

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	ANNEXURE-I			
a)	EARTHING NOTES FOR SWITCHYARD			
	GENERAL			
i)	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.			
ii)	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.			
iii)	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.			
b)	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	
c)	For Step and Touch potential the following parameters shall be considered			
	i) Current distribution factor – 1(One)			
	ii) Duration of fault current - 0.5 sec			
	iii) Human body weight - 50kg			
d)	Grid resistance shall be less than 1(one) ohm.			
e)	EARTHING CONDUCTOR LAYOUT			
i)	Earthing conductors in outdoor areas shall be burried atleast 600mm below finished grade level unless stated otherwise.			
ii)	Minimum 6000mm or higher spacing between rod electrodes shall be provided based on the earthmat design calculations.			
iii)	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.			
iv)	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.			
NORTH KARANPURA STPP (3 X 660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO.:CS-4410-001-2		SUB SECTION B-14 SWITCHYARD
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v)	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.			
vi)	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.			
vii)	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.			
viii)	Earthing conductors crossing the road shall be either installed in hume pipes or laid at greater depth to suit the site conditions.			
ix)	Earthing conductors embedded in the concrete fibre shall have approximately 50mm concrete cover.			
f)	EQUIPMENT AND STRUCTURE EARTHING			
i)	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.			
ii)	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.			
iii)	Metallic conduits shall not be used as earth continuity conductor.			
iv)	A separate earthing conductor shall be provided for earthing lighting fixtures, lighting poles, receptacles, switches, junction boxes, lighting conduits, etc.			
v)	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.			
vi)	Cable and cable boxes/glands, lockout switches etc. shall be connected to the earthing conductor running alongwith the supply cable which, in turn, shall be connected to earthing grid conductor at minimum two points, whether specifically shown or not.			
