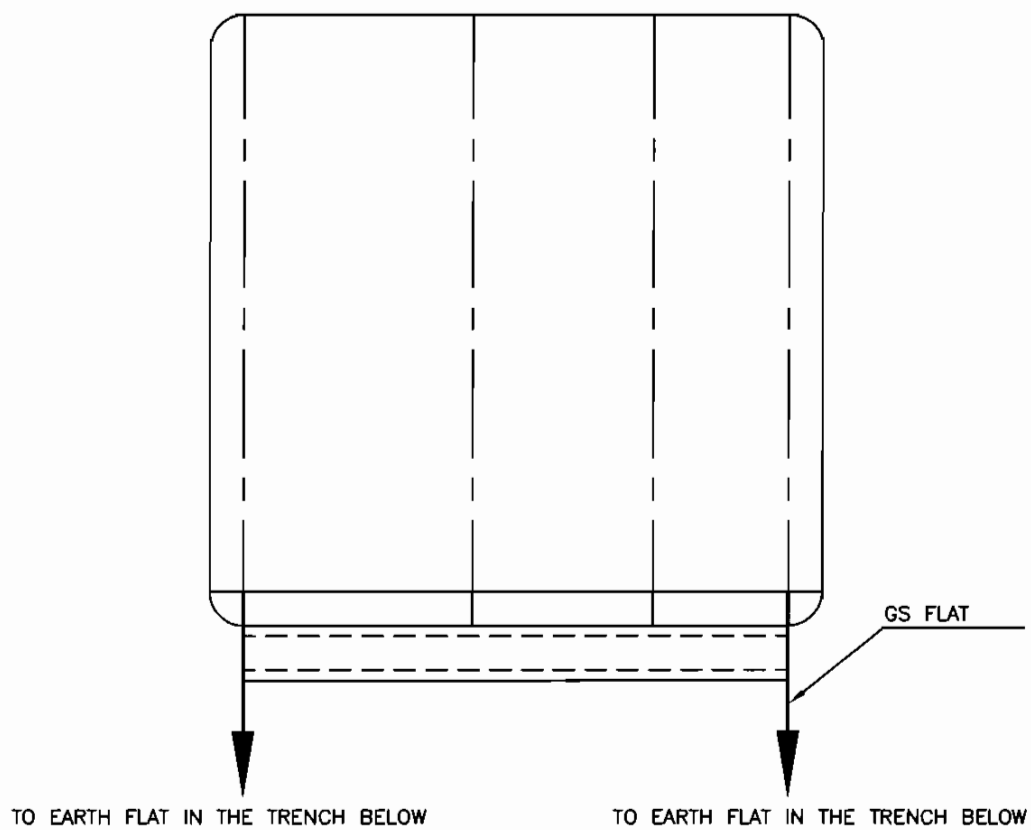
### AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH., E/S MECH. BOX

COMPU. DRG. REF.

Report No.

