

REV	DATE	ALTERED: VKS	REV	DATE	ALTERED:	
1	17.02.15	CHECKED: SL/RG	2	25.05.15	CHECKED:	
1. DRAWING REVISED IN LINE WITH TANGEDCO LETTER REF: CE/P/SE /M/P/EE-10/E/P/F.2X660MW Ennore SEZ STPP/D.28/15, DATED 07.02.2015			1. DRAWING REVISED IN LINE WITH TANGEDCO LETTER REF: SE/E/T&H(P)/EE-6/E/P/F.2x660MW Ennore SEZ STPP/D.137/15,dt.22.05.2015			
						STATUS : CONTRACT
						JOB NO.: 412

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

**TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)**

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

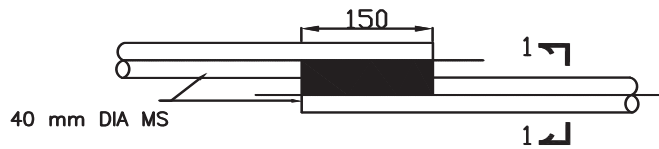

BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT, NEW DELHI

DEPT. E	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -
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TYPICAL BELOW GROUND EARTHING DETAILS

	NAME	SIGN	DATE
PREP	VKS		
CHKD	SL		
APPD	RG		

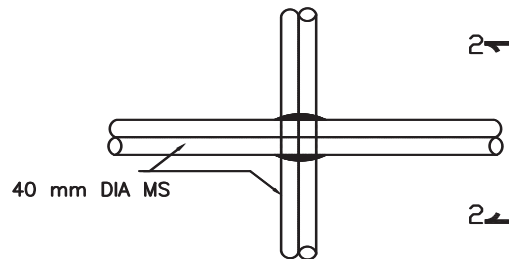
DEPT.							CARD CODE	DRAWING NO.	REV
SIGN			N.A.				-	PE-DG-412-509-E005	2
DATE								SHEET 1 OF 8	



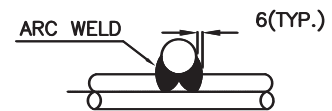
LAP JOINT



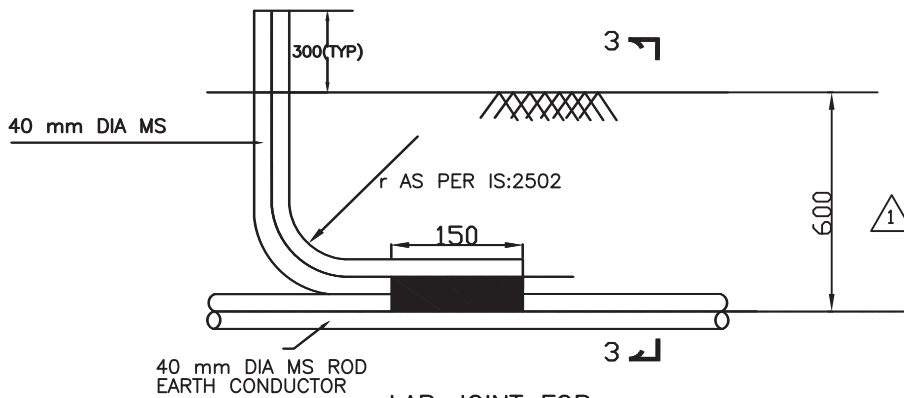
SECTION 1-1



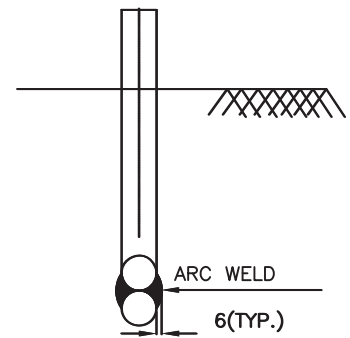
CROSS JOINT



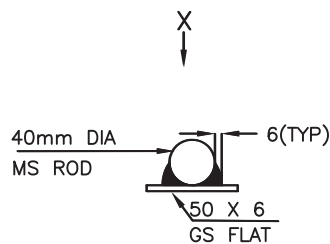
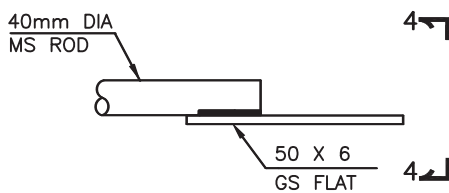
SECTION 2-2



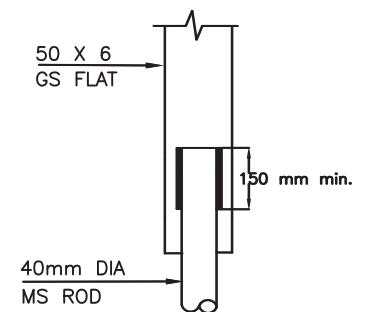
LAP JOINT FOR
RISER PIGTAIL



SECTION 3-3



SECTION 4-4
ROD FLAT JOINT



VIEW-X

WELDED JOINTS

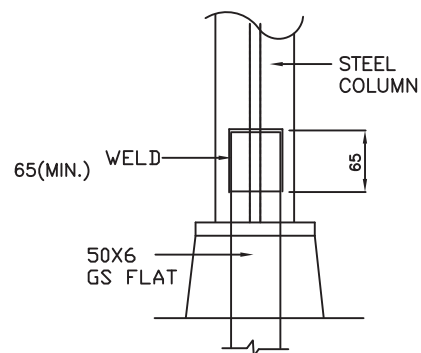
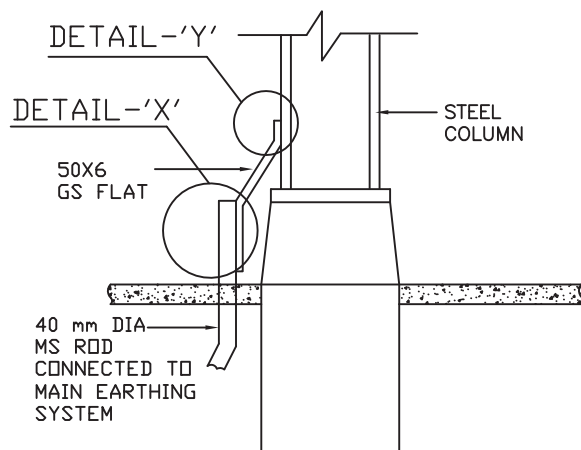
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TYPICAL BELOW GROUND EARTHING DETAILS

