


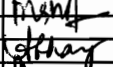
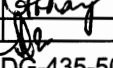
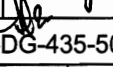
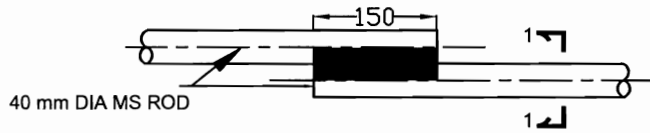


TYPICAL BELOW GROUND EARTHING DETAILS

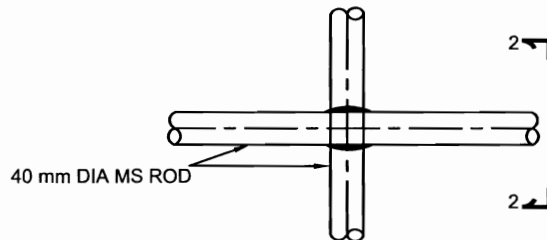
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					OWNER'S CONSULTANT		DESEIN PRIVATE LIMITED, DESEIN HOUSE, NEW DELHI						
REV.	DATE	ALTD	CHD	APPD									
					PROJECT	2 X 660 MW Udangudi Supercritical Thermal Power Project - Stage - 1							
435						BHARAT HEAVY ELECTRICALS LTD. POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			DEPT CODE	DRN	NAME MKM	SIGN	DATE
CONTRACT						E	DSGN	MKM		19/03/2018			
							CHD	AbA		19/03/2018			
							APPD	SL		20/03/18			
					TITLE	TYPICAL BELOW GROUND EARTHING DETAILS			DRAWING NO.		PE-DG-435-509-E005		
							SHEET 1 OF 11		REV.		00		



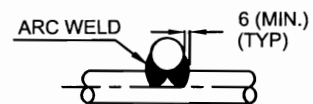
LAP JOINT



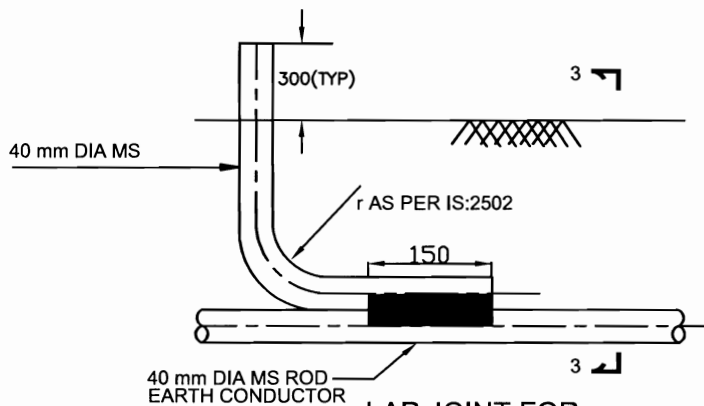
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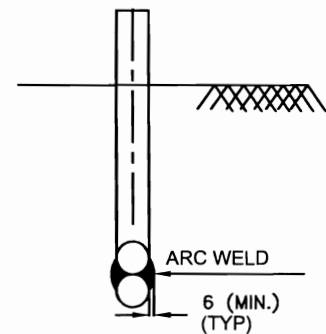
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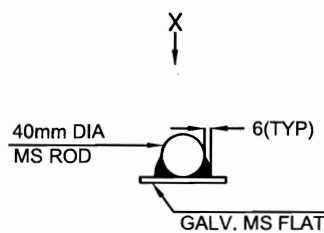
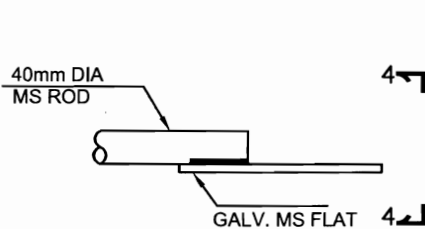
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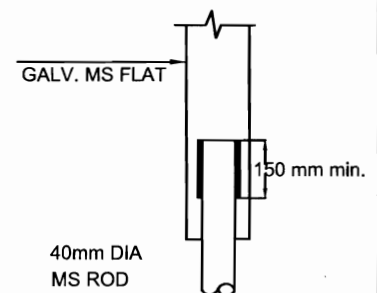
LAP JOINT FOR
RISER PIGTAIL