TB-4-359-316-161

SHEET No.  
15



EQUIPMENT  
CONTROL & RELAY PANELS

FLAT SIZE

50X6 MM

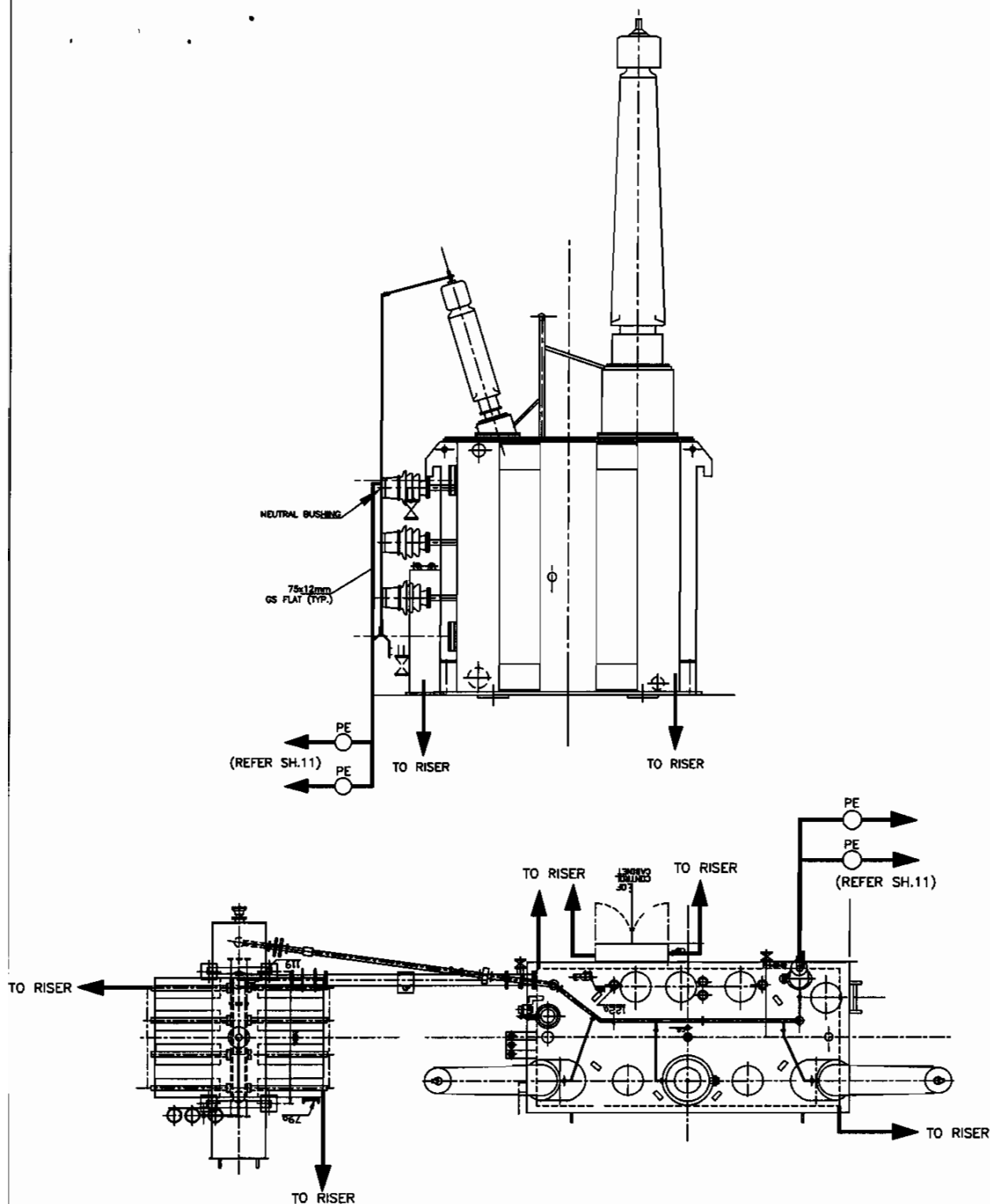


# EQUIPMENT EARTHING DETAILS CONTROL AND RELAY BOARD

DRG. No. TB-4-359-316-161

REV. 00

SHEET No.  
16



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 400KV BUS REACTOR  
 BY 75X12MM GI FLAT :

MAIN TANK	2 Nos.
RADIATOR SUPPORT	- 2 Nos.
CONTROL CABINET	- 2 Nos.



## EQUIPMENT EARTHING DETAILS BUS REACTOR

COMPU. DRG. REF.