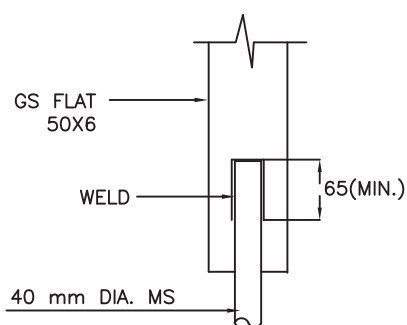
BHEL DRAWING No.
PE-DG-412-509-E005

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SHEET 2 OF 8

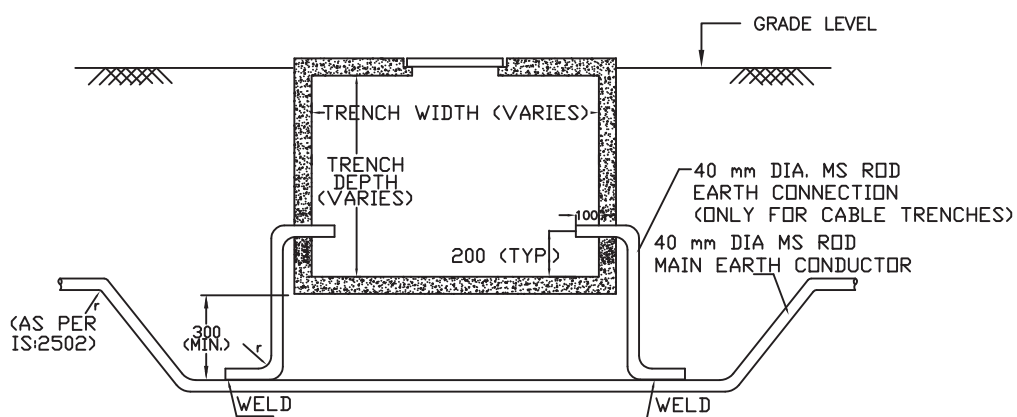


DETAIL-'Y'



DETAIL-'X'

COLUMN EARTHING



TRENCH CROSSING

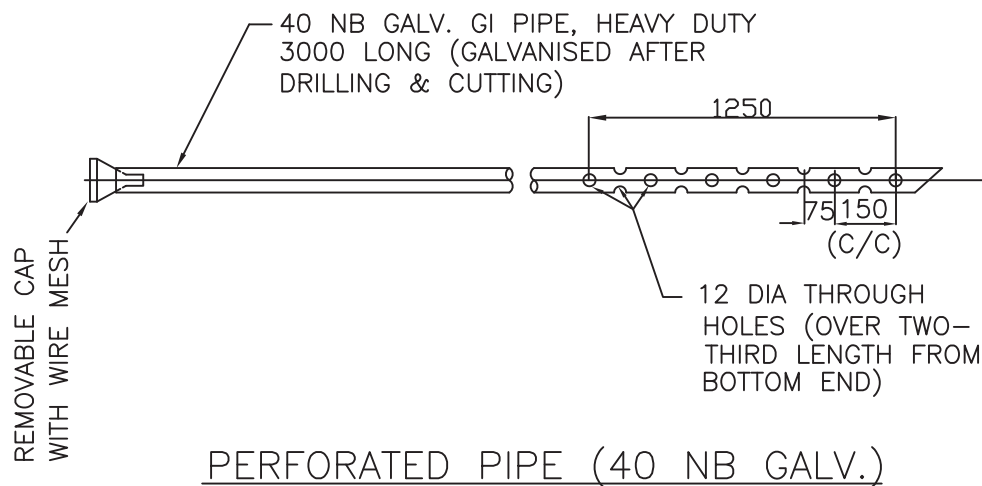
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TYPICAL BELOW GROUND EARTHING DETAILS

