




Equipment Earthing Philosophy (EEP)

RS	FIRST PREPARATION
REV:	DESCRIPTION:

EXECUTION PURPOSE					
 GUJARAT ENERGY TRANSMISSION CORPN.LTD. S.P.VIDYUT BHAVAN, RACE COURSE, VADODARA - 390 007					
Equipment Earthing Philosophy (Sub Remains Passed)					
DESIGN:	CHECKED:	APPROVED:			
D.K.P.	P.S.M.	MS (ENGG) ACE (ENGG)		PAGE 01	
SCALE:	DATE:	DRW. NO:	SHEET:	REV:	
N.T.A.	01-05-08	00700 / H / SWD / P-010	01 of 01	RS	

SR. NO.	DRG. NO.	SHEET	DESCRIPTION
1	GETCO/E/STD/P-012	1 OF 24	FRONT SHEET
2	GETCO/E/STD/P-012	2 OF 24	INDEX
3	GETCO/E/STD/P-012	3 OF 24	EARTHING NOTES
4	GETCO/E/STD/P-012	4 OF 24	TYPICAL ARRANGEMENT OF RISER FOR EARTHING SYSTEM
5	GETCO/E/STD/P-012	5 OF 24	TYPICAL ARRANGEMENT OF WELDING JOINT
6	GETCO/E/STD/P-012	6 OF 24	EARTHING DETAILS OF LIGHTING ARRESTOR
7	GETCO/E/STD/P-012	7 OF 24	TYPICAL EARTHING ARRANGEMENT FOR CVT/PT
8	GETCO/E/STD/P-012	8 OF 24	TYPICAL EARTHING ARRANGEMENT FOR CT
9	GETCO/E/STD/P-012	9 OF 24	TYPICAL EARTHING ARRANGEMENT FOR ISOLATOR
10	GETCO/E/STD/P-012	10 OF 24	TYPICAL EARTHING ARRANGEMENT FOR CIRCUIT BREAKER
11	GETCO/E/STD/P-012	11 OF 24	TYPICAL EARTHING ARRANGEMENT FOR BPI
12	GETCO/E/STD/P-012	12 OF 24	TYPICAL EARTHING ARRANGEMENT FOR POWER TRANSFORMER
13	GETCO/E/STD/P-012	13 OF 24	TYPICAL EARTHING ARRANGEMENT FOR TOWER WITH PEAK
14	GETCO/E/STD/P-012	14 OF 24	TYPICAL EARTHING ARRANGEMENT FOR TOWER WITHOUT PEAK
15	GETCO/E/STD/P-012	15 OF 24	TYPICAL EARTHING ARRANGEMENT FOR LIGHTNING MAST(LM)
16	GETCO/E/STD/P-012	16 OF 24	TYPICAL EARTHING ARRANGEMENT FOR EQUIPMENT OF CAPACITOR BANK
17	GETCO/E/STD/P-012	17 OF 24	TYPICAL EARTHING ARRANGEMENT FOR BMK
18	GETCO/E/STD/P-012	18 OF 24	DETAILS OF PANEL EARTHING
19	GETCO/E/STD/P-012	19 OF 24	TYPICAL EARTHING ARRANGEMENT OF CABLE TRENCH
20	GETCO/E/STD/P-012	20 OF 24	TYPICAL DETAILS OF EARTHING FOR D.P. STRUCTURE
21	GETCO/E/STD/P-012	21 OF 24	TYPICAL EARTHING ARRANGEMENT FOR SWITCH YARD GATE
22	GETCO/E/STD/P-012	22 OF 24	TYPICAL EARTHING ARRANGEMENT FOR SLIDING GATE
23	GETCO/E/STD/P-012	23 OF 24	CONNECTION OF FOUR ELECTRODE METHOD OF MEASURING SOIL RESISTIVITY
24	GETCO/E/STD/P-012	24 OF 24	MEASUREMENT OF EARTH RESISTIVITY

NO	PREPARED
REV	DESCRIPTION

 GUJARAT ENERGY TRANSMISSION CORP.LTD. S.P.VIDYUT BHAVAN, RACE COURSE, VADODARA - 390 007			
Index			
DRAWN: D.K.P.	CHECKED: P.S.M.	APPROVED: M. (MNS) A.C. (MNS)	SCALE: N.T.S.
DATE: 01-05-08	DRG. NO.: GETCO / E / STD / P-012	SHEET: 02 OF 24	REV: NO

GENERAL NOTES EARTHING SYSTEM

A) General

1. Exact locations of earthing conductors, earth electrodes, test pit and earthing connections can be changed, if required, to suit the site conditions.
2. Neutral points of systems of different voltage, metallic enclosures and frame works associated with all current carrying equipments and extraneous metal works associated with electrical system shall be connected to a single earthing system unless stipulated otherwise.
3. Earthing shall comply with IEEE-80:2000 / IS: 3043-1987.

B) Earthing conductor layout

1. Earthing conductors in outdoor areas shall be buried at least 600mm below finished ground level unless stated otherwise.
2. Wherever earthing conductor cross cable trenches, under ground services duct pipes, rail tracks, road etc. It shall be laid at a minimum depth of 300mm below bottom surface of respective item.
3. Earthing conductors & leads along their run of trench, ladder, etc. shall be supported by suitable welding / clamping at regular intervals. Earth conductors along cable trenches shall be on the wall preferably nearer to the tray.
4. Earthing conductor around the building shall be buried in earth at a minimum distance of 1000mm from the outer boundary of the building.

C) Equipment and structure earthing

1. All Earth Strip shall be taken along edge of structure.
2. All equipments/structures/steel columns shall be connected to near by main earth conductor by at least two risers.
3. Every alternate post of the fence and gates shall be connected to earthing conductor by one riser as shown in respective drawings.
4. All Structure/Equipment shall be earthed as shown in respective Drawings.
5. Earthing with Copper strip should be avoided. GI flat can serve the purpose.

		EXECUTION PURPOSE							
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		General Notes on Earthing System							
		DRAWN: D.K.P. CHECKED: P.S.M. APPD: M. (ENGR) AGE (ENGR)							
NO		FIRST PREPARATION		SCALE: N.T.S.		DATE: 01-08-08		DESIG. NO: GET/00 / B / 040 / P-012 SHEET: 3A OF 20 REV: NO	
REV:		DESCRIPTION:							

NOTE:-

D) Joints

1. Connection between,
 - a) Below ground riser and above ground riser.
 - b) Riser and Main earth conductor.
 - c) Between two main earth conductor.made by electric arc welding with low hydrogen content electrode as below:


Flat-to-Flat	-	50mmx6mm	-	3.5mm welding rod
Flat-to-Flat	-	75mmx10mm	-	4.0mm welding rod
Rod to Flat	-	50mmx6mm, 50mmx8mm, 75mmx10mm, 75mmx12mm	-	6.0mm welding rod
Rod to Rod	-	20/25/40mm dia.	-	6.0mm welding rod
2. All ground connections shall be made by electric arc welding with low hydrogen content electrodes. Joints shall be allowed to cool down gradually to atmospheric temperature before putting any load on it. All oxide films that may have formed during welding must be removed from the welded joints. Two coats of red oxide and black powder shall be applied after welding.
3. Bending of rod shall be done preferably by gas heating.

E) Power Cable Earthing

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

F) Specific Requirements for Earthing Systems

1. Earthing terminal of each tower with peak and LM shall be connected to MS rod electrode, which in turn, shall be connected to Main Earth Mat. Star shape horizontal conductor (4-5 nos. of same size) shall be connected on top of the electrode for lightning discharge.
2. Each earthing lead from the neutral of the Power Trafo./grounding reactor / Aux. Trafo., LA, CVT shall be directly connected to CI pipe electrode which in turn shall be connected to Main Earth Mat.

		EXECUTION PURPOSE			
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		General Notes on Earthing System			
		DESIGN:	CHECKED:	APPROVED:	DATE:
		D.K.P.	P.S.M.	MS (ENGR) ACE (ENGR)	20-07-20
		SCALE:	DATE:	DESIGN NO:	REV:
		N.T.A.	01-08-08	GET/00 / B / S/W / P-012	20-07-20
NO	FIRST PREPARATION				
REV:	DESCRIPTION:				

STANDARD GUIDELINES FOR EARTHING SYSTEM FOR EHV SUB-STATION

1.0 General:

Earthing system in the Sub-Station plays very vital role in power system performance and that's why it requires special attention. Here general philosophy for earthing system for GETCO is framed based on various standards and references.

IS 3043- 1987 gives overall guidelines for earthing of equipments.

In IE Rules 1956, rule 67 gives the guidelines for the earthing in the sub-station. IEEE-Standard 80 – gives detailed guidelines for providing Earthing Mat in Sub-Station.

CBIP Manual for earthing system (# 302) – gives various papers on earthing practices and case studies.

2.0 Methodology

As per the various standards, we design the complete earthing system for our EHV sub-stations. Earth mat is designed as per IEEE STD 80 - 2000. Equipments are provided the earthing as per IS 3043-1987. The drawing for earthing the equipments are compiled in Drg No GETCO/E/STD/P-012 sheet 1 to 24

- The complete design of earthing system depends on the data input. Soil Resistivity is the key input that's why its measurement plays major role in correct and optimum design.
- Soil Resistivity should be measured with reliable and accurate instrument.
- The process of measurement of Soil resistivity: Refer Drg no GETCO/E/STD/P-012 sheet 23 & 24.

Method of Measurement of Earth Resistivity:

Typical Switchyard Area: 70 Mtrs x 56 Mtrs

Lx = 70 Mtrs

Ly = 56 Mtrs

Diagonal Dm = 90 Mtrs

At a distance of 10-12 Mtrs along the diagonal point no. 1 to 7 & 8 to 14 are selected. Measurement with reliable (preferably electronic earth tester) meggar using Wenner's method is carried out. Select Loc. no.1, spacing between the spikes should be varied from 1.0 Mtr to 10.0 Mtrs (1, 2, 5 and 10).

Take the readings of resistance (R) considering distance between two spikes 1, 2, 5 & 10.

Similarly take the set of readings for all 14 locations.

Calculate Soil Resistivity (ρ) = $2 \pi S R$

Where, S = Distance between two spikes in Mtrs

R = Earth Resistance in Ohms

Derive the average value of resistivity for all the locations of equal distance.

RESISTANCE MEASURED					RESISTIVITY CALCULATED			
Loc. No.	With S=1 Mtr	With S=2 Mtr	With S=5 Mtr	With S=10 Mtr	With S=1 Mtr	With S=2 Mtr	With S=5 Mtr	With S=10 Mtr
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
Average								

The distance between two spikes - S should be 1, 2, 4, 8 & 16 Mtr. or 1, 2, 5, 10, 20 Mtr. for a particular locations of measurement and for each value of S, Resistivity (ρ) is calculated and average is calculated for such readings. This will give the average resistivity of the switchyard. If variation between max. and minimum values is $\leq 30\%$ then uniform Soil Resistivity Model can be considered other wise two/multi layer model should be selected and design in this case becomes complicated and requires special care.

- Resistivity measured with distance between two spike S will actually represents the resistivity at the depth of S mtr. So one should take the readings for more distance between two spike (as the availability of land permits) to get the real model of soil resistivity.
- 2.1 The entire switch yard is laid with one or more Earth Mat (also called MESH) as per design. The typical drawing of mesh is given in Drg No GETCO/E/STD/P-010 .Mesh is made up of conductors (either MS round bar or MS Flat or GI strip).Conductors are laid along X and Y direction of yard with separation of D mtr. (as per design) at a depth of min.0.6 mtr.and joined together with the help of welding joints at all junctions.
 - 2.2 Mesh should also be extended one/two meter beyond the fencing of switch yard. The poles of fencing should be connected to the mesh. The switch yard area should be such defined that fencing and 1-2 mtr beyond fencing area may fall in the area purchased by GETCO.When it is not possible to lay the mesh outside the fencing area,chainlink fencing should be replaced by compound wall of two meter height with poles (1.5mtr ht).of chain link fencing and these poles should be connected to main mesh.
 - 2.3 Below the mesh level, vertical ground rods (MS round bars) normally having length of 3.0 mtr, are driven along the periphery and at the junction

points of mesh. These rods help fault current to spread over the vicinity of land and thus discharge it in an earth rapidly.

- 2.4 Crushed metal (or gravel) of 20mm size with a layer of 0.10 mtr or 0.15 mtr as per design should be spread above the soil. Normally surface resistivity of metal /gravel, we use, is considered as 3000 Ω -Mtr.

