

ANNEXURE - C

APPROVED AS INDICATED BY ☒ BELOW

- ☒ CATEGORY - I APPROVED
- ☐ CATEGORY - II APPROVED; SUBJECT TO COMMENTS TO BE INCORPORATED
- ☐ CATEGORY - III NOT APPROVED, TO BE REVISED
- ☐ CATEGORY - IV FOR INFORMATION ONLY
- ☐ CATEGORY - IV-R FOR INFORMATION WITH COMMENTS

Contractor is responsible for Design, coordination, dimensions, quantities etc. Approval does not relieve the contractor of his responsibility for design and performance of the equipment / system / overall plant in accordance with the contract document.

MOTT MACDONALD 284431

Job No. Date 23.08.11

Checked by RT/AK

01	09.08.11	AS PER MOTT MACDONALD COMMENTS DATED 01.08.11	PURAN	SK <i>SK</i>	SKS <i>SK</i>	AS <i>SK</i>
REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY

NAME OF CUSTOMER/PROJECT

HINDUJA NATIONAL POWER CORPORATION LTD.
2X520MW VIZAG THERMAL POWER PLANT VISHAKHAPATTANAM

NAME OF CONSULTANT



BHARAT HEAVY ELECTRICALS LTD
UNIT: TRANSMISSION BUSINESS GROUP

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DEPT	NAME	SIGN.	DATE
CODE	DRN	PURAN	PURAN
	DESN	SK	-SD-
	CHD	SKS	-SD-
	APPD	AS	-SD-

TITLE

EQUIPMENT & STRUCTURE EARTHING DETAILS
FOR 400kV VIZAG SUBSTATION

CV	ME	EL	I&C	DEPT.	SCALE	BHEL DRG NO.
				SIGN	NTS	TB-4-330-316-011
				DATE		SHEETS. ENCLOSED. 24 REV. 01

LEGEND

- CONNECTION TO GROUND MAT THROUGH RISER.
— ⊗ PE CONNECTION TO PIPE ELECTRODE WITH TREATED EARTH PIT.
● RISER

GENERAL NOTES:

1. EARTH STRIP CLEATED TO LATTICE /PIPE TYPE STRUCTURE AT AN INTERVAL OF 1000mm.
2. ALL ELECTRICAL EQUIPMENTS SHALL BE EARTHED BY TWO SEPARATE AND DISTINCT EARTH CONNECTIONS AND SHALL BE CONNECTED TO DIFFERENT CONDUCTORS OF EARTHING GRID.
3. FOR WELDING DETAILS REFER SHEET #19, 20 & 21
4. E/WIRE DOWN CONDUCTOR SHALL BE CLEATED AT AN INTERVAL OF 2000mm ALONG WITH STRUCTURE.
5. NO HOLES IN STRUCTURE ARE ALLOWD FOR THIS PURPOSE.
6. 40 DIA MS ROD RISERS SHOULD BE BRING CLOSE TO EQUIPMENTS FOUNDATION.

SHEET NO. DESCRIPTION

- | | |
|-----|--|
| 02. | 400kV SF6 CIRCUIT BREAKER |
| 03. | 400kV CVT |
| 04. | 400kV POST INSULATOR (SOLID CORE TYPE) |
| 05. | 336kV LIGHTNING ARRESTER |
| 06. | MARSHALLING KIOSK |
| 07. | 400kV HORIZONTAL CENTER BREAK ISOLATOR WITH ONE EARTH SWITCH |
| 7A. | 400kV HORIZONTAL CENTER BREAK ISOLATOR WITH TWO EARTH SWITCH |
| 08. | TOWER WITH SHIELD WIRE |
| 8A. | TOWER WITHOUT SHIELD WIRE |
| 09. | 400kV CURRENT TRANSFORMER |
| 10. | CABLE TRENCH |
| 11. | DETAIL OF PIPE EARTH ELECTRODE IN TREATED EARTH PIT (ET) |

SHEET NO. DESCRIPTION

- | | |
|-----|---|
| 12. | RAIL BONDING |
| 13. | LT TRANSFORMER |
| 14. | AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH., E/S MECH. BOX. |
| 15. | SWITCHGEAR / MCC /RELAY PANEL. |
| 16. | 400kV SHUNT REACTOR WITHOUT NGR. |
| 17. | FENCE POST |
| 18. | TYPICAL ARRANGEMENT OF BOLTED JOINTS |
| 19. | WELDING DETAILS |
| 20. | WELDING DETAILS |
| 21. | WELDING DETAILS |
| 22. | 400kV WAVE TRAP |



EQUIPMENT EARTHING DETAILS

400kV SF6 CIRCUIT BREAKER

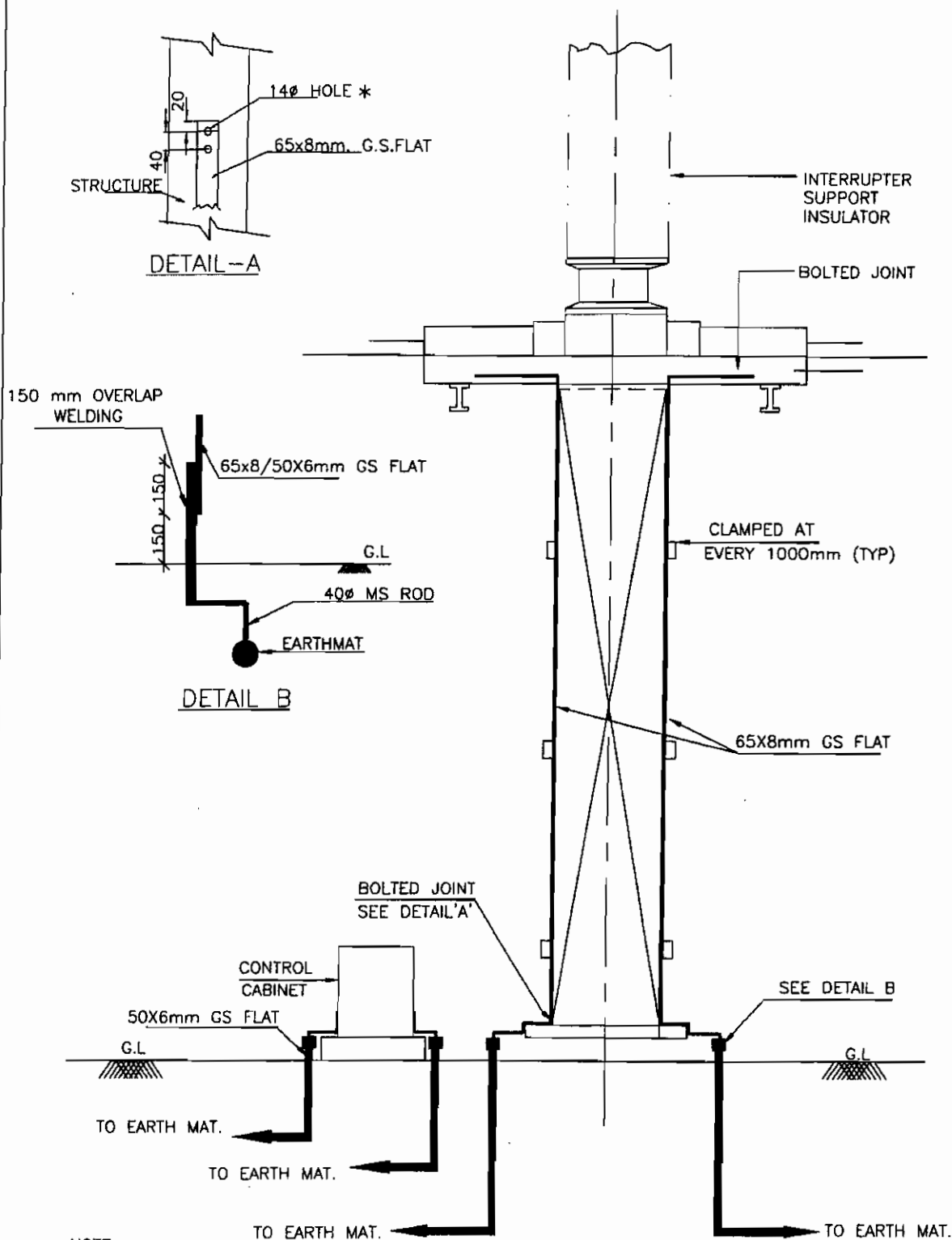
COMPUTER REF. NO.

DRG. No.

TB-4-330-316-011

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SHEET No.
01



NOTE:

- 1) * BOLT SIZE AND HOLE SIZE SHALL BE TO SUIT RESPECTIVE EQPT./STRUCTURE.
- 2) NO. OF RISERS PER CIRCUIT BREAKER = 2 NOS./PHASE
- 3) NO. OF RISERS FOR CONTROL CABINET = 2 NOS.
- 4) NO. OF RISERS FOR PLATFORM = 2 NOS. PER PLATFORM.



EQUIPMENT EARTHING DETAILS

400kV SF6 CIRCUIT BREAKER

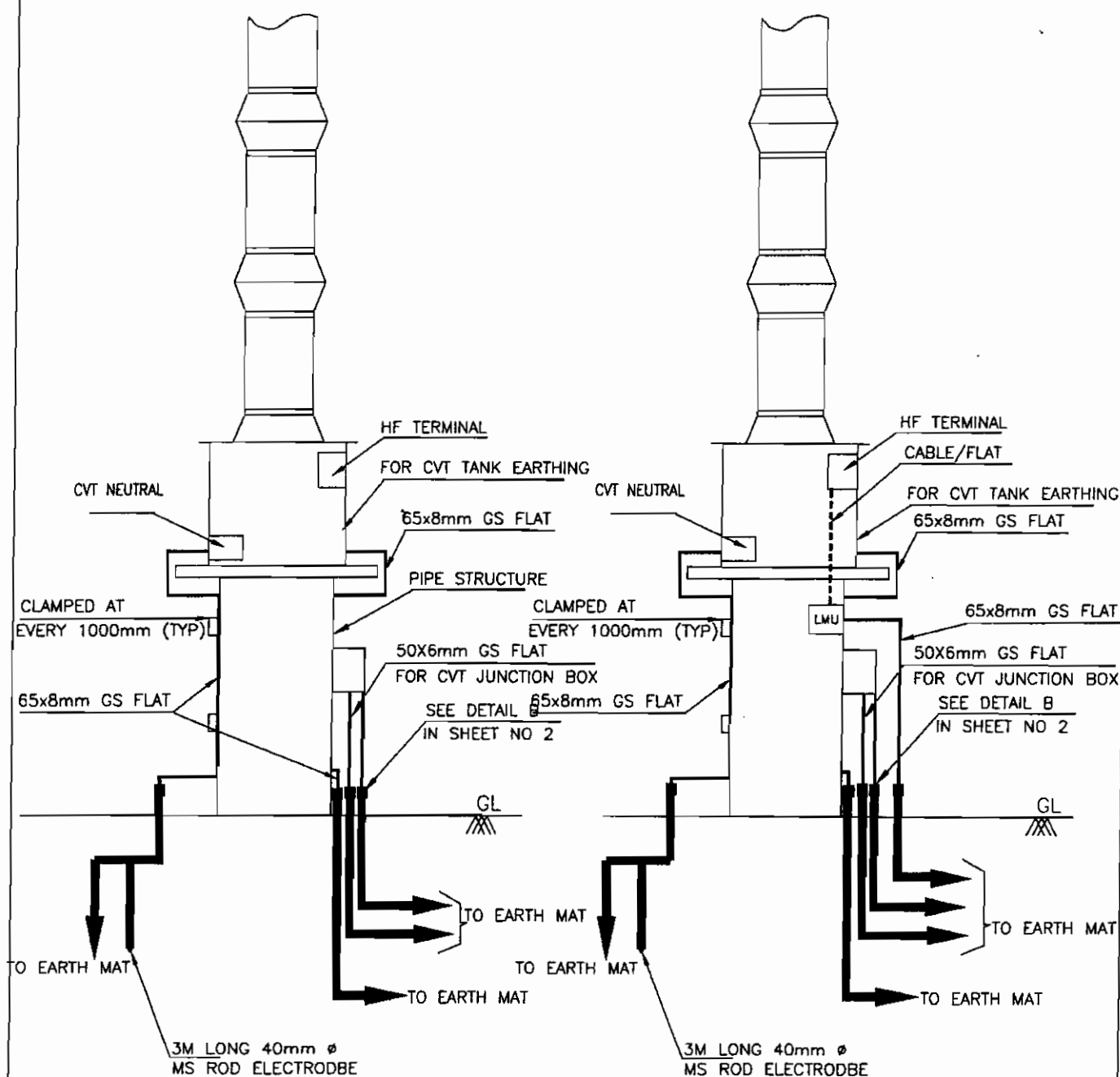
COMPUTER REF. NO.