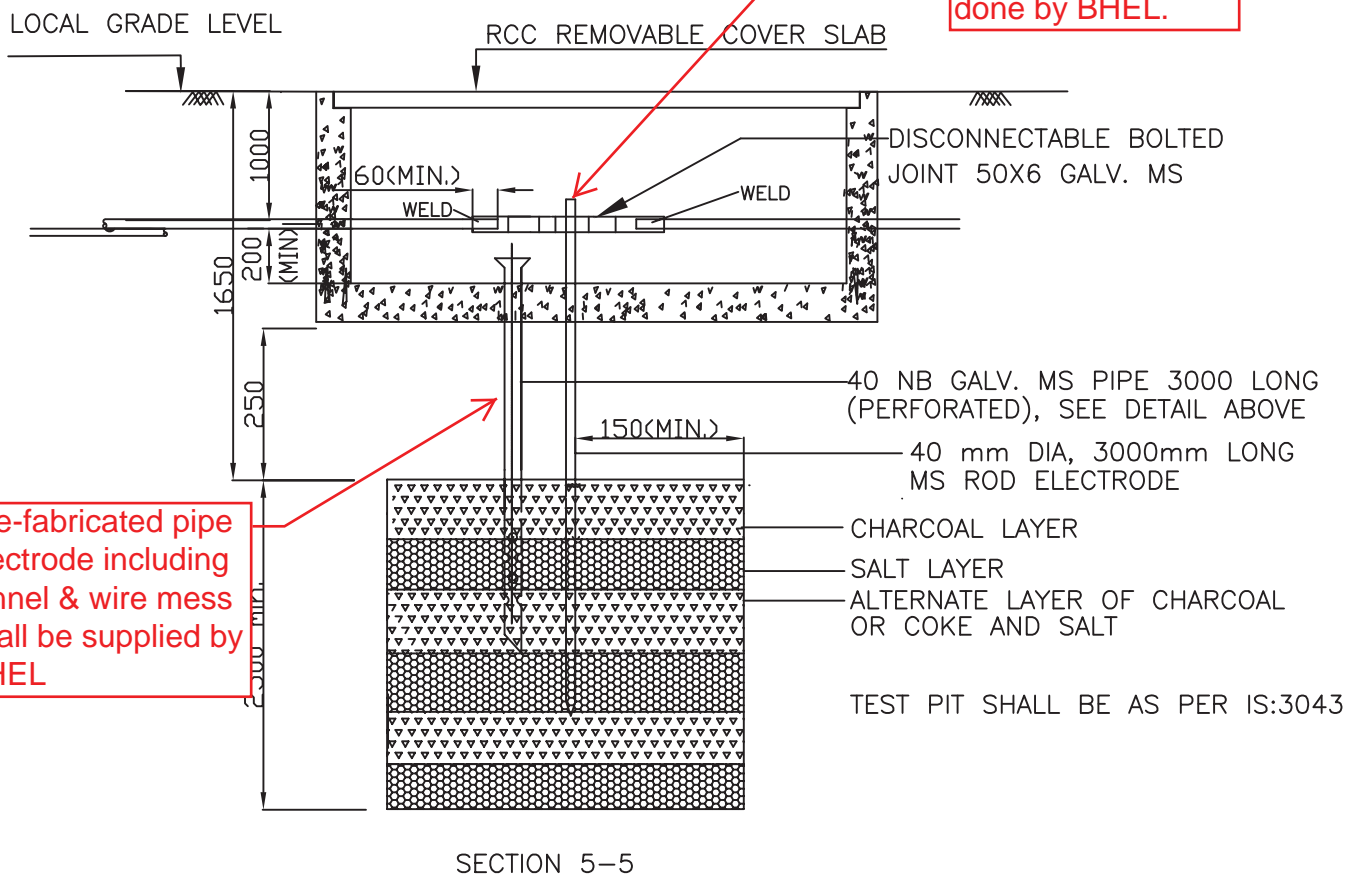
BHEL DRAWING No.
PE-DG-412-509-E005

REV. No. 02

SHEET 3 OF 8



fabrication of rod
electrode is in
bidders scope.
Supply of MS Rod,
GI Flat shall be
done by BHEL.



Pre-fabricated pipe
electrode including
funnel & wire mess
shall be supplied by
BHEL

SECTION 5-5

TEST PIT

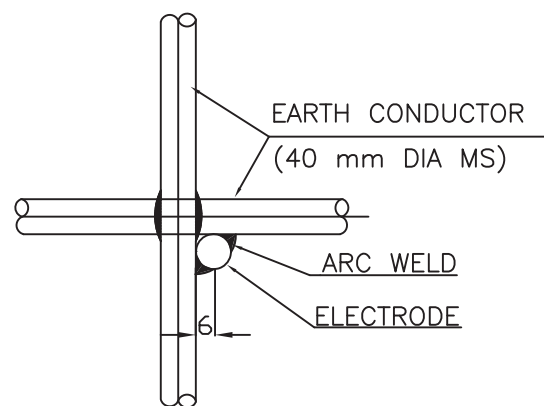
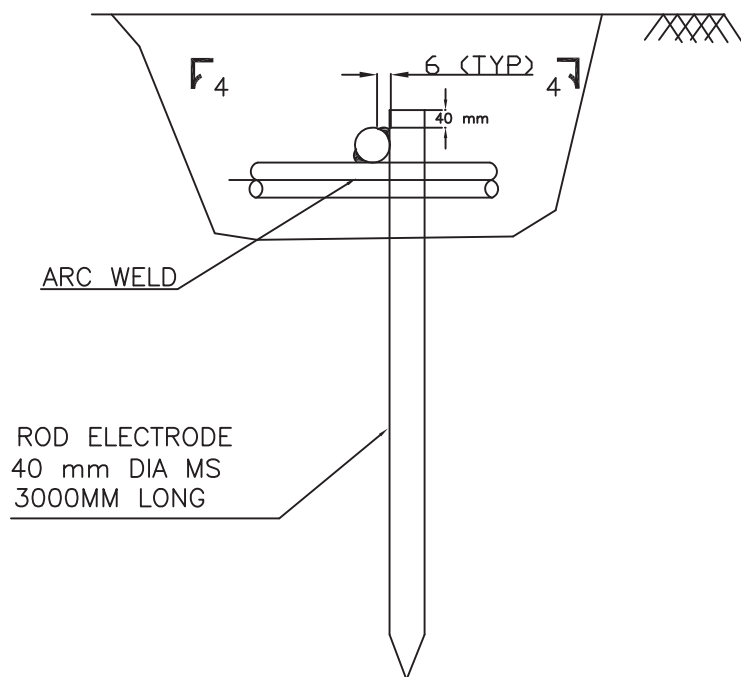
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TYPICAL BELOW GROUND EARTHING DETAILS

BHEL DRAWING No.
PE-DG-412-509-E005

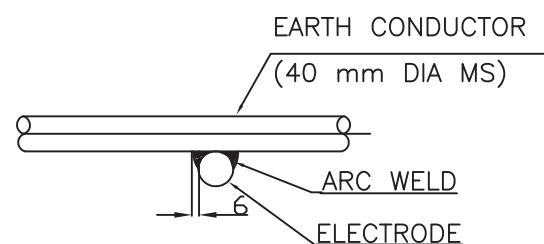
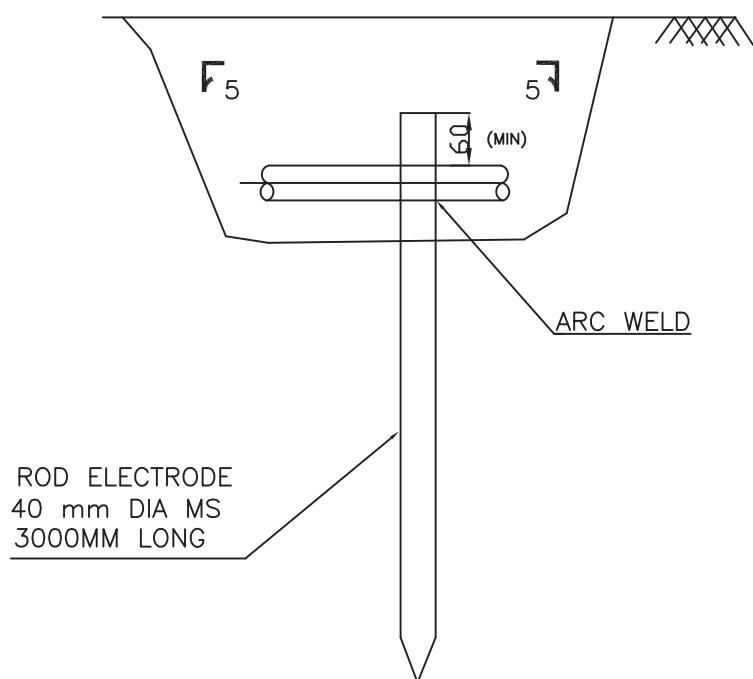
REV. No. 02

