

ANNEXURE-4:

LIST OF DRAWINGS/DOCUMENTS ENCLOSED WITH ETC BOQ

- 1) SINGLE LINE DIAGRAM
- 2) LAYOUT PLAN FOR 400KV SWITCHYARD
- 3) SECTIONAL ELEVATIONS-400KV SWITCHYARD
- 4) LAYOUT & SECTIONAL ELEVATIONS- 220KV SWITCHYARD
- 5) EQUIPMENT & STRUCTURE EARTHING DRAWING
- 6) EARTHMAT LAYOUT DRAWING
- 7) TRENCH LAYOUT DRAWING
- 8) CONTROL ROOM BUILDING DRAWING
- 9) CONTROL ROOM TRENCH LAYOUT.

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

100-010-510-001 TB-2-344-510-001

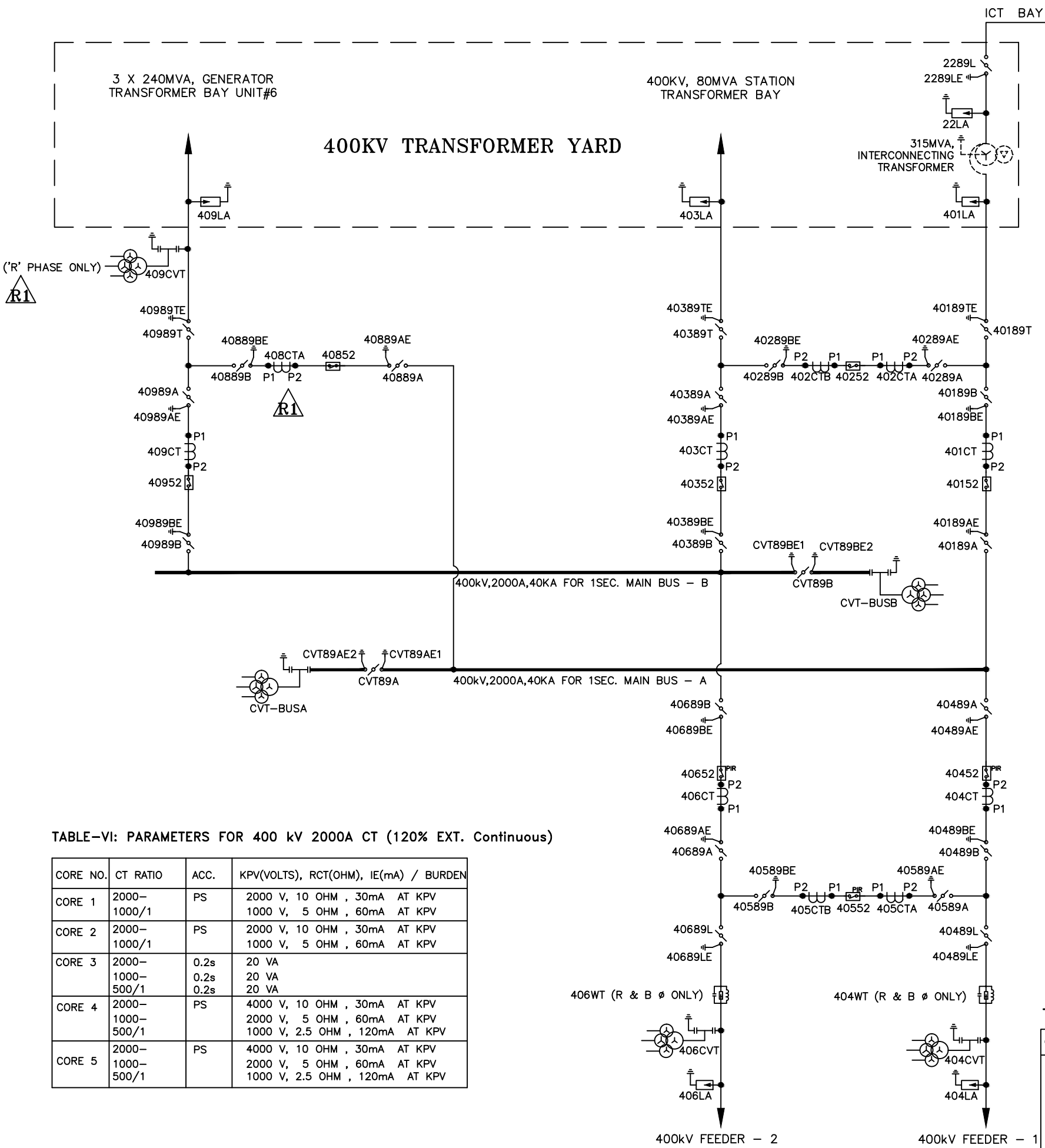


TABLE-VI: PARAMETERS FOR 400 kV 2000A CT (120% EXT. Continuous)

CORE NO.	CT RATIO	ACC.	KPV(VOLTS), RCT(OHM), IE(mA) / BURDEN
CORE 1	2000-1000/1	PS	2000 V, 10 OHM, 30mA AT KPV 1000 V, 5 OHM, 60mA AT KPV
CORE 2	2000-1000/1	PS	2000 V, 10 OHM, 30mA AT KPV 1000 V, 5 OHM, 60mA AT KPV
CORE 3	2000-1000-500/1	0.2s 0.2s 0.2s	20 VA 20 VA 20 VA
CORE 4	2000-1000-500/1	PS	4000 V, 10 OHM, 30mA AT KPV 2000 V, 5 OHM, 60mA AT KPV 1000 V, 2.5 OHM, 120mA AT KPV
CORE 5	2000-1000-500/1	PS	4000 V, 10 OHM, 30mA AT KPV 2000 V, 5 OHM, 60mA AT KPV 1000 V, 2.5 OHM, 120mA AT KPV

TABLE-VII: PARAMETERS FOR 400 kV CVT

CAPACITANCE	SEC No.	VOLTAGE RATIO	ACCURACY CLASS	BURDEN
4400 PF, +10%, -5%	1	$\frac{400kV}{\sqrt{3}} / \frac{110V}{\sqrt{3}}$	0.2	100VA
	2	$\frac{400kV}{\sqrt{3}} / \frac{110V}{\sqrt{3}}$	3P	200VA
	3	$\frac{400kV}{\sqrt{3}} / \frac{110V}{\sqrt{3}}$	3P	200VA

ACCURACY OF METERING CORE SHALL BE MAINTAINED THROUGH OUT THE ENTIRE BURDEN RANGE UPTO AND INCLUDING TOTAL SIMULTANEOUS BURDEN OF 100 VA.

TABLE-V: PARAMETERS FOR 220V CVT

CAPACITANCE (FOR CVT ONLY)	CORE No.	VOLTAGE RATIO	ACCURACY CLASS	BURDEN
4400pF +10% - 5%	1	$\frac{220kV}{\sqrt{3}} / \frac{110V}{\sqrt{3}}$	0.2	50VA
	2	$\frac{220kV}{\sqrt{3}} / \frac{110V}{\sqrt{3}}$	3P	100VA
	3	$\frac{220kV}{\sqrt{3}} / \frac{110V}{\sqrt{3}}$	3P	100VA

ACCURACY OF METERING CORE SHALL BE MAINTAINED THROUGH OUT THE ENTIRE BURDEN RANGE UPTO AND INCLUDING TOTAL SIMULTANEOUS BURDEN OF 100 VA.