DRG. No.

TB-4-330-316-011

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SHEET No.
2



(CVT WITHOUT LINE MATCHING UNIT CONNECTION)

(CVT WITH LINE MATCHING UNIT CONNECTION)

NOTE:

- (1) ROD ELECTRODE = 1 NOS./PHASE
- (2) NO. OF RISERS = 2 NOS PER PHASE FOR CVT WITHOUT LMU.
- (3) NO. OF RISERS = 3 NOS PER PHASE FOR CVT WITH LMU.
- (4) NO. OF RISERS FOR CVT JUNCTION BOX = 2 NOS.



EQUIPMENT EARTHING DETAILS

400KV CVT

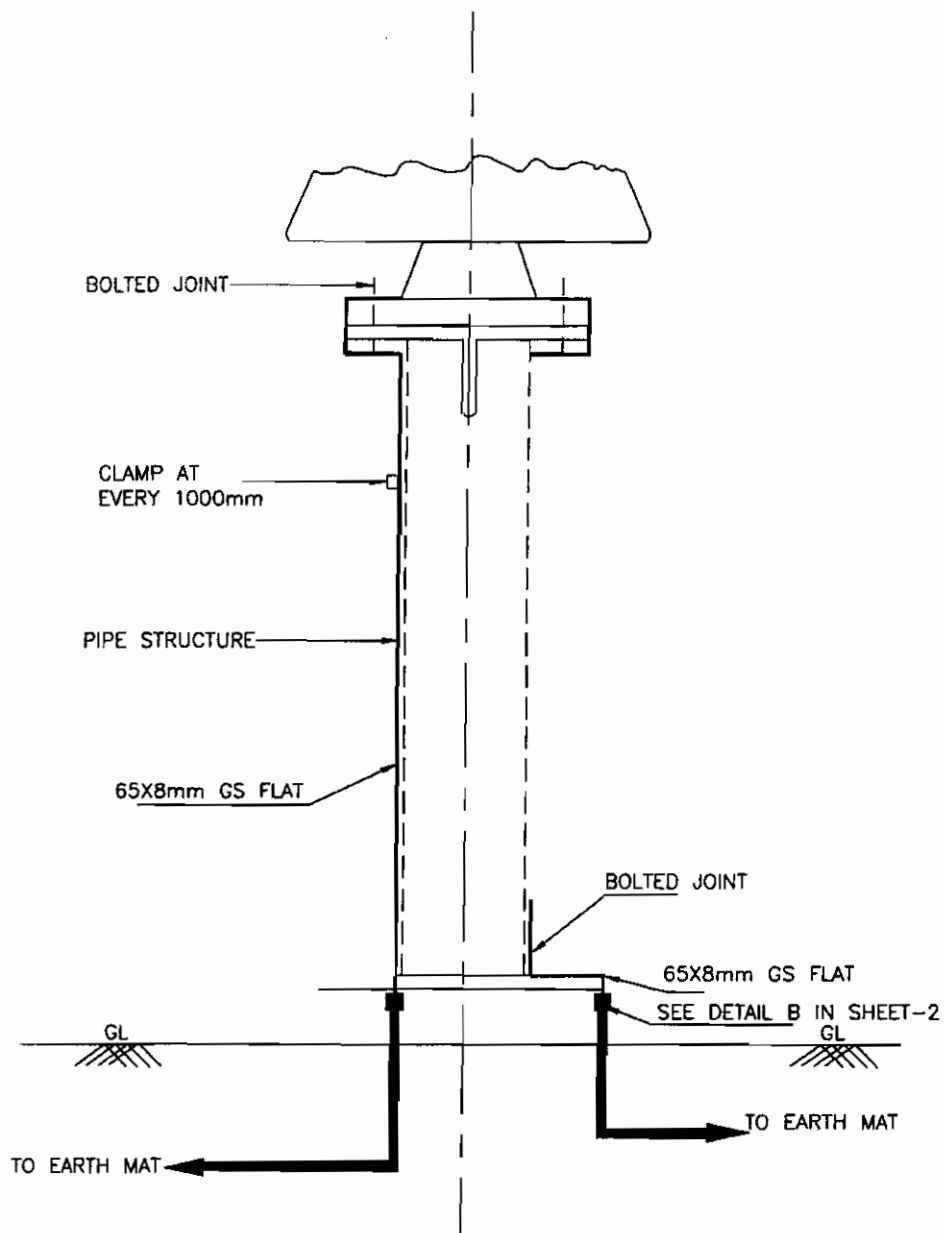
COMPUTER REF. NO.

DRG. No.

TB-4-330-316-011

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SHEET No.
3



NOTE:

(1) NO. OF RISERS = 2 NOS./PHASE



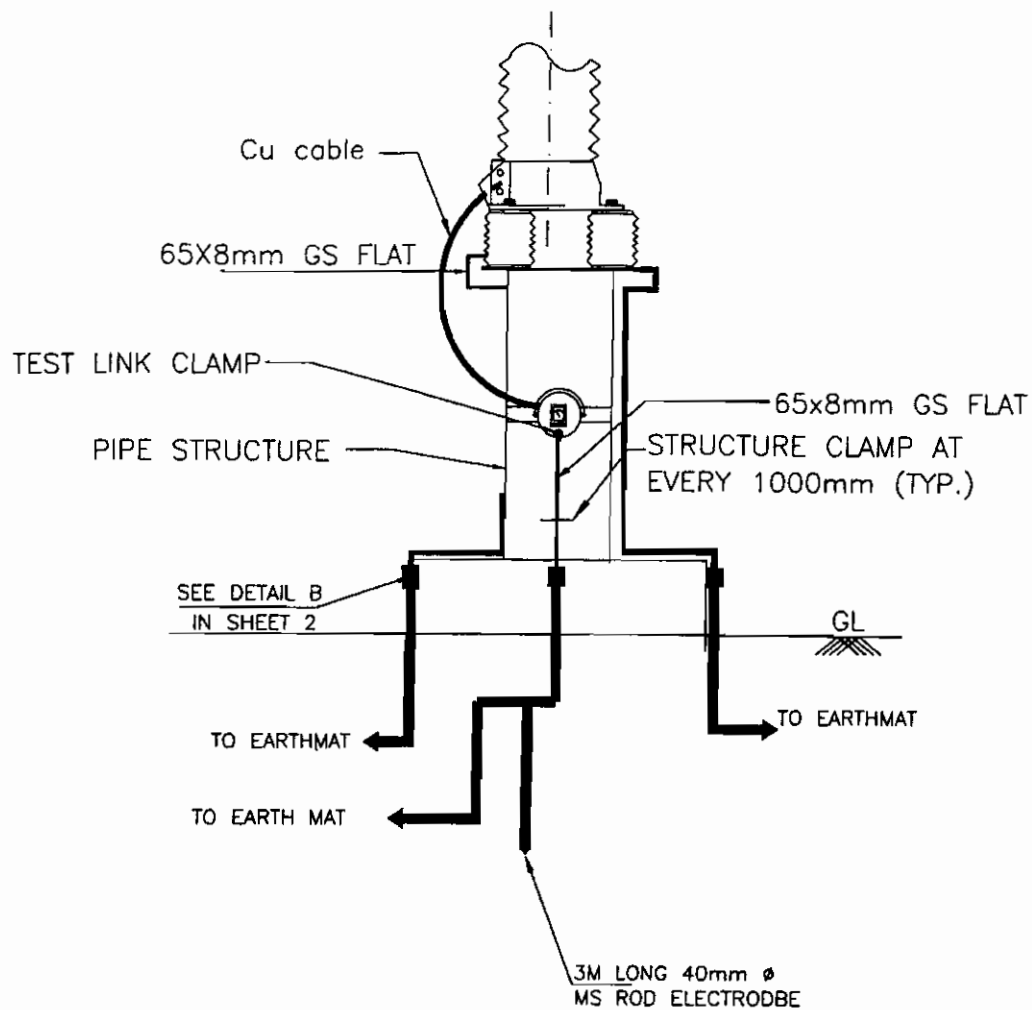
EQUIPMENT EARTHING DETAILS 400KV POST INSULATOR (SOLID CORE TYPE)

DRG. No.

TB-4-330-316-011

REV. 01

SHEET No.
4



NOTES;

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



EQUIPMENT EARTHING DETAILS

LIGHTNING ARRESTER(336kV)

COMPU. DRG. REF.

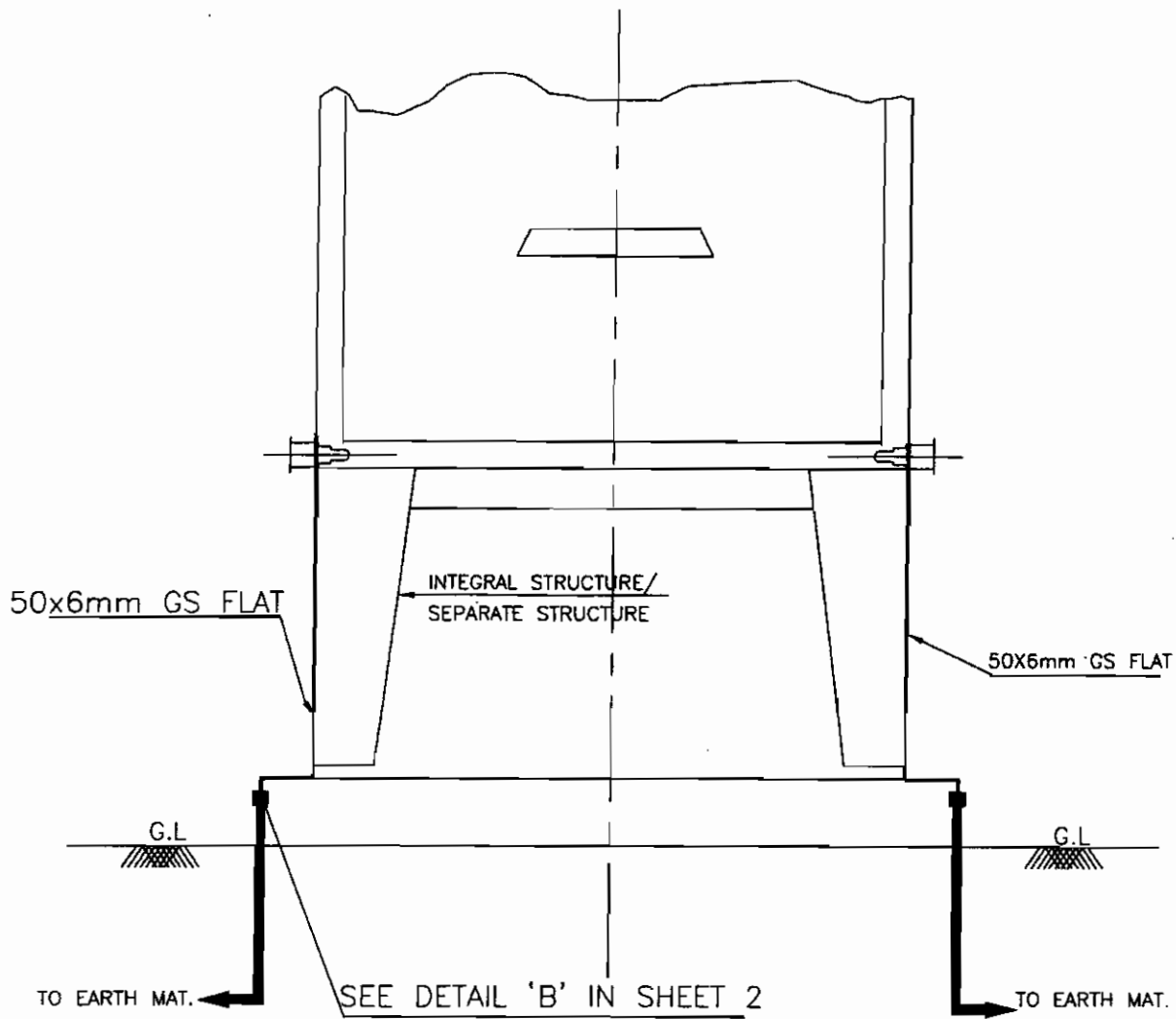
DRG.NO.