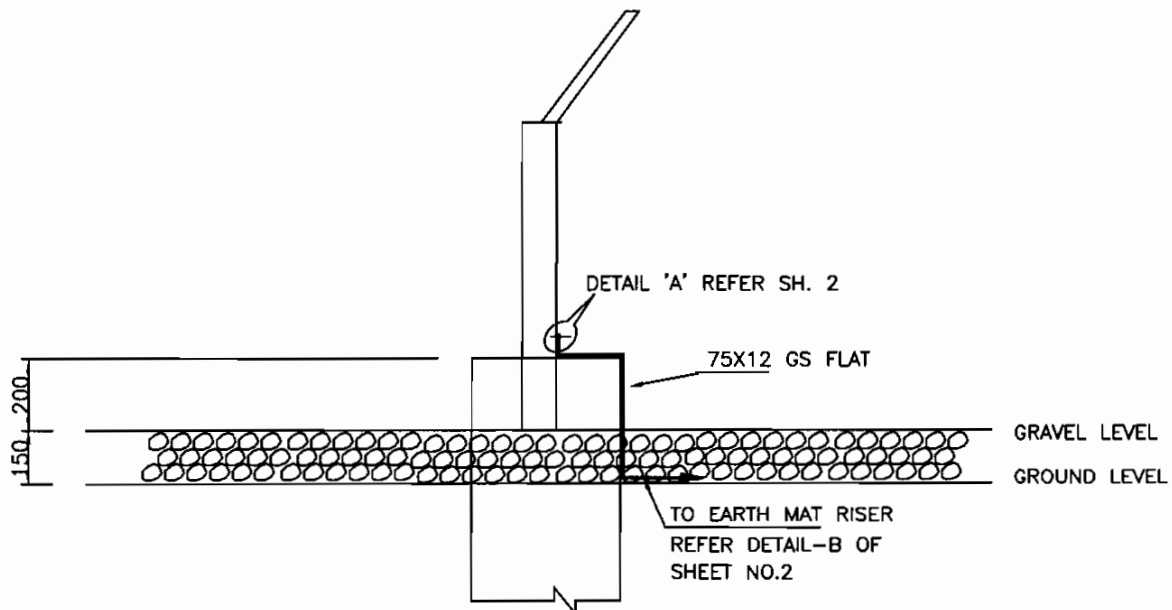
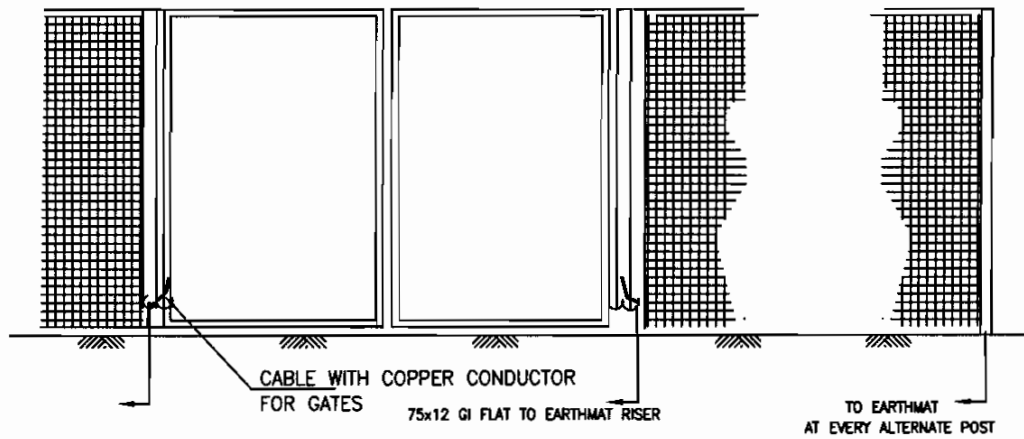
DRG. NO.

TB-4-359-316-161

SHEET  
17

## FENCE GATE

## FENCE GROUNDING



EVERY POST OF FENCE & GATES SHALL BE CONNECTED TO EARTHING LOOP BY 75X12 MM GS FLAT. EARTHING CONDUCTOR SHALL BE BURIED 2000mm OUTSIDE THE SWITCHYARD FENCE.

## FENCE EARTHING



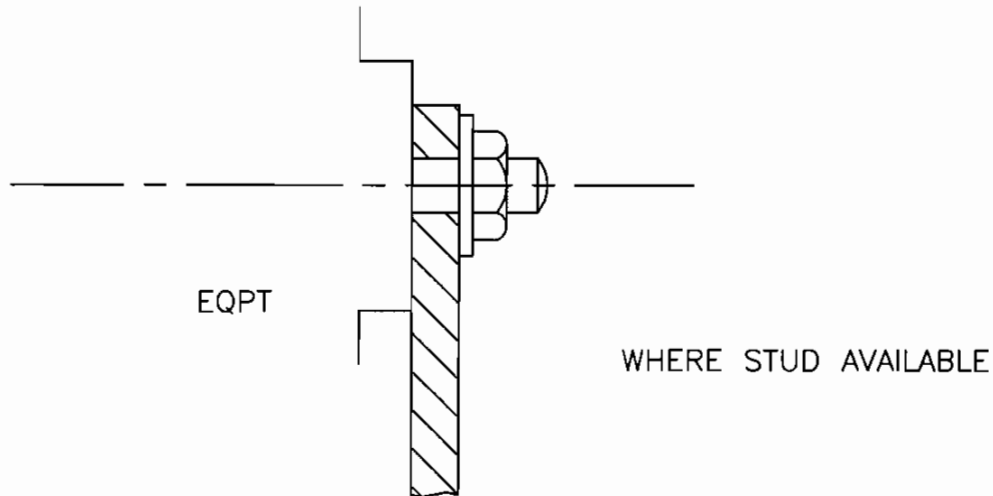
## EQUIPMENT EARTHING DETAILS GATE/FENCE POST

DRG. No.