TABLE-IV: PARAMETERS OF 220KV CT FOR STATION TRANSFORMER BAY

CORE No.	CURRENT RATIO	ACCURACY CLASS	Min. kpV (V)	Min. BURDEN	Max. i_e (mA) at $V_k/2$	Max Rct
1	200/1 A	PS	400	-	100 mA	2
2	200/1 A	PS	400	-	100 mA	2
3	200/1 A	0.2s	-	20VA ISF ≤ 5	-	-
4	800/1 A	PS	1000	-	30 mA	4
5	800/1 A	PS	1000	-	30 mA	4

TABLE I : BILL OF QUANTITIES

SL. NO.	SYMBOL	EQUIPMENT	QTY.
01		400 kV, 2000 A, 40 kA FOR 1 SEC. 3 PHASE OUTDOOR TYPE SF6 CIRCUIT BREAKER WITH PIR (400 Ohms)	3 Sets
02		400 kV, 2000 A, 40 kA FOR 1 SEC. 3 PHASE OUTDOOR TYPE SF6 CIRCUIT BREAKER WITHOUT PIR	5 Sets
03		220 kV, 2500 A, 40 kA FOR 3 SEC. 3 PHASE OUTDOOR TYPE SF6 CIRCUIT BREAKER WITHOUT PIR	2 Sets
04		400 kV, 2000 A, 40 kA FOR 1 SEC. HORIZONTAL DOUBLE BREAK MOTOR OPERATED, ELECTRICALLY GANGED ISOLATOR WITH ONE MOTOR OPERATED EARTH SWITCH	21 Sets
05		400 kV, 2000 A, 40 kA FOR 1 SEC. HORIZONTAL DOUBLE BREAK MOTOR OPERATED, ELECTRICALLY GANGED ISOLATOR WITH TWO MOTOR OPERATED EARTH SWITCH	2 Sets
06		220 kV, 1250 A, 40 kA FOR 3 SEC. HORIZONTAL DOUBLE BREAK MOTOR OPERATED, MECHANICALLY GANGED ISOLATOR WITHOUT EARTH SWITCH (STAGGERED TYPE)	4 Sets
07		220 kV, 1250 A, 40 kA FOR 3 SEC. HORIZONTAL DOUBLE BREAK MOTOR OPERATED, MECHANICALLY GANGED ISOLATOR WITH ONE MOTOR OPERATED EARTH SWITCH	3 Sets
08		220 kV, 1250 A, 40 kA FOR 3 SEC. HORIZONTAL DOUBLE BREAK MOTOR OPERATED, MECHANICALLY GANGED ISOLATOR WITH TWO MOTOR OPERATED EARTH SWITCH	2 Sets
09		400 kV, 5 CORE, 2000-1000/1-1, 2000-1000-500/1-1-1, SINGLE PHASE CURRENT TRANSFORMER	30 Nos.
10		220 kV, 5 CORE, 1000/1-1-1, 800/1-1, SINGLE PHASE CURRENT TRANSFORMER FOR ICT BAY	3 Nos.
11		220 kV, 5 CORE, 200/1-1-1, 800/1-1, SINGLE PHASE CURRENT TRANSFORMER FOR 220KV ST BAY	3 Nos.
12		400 kV, 4400pF, SINGLE PHASE CAPACITOR VOLTAGE TRANSFORMER	13 Nos.
13		220 kV, 4400pF, SINGLE PHASE CAPACITOR VOLTAGE TRANSFORMER	1 No.
14		360 kV, 20 kA, DISCHARGE CLASS 4, GAPLESS, HEAVY DUTY METAL OXIDE LIGHTNING ARRESTOR	15 Nos.
15		198 kV, 20 kA, DISCHARGE CLASS 4, GAPLESS, HEAVY DUTY METAL OXIDE LIGHTNING ARRESTOR	6 Nos.
16		400 kV, 1.0mH, 2000A, PEDESTAL MOUNTED WAVE TRAP	4 Nos.
17		315MVA, 400/220/33 KV INTERCONNECTING TRANSFORMER (APGENCO SCOPE)	1 Nos.

TABLE II : SYSTEM PARAMETERS

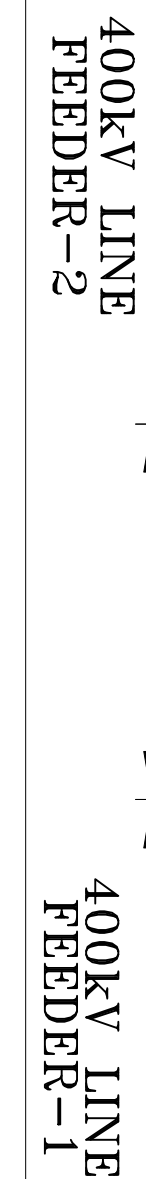
NOMINAL SYSTEM VOLTAGE	220 kV	400 kV
MAXIMUM SYSTEM VOLTAGE	245 kV	420 kV
FREQUENCY	50 Hz ±5%	50 Hz ±5%
SYSTEM EARTHING	EFFECTIVELY EARTHED	EFFECTIVELY EARTHED
BASIC INSULATION LEVEL	1050 kVp	1425 kVp
CREEPAGE DISTANCE	6125 mm	10500 mm
SHORT TIME CURRENT (FOR ALL CURRENT CARRYING PARTS)	40 kA FOR 3 SEC	40 kA FOR 1 SEC
LIGHTNING IMPULSE WITHSTAND	1425 kVp	1050 kVp
POWER FREQUENCY WITHSTAND	630 kVrms	460 kVrms
SWITCHING SURGE WITHSTAND	1050 kVp	-

TABLE-III: PARAMETERS FOR 220KV CT FOR ICT BAY

CORE No.	CURRENT RATIO	ACCURACY CLASS	Min. kpV (V)	Min. BURDEN	Max. i_e (mA) at $V_k/2$	Max Rct
1	1000/1 A	PS	1000	-	30 mA	5
2	1000/1 A	PS	1000	-	30 mA	5
3	1000/1 A	0.2s	-	20VA ISF ≤ 5	-	-
4	1600/2 A	PS	1600	-	30 mA	4
5	1600/2 A	PS	1600	-	30 mA	4