TB-4-330-316-011

REV. 01

SHEET No.

5



NOTES;

1. NO. OF RISERS= 2NOS.



EQUIPMENT EARTHING DETAILS MARSHALLING KIOSK

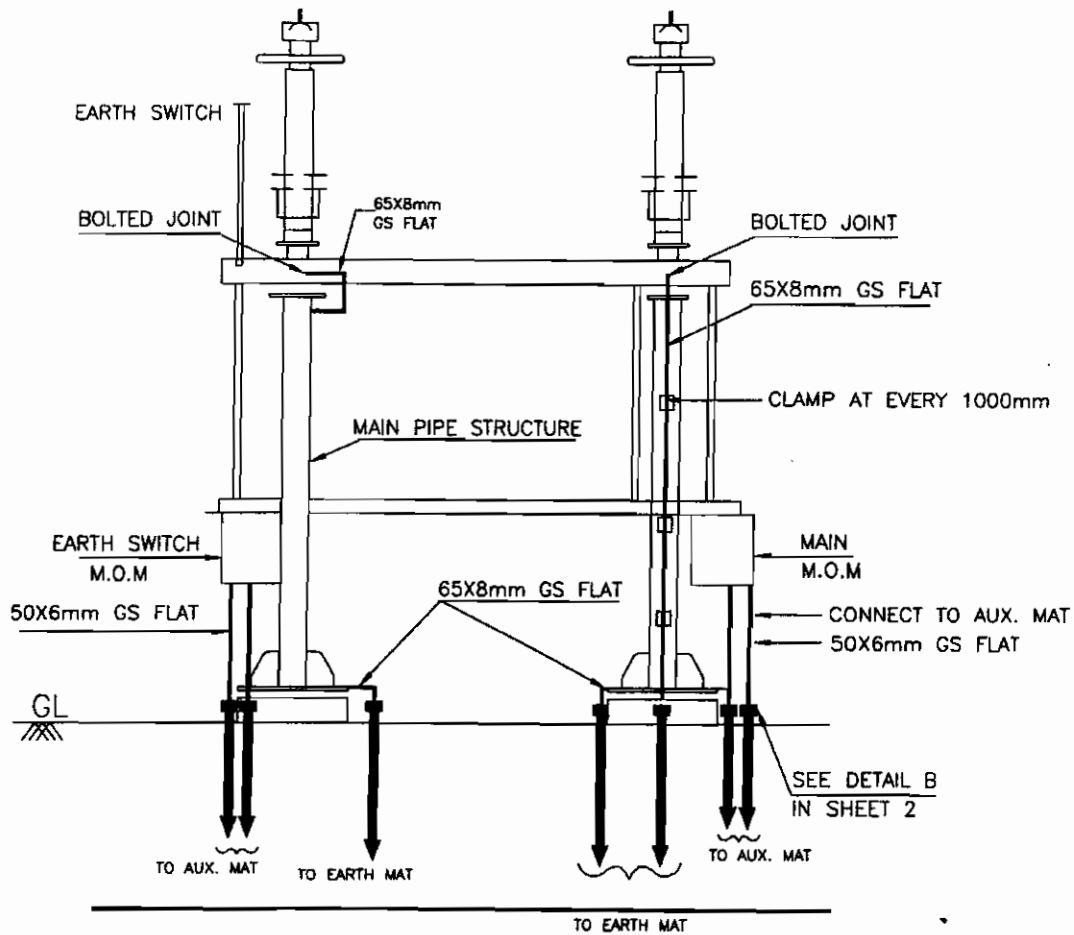
COMPUTERREF.NO.

DRG. No.

TB-4-330-316-011

REV. 01

SHEET No.
6



NOTES

1. AUXILIARY EARTH MAT SHALL BE PROVIDED BELOW EVERY MOM BOX (REFER SHEET 14)
2. NO. OF RISERS FOR ISOLATOR = 3 NOS./PHASE
3. NO. OF RISERS FOR MAIN MECHANISM BOX = 2 NOS.
4. NO. OF RISERS FOR EARTH SWITCH MECHANISM BOX = 2 NOS.



EQUIPMENT EARTHING DETAILS

400KV HCB

ISOLATOR (TYPICAL) WITH ONE EARTH SWITCH

COMPUTERREF.NO.

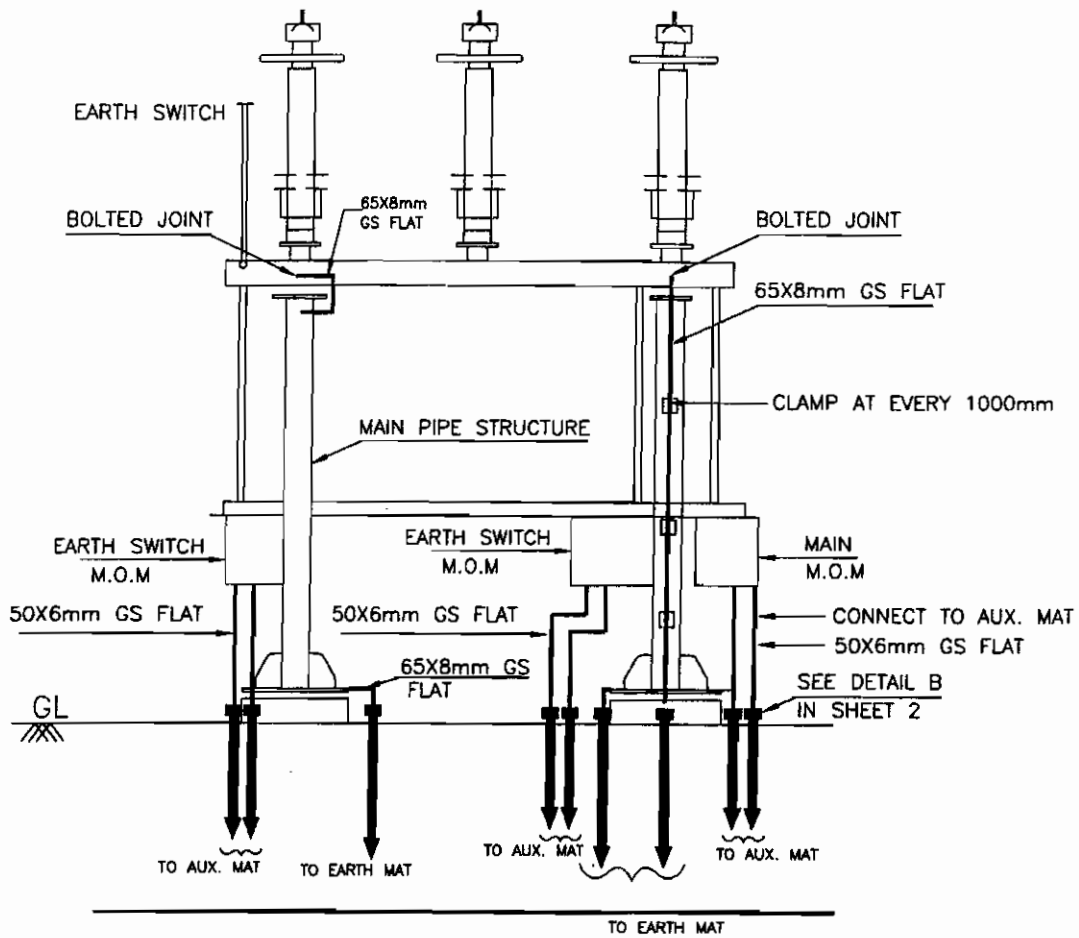
DRG. No.

TB-4-330-316-011

REV. 01

SHEET No.

7



NOTES

1. AUXILIARY EARTH MAT SHALL BE PROVIDED BELOW EVERY MOM BOX (REFER SHEET 14)
2. NO. OF RISERS FOR ISOLATOR = 3 NOS./PHASE
3. NO. OF RISERS FOR MAIN MECHANISM BOX = 2 NOS.
4. NO. OF RISERS FOR EARTH SWITCH MECHANISM BOX = 2 NOS.



EQUIPMENT EARTHING DETAILS

400KV HCB

ISOLATOR (TYPICAL) WITH TWO EARTH SWITCH

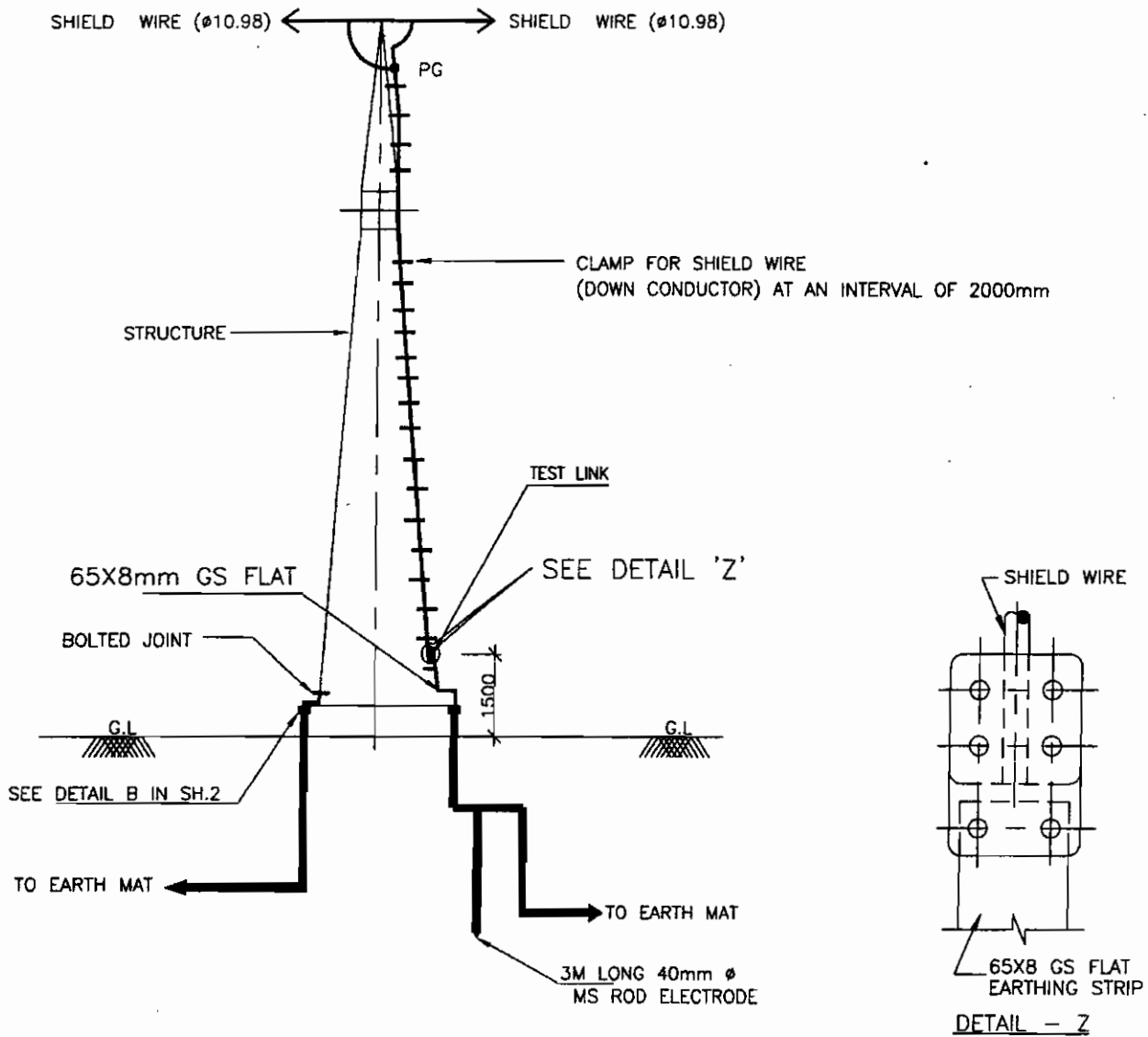
COMPUTER REF. NO.