vii)	Railway tracks within switchyard area shall be bonded across fish plates and connected to earthing grid at several locations.			
viii)	Earthing conductor shall be burried 2000mm outside the switchyard fence. Every post of the fence and gates shall be connected to earthing loop.			
ix)	Flexible earthing connectors shall be provided where flexible conduits are connected to rigid conduits to ensure continuity.			
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x) g) i) ii) iii) iv) v) vi) vii) h) i) i) ii) j) i) ii) iii)	Equipment earthing (Riser & welding of two conductors) shall be done as per enclosed sketch. JOINTING 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. 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. Steel to copper connections shall be brazed type and shall be treated to prevent moisture ingress. Resistance of the joint shall not be more than the resistance of the equivalent length of the conductor. 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. Bending of large diameter rod/thick conductor shall be done preferably by gas heating. All arc welding with large diameter conductors shall be done with low hydrogen content electrodes. 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. SPECIFIC REQUIREMENT FOR EARTHING SYSTEMS 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. Auxilliary earthing mat of 1500mmX1500mm size comprising of closely spaced conductors at 300mm x 300mm spacing and at 300mm below ground shall be provided below the operating handles of the isolators. Operating handle shall be directly connected to earthing mat. SPECIFIC REQUIREMENTS FOR LIGHTNING PROTECTION SYSTEM Conductors of the lightning protection system shall not be connected with the conductors of the safety earthing system above ground level. Down conductors shall be cleated on the structures at 2000mm interval. Connection between each down conductor and rod electrodes shall be made via test joint located approximately 150mm above ground level.	
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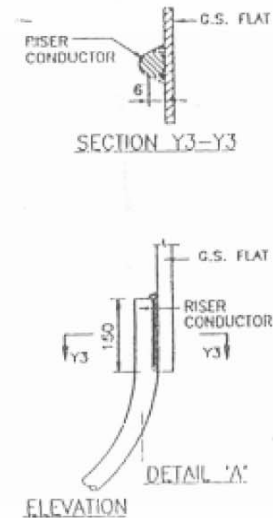
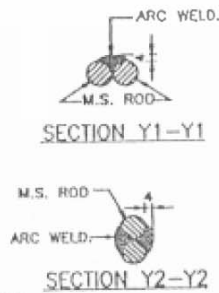
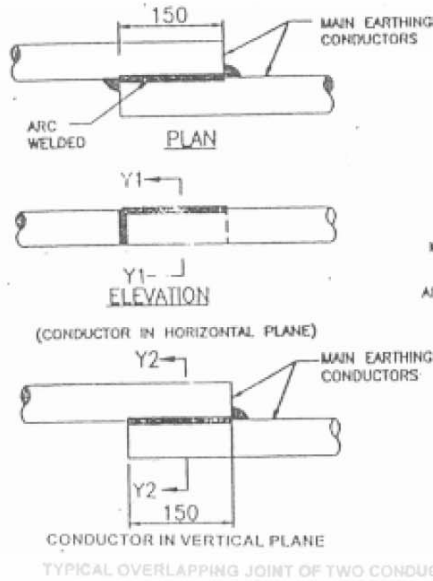
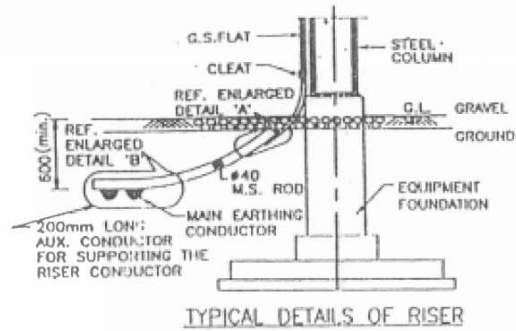
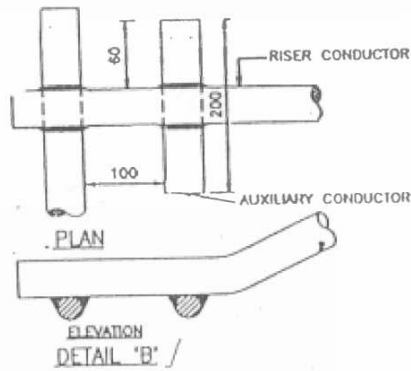
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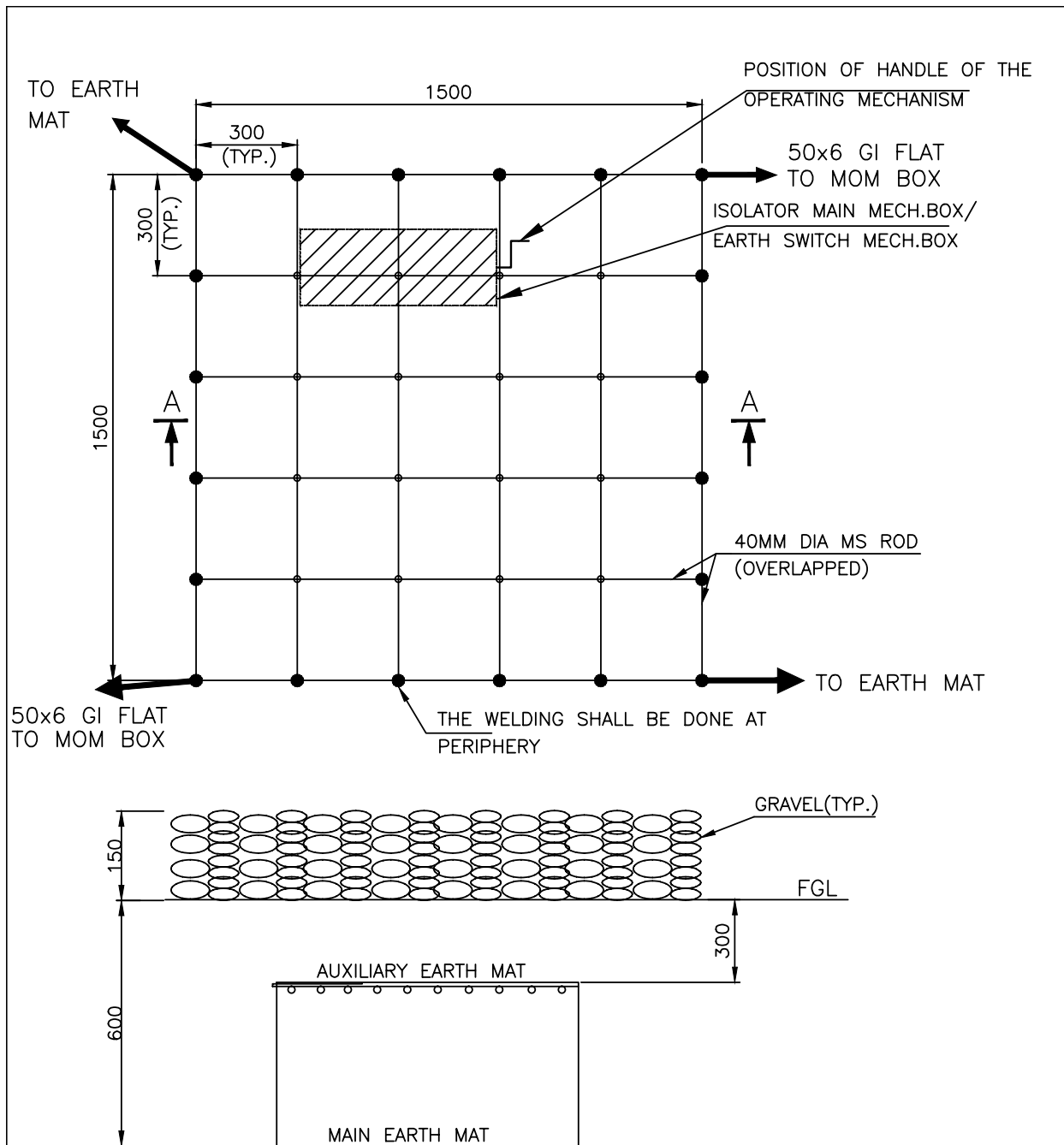
iv)