ADDITIONAL INFORMATION W.O.No. 80012	ग्राहक/परियोजना का नाम NAME OF CUSTOMER/PROJECT APGENCO 400/220 KV SWITCHYARD- RAYALSEEMA T.P.STN. STAGE-IV, UNIT#6 (1X600MW)
STATUS OF DRAWING CONTRACT	CONSULTANT: Desein Consulting Engineers
DISTRIBUTION OF PRINTS APGENCO - 1 CE(O&M), RTPP - 1 DESEIN - 5	भारत हेवी इलेक्ट्रिकल्स लिमिटेड द्रांसमिशन परियोजना विभाग BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION
REVISIONS REV. 01 18.11.2011 DRAWING HAS BEEN REVISED IN LINE WITH M/S DESEIN COMMENTS GIVEN VIDE LETTER REF: D-4026/VC-4100B/HYD/0113 Dt: 08.11.2011	कनका ड्राउन RK जैजा चेक NK/VK स्वीकृत DKM/AS
सिभाग TBEM कोड 422	नाम / NAME हस्ता / SIGN. दि./DATE 08.06.11
शीर्षक/TITLE SINGLE LINE DIAGRAM OF 400/220 KV SWITCHYARD	पृष्ठ क्र./SHEET No. 1 अगला पृष्ठ/NEXT SHEET -

$\overline{E}=594.355$
 $\overline{S}=68.075$


$$\begin{array}{r} \text{E}=854.355 \\ \text{S}=68.075 \end{array}$$

SL. NO.	SYMBOL	EQUIPMENT	QTY.
1		400 kV, 2000 A, 40 kA FOR 1 SEC. 3 PHASE, OUTDOOR TYPE SPRING/PNEUMATIC SF6 CIRCUIT BREAKER WITH PIR (400 Ohms)	3 SETS
2		400 kV, 2000 A, 40 kA FOR 1 SEC. 3 PHASE, OUTDOOR TYPE SPRING/PNEUMATIC SF6 CIRCUIT BREAKER WITHOUT PIR	5 SETS
3		400 kV, 2000 A, 40 kA FOR 1 SEC. HORIZONTAL DOUBLE BREAK MOTOR OPERATED, ELECTRICALLY GANGED ISOLATOR WITH ONE MOTOR OPERATED EARTH SWITCH	21 SETS
4		400 kV, 2000 A, 40 kA FOR 1 SEC. HORIZONTAL DOUBLE BREAK MOTOR OPERATED, ELECTRICALLY GANGED ISOLATOR WITH TWO MOTOR OPERATED EARTH SWITCH	2 SETS
5		400 kV, 5 CORE, 2000-1000/1-1, 2000-1000-500/1-1-1, SINGLE PHASE CURRENT TRANSFORMER	30 NOS.
6		400 kV, 4400pF, SINGLE PHASE CAPACITOR VOLTAGE TRANSFORMER	13 NOS.
7		360 kV, 20 KA DISCHARGE CLASS 4, GAPLESS, HEAVY DUTY METAL OXIDE LIGHTNING ARRESTER	15* NOS.
8		630 KVA, 11kV/ 0.433 kV, 3-PHASE, OMAN, DYN11, OUTDOOR TWO WINDING AUXILIARY TRANSFORMER	2 NOS.
9		400 kV, 8kV, SOLID CORE BUS POST INSULATOR	72 NOS.
10		315MVA, 400/220/33 kV INTERCONNECTING TRANSFORMER (GAPLESS SCOT)	1 NO.
11		220 kV, 1250 A, 40 kA FOR 3 SEC. HORIZONTAL DOUBLE BREAK MOTOR OPERATED, MECHANICALLY GANGED ISOLATOR WITH ONE MOTOR OPERATED EARTH SWITCH	1 SET
12		198 kV, 20 KA, DISCHARGE CLASS 4, GAPLESS, HEAVY DUTY METAL OXIDE LIGHTNING ARRESTER	6* NOS.
13		400 kV STRING INSULATOR COMPRISING 2X25 NOS., 120kN DISC WITH DOUBLE TENSION HARDWARE ACCESSORIES WITH TURNBUCKLE	39 SETS
14		400 kV STRING INSULATOR COMPRISING 2X25 NOS., 120kN DISC WITH DOUBLE TENSION HARDWARE ACCESSORIES WITHOUT TURNBUCKLE	39* SETS
15		400 kV STRING INSULATOR COMPRISING 1X25 NOS., 120kN DISC WITH SINGLE SUSPENSION DROP CLAMP	15 SETS
16		400 kV STRING INSULATOR COMPRISING 1X25 NOS., 120kN DISC WITH SINGLE SUSPENSION THROUGH CLAMP	3 SETS

TABLE III : CONDUCTOR DETAIL OF SWITCHYARD

MAIN BUS-I	4" HEAVY DUTY ALUMINIUM TUBE
MAIN BUS-II	4" HEAVY DUTY ALUMINIUM TUBE
INTERCONNECTION	4" HEAVY DUTY ALUMINIUM TUBE
JACKBUS/PROPEERS	TWIN ACSR MOOSE CONDUCTOR
OUTGOING LINE	TWIN MOOSE ACSR CONDUCTOR

TABLE III : CONDUCTOR DETAIL OF SWITCHYARD

16	400 KV STRING INSULATOR COMPRISING 1X25 NOS., 120KN DISC WITH SINGLE SUSPENSION THROUGH CLAMP	3 SETS
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* REFER NOTES:

- 1) 3 NOS. OF 220KV LIGHTNING ARRESTERS ARE LOCATED NEAR TO 220KV STATION TRANSFORMER.
- 2) 6 NOS. OF 360KV LIGHTNING ARRESTERS ARE LOCATED NEAR TO 400KV GENERATOR & STATION TRANSFORMER
- 3) 6 NOS. OF THESE DISC INSULATOR STRING ARE ERECTED AT POWERHOUSE 'A' ROW.

TABLE IV : MINIMUM CLEARANCES

MINIMUM CLEARANCE TABLE	
PHASE TO PHASE (PP)	4200 MM
PHASE TO EARTH (PE)	3500 MM
SECTION CLEARANCE (SC)	6500 MM
EQUIPMENT CONNECTION LEVEL FROM PLINTH	8000 MM

NOTE:-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. ALL SHOWN EQUIPMENT & STRUCTURE HEIGHTS ARE ABOVE PLINTH LEVEL. PLINTH LEVEL IS 300 MM ABOVE GROUND LEVEL.
3. 220KV STATION TRANSFORMER # 6 IS LOCATED IN 400KV TRANSFORMER YARD AREA, WHICH SHALL BE SHOWN IN SEPARATE Dwg.
4. LA PRESSURE RELIEF VALVE SHALL NOT BE TOWARDS TRANSFORMER SIDE/ANY EQUIPMENT KEPT NEAR LA.
5. ANGLE OF DEVIATION FOR THE OUTGOING LINE SHALL NOT EXCEED 30°.
6. SUPPLY & ERECTION OF 315 MVA, 400/220KV ICT IS NOT IN THE BHFL SCOPE.
7. SUPPLY & ERECTION OF DISC INSULATORS, HARDWARE, CONDUCTOR ETC FOR OUTGOING 400KV LINE ARE NOT IN BHFL SCOPE.
8. DIRECT STROKE LIGHTNING PROTECTION HAS BEEN PROVIDED BY 5 NOS. OF 50 M HIGH LIGHTNING MAST.
9. STRUNG INSULATORS & CONDUCTOR FOR OUTGOING LINE ARE NOT IN BHFL SCOPE OF SUPPLY.