0.1 mtr layer may contain 0.05 mtr layer of crushed fine powder of metal or sand and 0.05 mtr layer of 20 mm dia metal/gravel.

3.0 Treated Earth Electrodes

The typical drawing for pipe type earth electrode is given in Drg No. GETCO/E/STD/P-011 sheet 02. (please refer recommendation 4 xvii)

- 3.1 Each Neutral of power transformers is to be connected with two separate treated earth electrode (with 50/100 mm dia pipe). Both of them should be connected in parallel and finally connected with main earth mat. Similarly following earth electrodes (pipe type) should be provided in a sub-station for equipments and connected with mesh.
- Each Lightning Arrestor
 - Each Coupling Capacitor/CVT
 - Each neutral of distribution transformer.
 - Each class of CR panels combined together with one electrode
 - All PLCC panels combined together with one electrode
 - All the auxiliaries like Battery Chargers, LTPB and Lighting in control room together with one electrode
 - All VHF set & computer sets together with one electrode.
 - Each Yard kiosk

4.0 Recommendations (Important Aspect to keep in mind.)

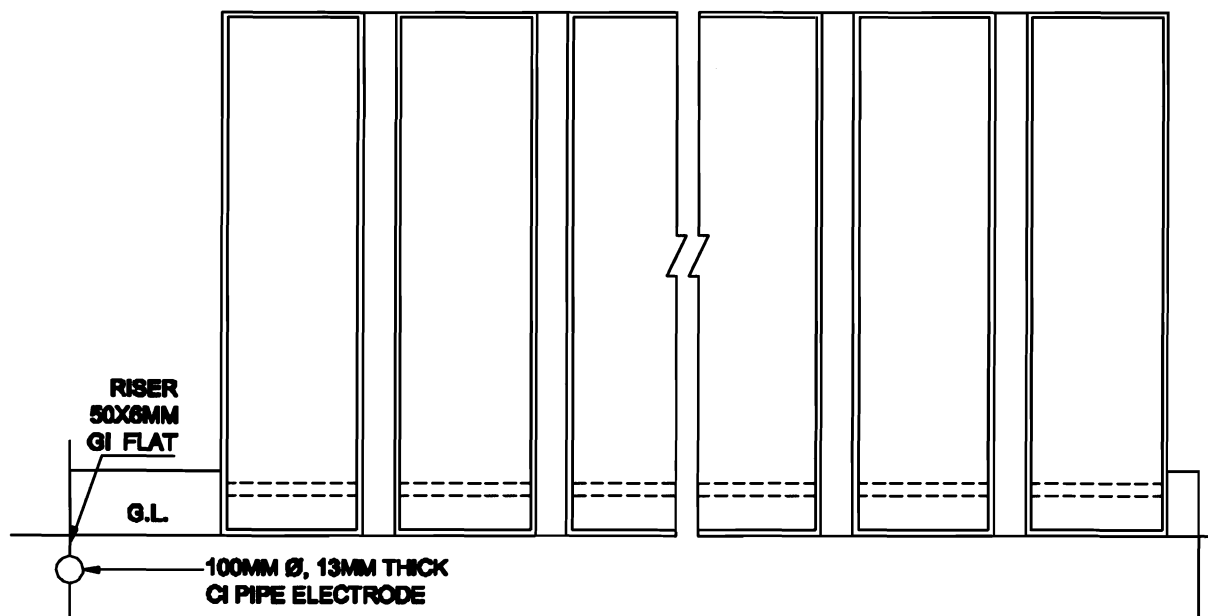
- i. Spacing between the conductors may be reduced as far as possible near the periphery of the grid.
- ii. Check pits in reasonable no of quantities (2 Nos for 66kV, 2/3 nos for 132kV ,4-6 nos for 220kV and 6-8 for 400kV Sub-station) should be provided as per drawing attached.(GETCO/E/STD/P-011 sheet 01)
- iii. Electrode for LA should be as near as possible so as to shorten the length of earth connection and preferably it should be of copper.
- iv. Use of bentonite powder (clay) under and around the complete mat and also around vertical ground rods and selected portion of the yard may be advised if resistivity is high. Other earth re-activating compound may be used for old electrodes or at the time of installation where resistivity is very high.
- v. Each Street light pole outside the switch yard should be provided with a earthing as per our standard practice (charcoal + Sault +earth with round wire coil) and circumference of the pole at the foundation should be provided with a surface layer (metal gravel) for app one mtr dia area.
- vi. If pipe line is passing through both the Zones of within switchyard and outside the switchyard then it should be buried below earth and connected

- to mesh with a conductor via clamp. If such pipe is required to be kept over the ground it should be painted with green color and one danger board should be provided stating caution of risk of high potential during fault.
- vii. No control cable should be drawn from live switch yard to out side switchyard.
 - viii. Power cable if required to be run from inside to outside switchyard, separate earthing with another mesh at the end outside the yard should be provided.
 - ix. All the reinforcement bars of RCC foundations should be firmly connected to the grid. It will increase the safety.
 - x. Main Gate of the switchyard should be provided with a flexible bond (usually of copper) at least at two places of each doorframe and should be connected with main mesh through suitable risers.
 - xi. Tower with peak should be provided with 3 mtr (or more length if requires as per design) vertical rod with 4 to 5 nos star shape horizontal conductor (round bar or strip) having 3 to 5 mtr length .The riser should be with minimum length & minimum bends and finally connected with main mesh. Similar is the case with LA (but provision of treated earth electrode may be continued if soil resistivity is high and hygroscopic nature of soil is required to be maintained.)
 - xii. No pipe electrode/rod electrode should be kept Isolated. In many cases pipe electrode of neutral of transformer and that for LAs are not connected with the grid .It is very dangerous in case of fault; high resistance is offered by earth and detection of fault by relay setting may not be done in time causing failure of equipment ,fire or other accidents.
 - xiii. For the entire switchyard there should be only one ground.
 - xiv. Single core cable with sheath should be earthed at one end only and not at the both ends as sheath will face circulating current for which is not designed and will get heated.
 - xv. Gate opening should be inside the switchyard instead of outside to safeguard against the dangerous voltage during opening the gate.
 - xvi. DG set doesn't require to be grounded as its operation is temporary and fault does not leave such bad effect on the system. Still for the sake of safety considering DG set as equipment it should be provided with body earthing at two places.
 - xvii. No treated earth electrode is required if resistivity is less (say < 50 ohm-mtr). For the purpose of mandatory electrode of neutrals and LAs etc ,simple pipe can serve the purpose. It is preferable to use 100 dia 13 mm thick CI pipe (with required 3/5 mtr length) electrodes but simple (not treated) for longer life.

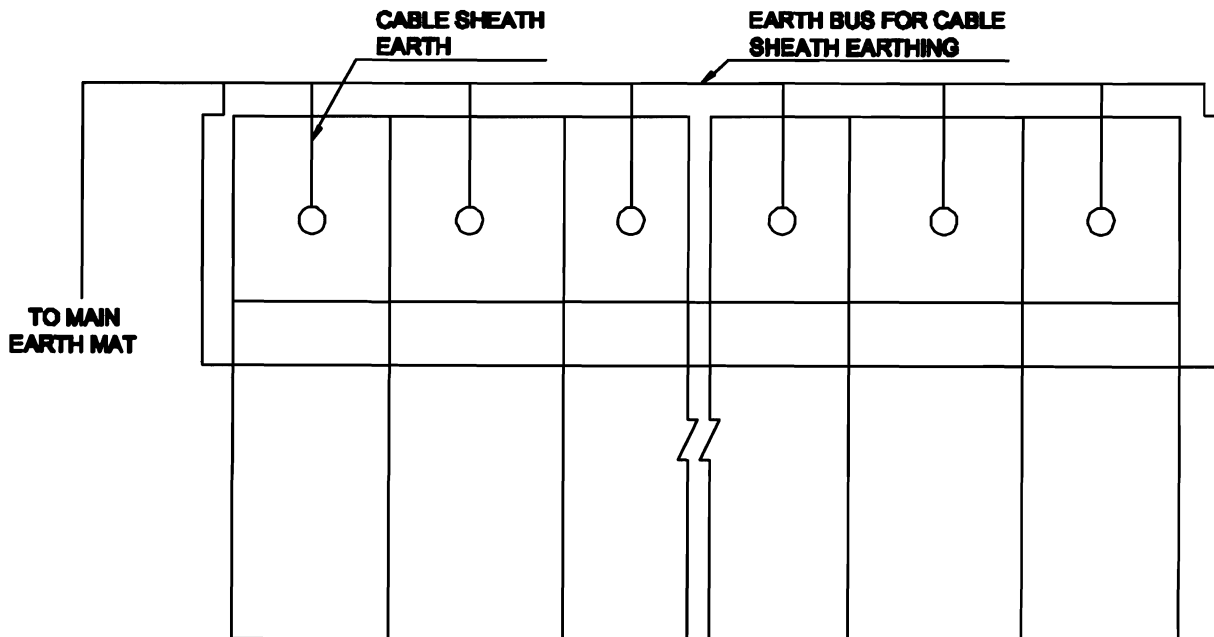
5.0 Standard Design and calculations:

5.1 Earth Mat sizes and calculations for various conditions are given in Ann-1

5.2 Calculation of resistance of pipe electrodes of various types for ready reference are given in Ann -2



ELEVATION





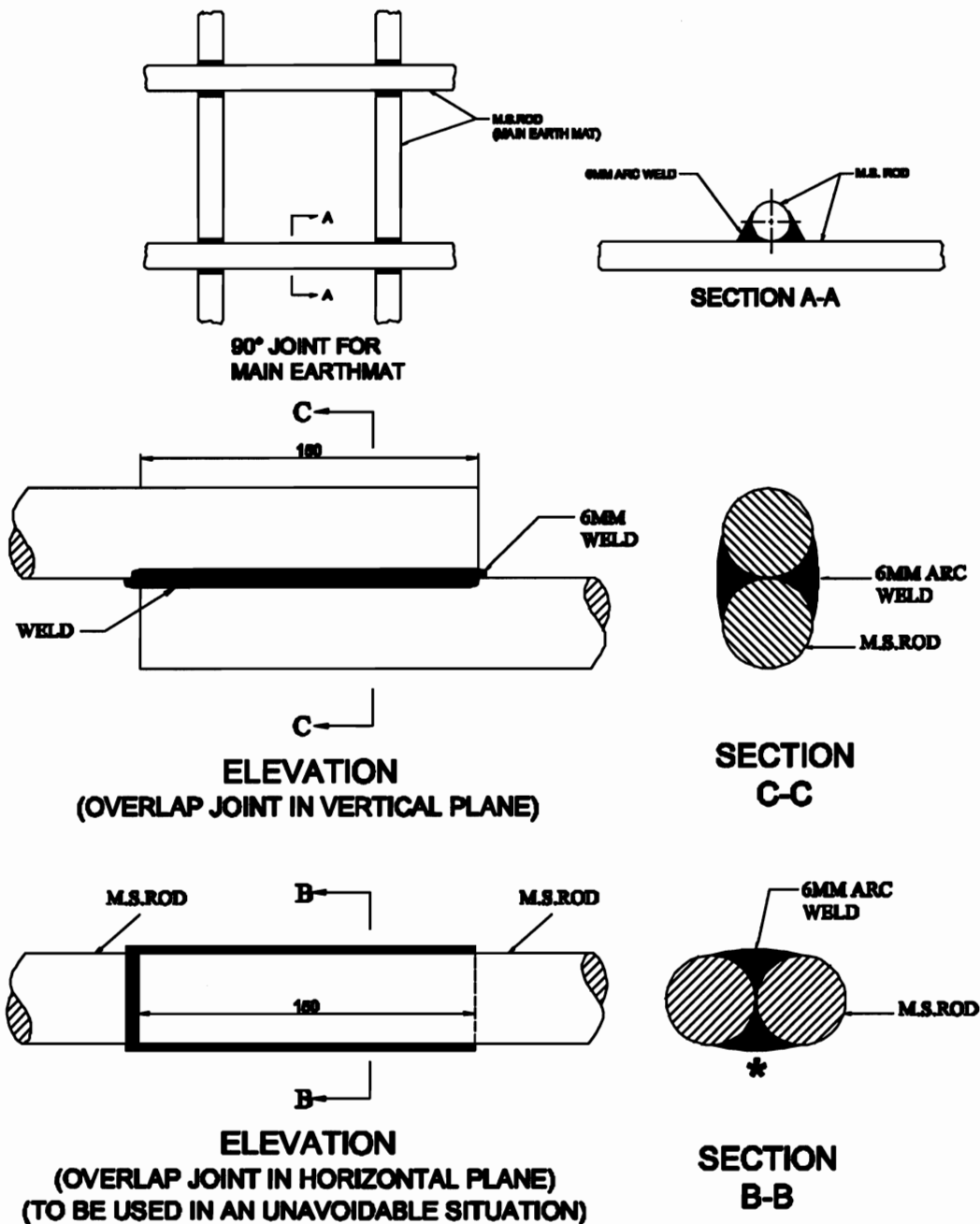
PLAN

NOTE:-

1. FOR PIPE ELECTRODE DETAIL REFER SHEET NO. 2 OF DRAWING NO:- P-011

NO	DESCRIPTION
REV:	

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Details of Panel Earthing			
DRAWN: M.P.P.	CHECKED: P.S.M.	APPROVED: EE (ENGRG) ACE (ENGRG)	 DATE: 01-08-08
SCALE: N.T.S.	DATE: 01-08-08	DES. NO.: GET/00 / 15 / STD / P-011	SHEET: 10 OF 24



NOTE:

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. WHILE CONNECTING EARTH MAT ROD WITH THE EXISTING LAID CONDUCTOR THE BOTTOM WELD MARKED * MAY NOT BE FEASIBLE AND HENCE NOT REQUIRED. HOWEVER THE SAME IS REQUIRED IF THE TWO CONDUCTORS ARE JOINED OUTSIDE, OVERLAP JOINT LINE VERTICAL PLANE TO BE USED TO THE EXTENT POSSIBLE.
3. WELDING SHALL BE DONE ALL AROUND TO THE EXTENT POSSIBLE.