SECTION 3-3



SECTION 4-4
ROD FLAT JOINT



VIEW-X

WELDED JOINTS

TITLE

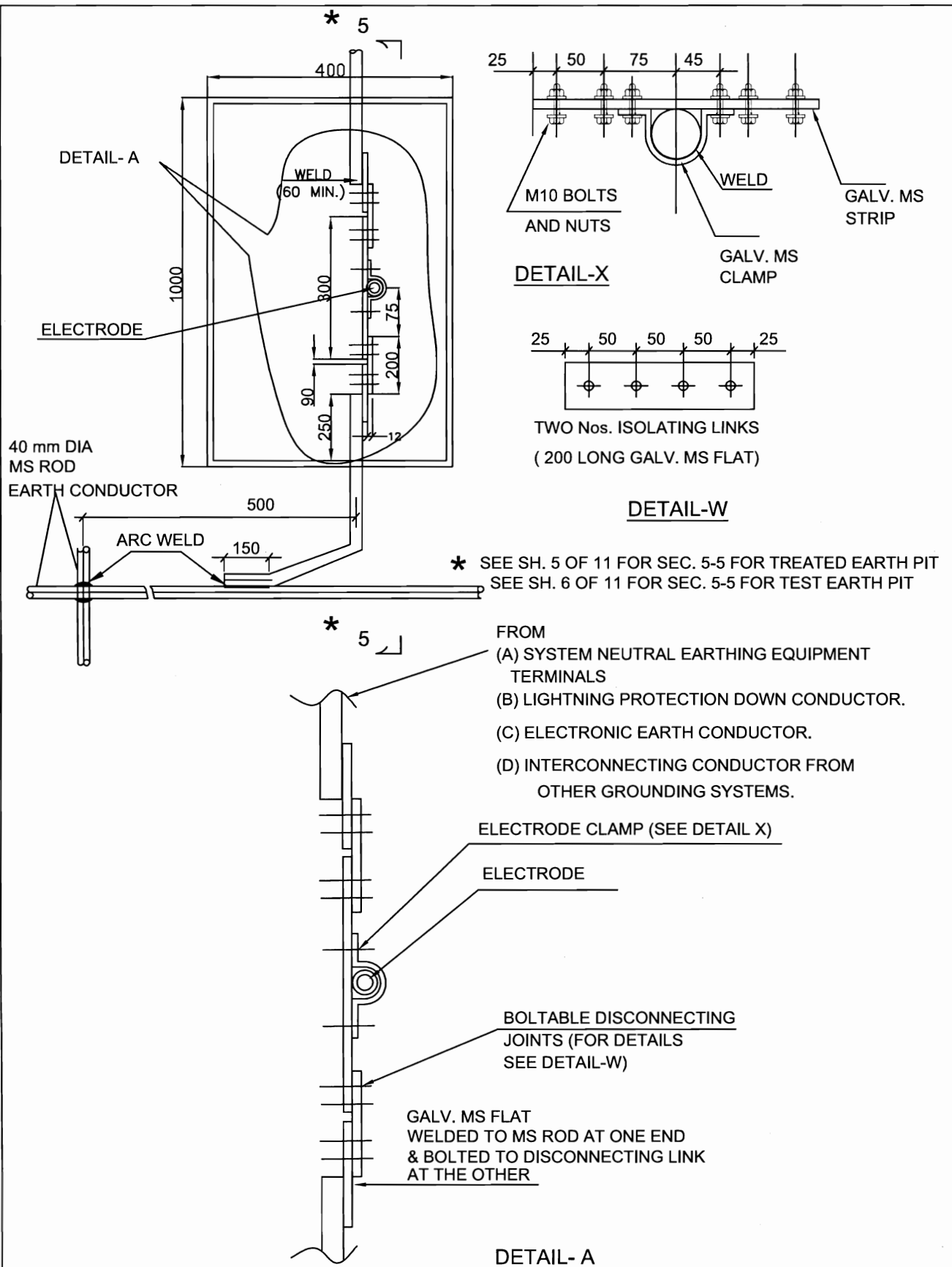
TYPICAL BELOW GROUND EARTHING
DETAILS

BHEL DRAWING No.
PE-DG-435-509-E005

REV. No. 00

SHEET 2 OF 11

Diagram illustrating the connection of a 40 mm DIA MS ROD MAIN GROUNDING GRID CONDUCTOR to a trench. The trench is shown with a width and depth that varies. The conductor is connected to the trench via a 40 mm DIA. MS ROD GROUND CONNECTION (ONLY FOR CABLE TRENCHES). The connection is made using a WELD. The trench is filled with a material labeled 200 (TYP.). The conductor is shown with a bend radius of 300MM (MIN). The connection is made at a depth of 100mm below the GRADE LEVEL. The conductor is labeled (AS PER IS:2502).