LEGEND :-

4" HEAVY DUTY TYPE ALUMINIUM
TWIN ACSR MOOSE CONDUCTOR

REF DRAWINGS :-

SINGLE LINE DIAGRAM FOR 400/220KV SWITCHYARD (STAGE-IV) – TB-2-344-510-001 REV.0
PLOT PLAN (STAGE-IV) – 0914-TSL-PL-DR-M-001 REV.02

[illegible]

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

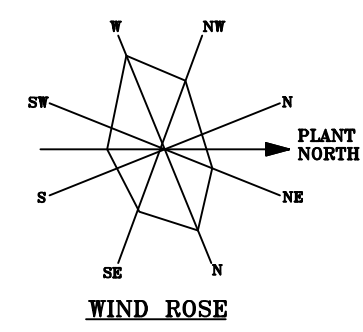


TABLE I : BILL OF QUANTITIES

Sl. No.	SYMBOL	EQUIPMENT	QTY. (Nos.)
1		220 kV, 2500 A, 40 kA FOR 3 SEC. 3 PHASE OUTDOOR TYPE SF6, SPRING OPERATED CIRCUIT BREAKER WITHOUT PIR	2
2		220 kV, 1250 A, 40 kA FOR 3 SEC. HORIZONTAL DOUBLE BREAK MOTOR OPERATED, MECHANICALLY GANGED ISOLATOR WITHOUT EARTH SWITCH (STAGGERED TYPE)	4
3		220 kV, 1250 A, 40 kA FOR 3 SEC. HORIZONTAL DOUBLE BREAK MOTOR OPERATED, MECHANICALLY GANGED ISOLATOR WITH ONE MOTOR OPERATED EARTH SWITCH	3*
4		220 kV, 1250 A, 40 kA FOR 3 SEC. HORIZONTAL DOUBLE BREAK MOTOR OPERATED, MECHANICALLY GANGED ISOLATOR WITH TWO MOTOR OPERATED EARTH SWITCH	2
5		220 kV, 5 CORE, 1000/1-1-1, 1800/2-2, SINGLE PHASE CURRENT TRANSFORMER FOR ICT BAY	3
6		220 kV, 5 CORE, 200/1-1-1, 800/1-1, SINGLE PHASE CURRENT TRANSFORMER FOR 220KV ST BAY	3
7		220 kV, 4400pF, SINGLE PHASE CAPACITOR VOLTAGE TRANSFORMER	1
8		198 kV, 10 kA, DISCHARGE CLASS 4, GAPLESS, HEAVY DUTY METAL OXIDE LIGHTNING ARRESTER	6**
9		220 kV SOLID CORE BUS POST INSULATOR	44

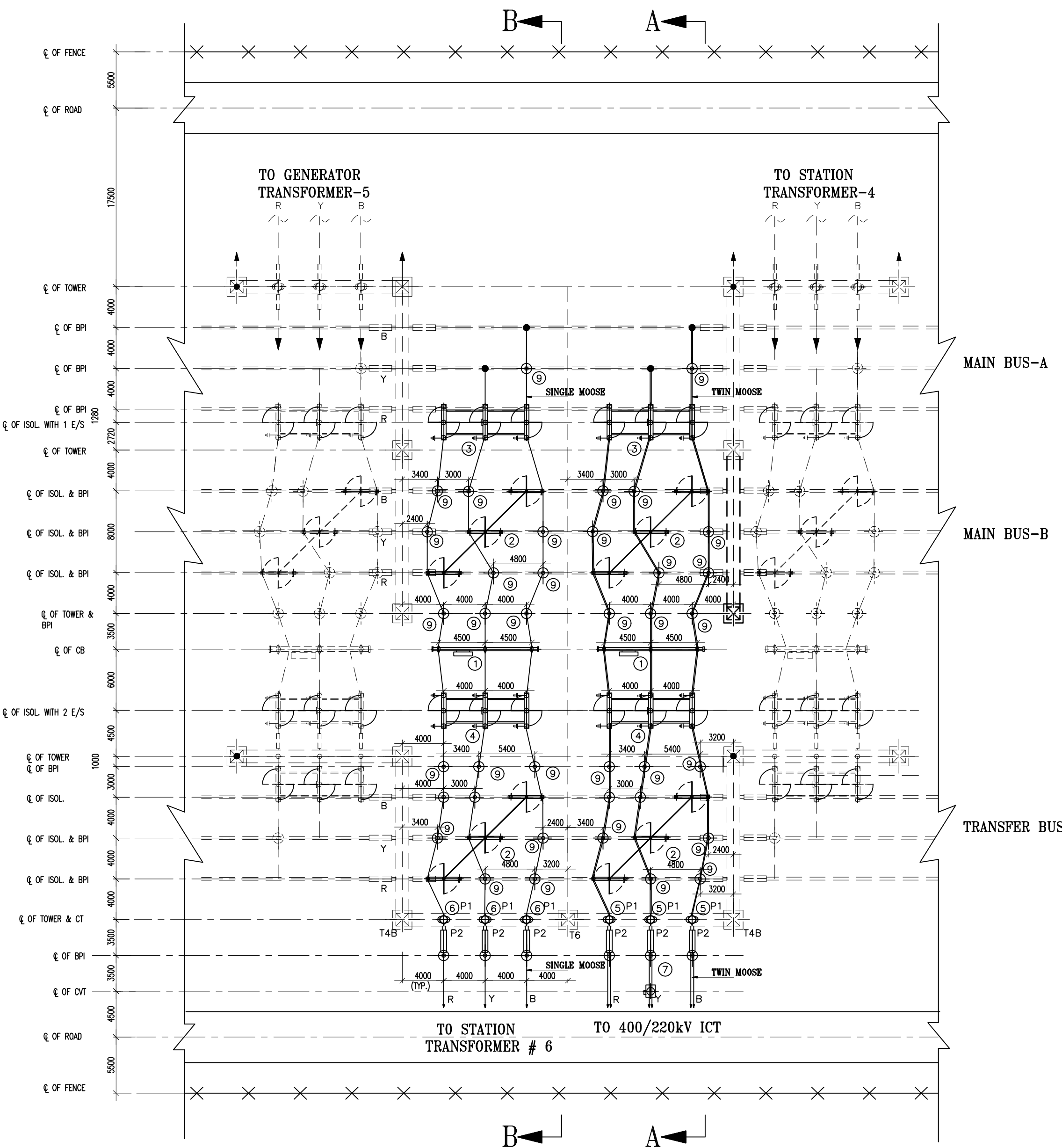
* ONE NO. DOUBLE BREAK ISOLATOR IS LOCATED NEAR TO ICT, WHICH SHALL BE SHOWN IN SEPARATE DRG.
** ALL 220KV LIGHTNING ARRESTERS ARE LOCATED NEAR TO ICT & ST#6, WHICH SHALL BE SHOWN IN SEPARATE DRG.