DRG. No.

TB-4-330-316-011

REV. 01

SHEET No.
7A



NOTE:

1. NO. OF ROD ELECTRODE : 1 NO. PER TOWER WITH DOWN CONDUCTOR.
2. NO. OF RISERS 2 NOS. / TOWER



EQUIPMENT EARTHING DETAILS
TOWER WITH SHIELD WIRE

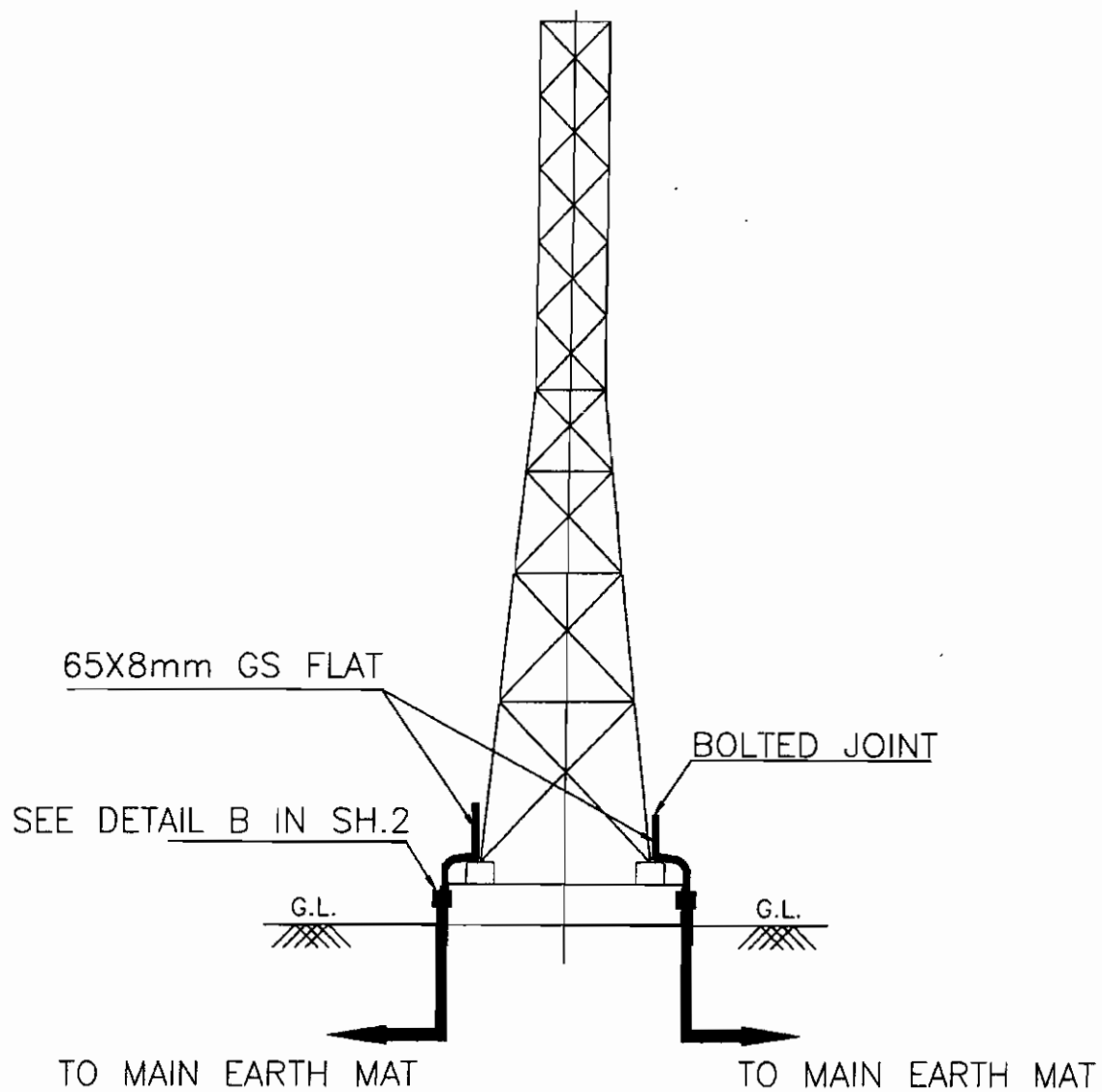
COMPUTERREF.NO.

DRG. No.

TB-4-330-316-011

REV. 01

SHEET No.
8



NOTE:

1. NO. OF RISERS=2 NOS. PER TOWER



EQUIPMENT EARTHING DETAILS

TOWER WITHOUT SHIELD WIRE

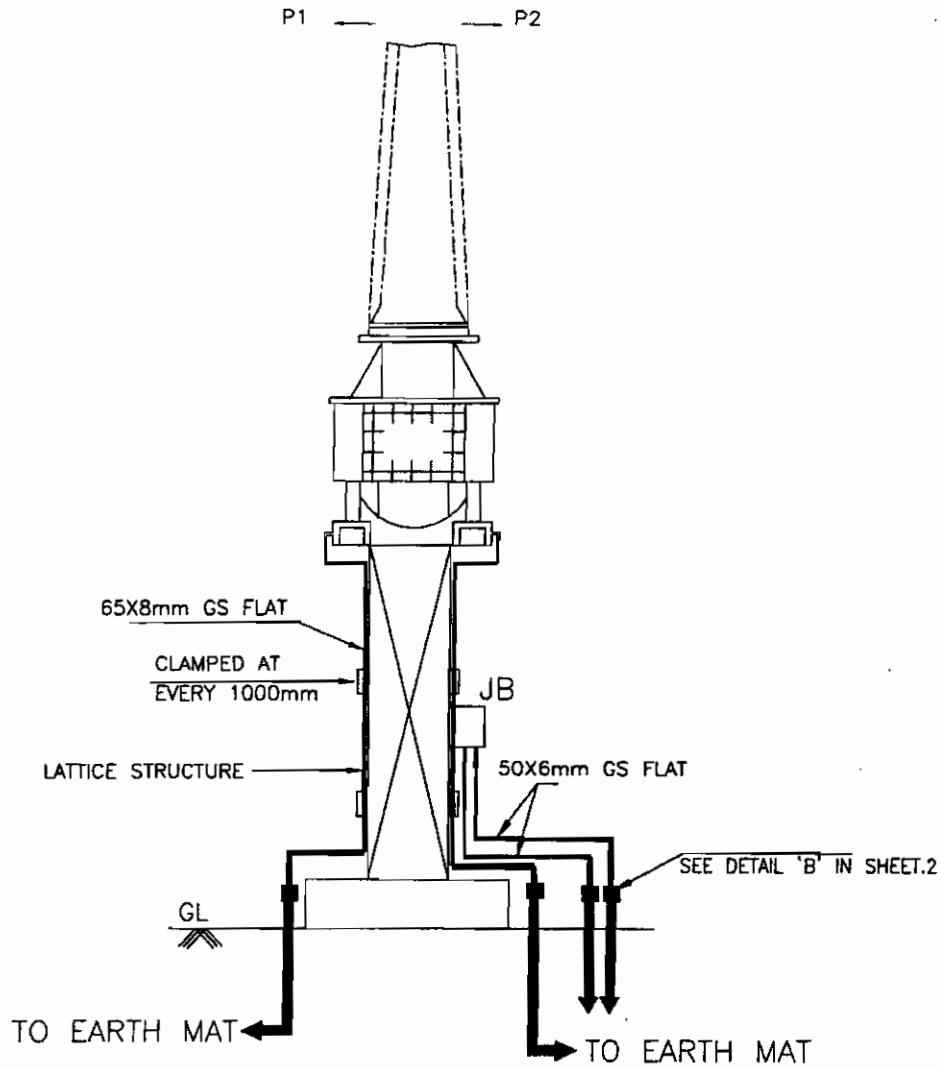
COMPUTER REF. NO.

DRG. No.

TB-4-330-316-011

REV. 01

SHEET No.
8A



NOTE:

1. NO. OF RISERS=2 NOS./PHASE
2. NO. OF RISERS FOR JUNCTION BOX=2 NOS.



EQUIPMENT EARTHING DETAILS
400KV CURRENT TRANSFORMER

COMPU. DRG. REF.

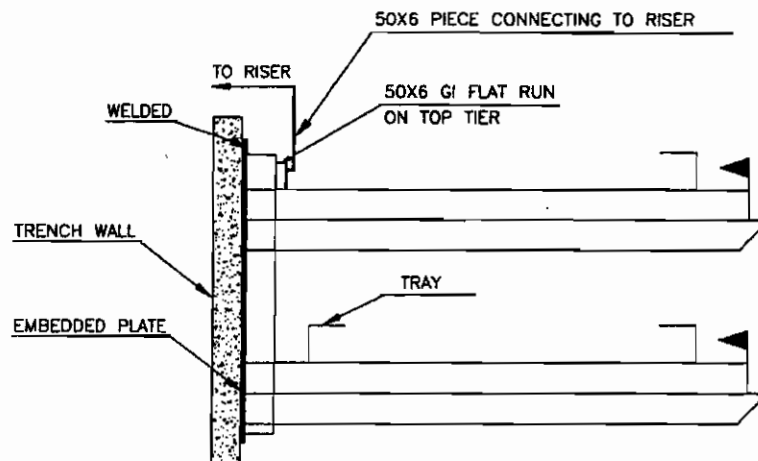
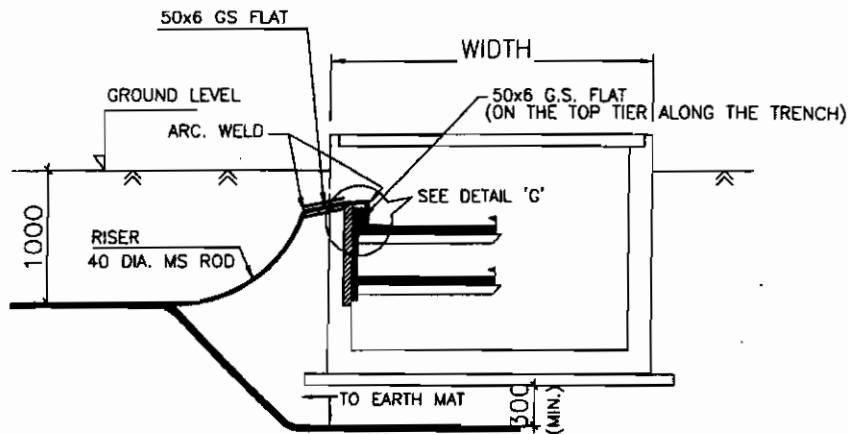
DRG.NO.

TB-4-330-316-011

REV. 01

SHEET No.

9



DETAIL 'G'

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

NOTE:

1. ALL TRENCHES SHALL BE EARTHED AT AN INTERVAL OF 30M ALONG THE LENGTH OF TRENCH.
2. THE EARTH STRIP (50x6 G.S. FLAT) SHALL RUN ON THE TOP TIER ALONG THE CABLE TRENCHES & WELDED TO EACH OF THE RACK AT EVERY 0.750M INTERVAL.
3. WHERE THE CABLE RACKS ARE PROVIDED ON BOTH SIDES OF THE TRENCH, BOTH SIDES SHALL BE EARTHED.