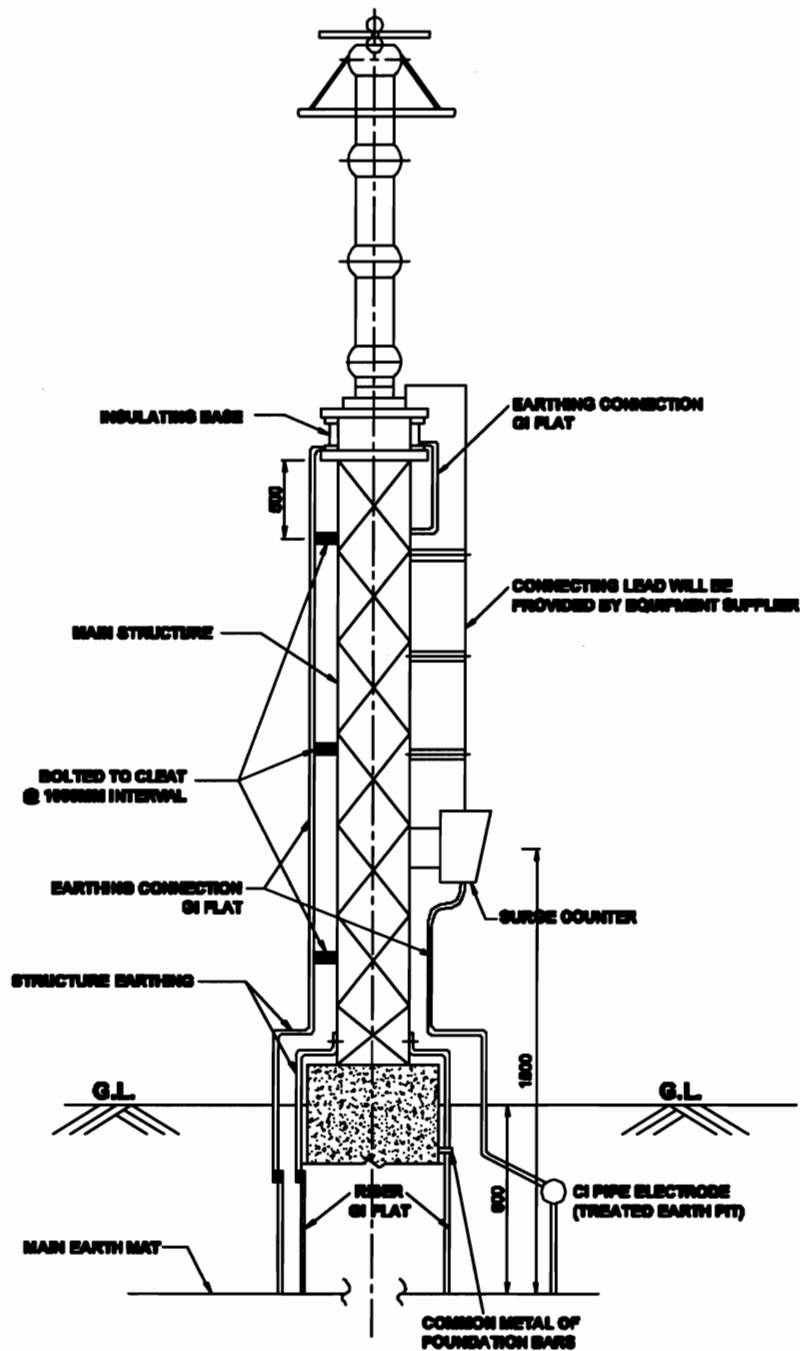
EXECUTION PURPOSE



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Typical Arrangement of Welding Joint

NO	FIRST PREPARATION	DRAWN:	CHECKED:	APPROVED:	DATE:	DESIGN NO:	SHEET:	REV:
REV:	DESCRIPTION:	N.P.P.	P.B.M.	EE (2400) ACE (2400)	01-08-08	08700 / E / 070 / P-012	08 OF 24	R0
		N.T.B.						



NOTES:

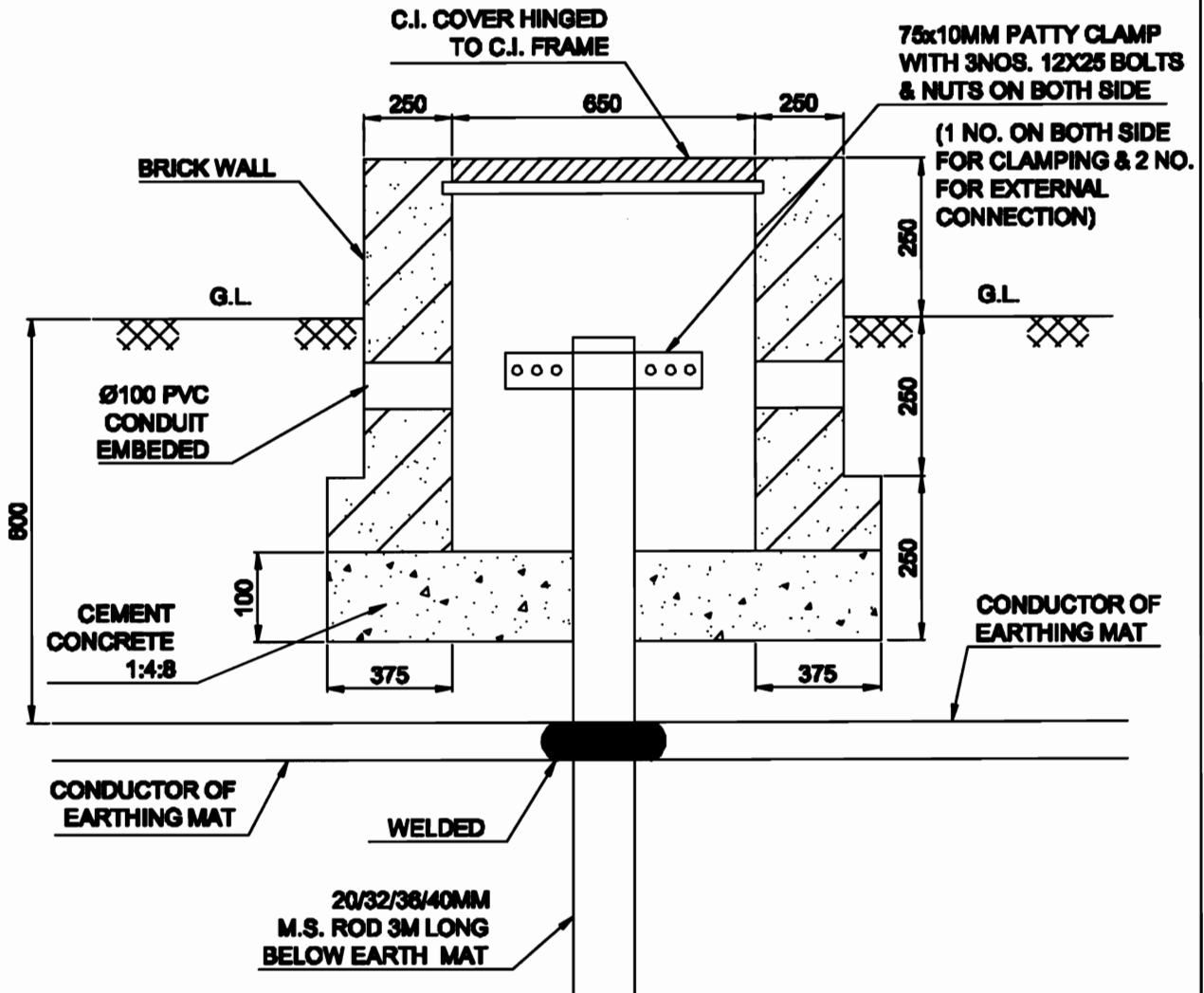
1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. NO. OF RUBBER PER SUPPORT - 3 NOS. (RUBBER FOR 66KV RUBBER ON FLAT FOR 10KA FAULT CURRENT AND RUBBER ON FLAT FOR 20KA FAULT CURRENT & ABOVE CLASS VEHICLES ON FLAT)
3. PIPE ELECTRODE REQUIRED - 1 NO. (FOR EACH LA) & SHALL BE FURTHER CONNECTED TO MAIN EARTH MAT.
4. EARTHING LEADS FROM ONE SOPT. / STRUCTURE SHALL BE CONNECTED TO DIFFERENT CONDUCTORS OF EARTHING GRID.
5. NO. OF CLEAT PER SUPPORT - 2 FOR 66KV
- 3 FOR 220 & 132KV
- 5 FOR 400KV
6. FOR PIPE ELECTRODE DETAIL REFER SHEET NO. 2 OF DWS. NOJ-011.

EXECUTION PURPOSE

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**Earthing Details Of
220kV Lighting Arrester**

DRWN:	CHECKED:	APPD:		
N.P.P.	P.S.M.	EE (SMBG)	ACE (SMBG)	DATE
SCALE:	DATE:	DWS. NO:	SHEET:	REV:
N.T.S.	01-08-08	08700 / S / 010 / P-012	8 OF 24	RS
REV:	DESCRIPTION:			
RS	FIRST PREPARATION			



NOTE:-

THIS TEST PIT IS TO BE PROVIDED TO UNTREATED EARTH ELECTRODE AND TO BE JOINED WITH MAIN MESH FOR THE PURPOSE OF :