Lightning conductors shall not pass through or run inside G.I. conduits.



NOTE : WELDING OF EARTHING CONDUCTOR SHALL BE CONDUCTED IN VERTICAL PLANE WHEREVER POSSIBLE

EQUIPMENT EARTHING DETAILS
STANDARD DRAWING



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.



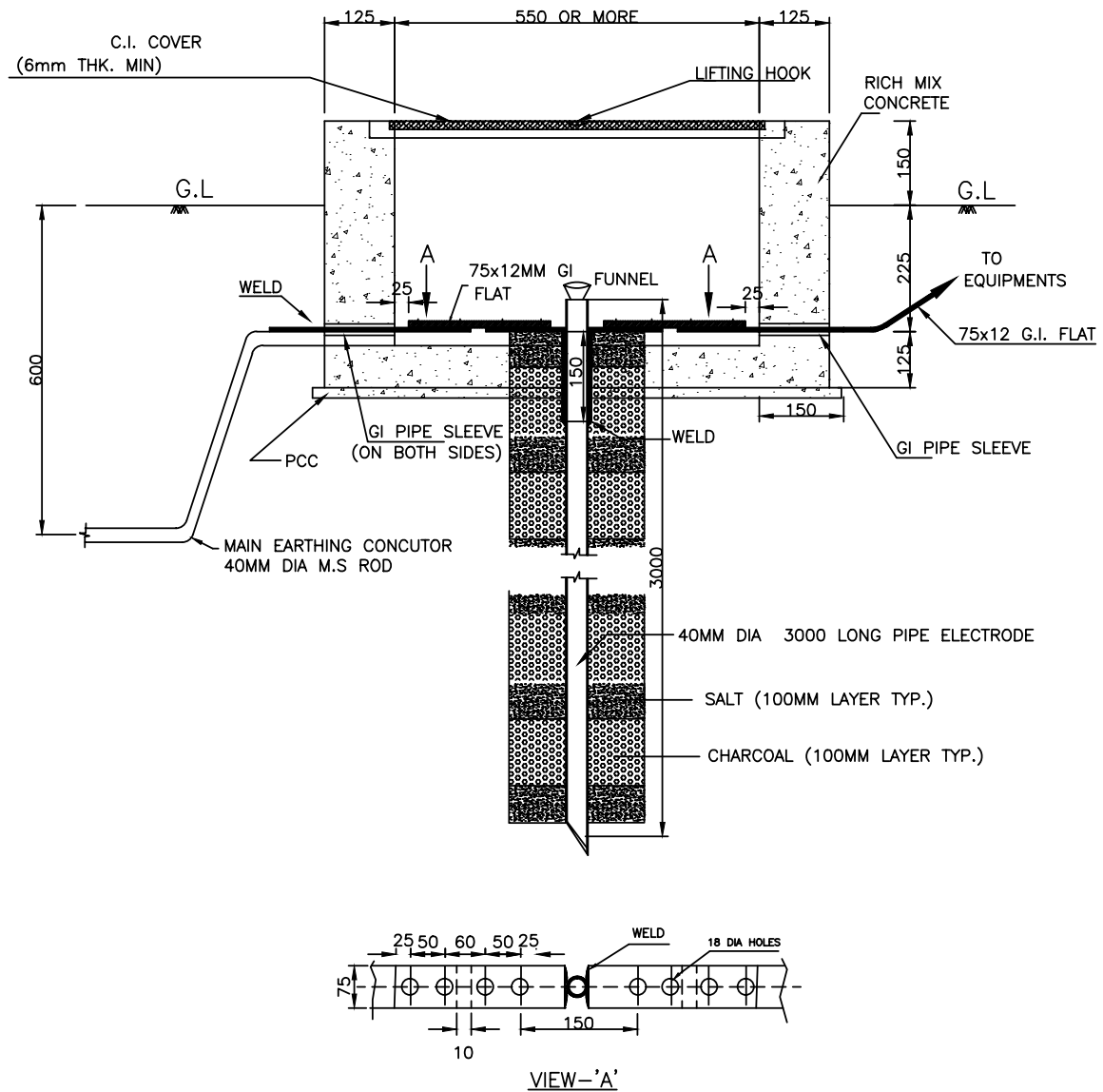