SHEET 5 OF 8



SECTION 4-4

ELECTRODE LOCATED AT JUNCTION OF EARTH CONDUCTORS



SECTION 5-5

ELECTRODES LOCATED ALONG PERIPHERAL EARTH CONDUCTOR (FOR USE AS EARTH ELECTRODES OTHER THAN TEST PITS)

TITLE

TYPICAL BELOW GROUND EARTHING DETAILS

BHEL DRAWING No.
PE-DG-412-509-E005

REV. No. 02

SHEET 6 OF 8

NOTES:—

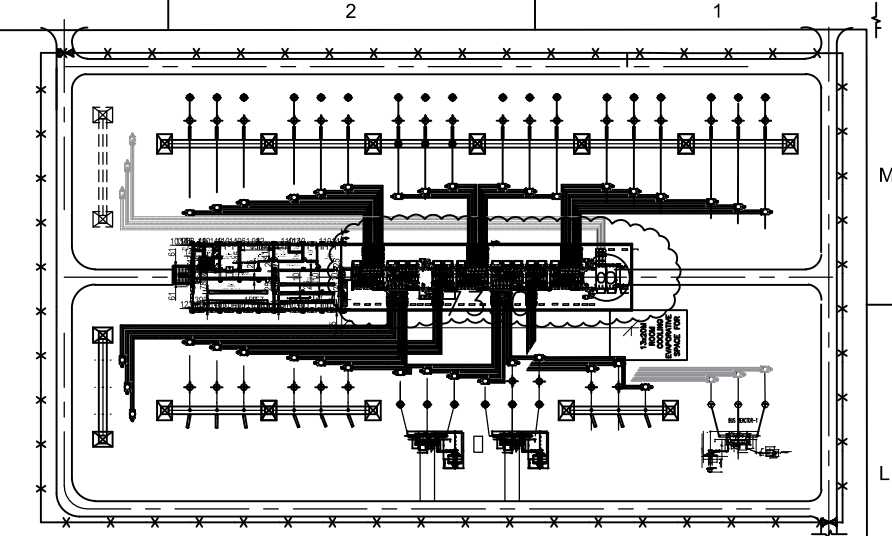
1. THIS DRAWING COVERS TYPICAL INSTALLATION DETAILS FOR BELOW GRADE GROUNDING SYSTEM, AND SHALL BE READ IN CONJUNCTION WITH RESPECTIVE GROUNDING LAYOUT DRAWINGS FOR DIFFERENT AREAS.
2. GROUND GRID OF MILD STEEL ROD MATERIAL DESIGNED TO LIMIT STEP AND TOUCH POTENTIALS WITHIN TOLERABLE LIMITS SHALL BE PROVIDED FOR THE MAIN POWER HOUSE AREA COVERING TRANSFORMER YARD, T.G. BUILDING, BOILER AREA, ESP, CHIMNEY AND CONTROL ROOM, AND AUX. PLANTS COVERED WITHIN THIS ENVELOPE.
3. AUXILIARY PLANT BUILDINGS (IN BHEL SCOPE) NOT COVERED BY THE MAIN GROUNDING GRID SHALL BE PROVIDED WITH RING ELECTRODE TYPE GROUNDING SYSTEM USING MILD STEEL ROD MATERIAL FOR LIMITING THE GROUND RESISTANCE BELOW 1 OHMS.
4. POWER STATION GROUND GRID AND AUXILIARY PLANT GROUNDING SYSTEM IN BHEL SCOPE SHALL BE INTERCONNECTED THROUGH AT LEAST TWO INTERCONNECTIONS WITH TEST FACILITY. HOWEVER FOR SEA WATER INTAKE SYSTEM, INTERCONNECTION WITH POWER STATION GROUNDING GRID IS NOT ENVISAGED DUE TO LONG DISTANCE.
5. THE EARTH CONDUCTOR BELOW GRADE LEVEL SHALL BE BARE 40 mm DIA MILD STEEL (M.S.) ROD. & SHALL BE BURIED IN EARTH AT A MINIMUM DEPTH OF 600 MM
BELOW GRADE LEVEL EARTH CONDUCTOR SHALL BE ROUTED
BELOW ROADS/ RAIL TRACKS/TRENCHES WITH MINIMUM CLEARANCES AS UNDER :
 - a) BELOW RAIL TRACK : MINIMUM 300 MM
 - b) BELOW ROAD/ CABLE TRENCHES/ PIPE TRENCHES : MINIMUM 300 MM.
6. EARTH RING CONDUCTOR AROUND THE OFFSITE BUILDINGS SHALL BE BURIED OUTSIDE THE BOUNDARY AT MINIMUM DISTANCE OF 1200 MM. FOR FENCE, THIS DISTANCE SHALL BE 2000 mm.
7. EARTH ELECTRODE & TEST PIT ELECTRODE SHALL BE 40 MM DIA X 3000 MM LONG MILD STEEL ROD DRIVEN INTO THE GROUND AND CONNECTED TO THE GROUNDING GRID CONDUCTOR.
TEST PIT SHALL BE AS PER IS:3043
8. RISERS / PIGTAILS FROM THE GROUNDING GRID / RING SHALL BE 40 mm DIA MILD STEEL ROD AND SHALL PROJECT 300 mm ABOVE GRADE/ CONCRETE FLOOR LEVEL UNLESS OTHERWISE SPECIFIED. ALL RISER PIGTAILS SHALL BE PAINTED GREEN FOR THE ABOVE GROUND PORTION.
9. THE INTERCONNECTING CONDUCTORS SHALL BE RUN PARALLEL TO AND AS CLOSE AS POSSIBLE TO THE INTERCONNECTING CABLE PATH ON PIPE CUM CABLE TRESTLE/ DUCT BANK/ TRENCH AS APPLICABLE.
10. ALL SYSTEM NEUTRALS, GROUNDING TERMINALS OF SURGE ARRESTORS SHALL BE CONNECTED TO TREATED EARTH PITS, WHICH IN TURN ARE CONNECTED TO THE STATION GROUNDING GRID.
11. EARTH PIT WITH RISER FOR SYSTEM NEUTRALS SHALL BE CONSTRUCTED AFTER ERECTION OF RELEVANT EQUIPMENT FOUNDATION.
12. ALL LIGHTNING PROTECTION DOWN CONDUCTORS SHALL BE CONNECTED TO DEDICATED GROUND ELECTRODES THROUGH ISOLATING LINKS AND THEN TO THE GROUNDING SYSTEM.