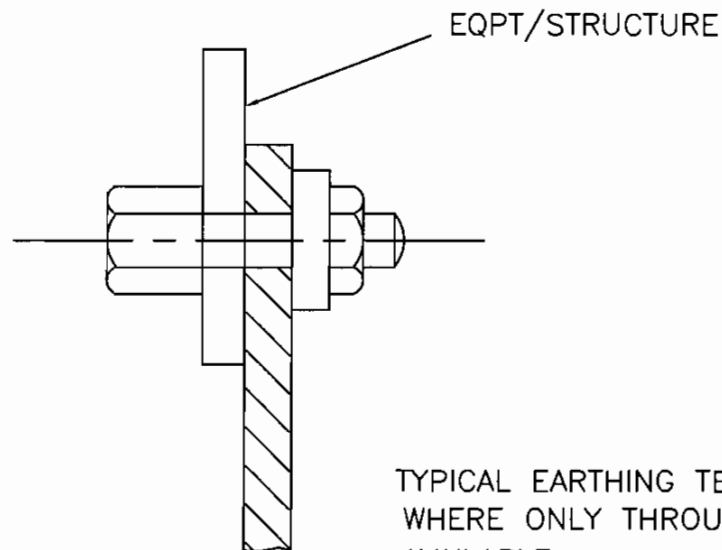
TB-4-359-316-161

SHEET No.  
18





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

DRG. No.