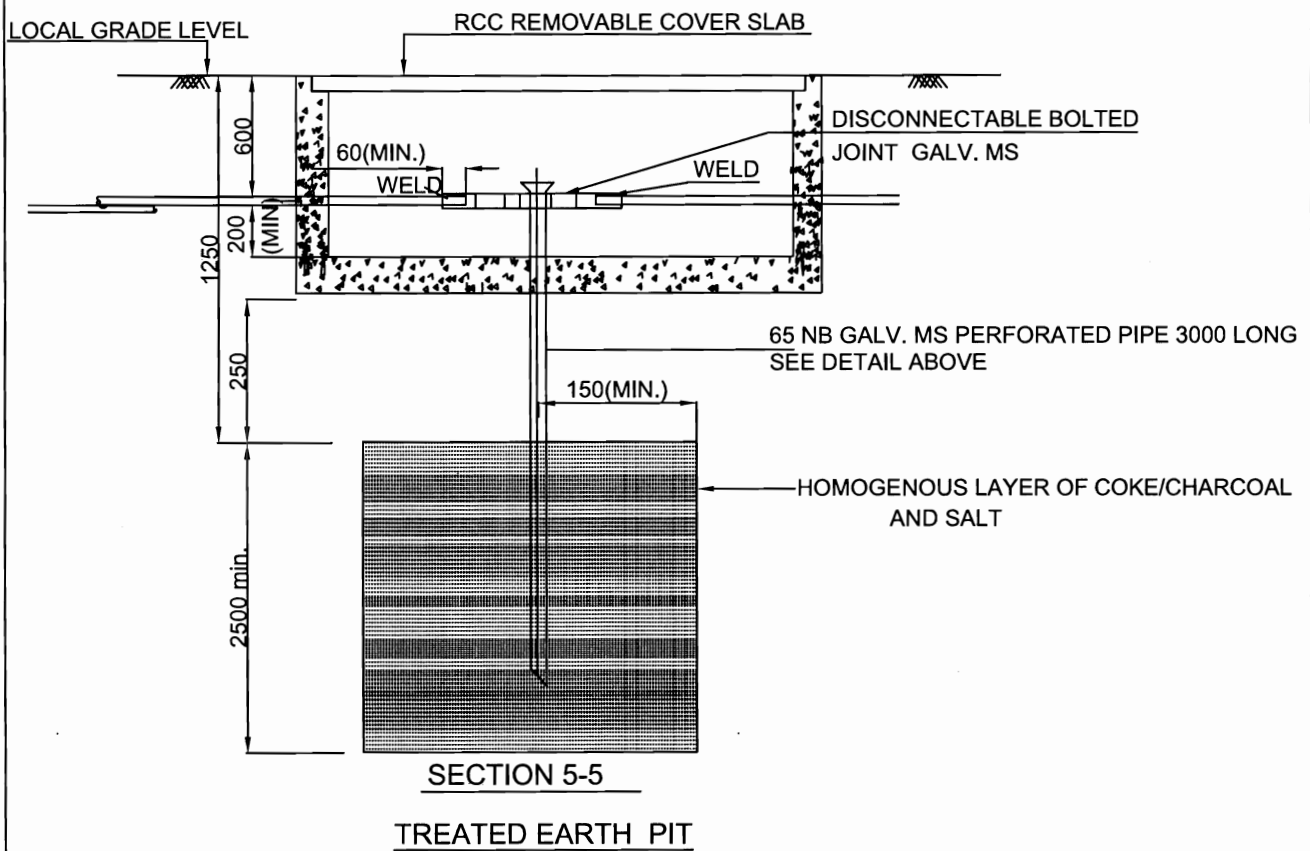
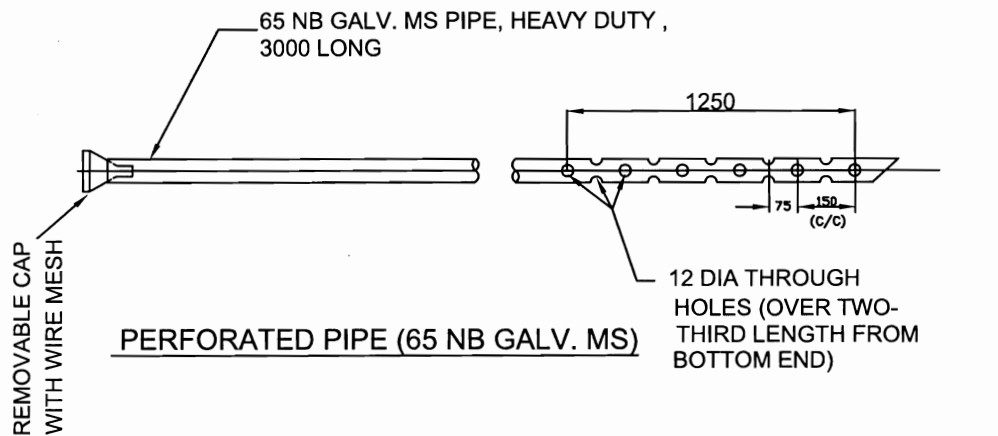
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TYPICAL BELOW GROUND EARTHING DETAILS