TITLE TYPICAL BELOW GROUND EARTHING DETAILS	BHEL DRAWING No. PE-DG-412-509-E005
	REV. No. 02
	SHEET 7 OF 8

NOTES:—

13. FOR ELECTRONIC GROUNDING, TWO NUMBER ELECTRONIC EARTH PITS SHALL BE PROVIDED FOR EACH UNIT IN MAIN PLANT AREA. HOWEVER, NO. OF ELECTRODES IN EACH PIT SHALL BE SUITABLY PROVIDED TO KEEP THE RESISTANCE LESS THAN 0.5 OHM. FOR OFFSITE AREAS INCLUDING ESP, ELECTRONIC EARTH PITS SHALL BE PROVIDED WHEREVER DCS/PLC IS ENVISAGED. FURTHER, FOR DETAILS OF ELECTRONIC GROUNDING, SYSTEM SUPPLIER DOCUMENTATION SHALL BE REFERRED.
- △
14. WELDING:
- (A) BARE MS
- a) ALL EARTH CONDUCTOR CONNECTIONS SHALL BE MADE BY ELECTRIC ARC WELDING ALL WELDING SHALL BE CARRIED OUT BY QUALIFIED AND EXPERIENCED WORKERS.
 - b) ALL ARC WELDING SHALL BE CARRIED OUT WITH LOW HYDROGEN CONTENT ELECTRODE.
 - c) ALL WELDED JOINTS SHALL BE ALLOWED TO COOL DOWN GRADUALLY TO ATMOSPHERIC TEMPERATURE BEFORE PUTTING ANY LOAD ON THEM. NO ARTIFICIAL COOLING SHOULD BE ADOPTED TO COOL WELDED JOINTS
 - d) THE WELDING REQUIRED FOR GROUNDING SHALL HAVE ADEQUATE STRENGTH.
 - e) BEFORE WELDING, THE EARTH CONDUCTOR SHALL BE CLAMPED TIGHTLY TO ENSURE GOOD SURFACE CONTACT AT WELDING POINTS.
 - f) TWO COATS OF RED OXIDE PAINT, FOLLOWED BY A COAT OF BITUMEN COMPOUND SHALL BE APPLIED ON ALL WELDED JOINTS.
- (B) GALVANISED MS
- a) CLEANING OF WELD AREA WITH WIRE BRUSH.
 - b) REMOVAL OF GALVANISATION COATING IN THE WELD AREA.
 - c) WELDING OF CONDUCTORS AS PER DETAILS SHOWN IN THIS DRAWING BY ELECTRIC ARC WELDING PROCESS USING LOW HYDROGEN CONTENT WELDING ELECTRODES.
 - d) NATURAL COOLING OF WELDED JOINT.
 - e) POST TREATMENT OF WELDED AREA :
 - i) ONE COAT OF ZINC CHROMATE PRIMER.
 - ii) ONE COAT OF ZINC RICH PAINT
- THE ABOVE TREATMENT SHALL EXTEND MINIMUM 100 MM ON BOTH SIDES OF THE WELD LENGTH.
- BENDING OF THE CONDUCTOR, WHEREVER NECESSARY, SHALL BE DONE BY GAS HEATING.
15. THE ERECTION OF BELOW GROUND EARTHING SYSTEM SHALL COMPLY WITH THE REQUIREMENTS OF IS 3043: CODE OF PRACTICE FOR EARTHING.
16. CIVIL DETAILS OF EARTH PITS/ TEST PITS ARE INDICATIVE. ACTUAL DETAILS SHALL BE SHOWN IN CIVIL DRAWINGS.
17. THE EARTH MAT (RING ELECTRODE SYSTEM) OF THE SEA WATER INTAKE SYSTEM SHALL BE CONNECTED TO PURCHASER'S (EXISTING NORTH CHENNAI STAGE II) COOLING WATER PUMP HOUSE OR ELECTRO CHLORINATION PLANT EARTH MAT.
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TITLE	BHEL DRAWING No.		
	PE-DG-412-509-E005		
	REV. No. 02		
TYPICAL BELOW GROUND EARTHING DETAILS			
SHEET 8 OF 8			