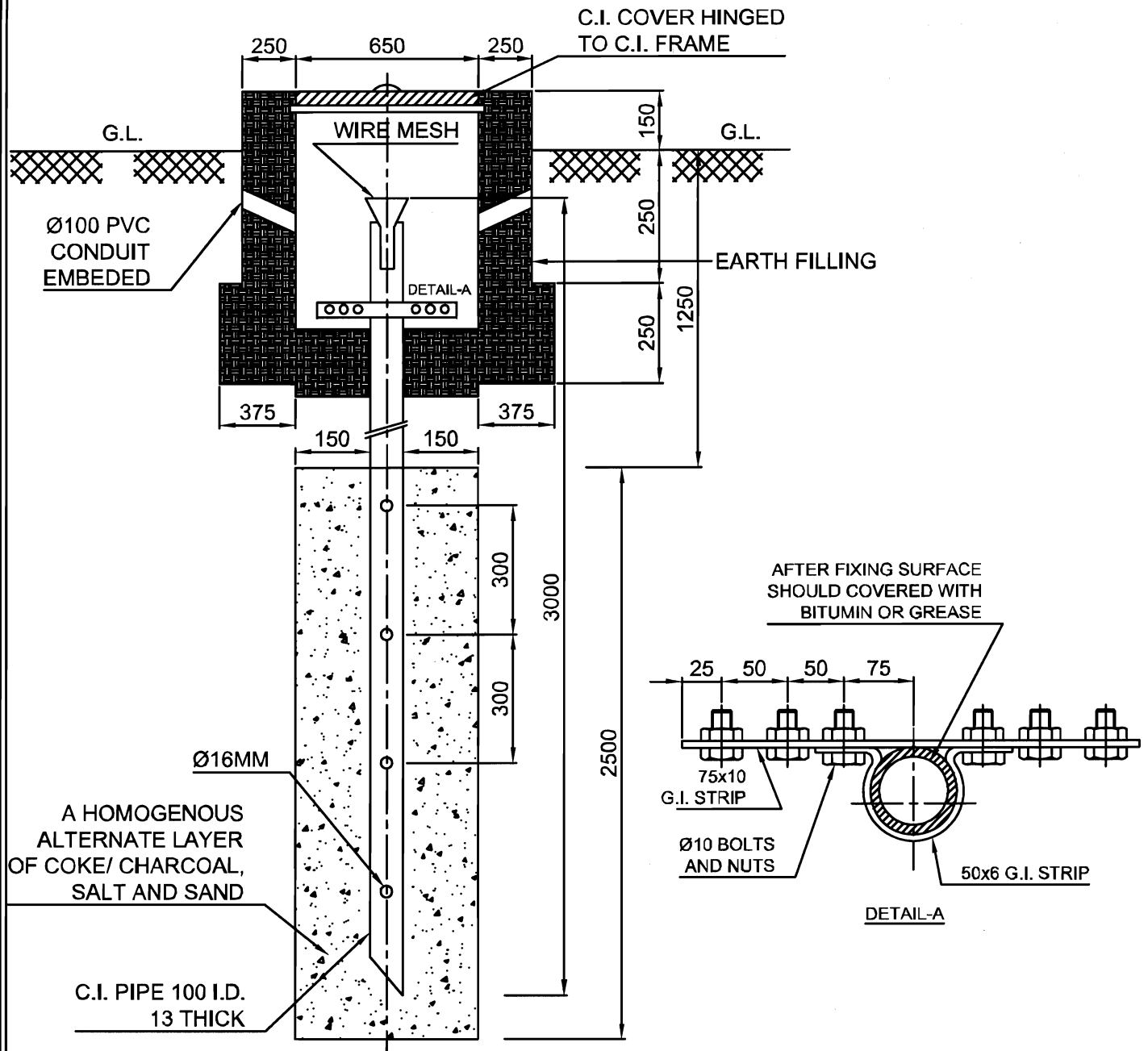
1. TO MEASURE THE EARTH RESISTANCE OF MAIN MESH. (DURING SHUTDOWN)
2. TO PROVIDE EXTERNAL EARTH CONNECTION TO THE EQUIPMENT / DEVICE TO BE CONNECTED TEMPORARILY.
3. IT'S WORKING SPACE IS REVISED FROM 400 TO 650MM AS PER CBIP MANUAL ON EARTHING SYSTEM # 302.

EXECUTION PURPOSE

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Typical Arrangement of Earh Test Pit
(Check Pit)

REV:	DESCRIPTION:	DRAWN:	CHECKED:	APPD:	DATE:	DRG. NO:	SHEET:	REV:
R1	REVISED AS PER FIELD INPUT & CBIP MANUAL # 302	N.P.P.	P.B.M.	EE (ENBG)	ACE (ENBG)	SET00 / B /	1 OF 2	R1
R0	FIRST PREPARATION DATE : 01-08-2007	SCALE:	DATE:	DRG. NO:	01-08-08	SET00 / B /	1 OF 2	R1
		N.T.S.	01-08-08	SET00 / B /	01-08-08	SET00 / B /	1 OF 2	R1



NOTE:-

1. ORIGINALLY DRAWING IS PREPARED FROM THE RECOMENDATION DRAWING GIVEN IN IS-3043 1987.
2. ITS WORKING SPACE IS REVISED FROM 400 TO 650MM AS PER CBIP MANUAL ON EARTHING SYSTEM # 302.
3. IN CASE OF LOW RESISTIVITY (<50 OHM MTR) TREATED ELECTRODE MAY NOT BE REQUIRED, SIMPLE PIPE OF SAME DIMENSIONS MAY BE PROVIDED .
4. CI PIPE SHOULD BE MANUFACTURED AS PER IS 1536: 2001. METHOD OF CASTING IS CENTRIFUGAL TYPE AND ACCORDINGLY WEIGHT OF PIPE SHOULD BE 33.3 KG/Mtr.
5. COVER WITH BRICK MASONARY MAY ALSO BE PROVIDED TO THIS ELECTRODE.

TENDER PURPOSE

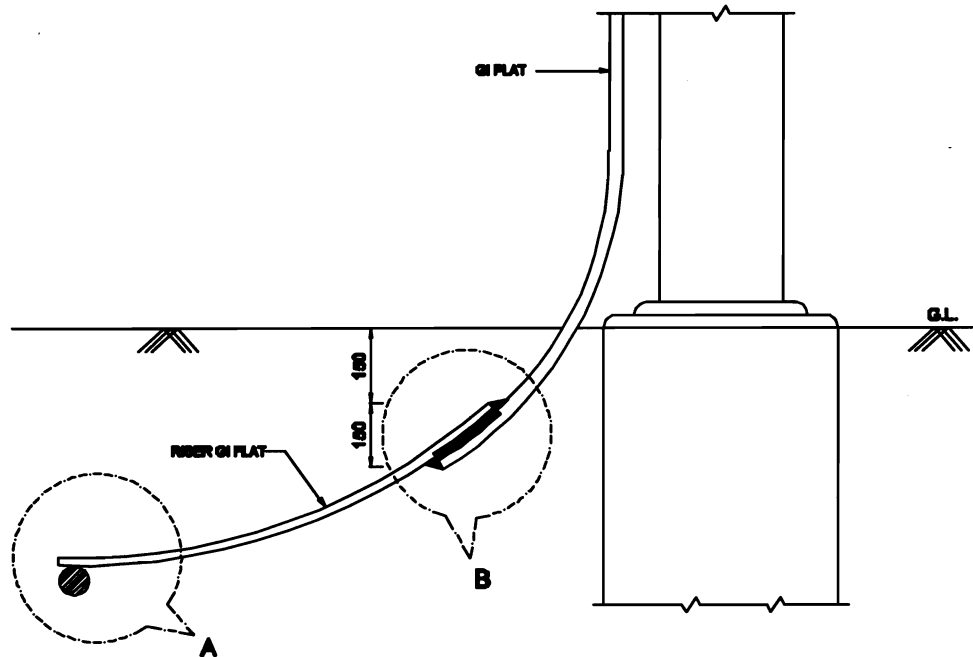


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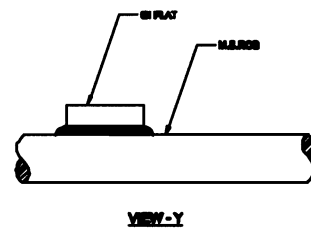
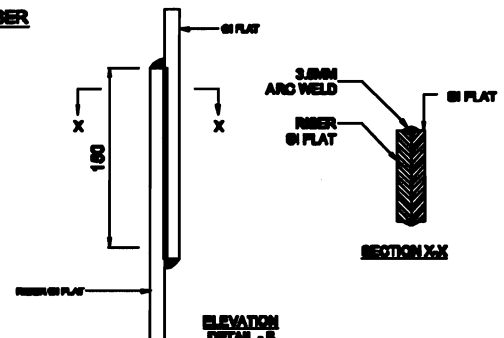
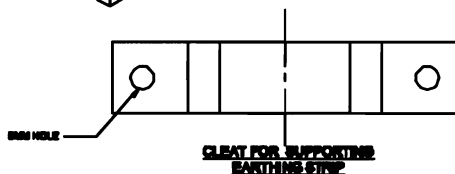
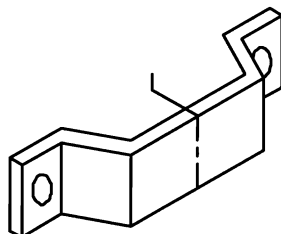
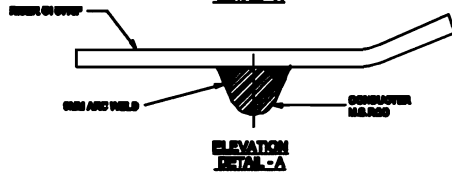
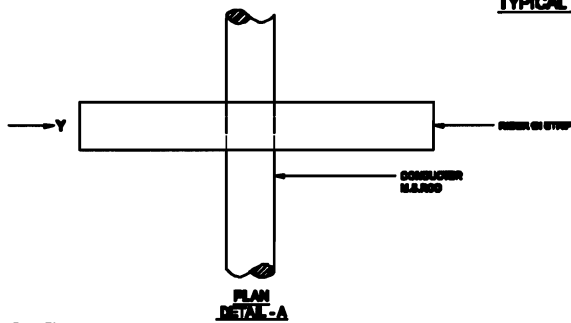
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Typical Arrangement of Pipe Earthing

R2	NOTE NO. 4 ELABORATED FOR QUALITY OF PIPE & DIMENSION DETAILS 'A' CLARIFIED. DT.07.01.2010	DRAWN:	CHECKED:	APPD:	SIZE:
R1	REVISED AS PER FIELD INPUT & CBIP MANUAL # 302	D.K.P.	P.B.M.	EE (ENGG) CE (ENGG)	A4
R0	FIRST PREPARATION DATE :- 01-08-2007	SCALE:	DATE:	DRG. NO:	SHEET: REV:
REV:	DESCRIPTION:	N.T.S.	07.01.2010	GETCO / E / 2S-043 / P-011	2 OF 2 R2



TYPICAL DETAILS OF RISER



NOTE:

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. TYPICAL ARRANGEMENT IS SHOWN WITH RISER OF GI PLAT, IF MS ROD IS USED IT WILL CHANGE ACCORDINGLY.
3. RISER FOR 66KV 800MM GI PLAT FOR 10KA FAULT CURRENT AND 800MM GI PLAT FOR 25KA FAULT CURRENT & ABOVE CLASS 75X10MM GI PLAT.
4. WELDING SHALL BE DONE ALL AROUND TO THE EXTENT POSSIBLE.