EQUIPMENT EARTHING DETAILS

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

COMPU. DRG. REF.

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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

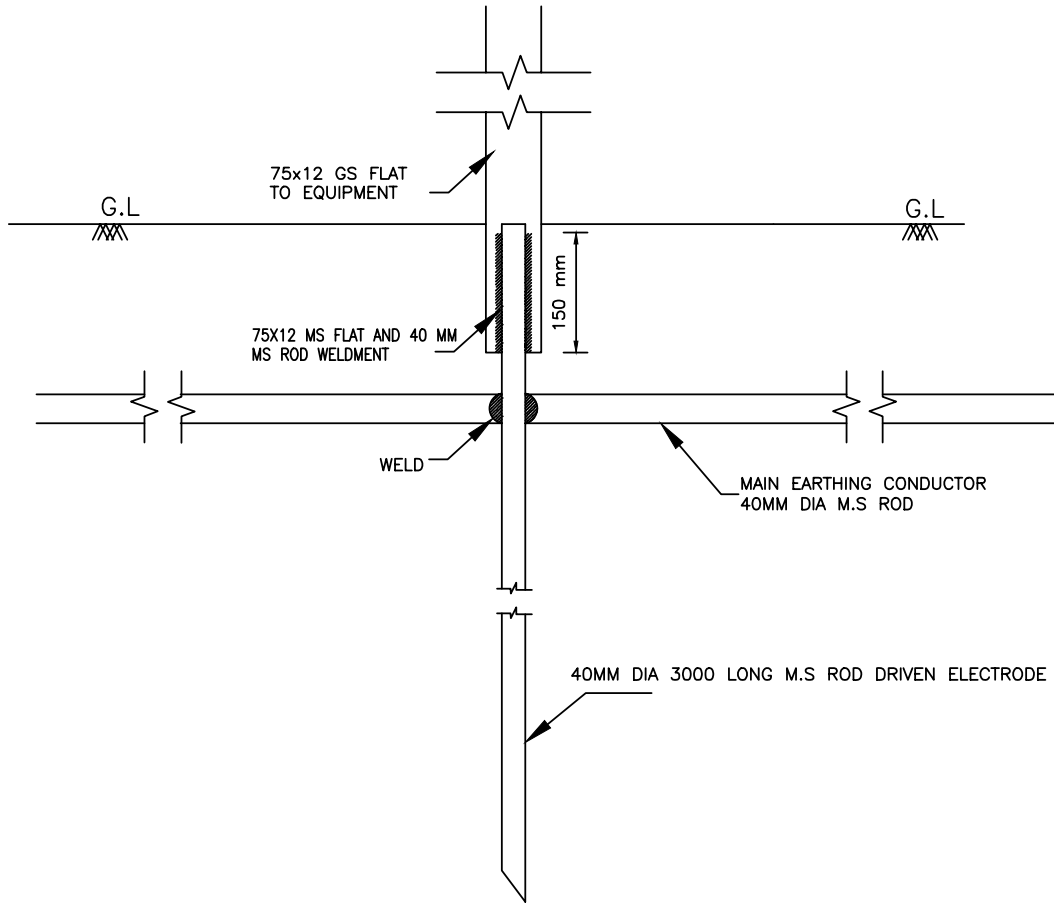
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NOTES:—