BHEL DRAWING No.
PE-DG-435-509-E005

REV. No. 00

SHEET 4 OF 11



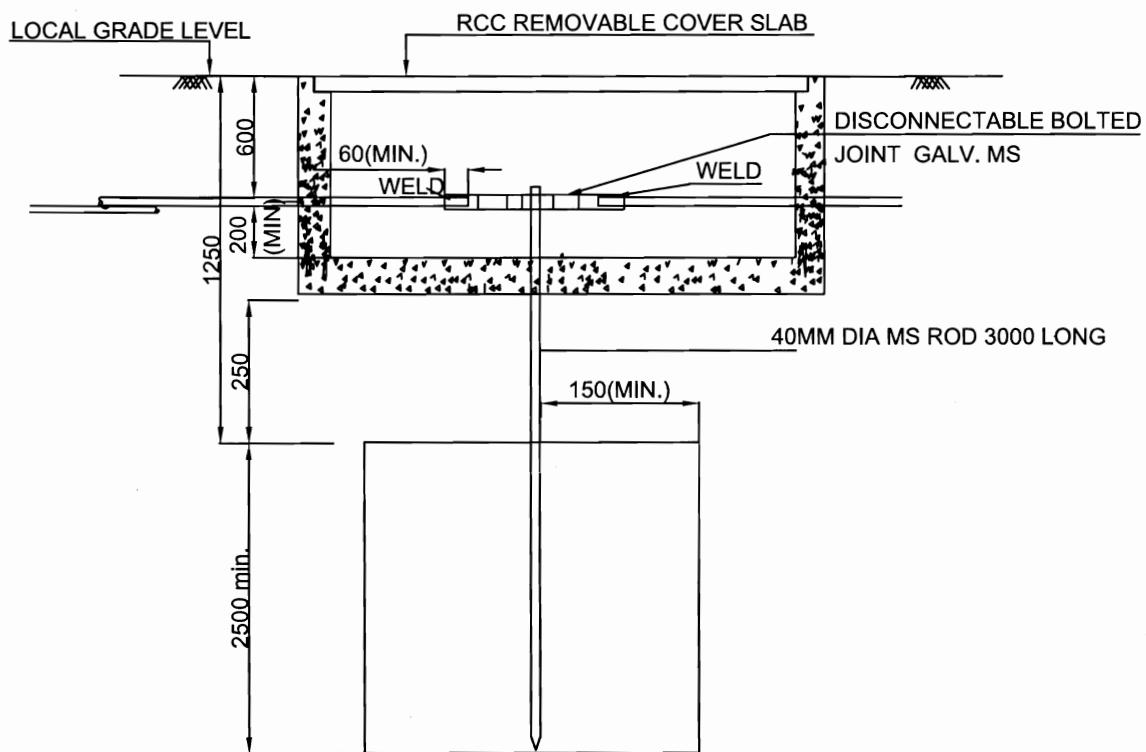
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TYPICAL BELOW GROUND EARTHING DETAILS

BHEL DRAWING No.
PE-DG-435-509-E005

REV. No. 00

SHEET 5 OF 11



SECTION 5-5

TEST EARTH PIT

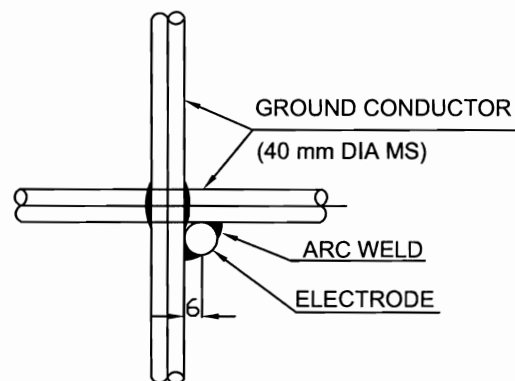
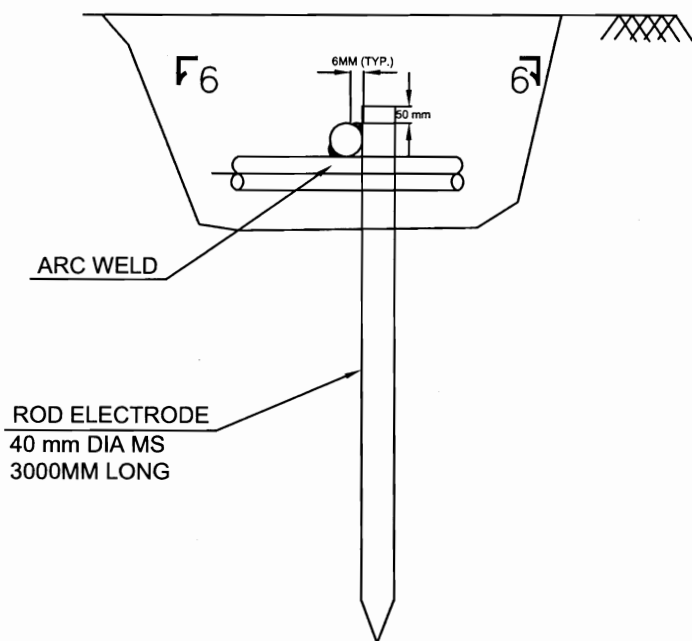
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TYPICAL BELOW GROUND EARTHING
DETAILS