EXECUTION PURPOSE



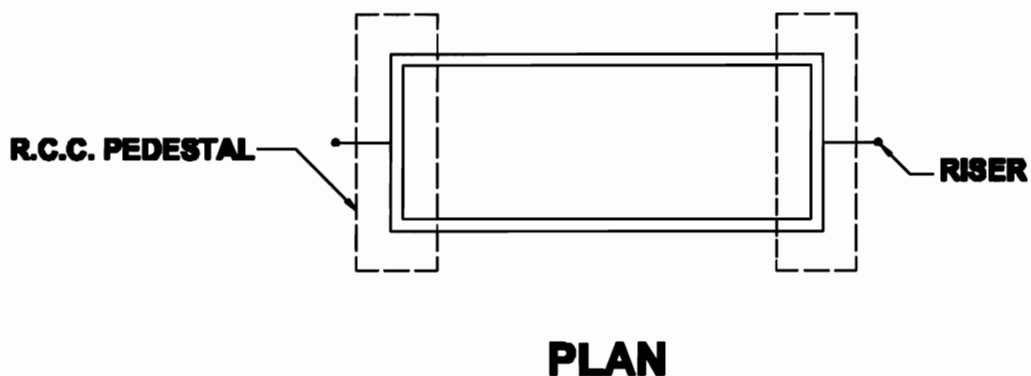
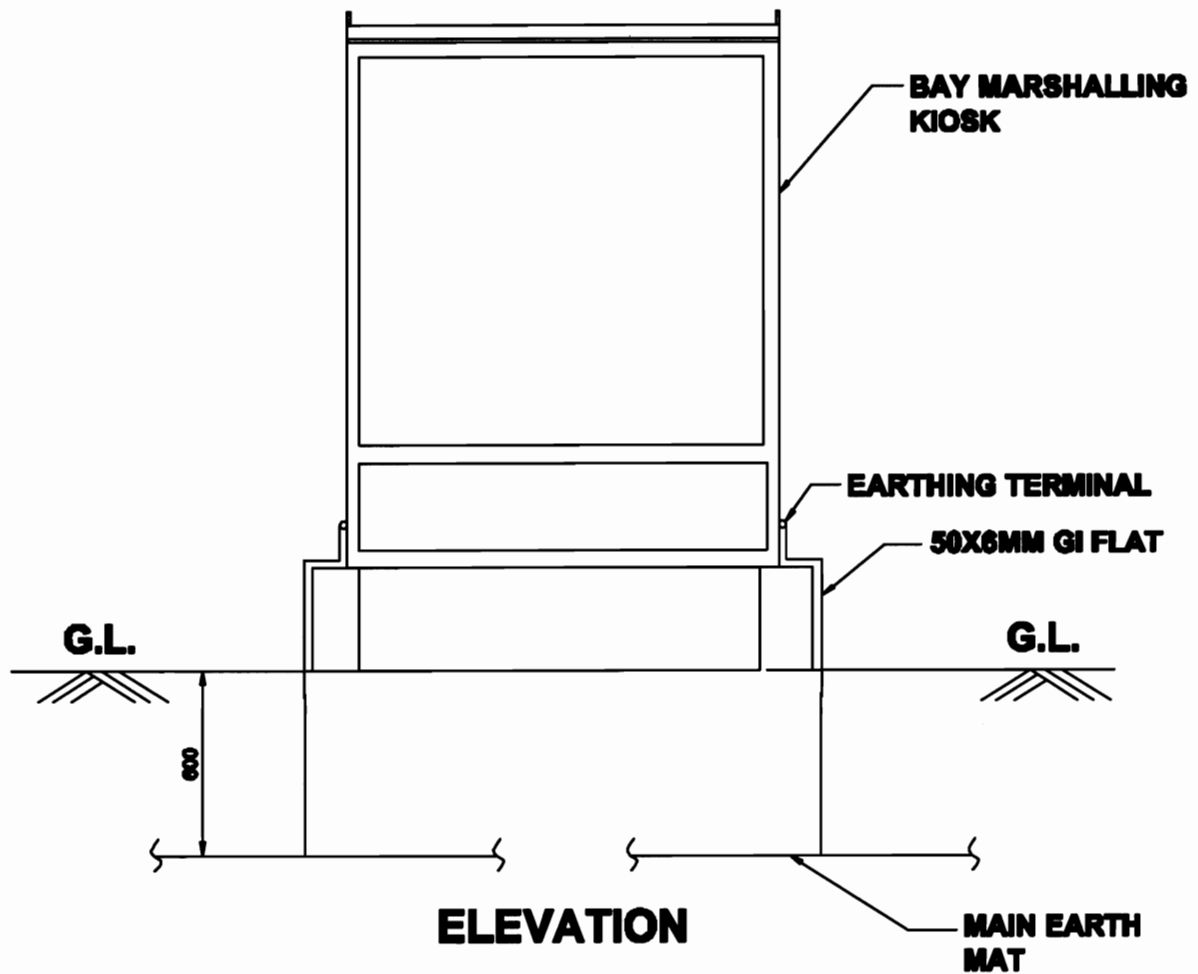
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Typical Arrangement of Riser for Earthing System

NO	FIRST PREPARATION
REV:	DESCRIPTION:

DRAWN:	CHECKED:	APPR:	DATE:
N.P.P.	P.S.M.	EE (ENGG)	ACE (ENGG)
SCALE:	DATE:	DRG. NO:	SHEET:
N.T.S.	01-08-08	08/00 / E / STD / P-012	04 OF 24

REV: R0



NOTES:

1. NO. OF RISERS -2 NOS.
(GI FLAT 50X6MM FOR ALL CLASS)
2. ALL DIMENSIONS ARE IN MM

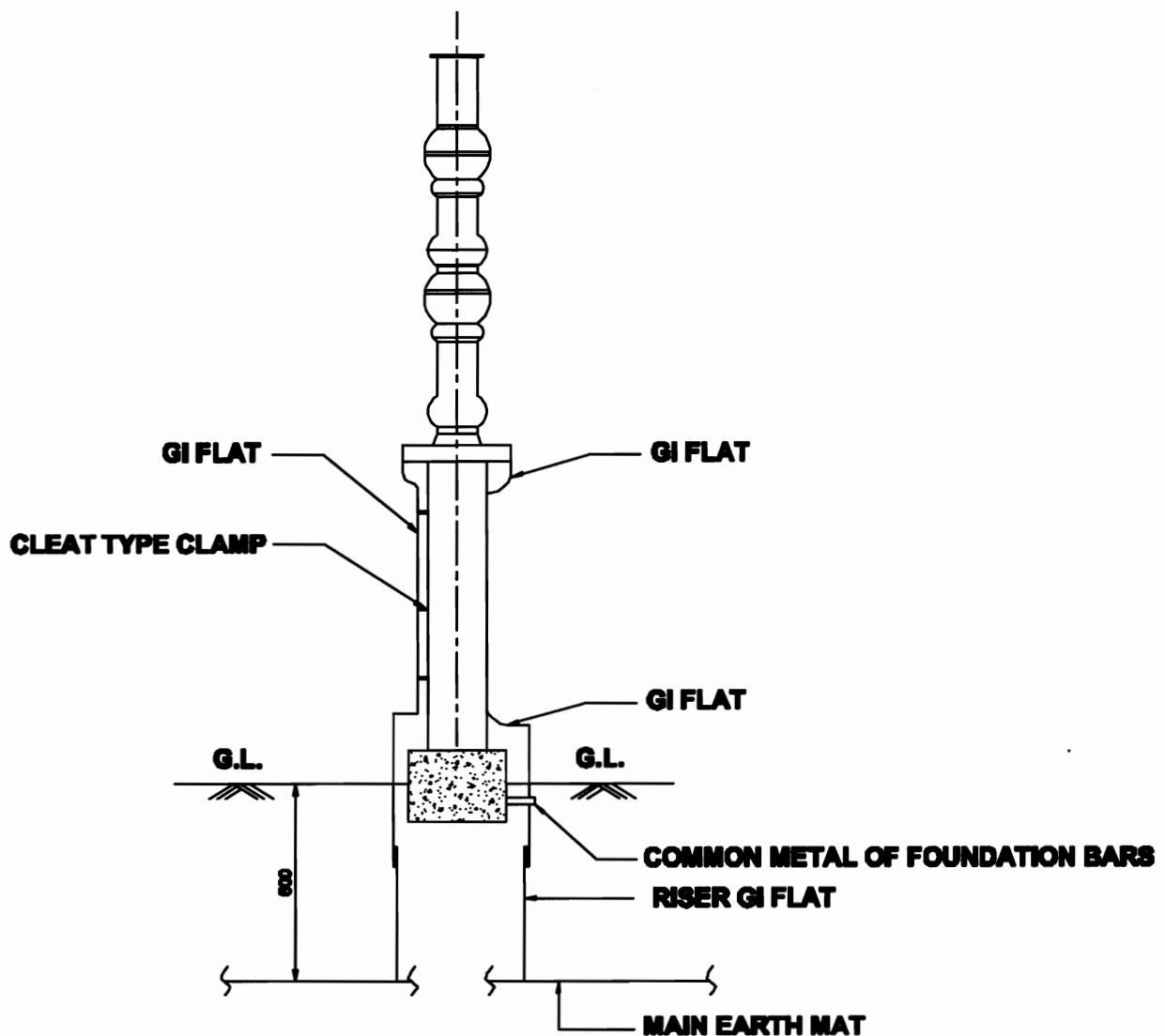
EXECUTION PURPOSE



GUJARAT ENERGY TRANSMISSION CORPN.LTD.
S.P.VIDYUT BHAVAN, RACE COURSE,
VADODARA - 390 007

Typical Earthing Arrangement for BMK


		DRAWN:	CHECKED:	APPD:		
		N.P.P.	P.S.M.	EE (ENRG)	ACE (ENRG)	SIZE A4
RD	FIRST PREPARATION	SCALE:	DATE:	DWG. NO:	SHEET:	REV:
REV:	DESCRIPTION:	N.T.S.	01-08-08	GETCO / S / STD / P-012	17 OF 24	RD

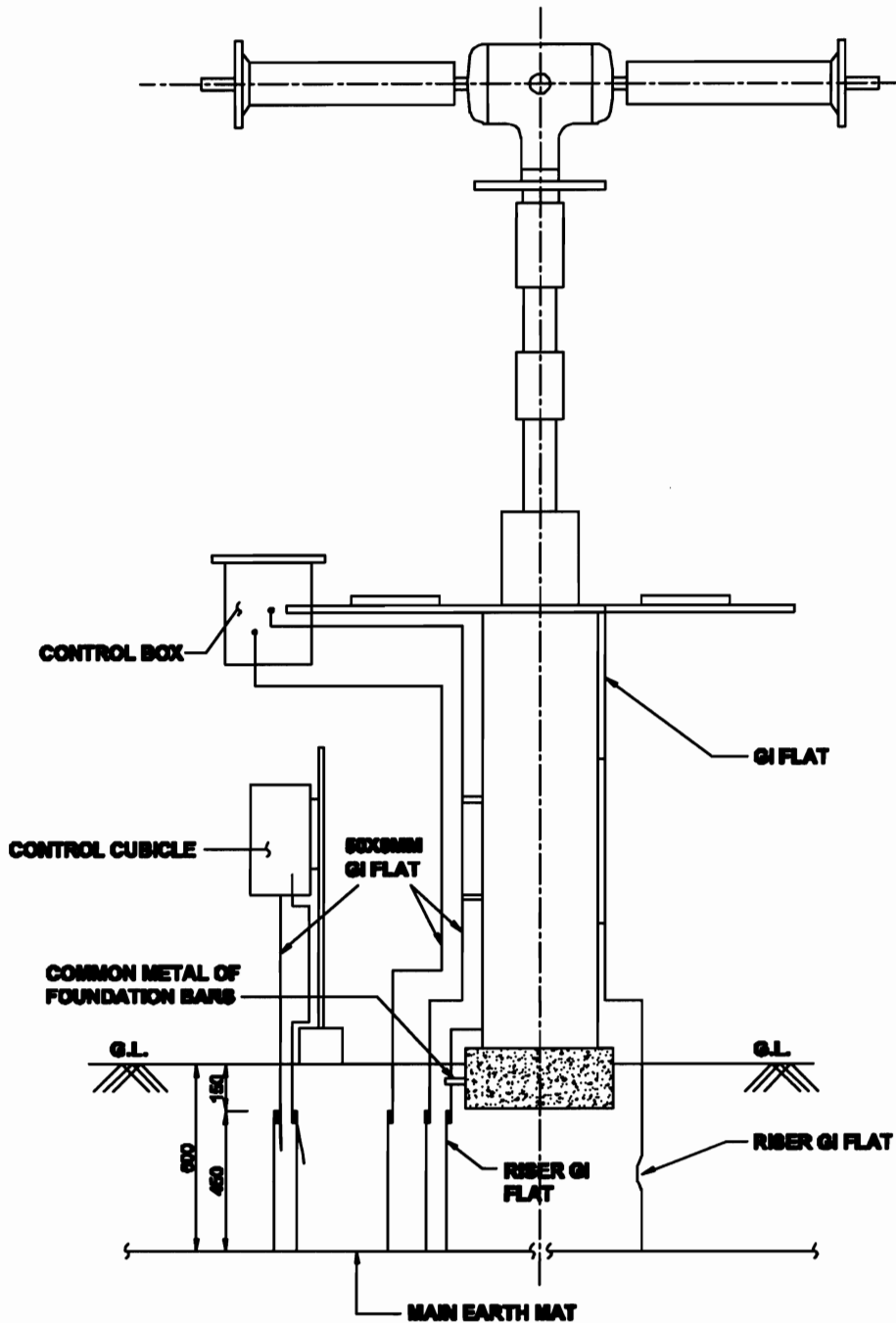


NOTES:

1. NO. OF RISER PER SUPPORT - 2 (RISER FOR 66KV 50X8MM GI FLAT FOR 10KA FAULT CURRENT AND 50X8MM GI FLAT FOR 25KA FAULT CURRENT & ABOVE CLASS 75X10MM GI FLAT).
2. ALL DIMENSIONS ARE IN MM.
3. EARTHING LEADS FROM ONE EQPT / STRUCTURE SHALL BE CONNECTED TO DIFFERENT CONDUCTORS OF EARTHING GRID.
4. NO. OF CLEAT TYPE CLAMP PER SUPPORT - 5 IN 400KV, 4 IN 220KV & 2 IN 66 AND 132KV.