EQUIPMENT EARTHING DETAILS CABLE TRENCH

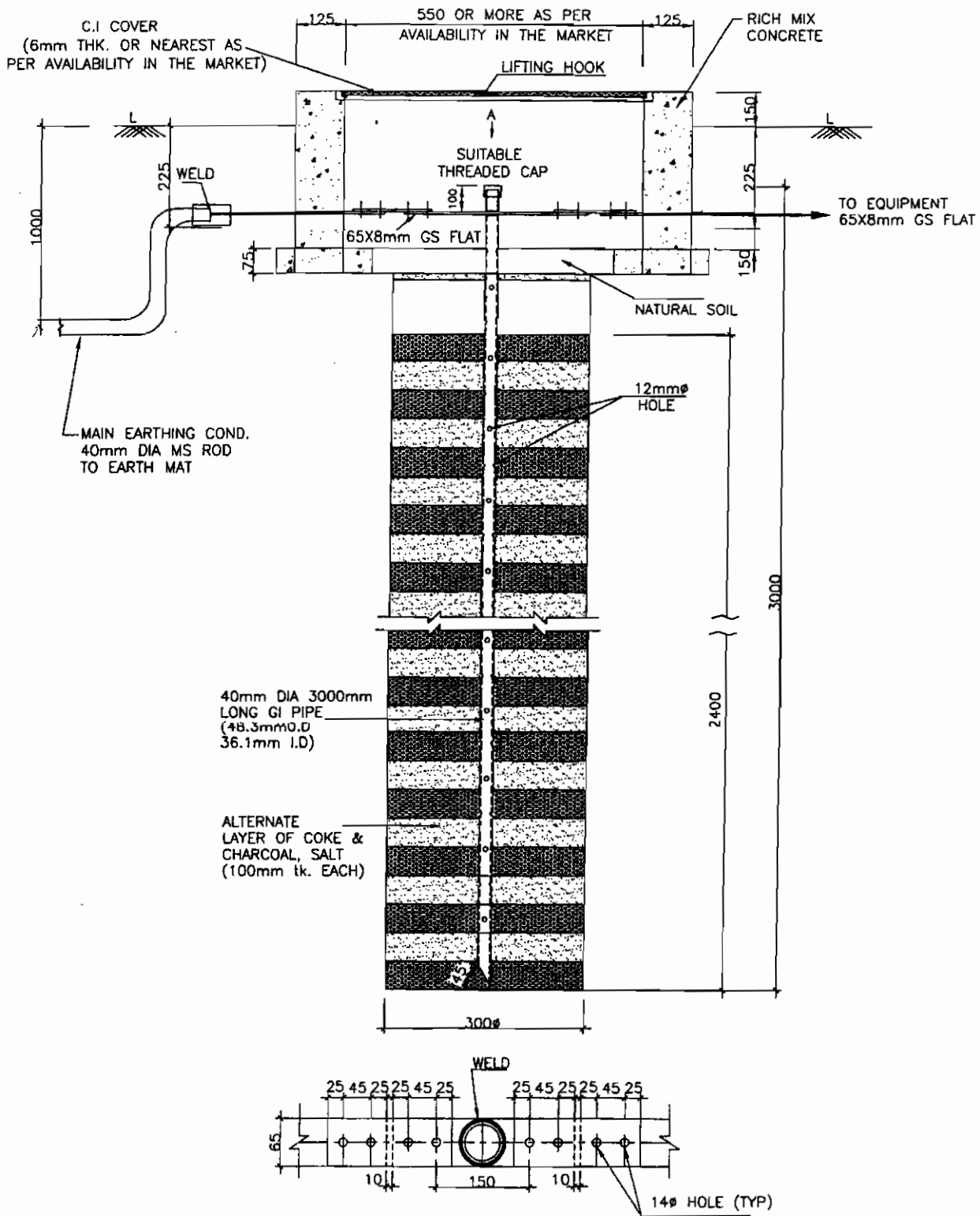
COMPU. DRG. REF.

DRG. NO.

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REV. 01

SHEET
10



NOTE:

1. ALL NUTS,BOLTS AND WASHERS SHALL BE GALVANISED AS PER SPECIFICATION.
2. TO BE USED FOR CONNECTING TO NEUTRAL OF LT TRANSFORMER/SHUNT REACTOR.



EQUIPMENT EARTHING DETAILS
DETAILS OF PIPE EARTH ELECTRODE
IN TREATED EARTH PIT (ET)

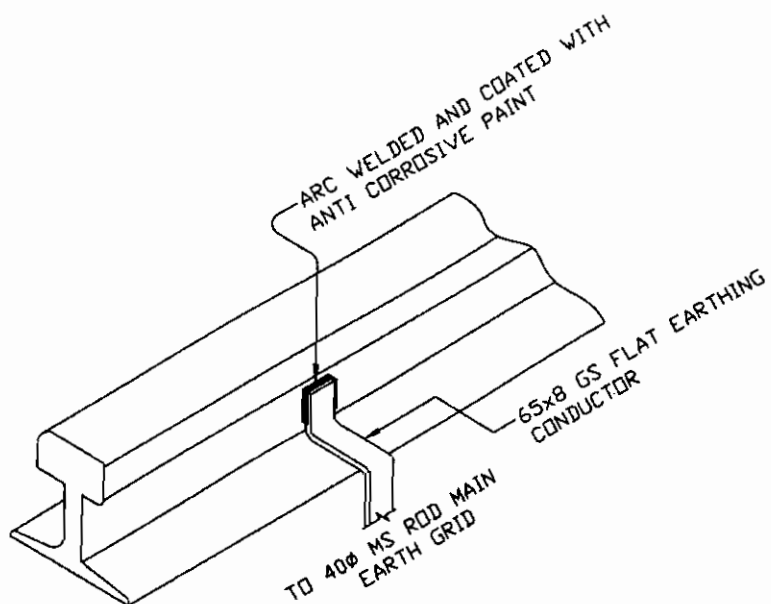
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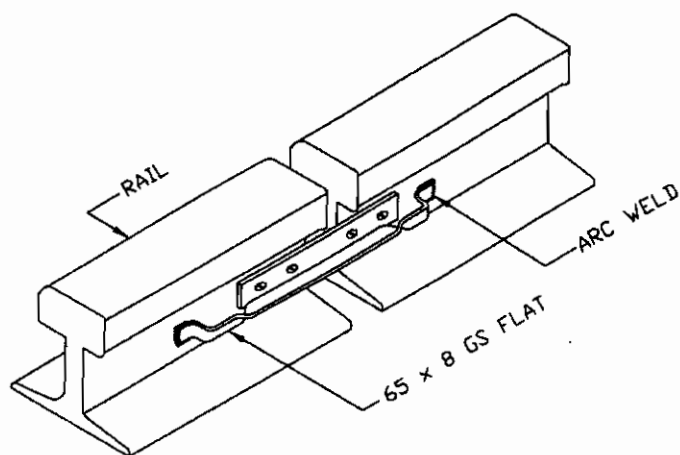
TB-4-330-316-011

REV. 01

SHEET No.
11



RAIL EARTHING



RAIL BONDING

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

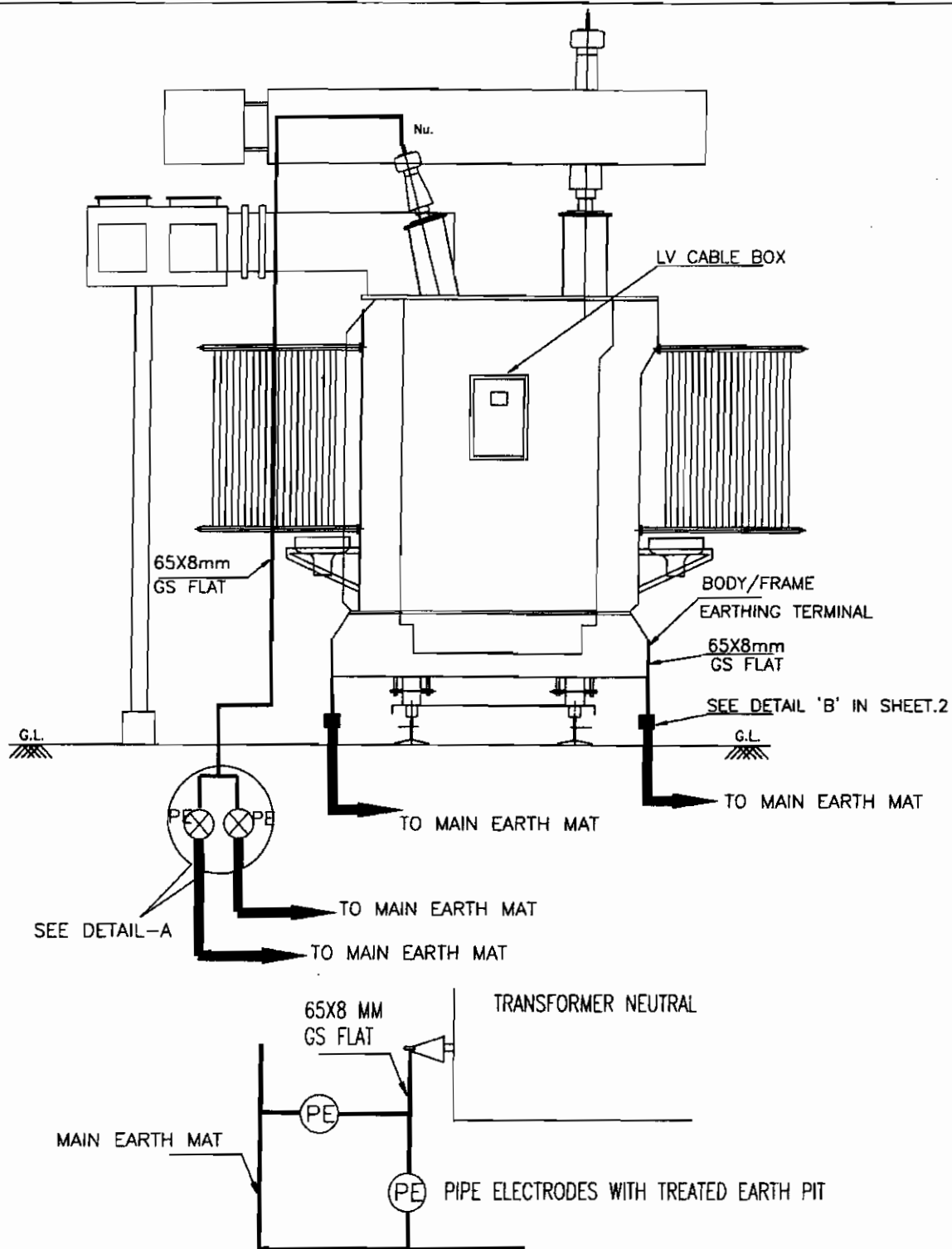
COMPU. DRG. REF.

DRG. NO.

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REV. 01

SHEET No.
12



DETAIL A

NOTE:

1. MINIMUM DISTANCE OF 6000mm SHALL BE MAINTAINED BETWEEN TWO TREATED PIPE ELECTRODE.
2. NO. OF RISERS FOR MAIN TANK = 2 NOS.
3. NO. OF RISERS FOR PIPE ELECTRODE = 2 NOS.