BHEL DRAWING No.
PE-DG-435-509-E005

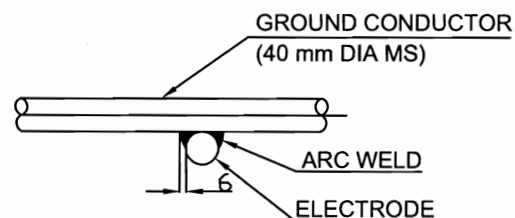
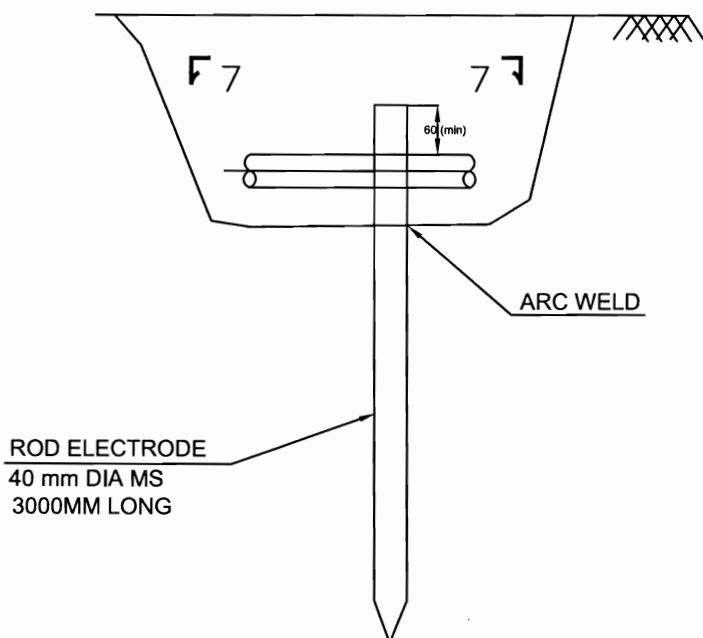
REV. No. 00

SHEET 6 OF 11



SECTION 6-6

ELECTRODE LOCATED AT JUNCTION OF GROUND CONDUCTORS



SECTION 7-7

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

TITLE

TYPICAL BELOW GROUND EARTHING
DETAILS

BHEL DRAWING No.
PE-DG-435-509-E005

REV. No. 00

SHEET 7 OF 11

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 AUXILIARY PLANTS COVERED WITHIN THIS ENVELOPE.
3. AUXILIARY PLANT BUILDINGS 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 OHM. MAIN PLANT EARTH MAT SHALL BE DESIGNED THAT TOTAL GROUND RESISTANCE DOES NOT EXCEED 0.5 OHM.
4. POWER STATION GROUND GRID & SWITCHYARD GROUND GRID AND AUXILIARY PLANT GROUNDING SYSTEM SHALL BE INTERCONNECTED THROUGH AT LEAST TWO INTERCONNECTIONS WITH TEST FACILITY.
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/ROAD : MINIMUM 600 MM
 - b) BELOW 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 1500 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.
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 EHV SURGE ARRESTORS AND VOLTAGE TRANSFORMERS SHALL BE CONNECTED TO TWO TREATED EARTH PITS, WHICH IN TURN ARE CONNECTED TO THE STATION GROUNDING GRID.
11. TREATED EARTH PIT WITH RISER FOR SYSTEM NEUTRALS SHALL BE CONSTRUCTED AFTER COMPLETION 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-435-509-E005