RD	FIRST PREPARATION
REV:	DESCRIPTION:

EXECUTION PURPOSE					
 GUJARAT ENERGY TRANSMISSION CORPN.LTD. S.P.VIDYUT BHAVAN, RACE COURSE, VADODARA - 390 007					
Typical Earthing Arrangement for RPI					
DRAWN:	CHECKED:	APPROVED:			
M.P.P.	P.S.M.	EE (ENSG)	ACE (ENSG)	SCALE:	DATE:
N.T.S.	01-08-08	0200 / S / 010 / P-012	11 OF 24	REV:	RD



NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. NO. OF RISER PER 8 NOS.(2 PER SUPPORT + 2 PER CONTROL BOX + 2 FOR COMMON CONTROL CUBICLE)
3. NO. OF CLEAT TYPE CLAMP 4 PER STRUCTURE
4. EARTHING LEADS FROM ONE EQPT/STRUCTURE SHALL BE CONNECTED TO DIFFERENT CONDUCTORS OF EARTHING GRID
5. RISER FOR 66KV 80X8MM GI FLAT FOR 16KA FAULT CURRENT AND 80X8MM GI FLAT FOR 25KA FAULT CURRENT & ABOVE CLASS 75X10MM GI FLAT.

EDUCATION PURPOSE

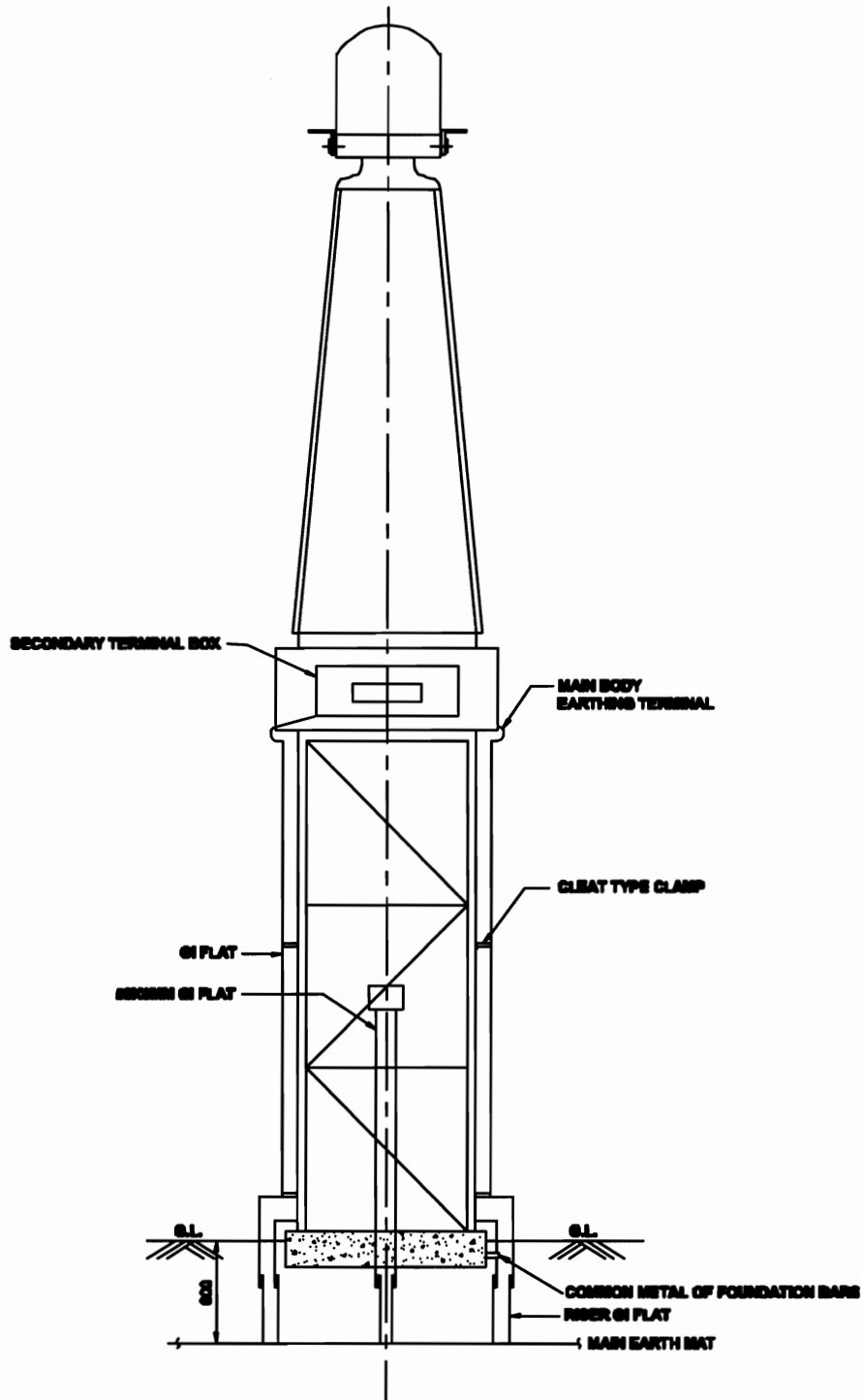


GUJARAT ENERGY TRANSMISSION CORPN.LTD.
S.P.VIDYUT BHAVAN, RACE COURSE,
VADODARA - 390 007

Typical Earthing Arrangement for Circuit Breaker

NO	FIRST PREPARATION
REV:	DESCRIPTION:

DRAWN:	CHECKED:	APPD:	DATE:	SHEET:	REV:
N.P.P.	P.S.M.	EE (SMBG)	ACE (SMBG)	16 OF 24	NO
SCALE:	DATE:	DRS. NO:	DATE:		
N.T.S.	01-08-08	08700 / E / 010 / P-012			



NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. NO. OF RISER PER SUPPORT - 08 NOS. (4 NOS. PER STRUCTURE + 2 NOS. PER JUNCTION BOX)
3. RISER FOR 66KV SYSTEM ON PLAT FOR 10KA FAULT CURRENT AND 60MM ON PLAT FOR 20KA FAULT CURRENT & ABOVE CLASS SYSTEM ON PLAT.
4. EARTHING LEADS FROM ONE BOLT / STRUCTURE SHALL BE CONNECTED TO DIFFERENT CONDUCTORS OF EARTHING GRID
5. NO. OF CLEAT TYPE CLAMP 4 PER SUPPORT

EXECUTION PURPOSE

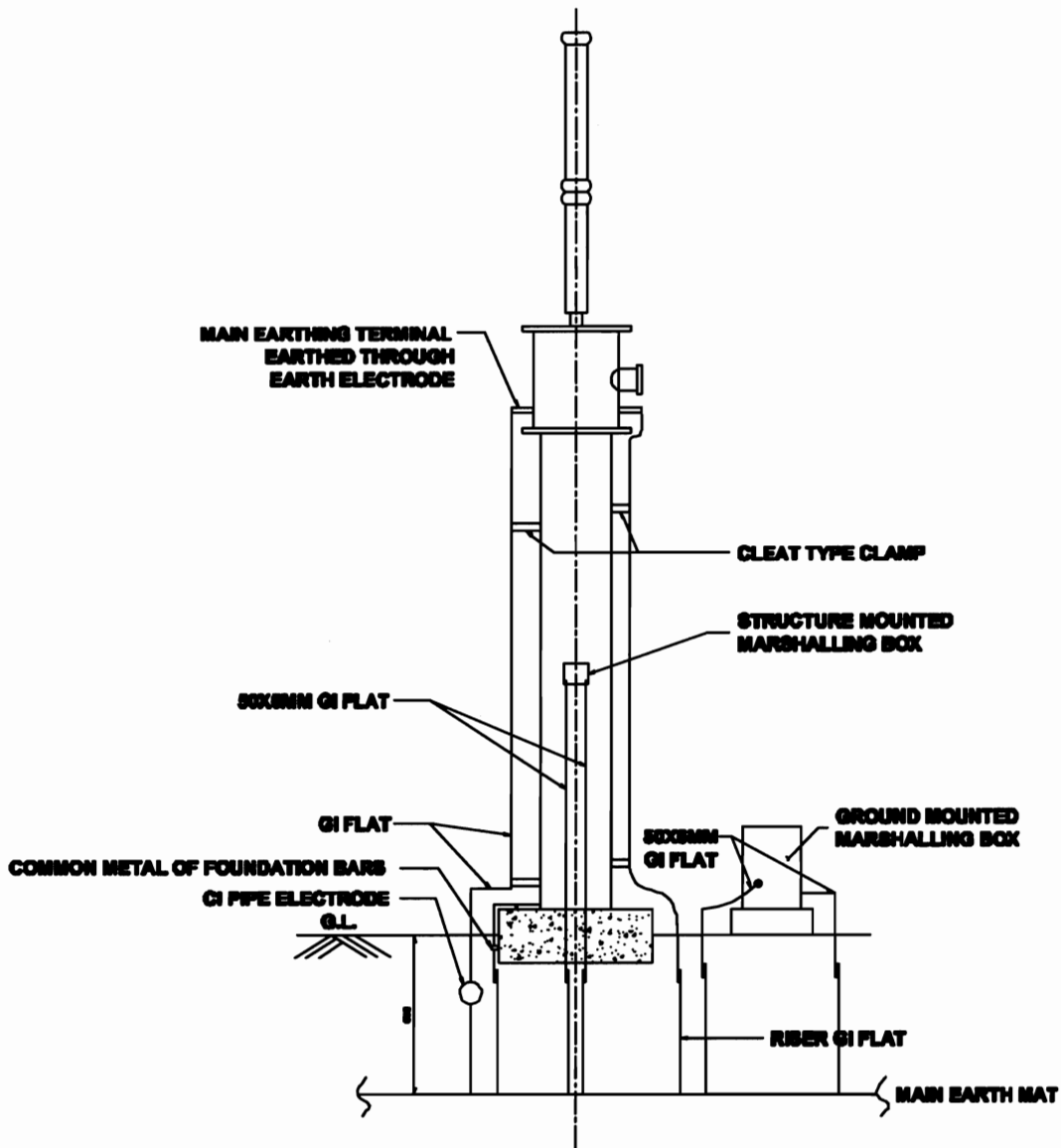


GUJARAT ENERGY TRANSMISSION CORPN.LTD.
S.P.VIDYUT BHAVAN, RACE COURSE,
VADODARA - 390 007

Typical Earthing Arrangement for CT

RD	FIRST PREPARATION
REV:	DESCRIPTION:

DRAWN:	CHECKED:	APPD:	DATE:	DES. NO:	SHEET:	REV:
N.P.F.	P.B.M	BE (ENR0)	ACE (ENR0)	01-08-05	08 OF 24	RS
SCALE:	DATE:	DES. NO:	DATE:	DES. NO:	SHEET:	REV:
N.T.S.	01-08-05	01-08-05	01-08-05	01-08-05	08 OF 24	RS



NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. NO. OF RISERS 66 (3 PER SUPPORT + 2 FOR MARSHALLING BOX)
3. RISER FOR 66KV 80X10MM GI FLAT FOR 10KA FAULT CURRENT AND 80X10MM GI FLAT FOR 25KA FAULT CURRENT & ABOVE CLASS 75X10MM GI FLAT.
4. PIPE ELECTRODES REQD. 1 PER CVT AND SHALL BE FURTHER CONNECTED TO MAIN EARTH MAT.
5. FOR DETAILS OF PIPE EARTH ELECTRODE REF. SHEET NO. 2 OF DRG. NO.P-011.
6. EARTHING LEADS FROM ONE EQPT / STRUCTURE SHALL BE CONNECTED TO DIFFERENT CONDUCTORS OF EARTHING GRID.
7. NO. OF CLEAT TYPE CLAMP 66 NOS. PER SUPPORT FOR 400KV 84 NOS. PER SUPPORT FOR OTHER