TABLE II : SYSTEM PARAMETERS

NOMINAL SYSTEM VOLTAGE	220 kV
MAXIMUM SYSTEM VOLTAGE	245 kV
FREQUENCY	50 Hz $\pm 5\%$
SYSTEM EARTHING	EFFECTIVELY EARTHED
BASIC INSULATION LEVEL	1050 kVp
CREEPAGE DISTANCE	6125 mm
SHORT TIME CURRENT (FOR ALL CURRENT CARRYING PARTS)	40 kA FOR 3 SEC

TABLE III : CONDUCTOR DETAIL OF SWITCHYARD.

MAIN BUS-I	QUAD MOOSE ACSR COND.
MAIN BUS-II	QUAD MOOSE ACSR COND.
TRANSFER BUS	TWIN MOOSE ACSR COND.
INTERCONNECTION/ DROPPERS	SINGLE ACSR MOOSE CONDUCTOR- ST BAY TWIN ACSR MOOSE CONDUCTOR- ICT BAY
OUTGOING LINE	SINGLE ACSR MOOSE CONDUCTOR- ST BAY TWIN ACSR MOOSE CONDUCTOR- ICT BAY



NOTE:-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. THE TWO EXTENSION BAYS IN PRESENT SCOPE ARE ALREADY PROTECTED AGAINST DIRECT LIGHTING STROKE AS PER M/S CONTROL & SCHEMATICS LTD DRG NO. AREVA-RTPP-E-006
3. ALL SHOWN EQUIPMENT & STRUCTURE HEIGHTS ARE ABOVE PLINTH LEVEL. PLINTH LEVEL IS 300 MM ABOVE GROUND LEVEL.
4. 220KV STATION TRANSFORMER # 6 AND 400/220KV INTERCONNECTING TRANSFORMER, BOTH, ARE LOCATED IN 400KV YARD AREA, WHICH SHALL BE SHOWN IN SEPARATE DRG.
5. ALL THE EQUIPMENTS SHOWN IN SOLID LINES ARE IN PRESENT SCOPE. ALL OTHER PART SHOWN IN DOTTED AND LIGHT LINES ARE EXISTING.
6. ANGLE OF DEVIATION FOR THE OUTGOING LINE SHALL NOT EXCEED 30°.
7. TENSION INSULATORS FOR OUTGOING LINE SHOWN AT OUTGOING GANTRY HAVE NOT BEEN TAKEN IN THE BOQ. THESE SHALL BE SHOWN IN SEPARATE DRG UNDER TRANSMISSION LINE PACKAGE.
8. BOTH THE EXTENSION BAYS ARE ALREADY PROTECTED FOR DIRECT STROKE LIGHTNING PROTECTION THROUGH EXISTING TOWERS WITH EXTENDED PEAKS.

TABLE IV : MINIMUM CLEARANCES

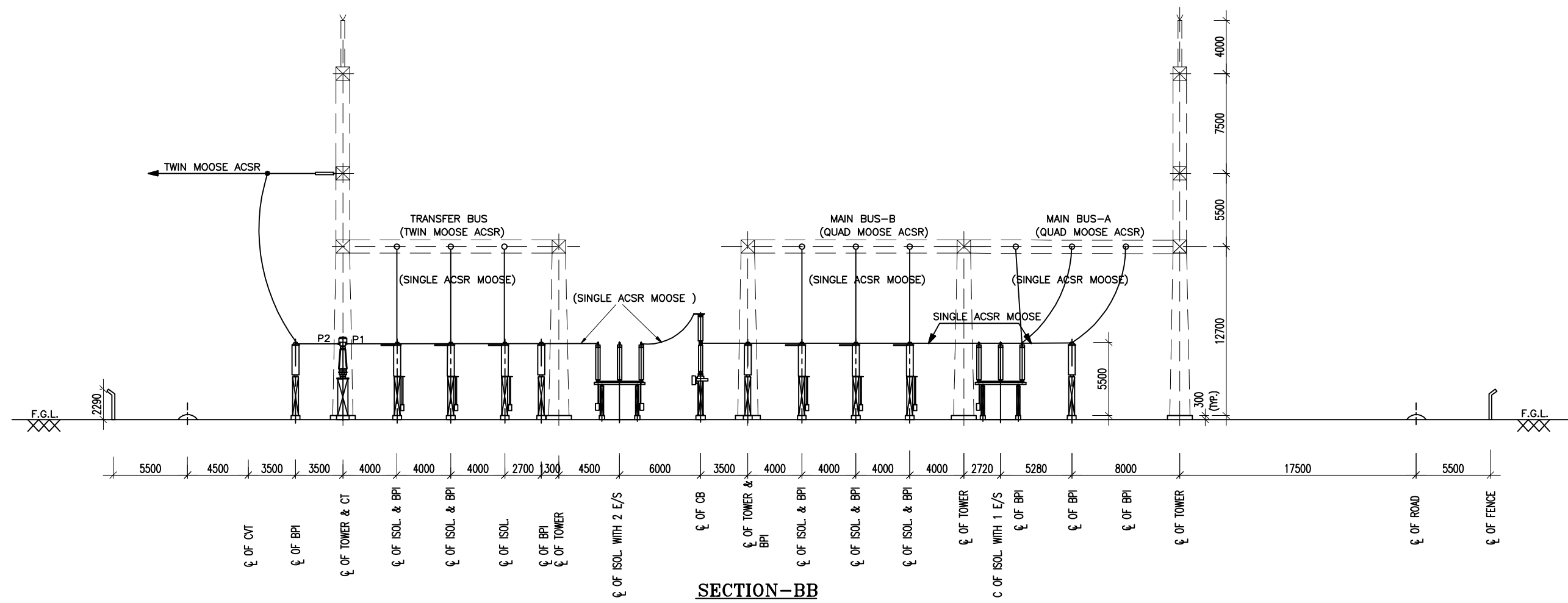
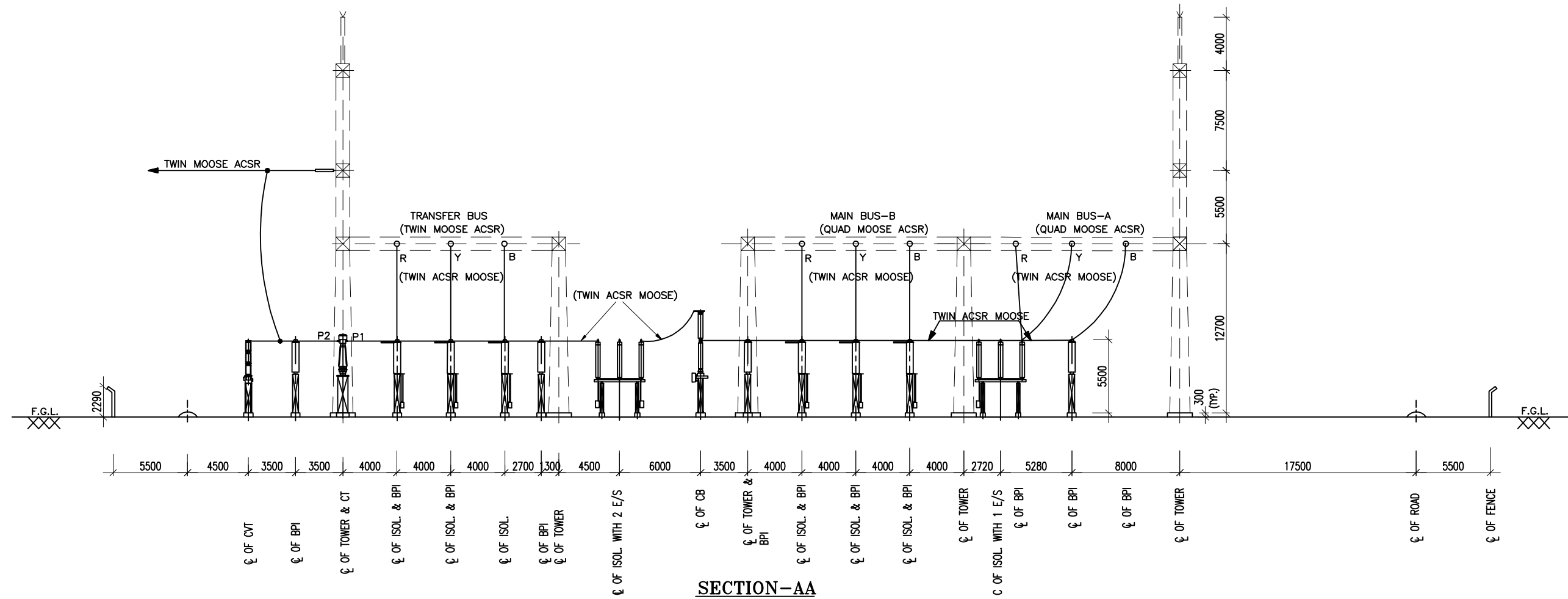
MINIMUM CLEARANCE TABLE AS PER IS:10118	220kV
PHASE TO PHASE (PP)	2100
PHASE TO EARTH (PE)	2100
SECTION CLEARANCE (SC)	5000
HEIGHT OF CONDUCTOR CENTER LINE OF FIRST LEVEL FROM PLINTH LEVEL	5500
GROUND CLEARANCE TO NEAREST PART NOT AT EARTH POTENTIAL OF AN INSULATOR SUPPORTING LIVE CONDUCTOR	2550