KEY PLAN

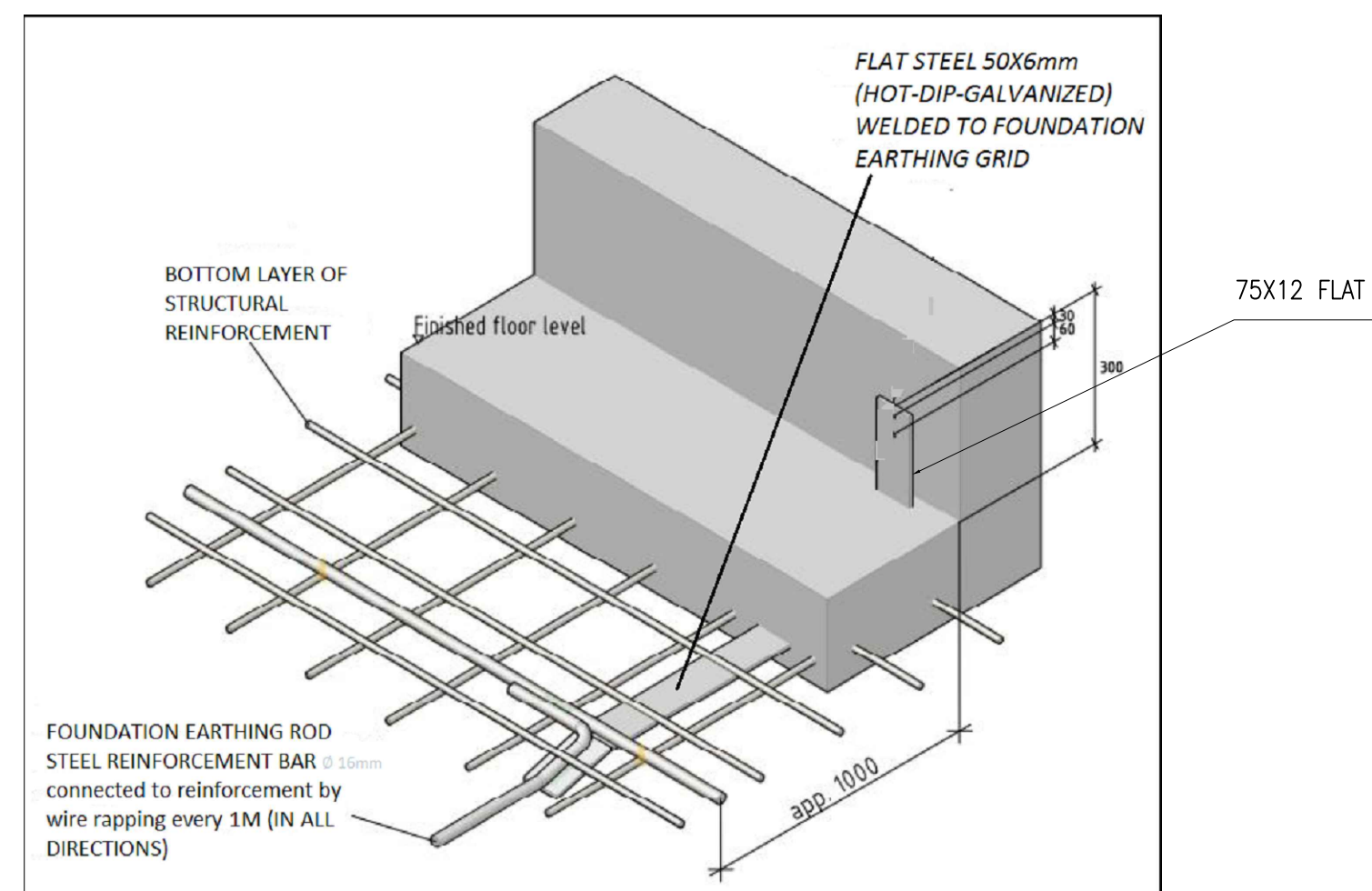
NOTES:-

1. THIS DRAWING COVERS EARTHING IN GIS BUILDING.
2. AUXILIARY GRID – 40MM MS ROD AT THE GRID SPACING OF APPROXIMATELY 5 METER X 5 METER AT A LEVEL OF (-) 1.5 METER FROM BUILDING'S FINISHED FLOOR LEVEL.
3. OUTDOOR SWITCHYARD EARTHING COVERED UNDER EARTHMAT LAYOUT TB-378-510-011
4. LOCATION OF EARTHING CONDUCTORS / RISERS SHOWN IN THE DRAWING MAY CHANGE TO SUIT THE SITE REQUIREMENT.
5. WHEREVER EARTHING CONDUCTOR (40MM MS ROD) CROSSES CABLE TRENCHES, DRAIN, IT SHALL BE LAID MINIMUM 300 MM BELOW THEM AND SHALL BE CIRCUMVENTED IN CASE IT FOULS WITH EQUIPMENT/STRUCTURE FOUNDATIONS.
6. IF EARTHING CONDUCTORS (40MM MS ROD) NEED TO BE EMBEDDED IN THE CONCRETE SHALL HAVE APPROXIMATELY 50MM CONCRETE COVER
7. ALL THE DIMENSIONS ARE IN MM, UNLESS OTHERWISE MENTIONED.


Sl. No	Drawing No	Drawing Title
1	TB- 378-510-011	EARTHMAT LAYOUT FOR 400KV SWITCHYARD
2	TB-378-316-101-07	400kV GIS SWITCHGEAR INTERFACE FOR GROUNDING & GROUNDING PROCEDURE/ PHILOSOPHY
3	TB-378-316-101-08	400kV GIS SWITCHGEAR- CIVIL DESIGN SPECIFICATION
4	Annexure-1 Dated 24.12.2018	Report on Transient Enclosure Voltage 400 kV GIS
5	TB-378-510-033	Earthmat Design Calculation for 400kV Switchyard
6	TB-378-510-002	400KV GIS AND POTHEAD YARD LAYOUT PLAN ENNORE
7	TB-0-378-607-603	Foundation layout for 400kV yard.

LEGENDS:-

— 40mm DIA MS ROD



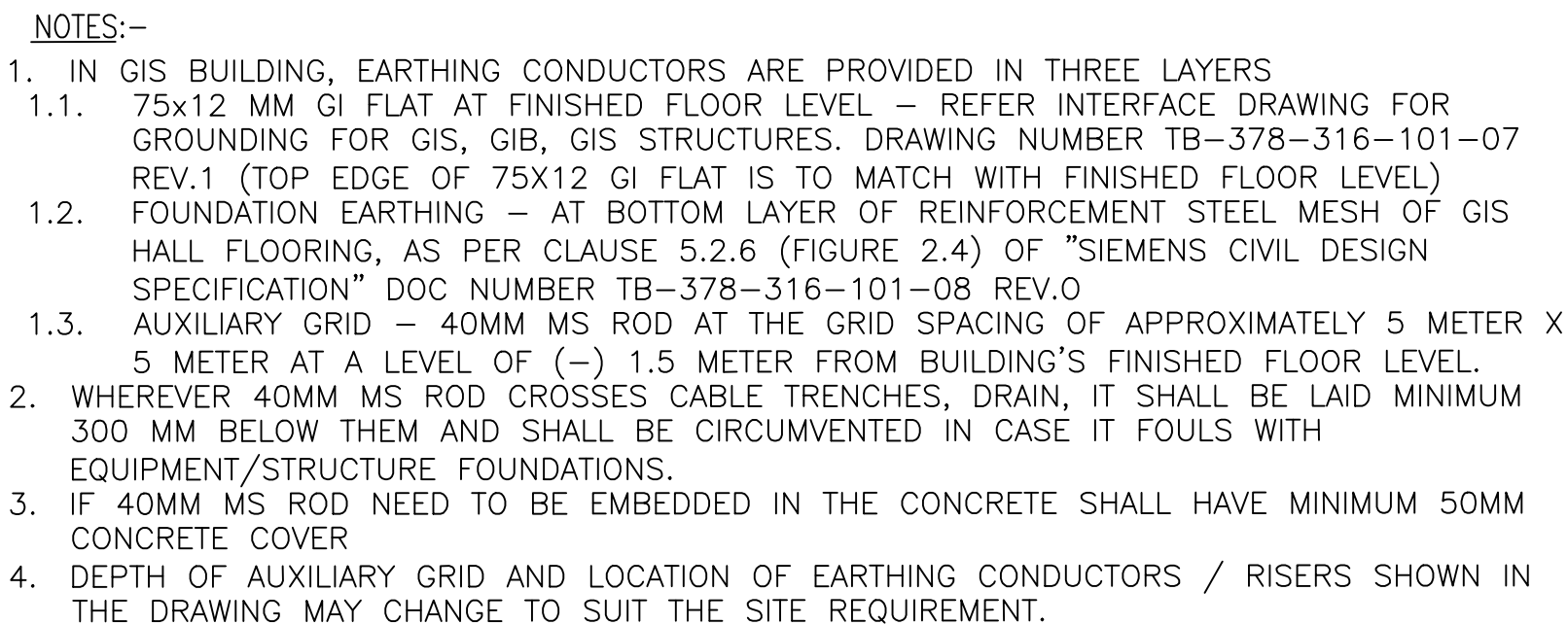
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		CHECKED			CHECKED			CHECKED
		APPROVED			APPROVED			APPROVED
ZONE			ZONE			ZONE		