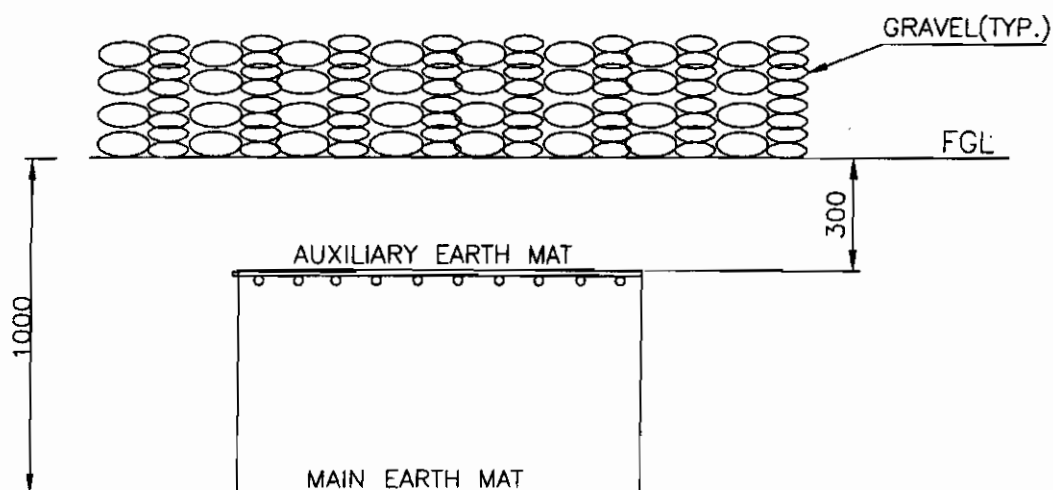
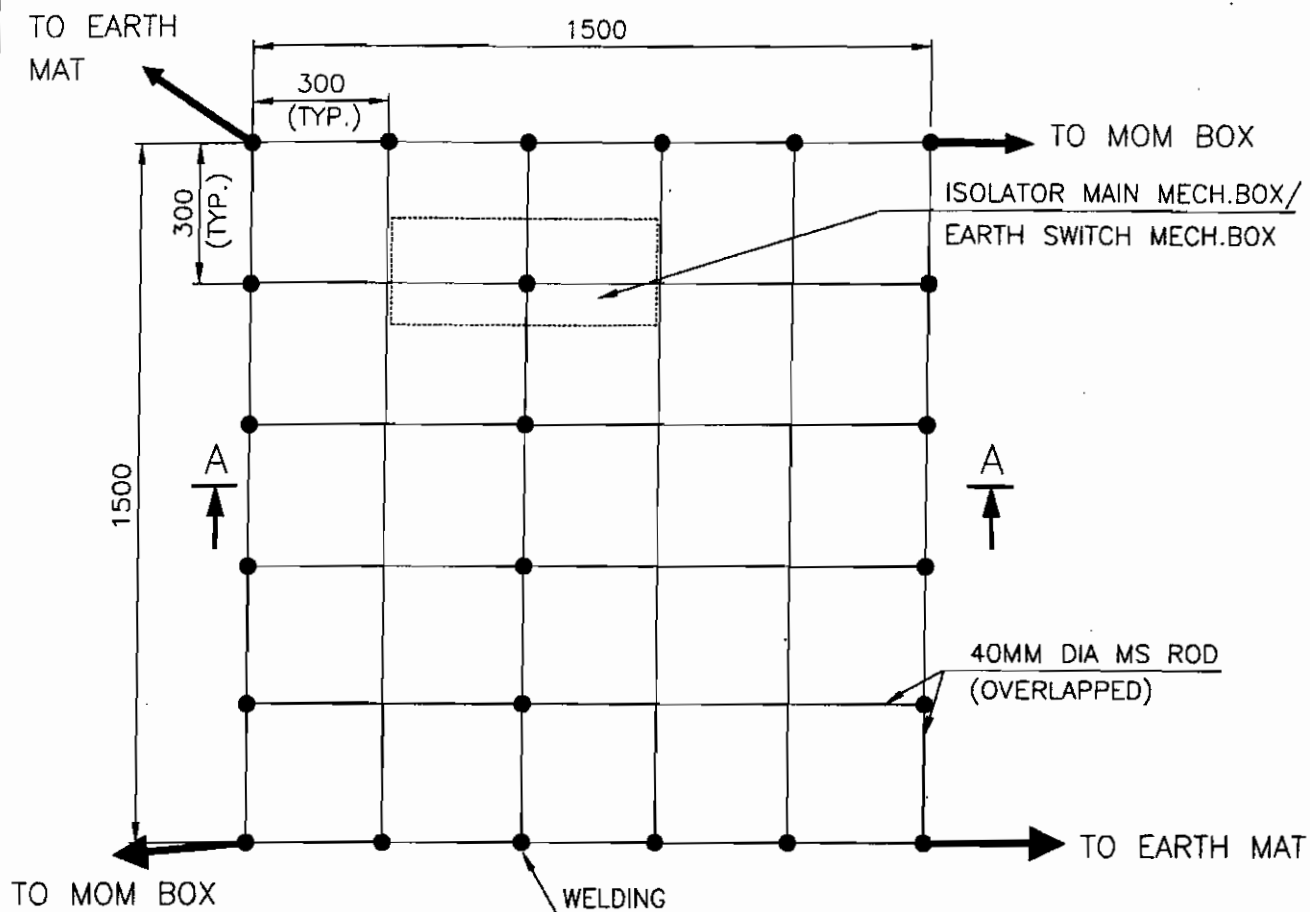
EQUIPMENT EARTHING DETAILS
LT TRANSFORMER

DRG. No.

TB-4-330-316-011

REV. 01

SHEET No.
13



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

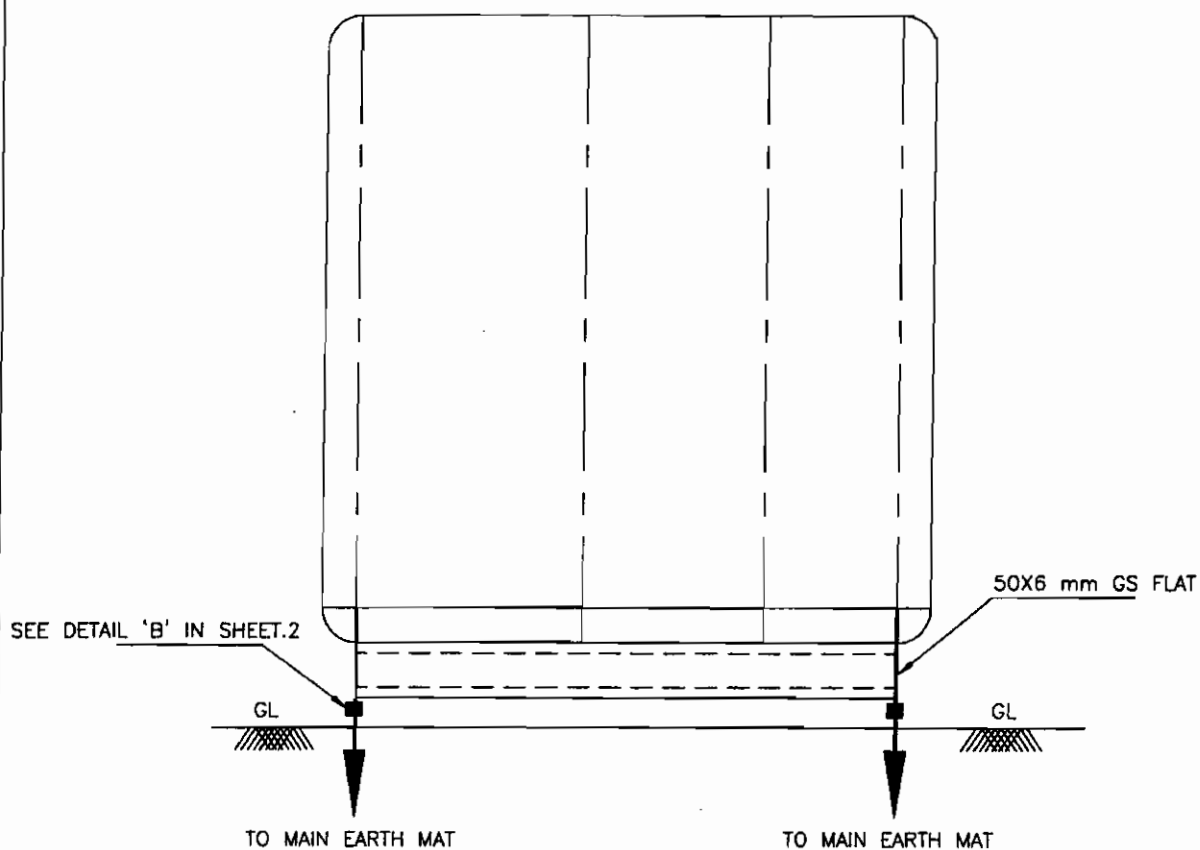
COMPU. DRG. REF.

Report No.

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SHEET No.
14



EQUIPMENT	FLAT SIZE
SWITCHGEAR/ MCC	50X6 mm
AC / DC DISTRIBUTION BOARDS	50X6 mm
RELAY PANELS	50X6 mm

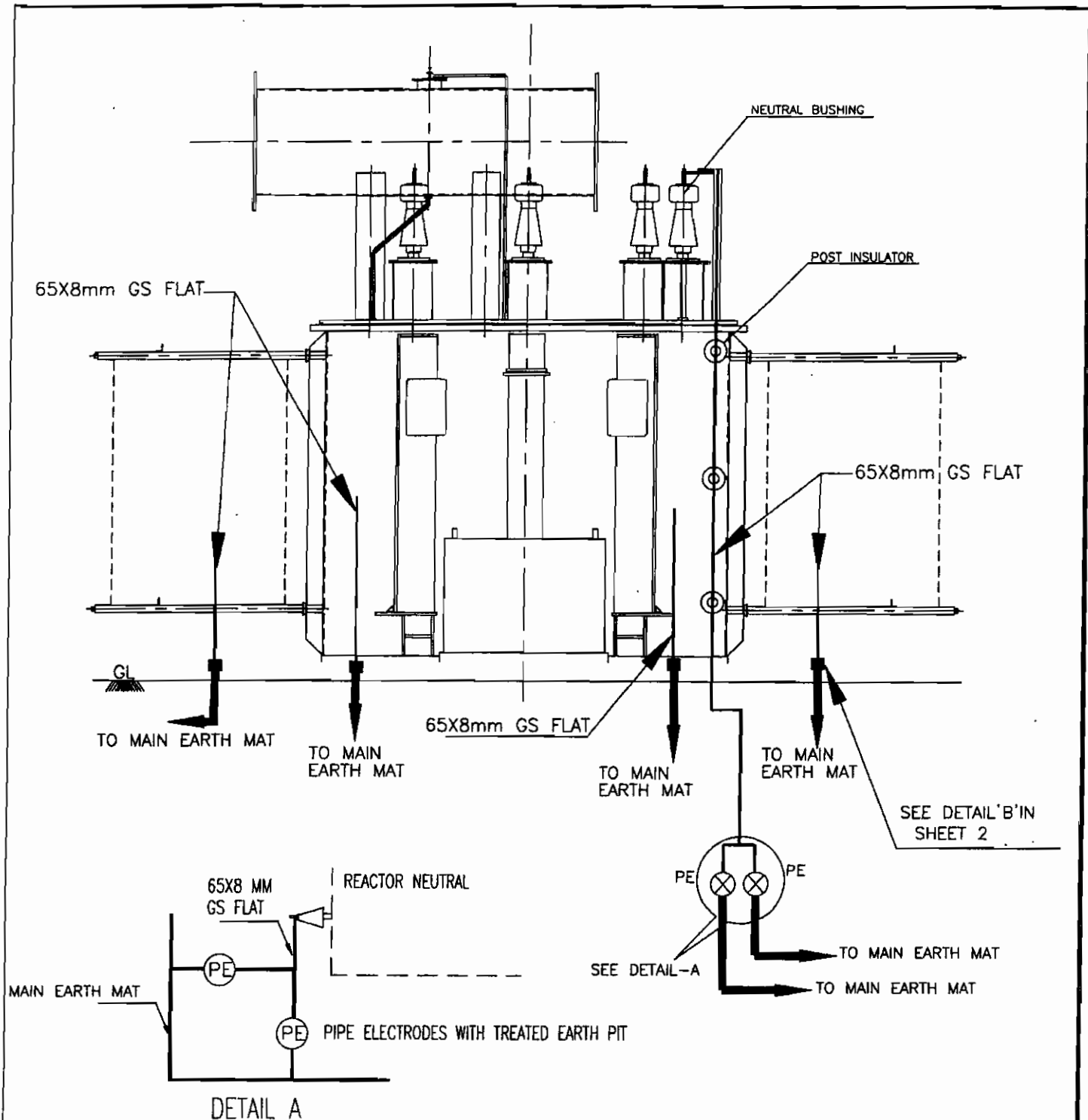


EQUIPMENT EARTHING DETAILS SWITCHGEAR / MCC / RELAY PANEL/AC KIOSK.