LEGEND :-

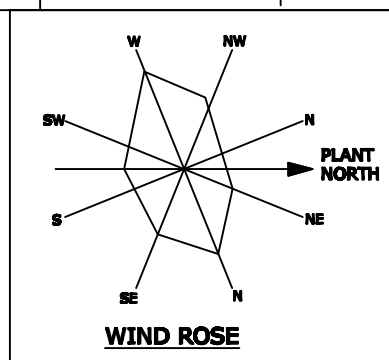
— SINGLE ACSR MOOSE CONDUCTOR
— TWIN ACSR MOOSE CONDUCTOR

REF. DRAWINGS :-

220KV SWITCHYARD LAYOUT (STAGE-II) - TB-0-229-316-002 REV.06 [BHEL, BHOPAL]
220KV SWITCHYARD SECTIONS (STAGE-II) - TB-0-229-316-003 REV.06 [BHEL, BHOPAL]
220KV SUB STATION EXTENSION WORK (STAGE-II) - AREVA-RTPP-E-002 [C & S LTD, HYDERABAD]



ADDITIONAL INFORMATION W.D.No.	80012	APGENCO NAME OF CUSTOMER/PROJECT 400/220 KV SWITCHYARD- RAYALSREMA T.P. PLANT STAGE-IV, UNIT#6 (1X600MW)	
STATUS OF DRAWING - CONTRACT DISTRIBUTION OF PRINTS	APGENCO - 2 CE(O&M), RTPP - 1 DESEIN - 5	CONSULTANT: Deesin Consulting Engineers Bharat Heavy Electricals Ltd. TRANSMISSION PROJECTS DIVISION	
REV. DATE	01 29.12.11	REV. DATE 02 20.04.15	
APPROVED BY	MANOJ	APPROVED BY	MANOJ
CHECKED BY	DKM	CHECKED BY	DKM
DESIGNED BY	RS	DESIGNED BY	RS
SCALE	1 : 230	SCALE	1 : 230
TITLE	LAYOUT PLAN AND SECTIONS - 220 KV SWITCHYARD EXTENSION	DRAWING NO.	TB-0-344-316-202
DATE	01	DATE	02



TO 220KV SWITCH YARD TBEM SCOPE

NOTE REGARDING THE LOCATION:-
THIS STRINGING BETWEEN POWERHOUSE 'A' ROW
AND SWITCHYARD GENTRY IS BETWEEN THE
FOLLOWING PLOT PLANGRID LINES:
A) BETWEEN 500 AND 700 (EAST)
A) BETWEEN 000 AND 300 (SOUTH)

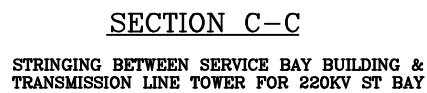
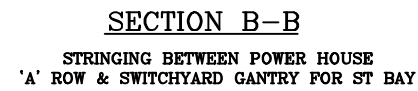
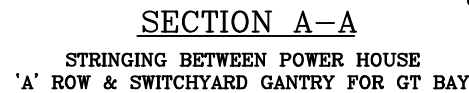
NOTE:—

- LEGEND :-

REF DRAWINGS :-

REV.	DATE	ALTERED CHECKED APPROVED	REV.	DATE	ALTERED CHECKED APPROVED	REV.	DATE	ALTERED CHECKED APPROVED	REV.	DATE	ALTERED CHECKED APPROVED	REV.	DATE	ALTERED CHECKED APPROVED
70NF			70NF			70NF			70NF			70NF		