REV. No. 00

SHEET 8 OF 11

NOTES:-

13 ELECTRONIC GROUNDING

FOR ELECTRONIC GROUNDING, ONE NUMBER ELECTRONIC GROUNDING PIT SHALL BE PROVIDED AS PER ENCLOSED ELECTRONIC EARTH PIT DRAWING .
ONLY ELECTRONIC GROUNDING CONNECTIONS SHALL BE BROUGHT TO THE PIT.
NO OTHER GROUND CONNECTIONS (I.E. SYSTEM/ EQUIPMENT GROUND CONNECTIONS) SHALL BE PERMITTED. THE OTHER END CONNECTION FROM THE ELECTRONIC GROUNDING PITS SHALL BE MADE TO STATION GROUND. TWO CONNECTION SHALL BE MADE FROM EACH PIT TO STATION GRID. NO INTERCONNECTION SHALL BE DONE BETWEEN THE ELECTRONIC GROUNDING PITS. FOR FURTHER DETAILS OF ELECTRONIC GROUNDING, BHEL-EDN DOCUMENTATION SHALL BE REFERRED. FOR PLC BASED SYSTEM (IF APPLICABLE) DRG ATTACHED AS ANNEXURE-V SHALL BE REFERRED.

14. TEST PIT SHALL BE PROVIDED FOR ISOLATION OF MAIN PLANT EARTH MAT AND OTHER AREAS EARTH MAT. EARTH ELECTRODE IN CASE OF TEST PIT SHALL BE 40MM DIA MS ROD.

15. WELDING:

BARE MS

- a) ALL GROUND CONDUCTOR CONNECTIONS SHALL BE MADE BY ELECTRIC ARC WELDING USING LOW HYDROGEN ELECTRODES BY QUALIFIED AND EXPERIENCED WORKERS.
- b) 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
- c) BEFORE WELDING, THE GROUND CONDUCTOR SHALL BE CLAMPED TIGHTLY TO ENSURE GOOD SURFACE CONTACT AT WELDING POINTS.
- d) TWO COATS OF RED OXIDE PAINT, FOLLOWED BY A COAT OF BITUMEN COMPOUND SHALL BE APPLIED ON ALL BURIED WELDED JOINTS, FOR A MINIMUM LENGTH OF 100mm ON BOTH SIDE O WELD LENGTH.
- e) BENDING OF CONDUCTOR, WHERE EVER NECESSARY, SHALL BE DONE BY GA HEATING. APPLICABLE FOR BOTH GALV. MS TO GALV. MS AND BARE MS TO GALV. MS WELDING.

(B) GALVANISED MS

- a) CLEANING OF WELD AREA WITH WIRE BRUSH AND REMOVAL OF GALVANISATION COATING . IN THE WELD AREA SHALL BE CARRIED OUT BEFORE CARRYING OUT STEPS 14a) TO e) ABOVE.
- b) ONE COAT OF ZINC RICH CHROMATE PRIMER & ONE COAT OF ZINC PAINT. THIS WILL BE

16. THE INSTALLATION OF BELOW GROUND EARTHING SYSTEM SHALL COMPLY WITH THE REQUIREMENTS OF IS : 3043 (CODE OF PRACTICE FOR EARTHING)