DRG. No. TB-4-330-316-011

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SHEET No.
15

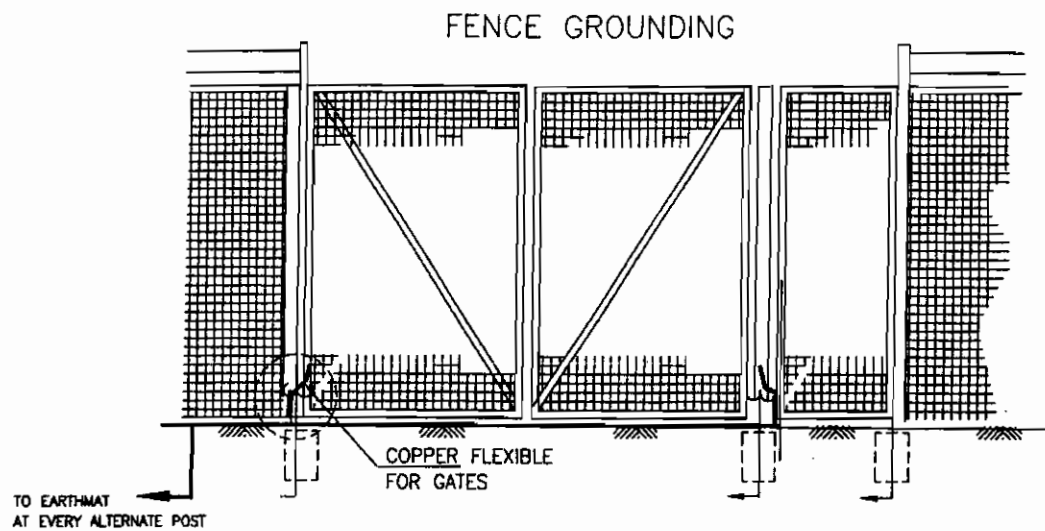


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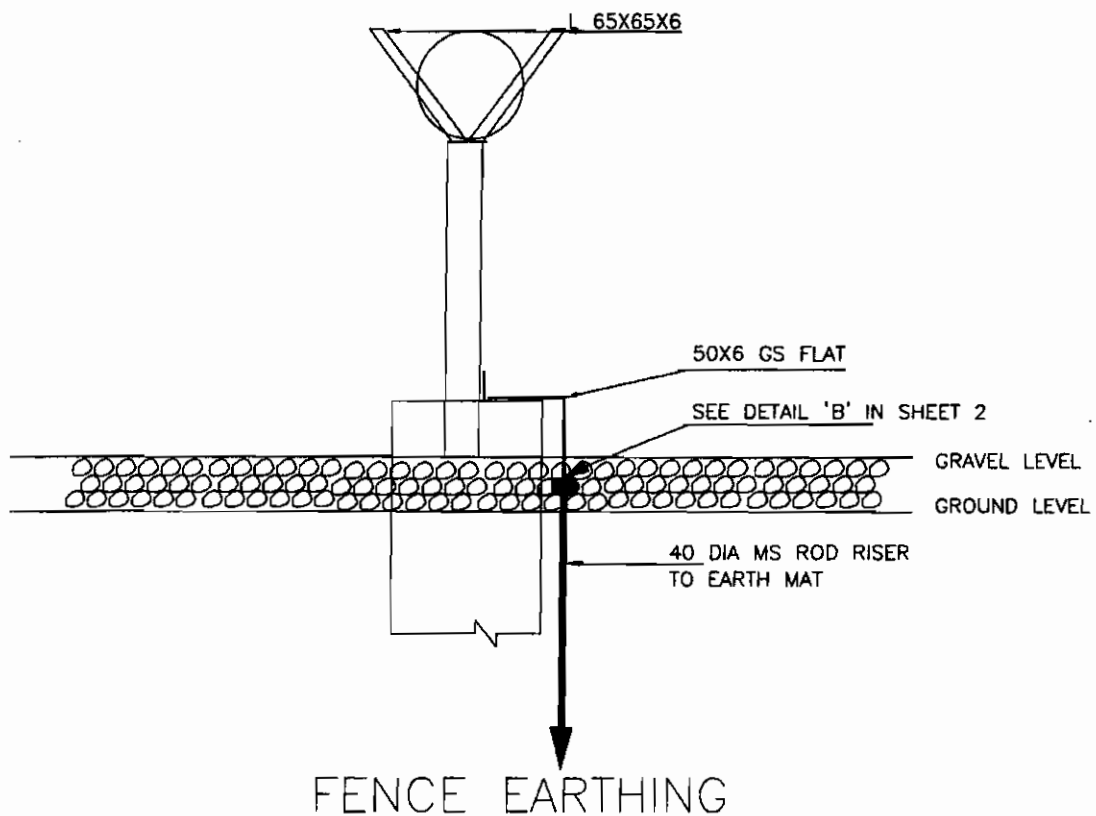
1. MINIMUM DISTANCE OF 6000mm SHALL BE MAINTAINED BETWEEN TWO TREATED PIPE ELECTRODE.
2. NO. OF RISERS FOR MAIN TANK = 2 NOS.
3. NO. OF RISERS FOR PIPE ELECTRODE = 2 NOS.
4. NO. OF RISERS FOR RADIATOR = 2 NOS.



EQUIPMENT EARTHING DETAILS
SHUNT REACTOR WITHOUT NGR



EVERY ALTERNATE FENCE POSTS SHALL BE EARTHED BY 50X6 MM GS FLAT.



EQUIPMENT EARTHING DETAILS

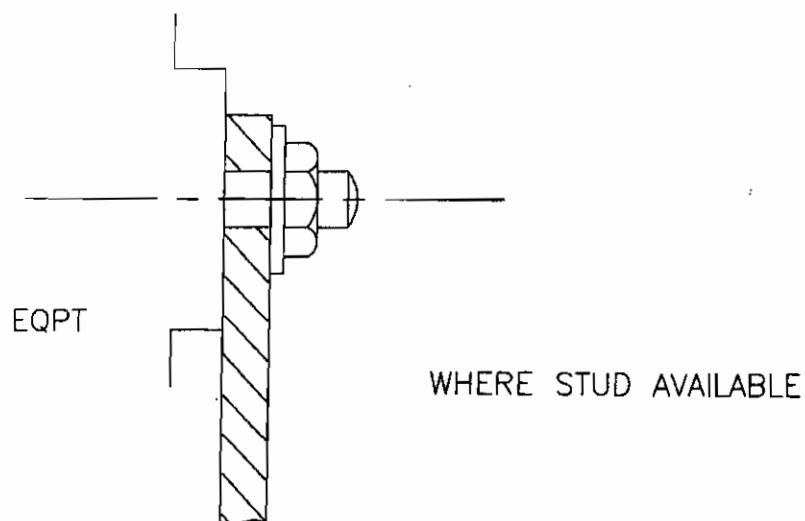
FENCE POST

DRG. No.

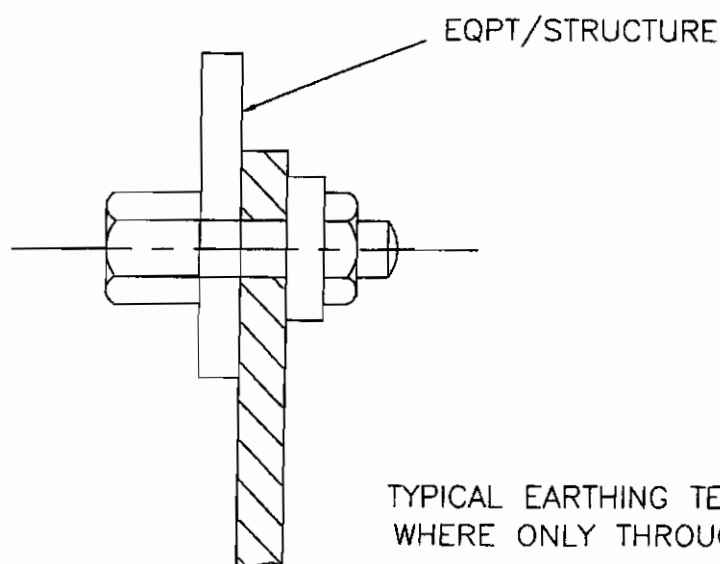
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REV. 01

SHEET No.
17



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.

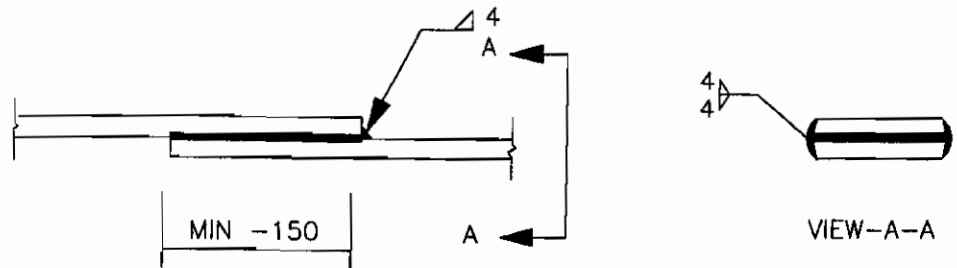
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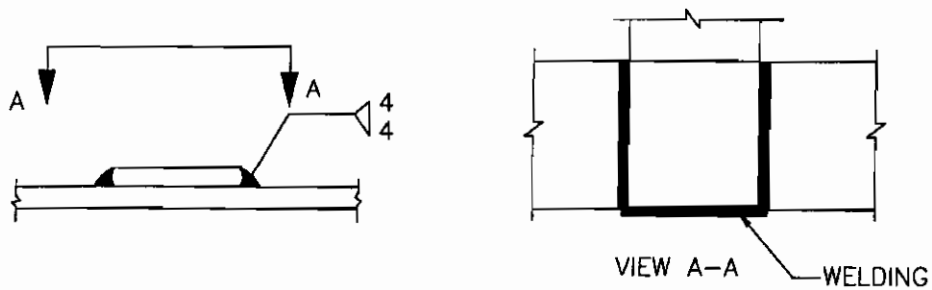
SHEET No.
18

STRIP TO STRIP

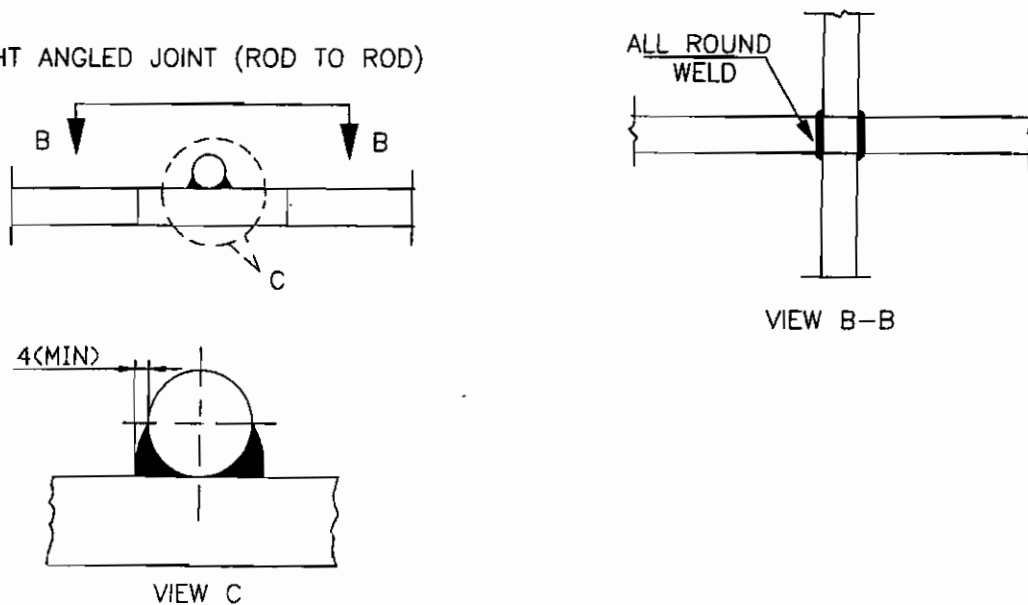
1. STRAIGHT LAP JOINT/RISER



2. CROSS LAP JOINT



RIGHT ANGLED JOINT (ROD TO ROD)