EXECUTION PURPOSE





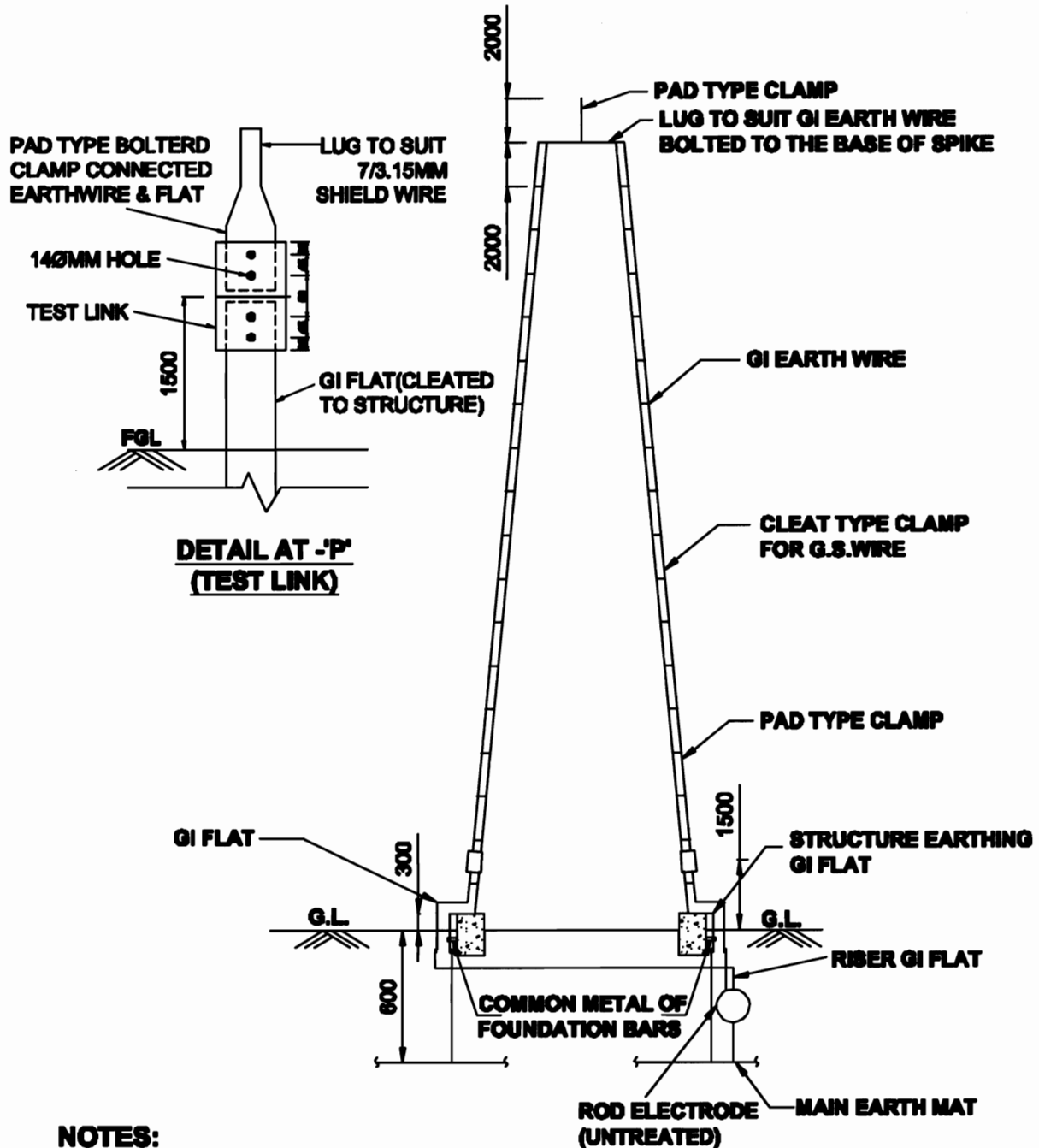
GUJARAT ENERGY TRANSMISSION CORPN.LTD.
S.P.VIDYUT BHAVAN, RACE COURSE,
VADODARA - 380 007

Typical Earthing Arrangement for CVT / PT

NO	DESCRIPTION:
REV:	

DRAWN:	CHECKED:	APPD:	DATE:	DRG. NO:	SHEET:	REV:
N.P.P.	P.S.M.	EE (ENR02)	ACE (ENR02)	06/00 / 1 / 010 / P-012	07 OF 34	NO
SCALE:	DATE:	DRG. NO:	DATE:	DRG. NO:	SHEET:	REV:
N.T.S.	01-08-08	06/00 / 1 / 010 / P-012	07 OF 34	NO		

		GUJARAT ENERGY TRANSMISSION CORPN.LTD. S.P.VEDYUT BHAVAN, RACE COURSE, VADODARA - 390 007		DEMOLITION PURPOSE	
<p align="center"><u>Typical Earthing Arrangement for Isolator</u></p>					
DRAWN: N.P.P.	CHECKED: P.B.M.	APPROVED: EE (ENGG) ACE (ENGG)		 EE	
SCALE: N.T.S.	DATE: 01-08-08	DWG. NO.: GETCO / E / STD / P-012	SHEET: 05 OF 20	REV: 00	



NOTES:

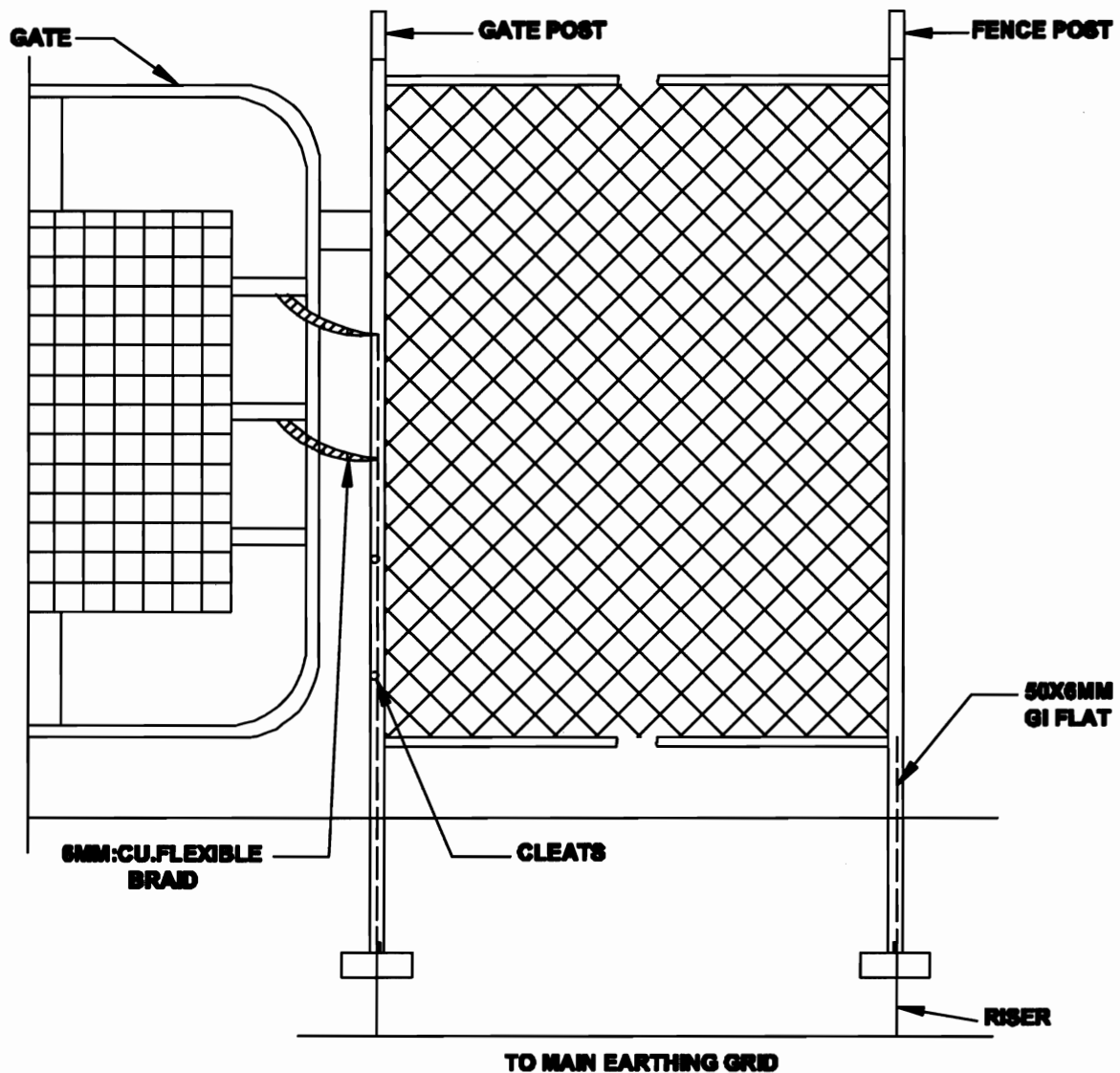
1. EARTHING LEADS FROM EQPT./STRUCTURE SHALL BE CONNECTED TO DIFFERENT CONDUCTORS OF RATHING GRID.
2. ALL DIMENSIONS ARE IN MM.
3. NO. OF RISERS - 4 NOS. (RISER FOR 66KV 80X8MM GI FLAT FOR 16KA FAULT CURRENT AND 80X8MM GI FLAT FOR 25KA FAULT CURRENT & ABOVE CLASS 75X10MM GI FLAT).
4. CLEATS SHALL NOT BE MOUNTED ON STRUCTURE JOINTS
5. NO. OF ROD ELECTRODE (UNTREATED) - 1 NO. AND SHALL BE FURTHER CONNECTED TO MAIN EARTH MAT.
6. NOS. OF CLEAT TYPE CLAMPS REQUIRED - 80 NOS. FOR 400KV & 220KV
7. GI EARTH WIRE - 7/3.00MM FOR 400KV AND 7/3.15MM FOR ALL OTHER

DESIGNATION PURPOSE

GUJARAT ENERGY TRANSMISSION CORPN.LTD.
S.P.VIDYUT BHAVAN, RACE COURSE,
VADODARA - 380 007

Typical Earthing Arrangement for LM

DRWN:	CHECKED:	APPD:	REV:
N.P.P.	P.B.M.	EE (ENGG)	ACE (ENGG)
SCALE:	DATE:	DRW. NO:	SHEET:
N.T.S.	01-08-05	00000 / E / STD / P-012	15 OF 20
REV:	DESCRIPTION:		
RS	FIRST PREPARATION		

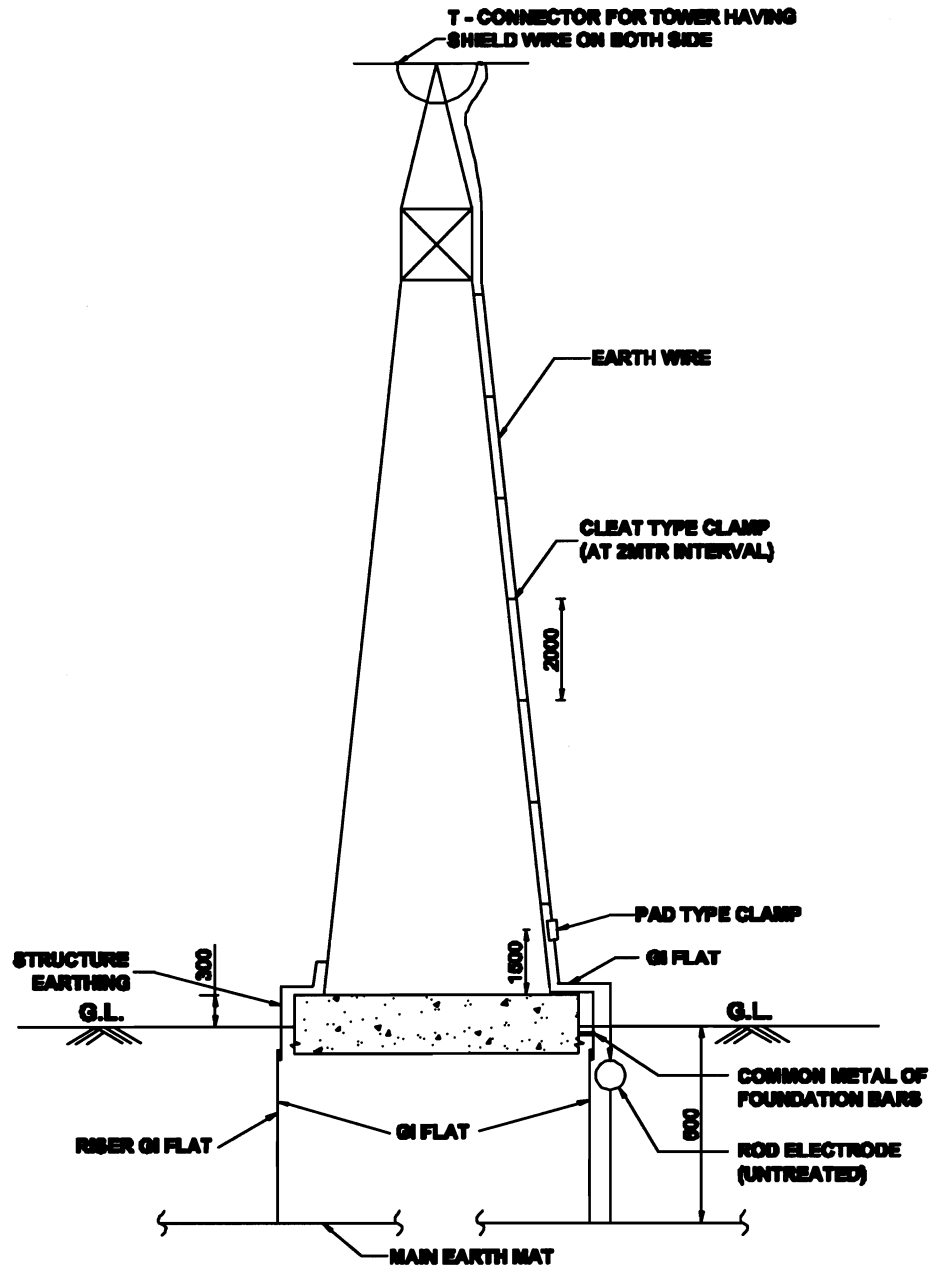


NOTES:-

1. NO. OF CU.FLEXIBLE BRAID REQD. 2 PER GATE POST.
2. EVERY ALTERNATE POST OF THE FENCE SHALL BE CONNECTED TO EARTH MAT THROUGH A RISER.