ADDITIONAL INFORMATION W.O.NO.		80012		ग्राहक / क्लिंट का नाम APGENCO NAME OF CUSTOMER/PROJECT 400/220 KV SWITCHYARD - RAYALSEEMA T.P.PIANT STAGE-IV, UNIT#6 (1X800MW)																	
STATUS OF DRAWING = CONTRACT		CONSULTANT:		Desein Consulting Engineers																	
DISTRIBUTION OF PRINTS APGENCO - 2 RTPP Site - 1 DESIGN - 5		भारत हेवी इलेक्ट्रिकल्स लिमिटेड भारतीय भारी बिजली निगम BHA BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION		<table><tr><th>शरीत / SHEET</th><th>अवधि / NAME</th><th>दिनांक / DATE</th><th>प्रति / NO.</th></tr><tr><td>प्रीत / PREPARED</td><td>MANOJ</td><td>Sd/-</td><td>20.11.11</td></tr><tr><td>जांचा / CHECKED</td><td>MDQ</td><td>Sd/-</td><td>20.11.11</td></tr><tr><td>स्वीकृत / APPROVED</td><td>RS</td><td>Sd/-</td><td>20.11.11</td></tr></table>		शरीत / SHEET	अवधि / NAME	दिनांक / DATE	प्रति / NO.	प्रीत / PREPARED	MANOJ	Sd/-	20.11.11	जांचा / CHECKED	MDQ	Sd/-	20.11.11	स्वीकृत / APPROVED	RS	Sd/-	20.11.11
शरीत / SHEET	अवधि / NAME	दिनांक / DATE	प्रति / NO.																		
प्रीत / PREPARED	MANOJ	Sd/-	20.11.11																		
जांचा / CHECKED	MDQ	Sd/-	20.11.11																		
स्वीकृत / APPROVED	RS	Sd/-	20.11.11																		
REV.	DATE	परिवर्तन / REVISION	TBEM	उत्पादन / SCALE	दृष्टी कोड / MARK CODE																
01	20.02.13	आदेशानुसार / AS PER ORDER	कोड / 422																		
DRAWMG HAS BEEN REVISED IN LINE WITH DESIGN COMMENTS VISE LETTER NO. 959 DATED: 07.01.2013 LAYOUT PLAN FOR STRINGING BETWEEN POWERHOUSE 'A' ROW & SWITCHYARD GENTRY																					
डाटा./TITL./DRAWING NO. TB-1-344-316-403A					मुद्रण/NO. 01																



NOMINAL SYSTEM VOLTAGE	220 kV	400 kV
MAXIMUM SYSTEM VOLTAGE	245 kV	420 kV
FREQUENCY	50 Hz $\pm 5\%$	50 Hz $\pm 5\%$
SYSTEM EARTHING	EFFECTIVELY EARTHED	EFFECTIVELY EARTHED
BASIC INSULATION LEVEL	1050 kVp	1425 kVp
CREEPAGE DISTANCE	6125 mm	10500 mm
SHORT TIME CURRENT (FOR ALL CURRENT CARRYING PARTS)	40 kA FOR 3 SEC	40 kA FOR 1 SEC

MINIMUM CLEARANCE TABLE AS PER IS:10118	220kV	400kV
PHASE TO PHASE (PP)	2100	4200
PHASE TO EARTH (PE)	2100	3500
SECTION CLEARANCE (SC)	5000	6500

DESCRIPTION	220KV ST CONNECTION	400KV GT & ST CONENCTION
OVERHEAD CONDUCTOR	SINGLE ACSR MOOSE CONDUCTOR	TWIN MOOSE ACSR COND.
DROPPERS	SINGLE ACSR MOOSE CONDUCTOR	TWIN ACSR MOOSE CONDUCTOR

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. ALL SHOWN EQUIPMENT & STRUCTURE HEIGHTS ARE ABOVE PLINTH LEVEL.
PLINTH LEVEL IS 300 MM ABOVE GROUND LEVEL.
3. ANGLE OF DEVIATION FOR THE OUTGOING LINE SHALL NOT EXCEED 30°.

_____ ACSR MOOSE CONDUCTOR
 _____ SHIELD WIRE

TRANSFORMER YARD (RTPP UNIT#6)- PE-DG-371-100-E001
LAYOUT PLAN FOR STRINGING BETWEEN POWERHOUSE 'A' ROW &
SWITCHYARD GANTRY- TB-1-344-316-403A



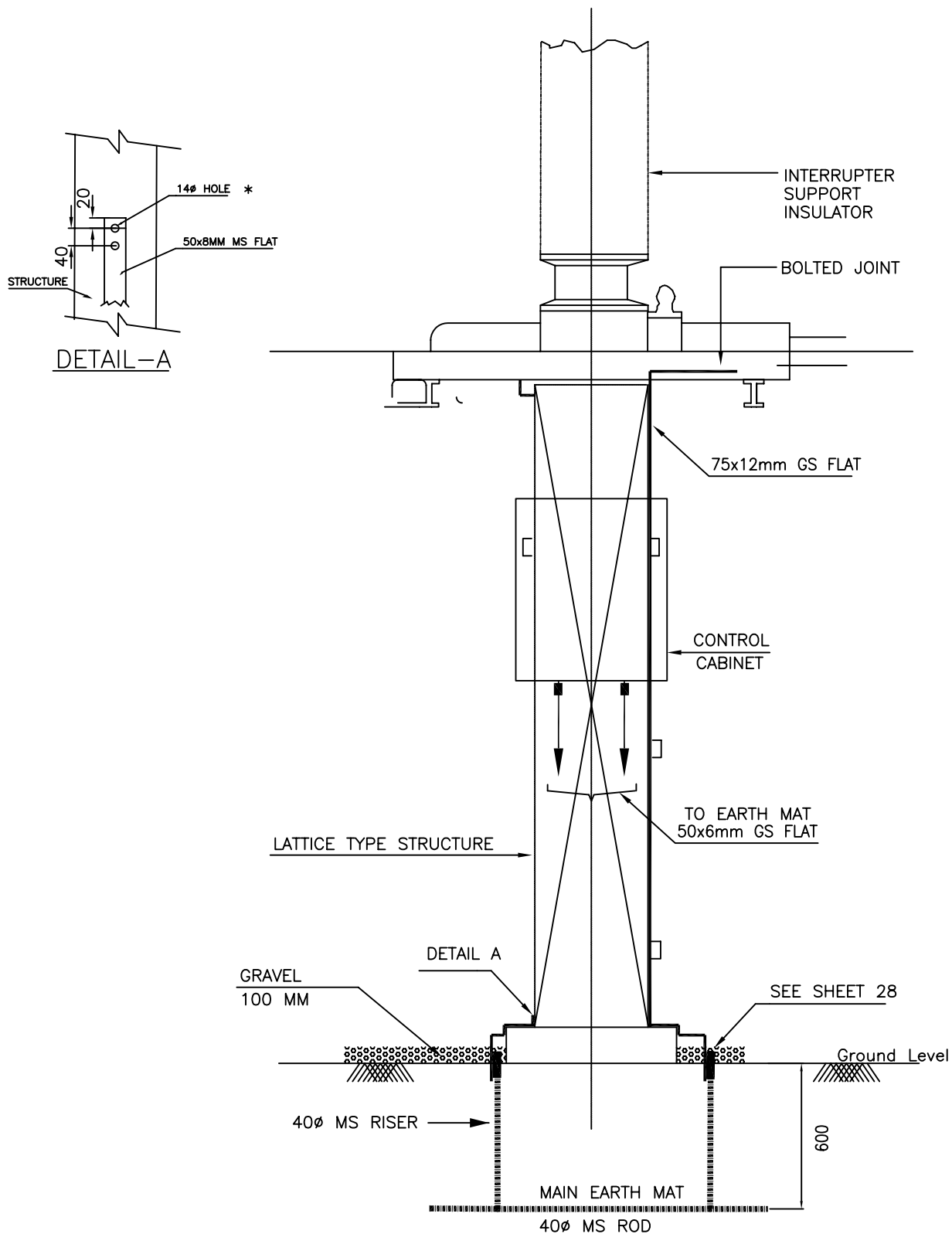
ADDITIONAL INFORMATION W.O.No. 80012			ग्राहक/परियोजना का नाम APGENCO NAME OF CUSTOMER/PROJECT 400/220 KV SWITCHYARD - RAYALSEEMA T.P. PLANT STAGE - IV, UNIT#6 (1X600M)																		
STATUS OF DRAWING — CONTRACT			CONSULTANT: Desein Consulting Engineers																		
DISTRIBUTION OF PRINTS APGENCO — 2 RTPP Site — 1 DESSIN — 5			भारत ही इलेक्ट्रिकल लिमिटेड दुर्वाधिन परियोजना विभाग BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION <table><thead><tr><th>वर्क नाम</th><th>ग्राम / NAME</th><th>ह-फैल / SGNL</th><th>दि./DATE</th></tr></thead><tbody><tr><td>ग्रेड</td><td>RK/NK</td><td>Sd/-</td><td>20.11.12</td></tr><tr><td>ड्रेन</td><td>DKM</td><td>Sd/-</td><td>20.11.12</td></tr><tr><td>गोला रोड (गोला रोड)</td><td>RS</td><td>Sd/-</td><td>20.11.12</td></tr></tbody></table>			वर्क नाम	ग्राम / NAME	ह-फैल / SGNL	दि./DATE	ग्रेड	RK/NK	Sd/-	20.11.12	ड्रेन	DKM	Sd/-	20.11.12	गोला रोड (गोला रोड)	RS	Sd/-	20.11.12
वर्क नाम	ग्राम / NAME	ह-फैल / SGNL	दि./DATE																		
ग्रेड	RK/NK	Sd/-	20.11.12																		
ड्रेन	DKM	Sd/-	20.11.12																		
गोला रोड (गोला रोड)	RS	Sd/-	20.11.12																		
REV.	DATE	ALTERED CHECKED APPROVED	ड्राइंग DEPT. T2EM शीट नं. 422	 अनुपात / SCALE 1 : 485	कार्य चिह्न CNO CODE																
01	20.02.13																				
ZONE DRAWING HAS BEEN REVISED IN LINE WITH DESIGN COMMENTS VIDE THEIR LETTER NO. 1063 DATED: 08.02.2013			SECTION/TITLE SECTION ELEVATION FOR STRINGING BETWEEN POWER HOUSE 'A' BOW & SWITCHYARD GANTRY																		
			ड्राइंग क्र./DRAWING NO. TPB-1-344-316-404A																		
			ग्राहक क्र./SHEET No. 01 अंतिम पृष्ठ/ NEXT SHEET																		