EQUIPMENT EARTHING DETAILS WELDING DETAIL

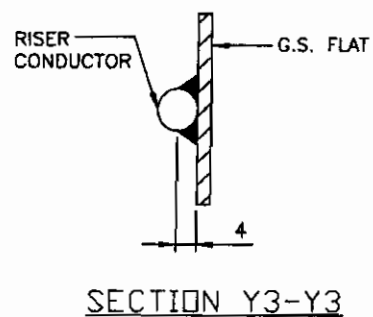
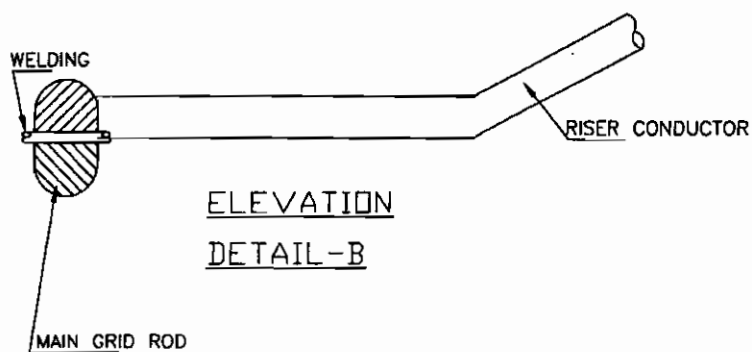
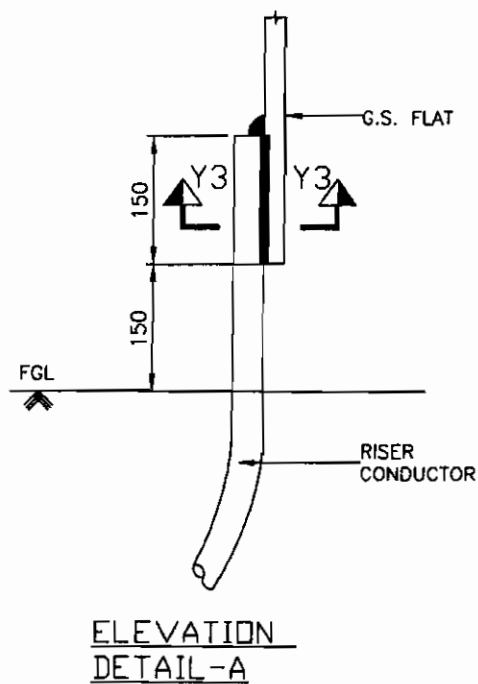
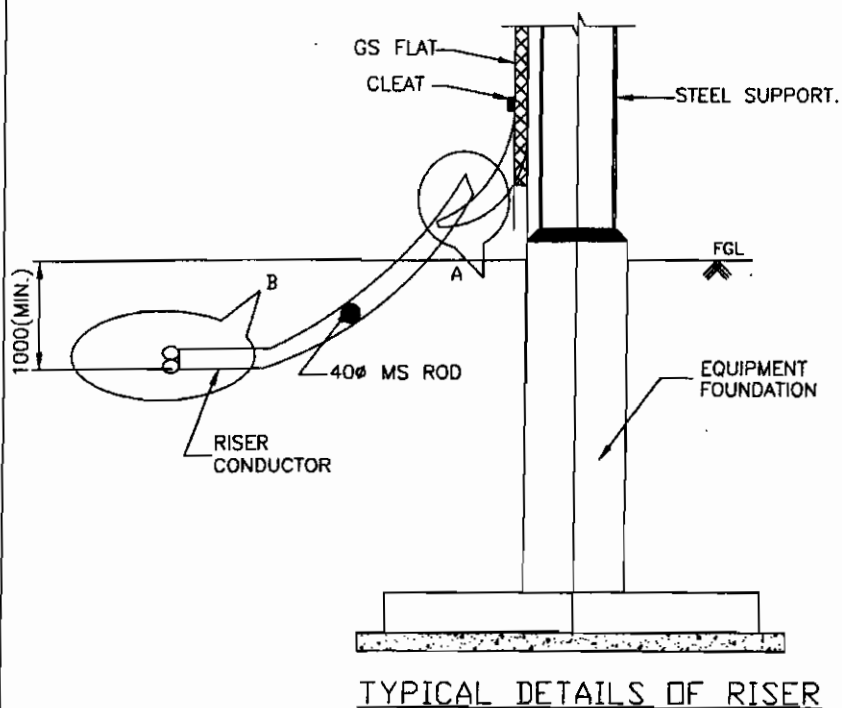
COMPUTER REF. NO.

DRG. No.

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SHEET No.
19



EQUIPMENT EARTHING DETAILS

WELDING DETAILS

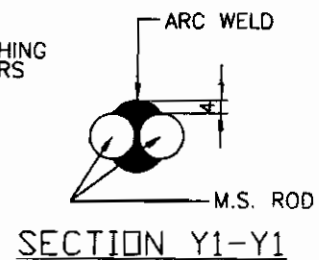
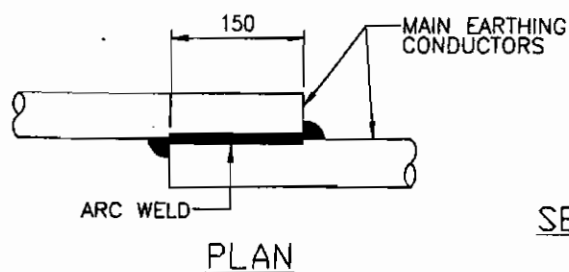
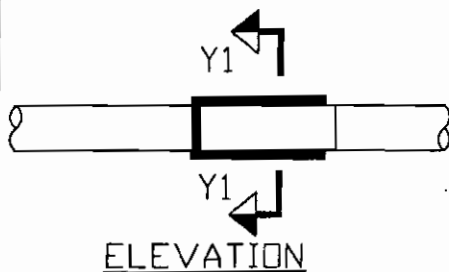
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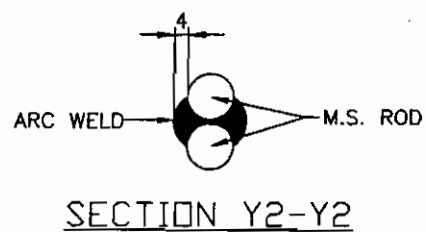
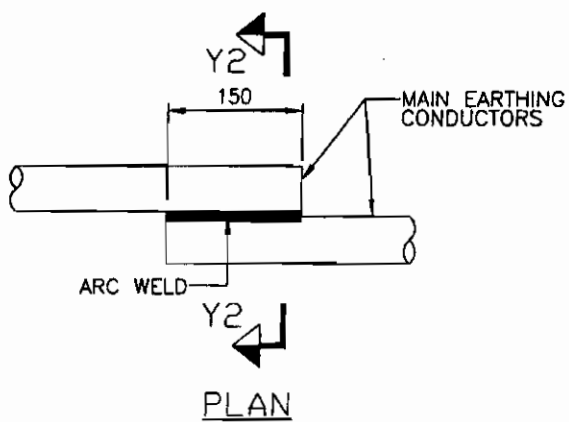
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SHEET No.
20



(CONDUCTOR IN HORIZONTAL PLANE)



(CONDUCTOR IN VERTICAL PLANE)



EQUIPMENT EARTHING DETAILS

WELDING DETAILS

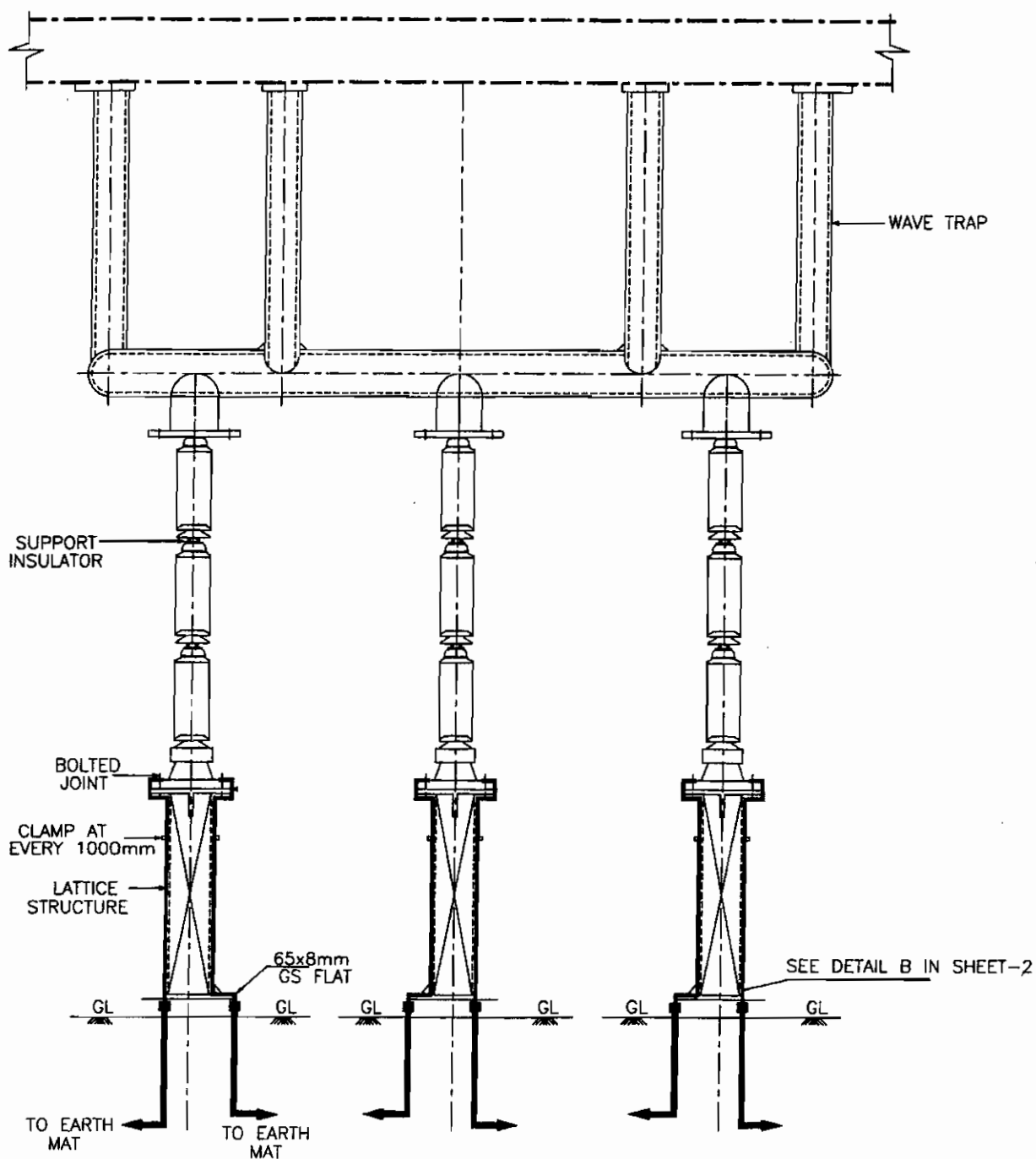
COMPUTERREF.NO.

DRG. No.

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SHEET No.
21



NOTE:

1. NO. OF RISERS : 6 NOS. PER PHASE.



EQUIPMENT EARTHING DETAILS

400kV WAVE TRAP

COMPUTER REF. NO.

DRG. No.

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REV. 01

SHEET No.
22