ADDITIONAL INFORMATION W.O.No. 64007			ग्राहक/परियोजना का नाम TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)										
STATUS OF DRAWING			NAME OF CUSTOMER/PROJECT 400KV GIS AT 2 X 660 MW ENnore SEZ SUPERCRITICAL THERMAL POWER PROJECT AT ASH DYKE OF NCTPS										
DISTRIBUTION OF PRINTS			NAME OF CONSULTANT DESEIN PRIVATE LIMITED, NEW DELHI.										
			B										
 भारत हेवी इलेक्ट्रिकल्स लिमिटेड भारतीय आपावर कर्तुषः BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP			<table border="1"> <thead> <tr> <th>क्रमांक / NO.</th> <th>नाम / NAME</th> <th>हस्ता / SIGN.</th> <th>दि./DATE</th> </tr> </thead> <tbody> <tr> <td>अनुपात / SCALE</td> <td>शेड कार्ड / CARD CODE</td> <td></td> <td></td> </tr> </tbody> </table>			क्रमांक / NO.	नाम / NAME	हस्ता / SIGN.	दि./DATE	अनुपात / SCALE	शेड कार्ड / CARD CODE		
क्रमांक / NO.	नाम / NAME	हस्ता / SIGN.	दि./DATE										
अनुपात / SCALE	शेड कार्ड / CARD CODE												
REV.	DATE	ALTERED CHECKED APPROVED	विभाग / DEPT.	प्रो. कोड / PRJ. CODE									
ZONE			शीटिंग/TITLE	डाटाईंग/DRAWING NO. TB-378-610-15	पृष्ठ सं./ SHEET No. 01 (उत्तम पृष्ठ / NEXT SHEET 02								
			GIS BUILDING EARTHING										

COMPUTER DRG. PATH NAME :

SIGN. & DATE	REF. DRG. No.
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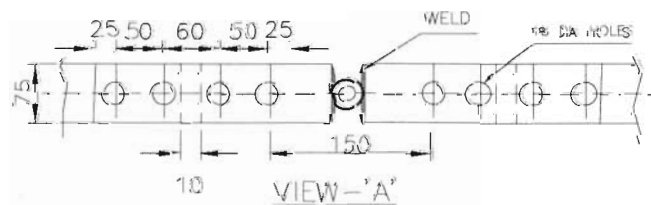
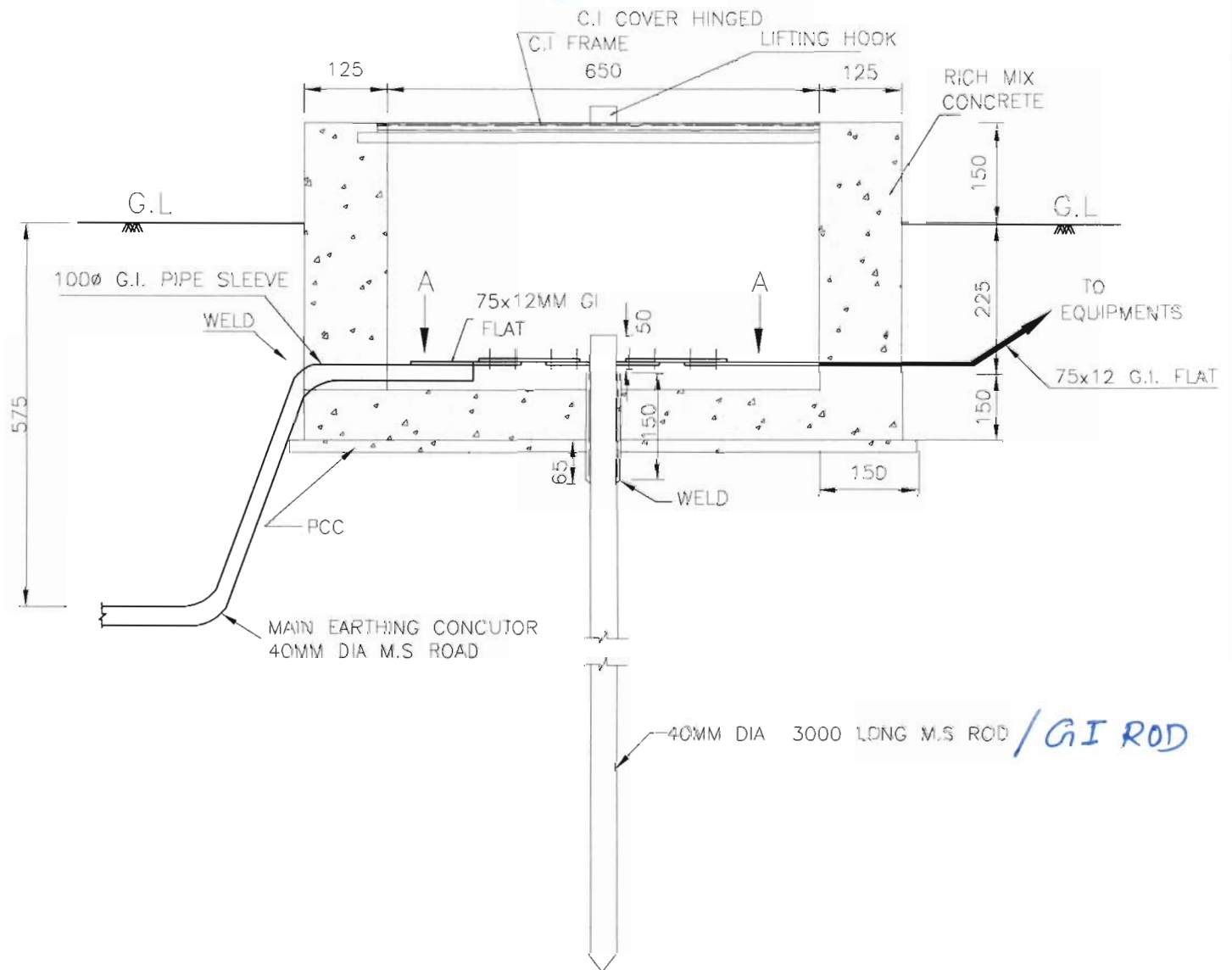
INVENTORY No.