NO	DESCRIPTION
REV	DESCRIPTION

EXHIBITION PURPOSE			
GUJARAT ENERGY TRANSMISSION CORPN.LTD. S.P.VIDYUT BHAVAN, RACE COURSE, VADODARA - 390 007			
Typical Earthing Arrangement for Switch Yard Gate			
DRAWN:	CHECKED:	APPROVED:	DATE:
N.P.P.	P.B.M.	SE (SMBQ)	AGE (SMBQ)
SCALE:	DATE:	DRG. NO:	SHEET:
N.T.S.	01-08-05	GEYOD/S/1/STG/P-012	21 OF 24
REV:	DESCRIPTION:	NO	REV:



NOTES:

1. NO.OF RISERS - 3NOS (RISER FOR 66KV 50X5MM GI FLAT FOR 16KA FAULT CURRENT AND 80X8MM GI FLAT FOR 25KA FAULT CURRENT & ABOVE CLASS 75X10MM GI FLAT).
2. NO.OF UNTREATED ROD ELECTRODE - 1NO.
3. CLEAT TYPE CLAMP SHALL NOT BE MOUNTED ON STR. JOINTS.
4. CLEAT TYPE CLAMPS QTY. - 12 NOS. 400KV, 8NOS. 220KV & 6NOS. FOR 66KV
5. NO OF PAD TYPE CLAMP REQD. - 1NO.
6. T- CONNECTOR FOR 7/3.58 OR 7/3.16MM GI EARTH WIRE - 1NOS.
7. HEIGHT OF TOWER 66KV - CPE3 - 30MTR
- CPA2 - 13MTR
133KV - 14MTR
220KV - 22MTR
400KV - 28MTR

EXECUTION PURPOSE

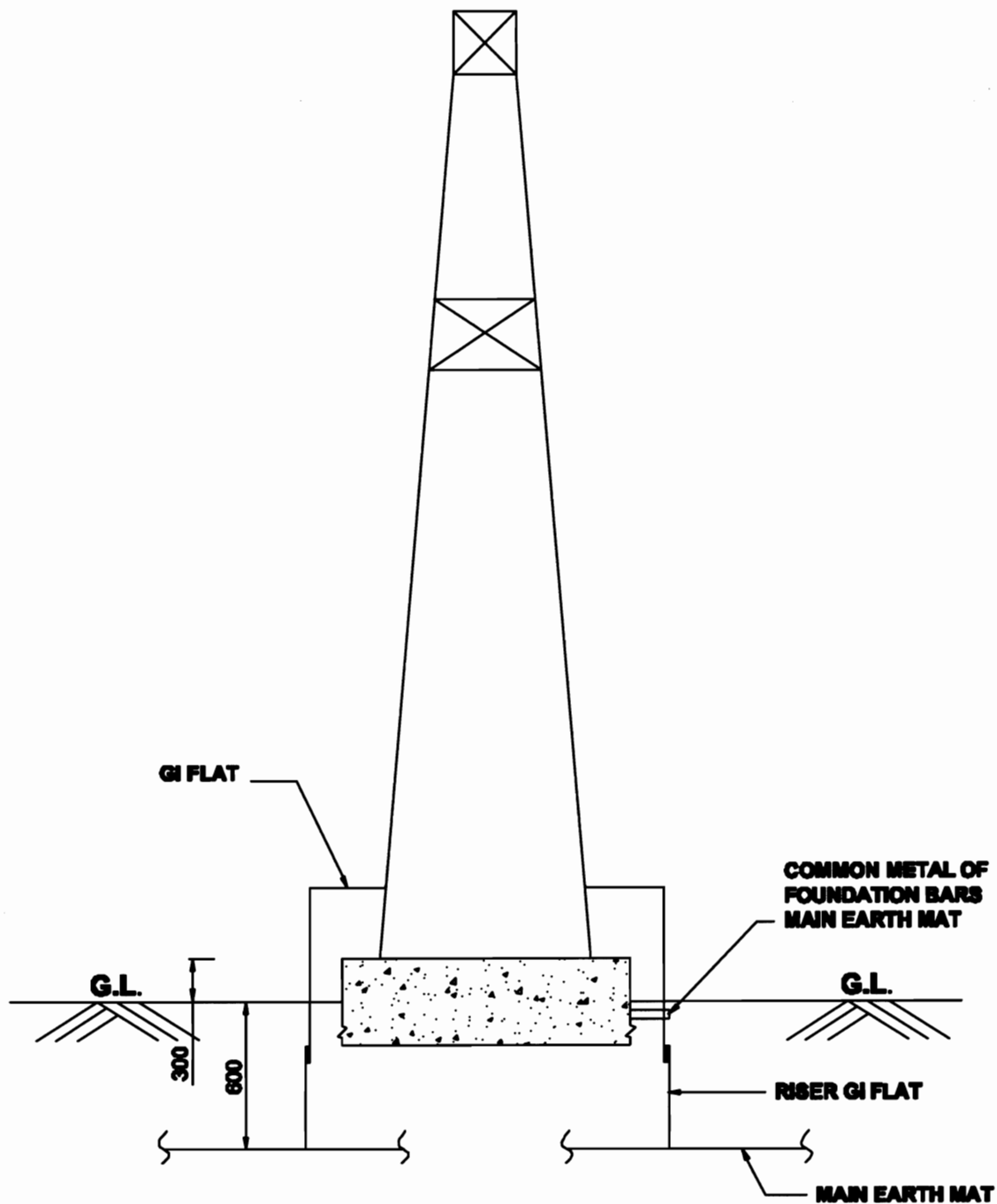


GUJARAT ENERGY TRANSMISSION CORPN.LTD.
S.P.VIDYUT BHAVAN, RACE COURSE,
VADODARA - 380 007

Typical Earthing Arrangement for Tower with Peak

NO	FIRST PREPARATION
REV:	DESCRIPTION:

DRAWN:	CHECKED:	APPD:	DATE:	REV:
M.P.P.	P.B.M.	EE (ENGG)	ACE (ENGG)	AS
SCALE:	DATE:	DRS. NO:	SHEET:	REV:
N.T.S.	01-05-05	68700 / B / STD / P-012	13 OF 24	RS



NOTES:

1. RISER FOR 66KV 50X6MM GI FLAT FOR 10KA FAULT CURRENT AND 50X8MM GI FLAT FOR 25KA FAULT CURRENT & ABOVE CLASS 75X10MM GI FLAT.
2. ALL DIMENSIONS ARE IN MM

DESIGN PURPOSE

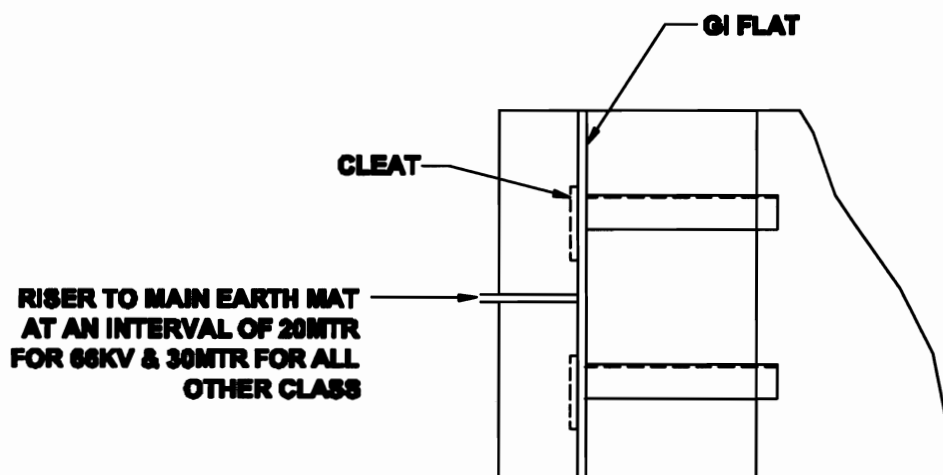
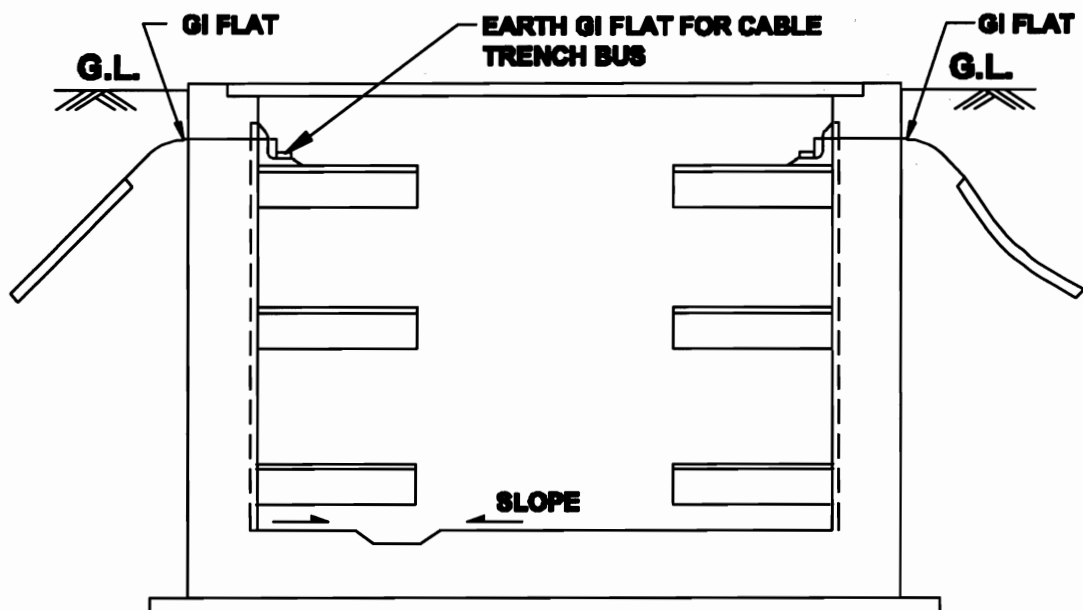
GUJARAT ENERGY TRANSMISSION CORPN.LTD.
S.P.VIDYUT BHAVAN, RACE COURSE,
VADODARA - 380 007

Typical Earthing Arrangement for Tower without Peak

NO	DESCRIPTION
REV:	DESCRIPTION:

DRAWN:	CHECKED:	APPD:	DATE:
M.P.P.	P.S.M.	EE (ENGG)	AGE (ENGG)
SCALE:	DATE:	DWG. NO:	SHEET:
N.T.S.	01-08-08	GEYTD / II / STD / P-012	14 OF 24

REV: NO





TYP. PLAN

NOTE:-

1. RISER FOR 66KV 50X8MM GI FLAT FOR 10KA FAULT CURRENT AND 50X8MM GI FLAT FOR 25KA FAULT CURRENT & ABOVE CLASS 75X10MM GI FLAT.

NO	FIRST PREPARATION
REV:	DESCRIPTION:

EXECUTION PURPOSE					
 GUJARAT ENERGY TRANSMISSION CORPN.LTD. S.P.VIDYUT BHAVAN, RACE COURSE, VADODARA - 390 007					
Typical Earthing Arrangement of Cable Trench					
DRAWN:	CHECKED:	APPD:			
M.P.F.	P.S.M.	SE (ENGRG)	ACE (ENGRG)	 SCALE A4	
SCALE:	DATE:	DRW. NO:	SHEET:	REV:	
N.T.S.	01-08-08	GETOD / S / STD / P-012	10 OF 24	NO	