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 WITHOUT TEST PIT

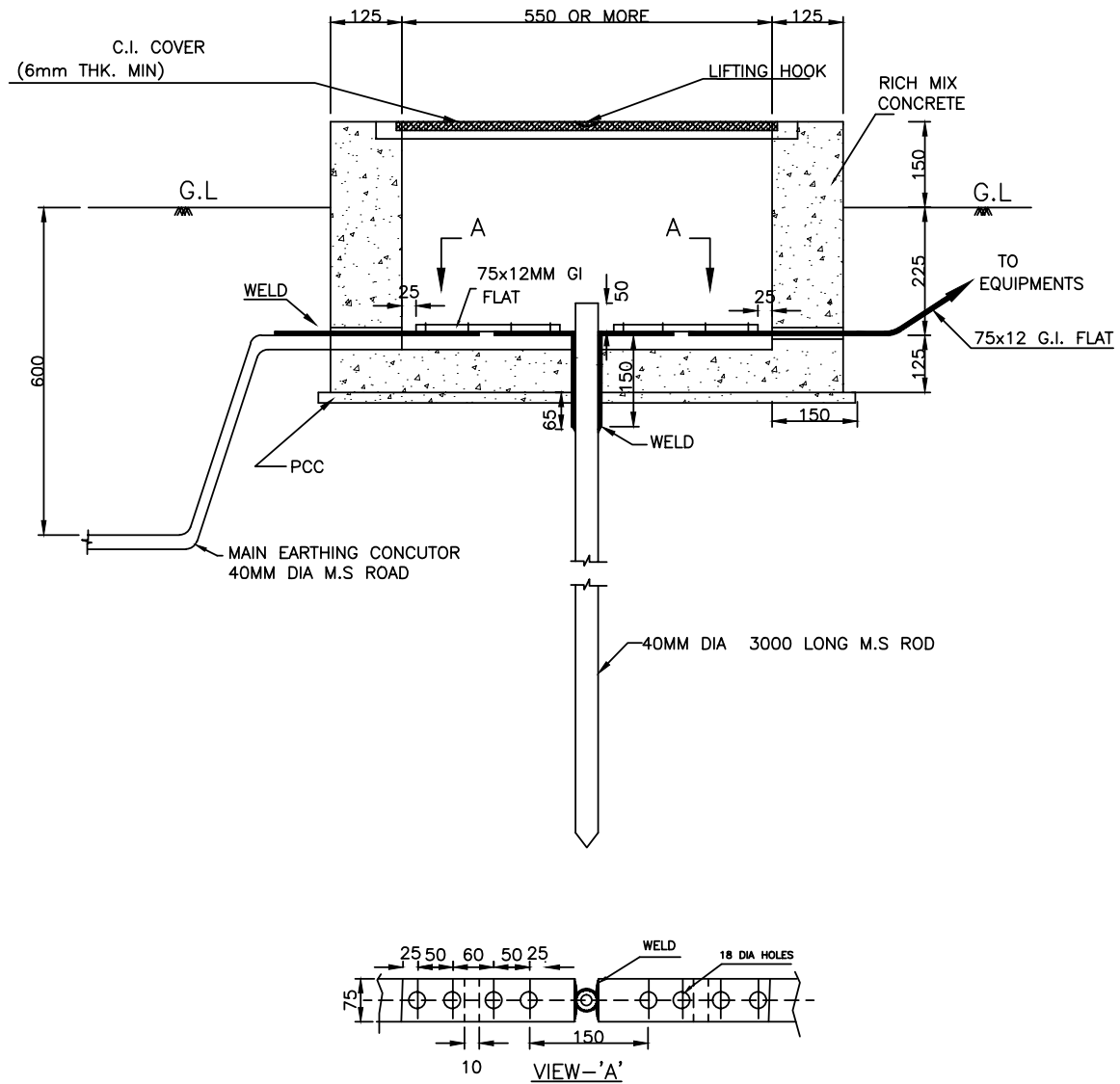
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NOTES:-

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 PROTECTION SYSTEM AND TOWERS WITH PEAK.



EQUIPMENT EARTHING DETAILS

ROD EARTH ELECTRODE WITH TEST PIT FOR TOWERS AND LM

COMPU. DRG. REF.

DRG. No.

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SHEET No.

12A