 75X12 GI FLAT
 50X6 GI FLAT
 12MM FOUNDATION EARTHING BAR
 40 MM DIA MS ROD

						ADDITIONAL INFORMATION W.O.No. 8-6007		आइस/परियोजना का नाम TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO) 400KV GIS AT 2 X 660 MW ENNORE SEZ SUPERCRITICAL THERMAL POWER PROJECT AT ASH DYKE OF NCTPS				
						STATUS OF DRAWING						
						DISTRIBUTION OF PRINTS						
								NAME OF CONSULTANT DESEIN PRIVATE LIMITED, NEW DELHI.				
						<div>भारत हेवी इलेक्ट्रिकल्स लिमिटेड भारत भारी बिजली संयंत्र समूह BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP</div>		<div>कार्य WORK विषय SUBJECT संशोधन REVISION अनुमति APPROVAL</div>		<div>शीट / NAME PAGE पृष्ठ / NO. पृष्ठ / NO. पृष्ठ / NO.</div>	<div>हस्ताक्षर / SIGN SIGNATURE हस्ताक्षर / SIGN SIGNATURE हस्ताक्षर / SIGN SIGNATURE</div>	<div>दि./DATE DATE दि./DATE DATE दि./DATE DATE</div>
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GIS BUILDING EARTHING												
पृष्ठ क./SHEET No. 02 [गोपनी] पृष्ठ/NEXT SHEET --												

IS 3043



NOTE:-

1. TO BE USED FOR CONNECTING DOWN CONDUCTOR OF LIGHTNING PROTECTION SYSTEM.



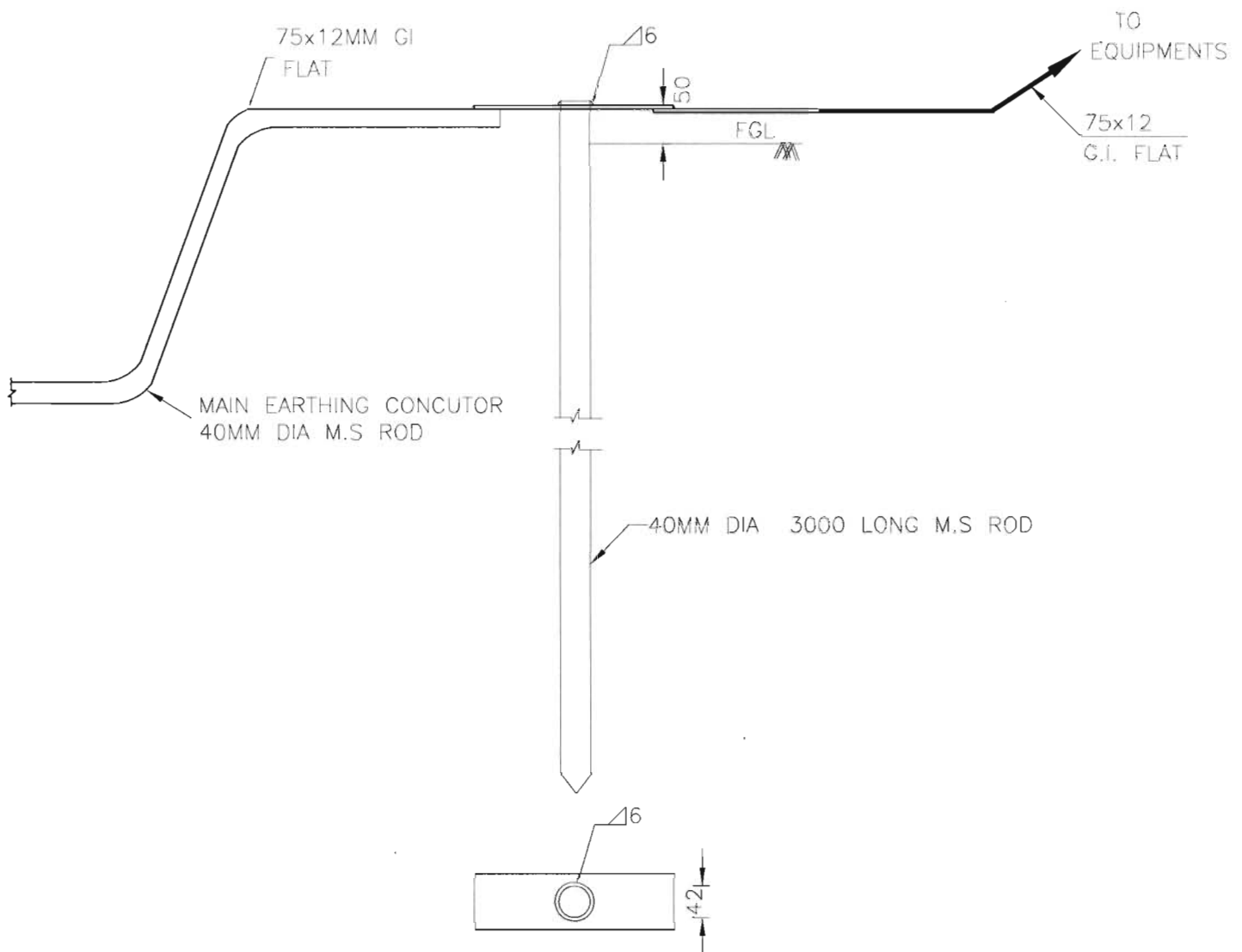
EQUIPMENT EARTHING DETAILS

ROD EARTH ELECTRODE WITH TEST LINK

COMPU. DRG. REF.

DRG. No.

TB-STD-316-ROD ELECTRODE WITH PIT



NOTE:-

1. TO BE USED FOR CONNECTING NEUTRAL OF CVT AND SURGE COUNTER OF LA



EQUIPMENT EARTHING DETAILS ROD EARTH ELECTRODE WITHOUT TEST LINK

COMPU. DRG. REF.

DRG. No. TB-STD-316-ROD ELECTRODE W/O PIT