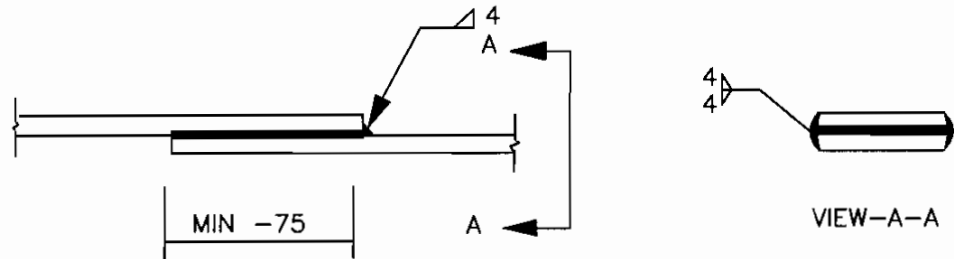
TB-4-359-316-161

REV. 00

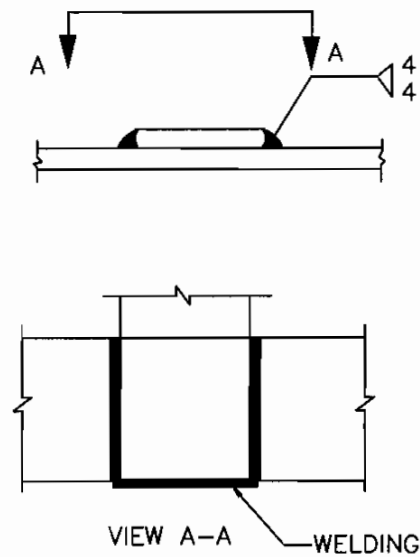
SHEET No.  
19

## C. STRIP TO STRIP (50X6 MS FLAT)

### 1. STRAIGHT LAP JOINT/RISER



### 2. CROSS LAP JOINT



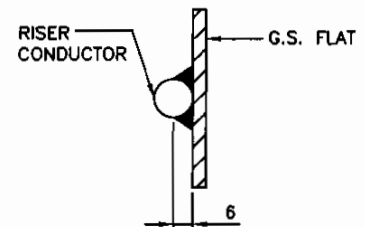
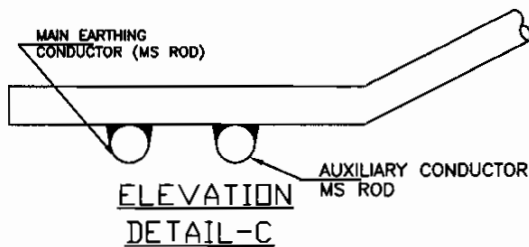
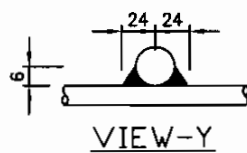
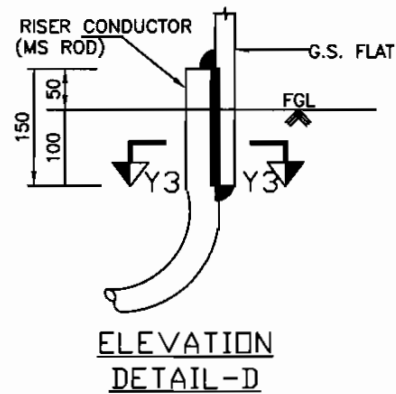
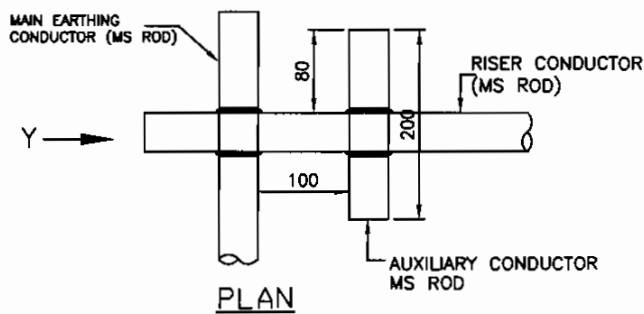
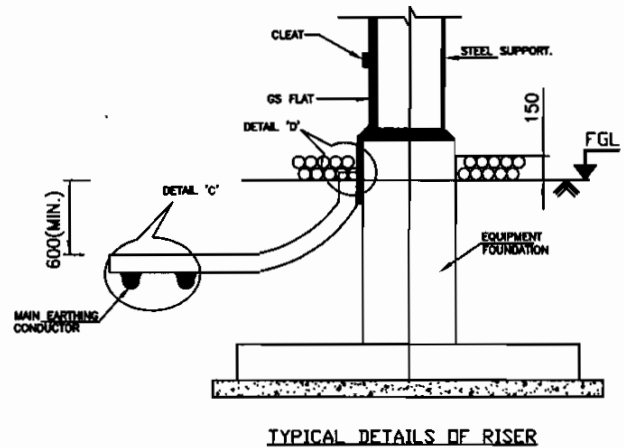
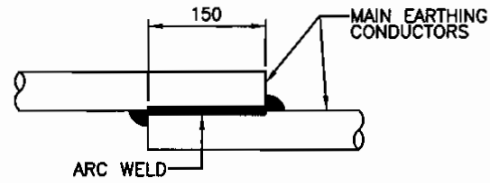
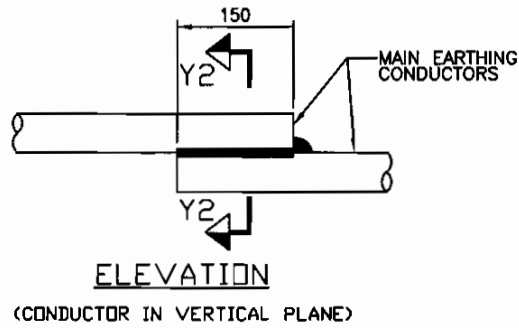
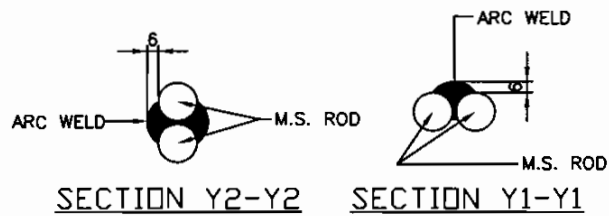
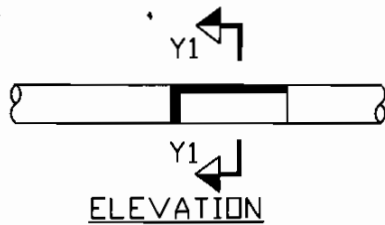
## EQUIPMENT EARTHING DETAILS WELDING DETAILS

COMPUTERREF.NO.

DRG. No.

TB-4-359-316-161

SHEET No.  
20



**TYPICAL OVERLAPPING JOINT OF TWO CONDUCTORS**



## EQUIPMENT EARTHING DETAILS

### WELDING DETAILS

COMPUTER REF. NO.

DRG. No.

TB-4-359-316-161

SHEET No.  
21