17. CIVIL DETAILS OF TEST PITS ARE INDICATIVE. ACTUAL DETAILS SHALL BE SHOWN IN CIVIL DRAWINGS.

18. REFERENCE DRAWING :-
BHEL DRG NO. PE-DG-435-509-E004
(TYPICAL ABOVE GROUND EARTHING DETAILS)

TITLE

TYPICAL BELOW GROUND EARTHING DETAILS

BHEL DRAWING No.
PE-DG-435-509-E005

REV. No. 00

SHEET 9 OF 11



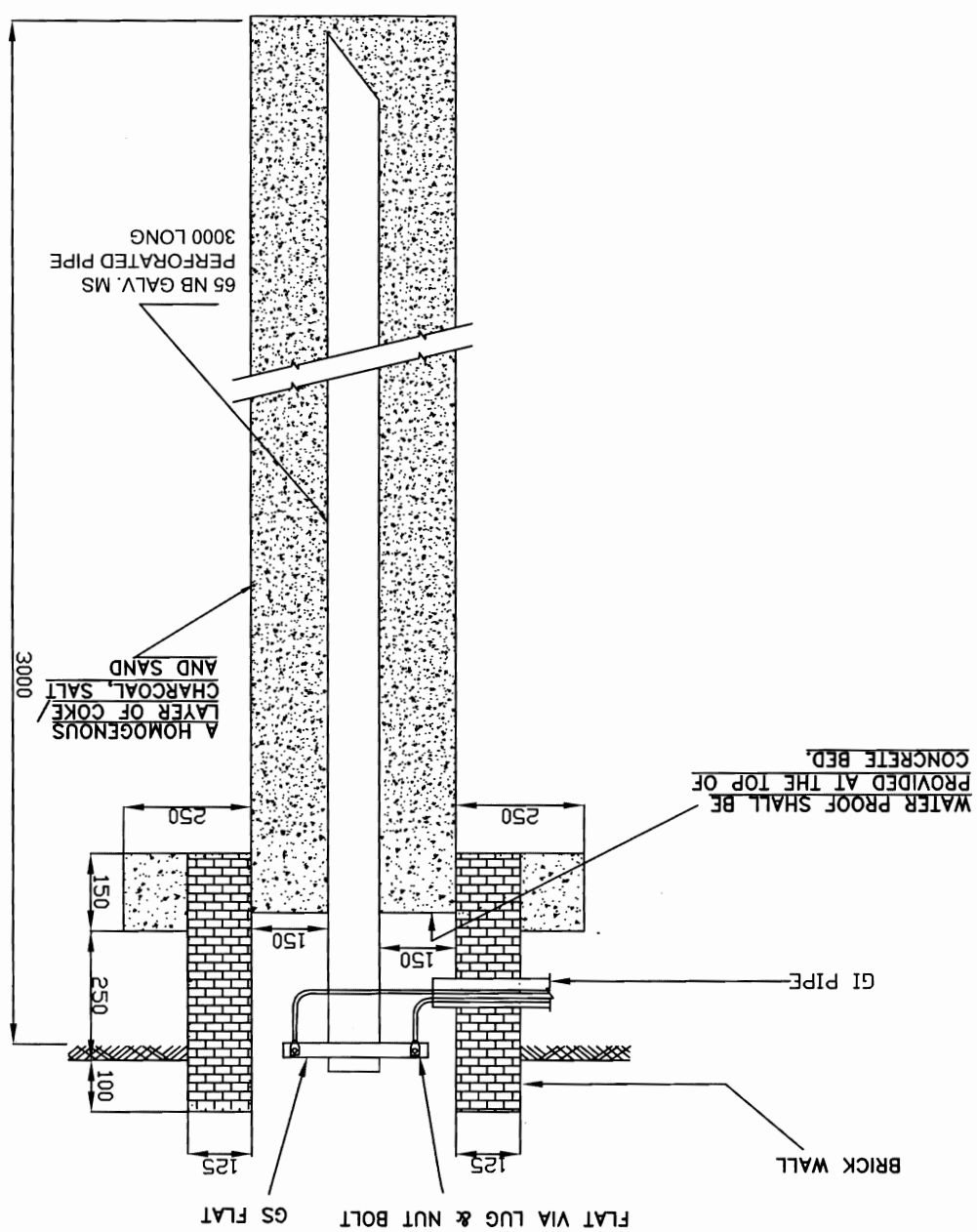
TYPICAL BELOW GROUND EARTHING DETAILS

BHEL DRAWING NO. PE-DG-435-509-E005
SH 10 OF 11

TYPICAL DETAILS OF ELECTRONIC TEST PIT WITH SINGLE ELECTRODE

1. ALL DIMENSIONS ARE IN MM.

NOTE:



ANNEXURE-IV

SYSTEM GROUNDING DIAGRAM FOR PLC SYSTEM

NOTES:

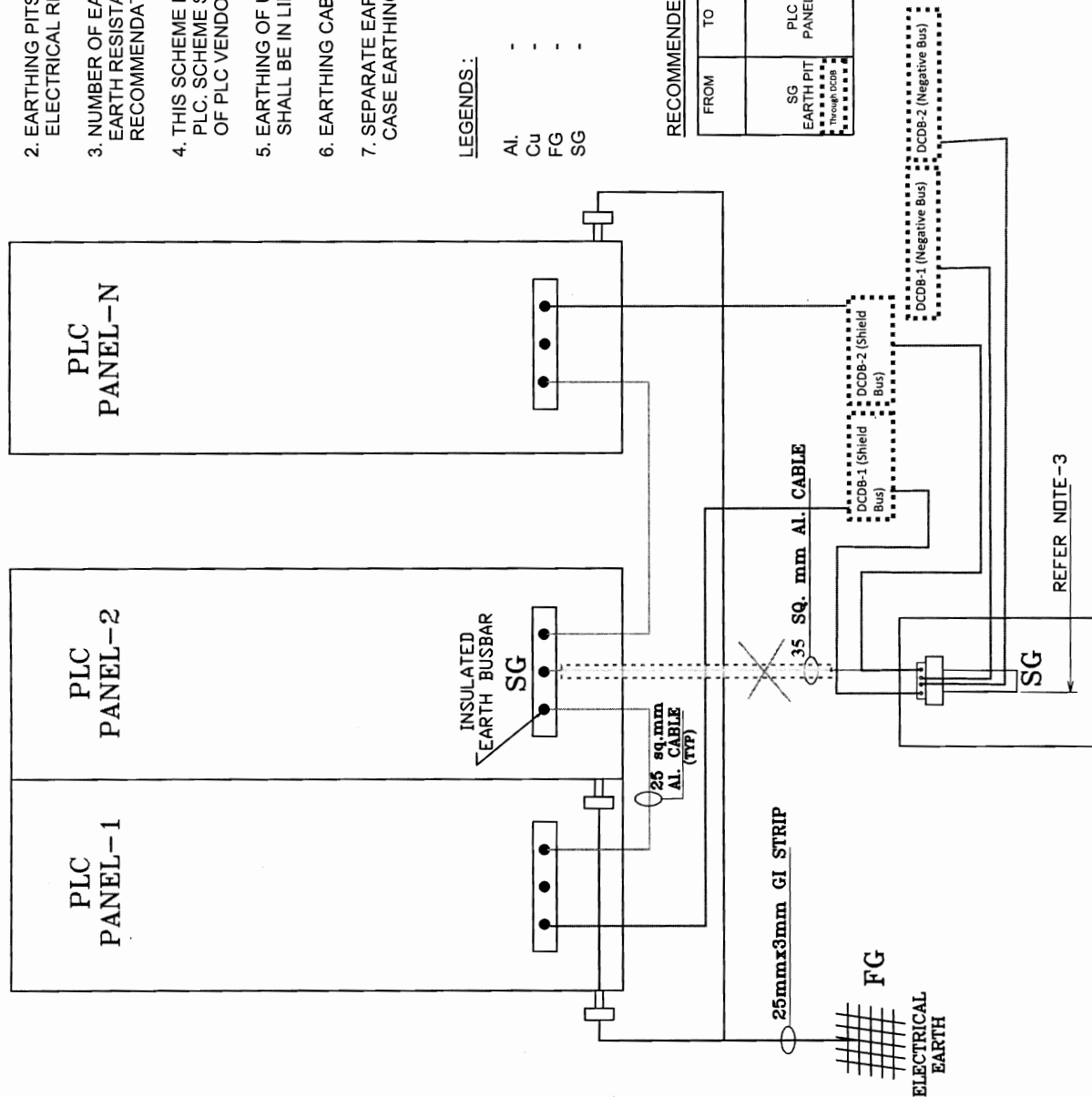
1. DISTANCE BETWEEN PLC PANEL AND EARTH PIT SHOULD BE LESS THAN 100 Mtr, PREFERABLY.
2. EARTHING PITS SHALL BE PREPARED IN LINE WITH PEM-ELECTRICAL RECOMMENDED DRAWING.
3. NUMBER OF EARTH PITs SHALL BE SUCH THAT THE COMBINED EARTH RESISTANCE IS LESS THAN 1 OHM OR VENDOR RECOMMENDATION, WHICHEVER IS BETTER.
4. THIS SCHEME IS GENERAL GUIDELINE FOR EARTHING OF PLC. SCHEME SHALL BE MODIFIED AS PER RECOMMENDATION OF PLC VENDOR.
5. EARTHING OF UPS/DC CHARGER SYSTEM, AS APPLICABLE, SHALL BE IN LINE WITH PLC VENDOR RECOMMENDATION.
6. EARTHING CABLES SHALL BE MULTI STRAND TYPE.
7. SEPARATE EARTHING CABLE TO GI STRIP SHALL BE PROVIDED IN CASE EARTHING BOLT OF ADJACENT PANEL IS NOT CONNECTABLE.

LEGENDS:

AL	-	ALUMINUM CABLE
Cu	-	COPPER CABLE
FG	-	FRAME GROUND/CHASSIS GROUND
SG	-	SIGNAL GND (ISOLATED FROM CABINET FRAME)

RECOMMENDED CABLE SPECIFICATION:

FROM	TO	DISTANCE (Mtrs)	AL. CABLE SIZE (Sqmm)	Cu. CABLE SIZE (Sqmm)
SG EARTH PIT Through DCDB	PLC PANEL	< 70	25	16
		> 70 & < 100	35	25



ELECTRONICS EARTH PIT

REFER NOTE-3

DATE	DRWN	DGN	CHD	APPD	RECOMMENDED GROUNDING	
15.01.15	GA	SSB	MMV	DP	SCHEME FOR PLC SYSTEM	
			SSS			