1. EARTH STRIP & EARTH WIRE SHALL BE CLEATED TO LATTICE TYPE STRUCTURE AT AN INTERVAL OF 1 M & 2 RESPECTIVELY.
2. ALL EARTH STRIPS SHALL BE TAKEN FLAT ALONG EDGE OF STRUCTURE.
3. MAXIMUM OF TWO EARTHING STRIP SHALL BE CONNECTED TO ONE RISER.
4. ALL EARTHING SHALL BE DONE IN ACCORDANCE WITH IS:3034 UNLESS OTHERWISE STATED IN TECHNICAL SPECIFICATION
6. EACH RISER OF A PARTICULAR EQUIPMENT SHALL BE CONNECTED TO A DIFFERENT EARTH ROD (EITHER HORIZONTAL OR VERTICAL EARTH ROD)
7. ALL EQUIPMENT & STRUCTURES SHALL BE EARTHED AT TWO POINTS WITH 75X12 MM GS FLAT.
8. ALL JUNCTION BOXES, OPERATING MOM BOXES, MKs, PANELS, CABINETS SHALL BE EARTHED AT TWO POINTS WITH 50X6 MM GS FLAT.
9. ALL WELDING JOINTS BETWEEN MS ROD & GS FLAT SHALL BE BELOW GRAVEL LEVEL.
9. GRAVEL LEVEL IS 100 MM ABOVE GROUND LEVEL.

40Ø MS ROD FOR RISER/EARTH MAT
GS FLAT (75X12 MM/ 50X 6 MM)

SHEET.		DESCRIPTION		SHEET.		DESCRIPTION	
2.	SF6 CIRCUIT BREAKER	17.	ROD ELECTRODE WITH TEST PIT				
3.	CVT	18.	RAIL BONDING				
4.	POST INSULATOR (SOLID CORE TYPE)	19.	LIGHTNING MAST				
5.	LIGHTNING ARRESTER	20.	AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH., E/S MECH. BOX				
6.	MARSHALLING KIOSK	21.	SWITCHGEAR / MCC / C & R PANEL /ACDCDB/LDB INSIDE CONTROL ROOM				
7.	DOUBLE BREAK ISOLATOR WITHOUT EARTH SWITCH	22.	AUX TRANSFORMER				
8.	DOUBLE BREAK ISOLATOR WITH ONE EARTH SWITCH	23.	FENCE POST				
9.	DOUBLE BREAK ISOLATOR WITH TWO EARTH SWITCH	24.	CABLE TRENCH				
10.	ISOLATOR TYPICAL PLAN	25.	TYPICAL ARRANGEMENT OF BOLTED JOINTS				
11.	CURRENT TRANSFORMER	26.	WELDING DETAILS-1				
12.	WAVE TRAP	27.	WELDING DETAILS-2				
13.	SHIELD WIRE TOWER	28.	RISERS & GS FLAT WELDING ARRANEGMENT				
14.	TOWER WITHOUT PEAK						
15.	PIPE EARTH ELECTRODE IN TREATED EARTH PIT						
16.	ROD ELECTRODE WITHOUT TEST PIT						

JOB NO.					PROJECT 400/220KV SWITCHYARD- RTPP STAGE-IV (600MW UNIT#6)											
STATUS CONTRACT					CUSTOMER APGENCO, HYDERABAD											
DRG./REF. NO. (INTERNAL)					CONSULTANT DESEIN PVT LTD, HYDERABAD											
 भारत हेवी इलेक्ट्रिकल्स लिमिटेड दांसमिशन परियोजना विभाग BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION					DEPT CODE				NAME		SIGN.		DATE			
							DRN						04.05.11			
							DESN		NK				04.05.11			
							CHD		DKM				04.05.11			
APPD		RS				04.05.11										
REV.	DATE	ALTD	CHD	APPD												
					TITLE EQUIPMENT EARTHING DETAILS											
										DEPT.		SCALE		DRAWING NO.		
										SIGN				TB-4-344-509-013		
										DATE				SHEET 1 OF 28		REV. 00



NOTE:

- 1) COMMON CONTROL CABINET SHALL BE EARTHED SEPARATELY.
- 2) NO. OF RISERS FOR CIRCUIT BREAKER - 2 / PHASE
- 3) NO. OF RISERS FOR LADDER - 2 / PHASE
- 4) NO. OF RISERS FOR CONTROL CABINET - 2 / PHASE



EQUIPMENT EARTHING DETAILS

CIRCUIT BREAKER

COMPU. DRG. REF.

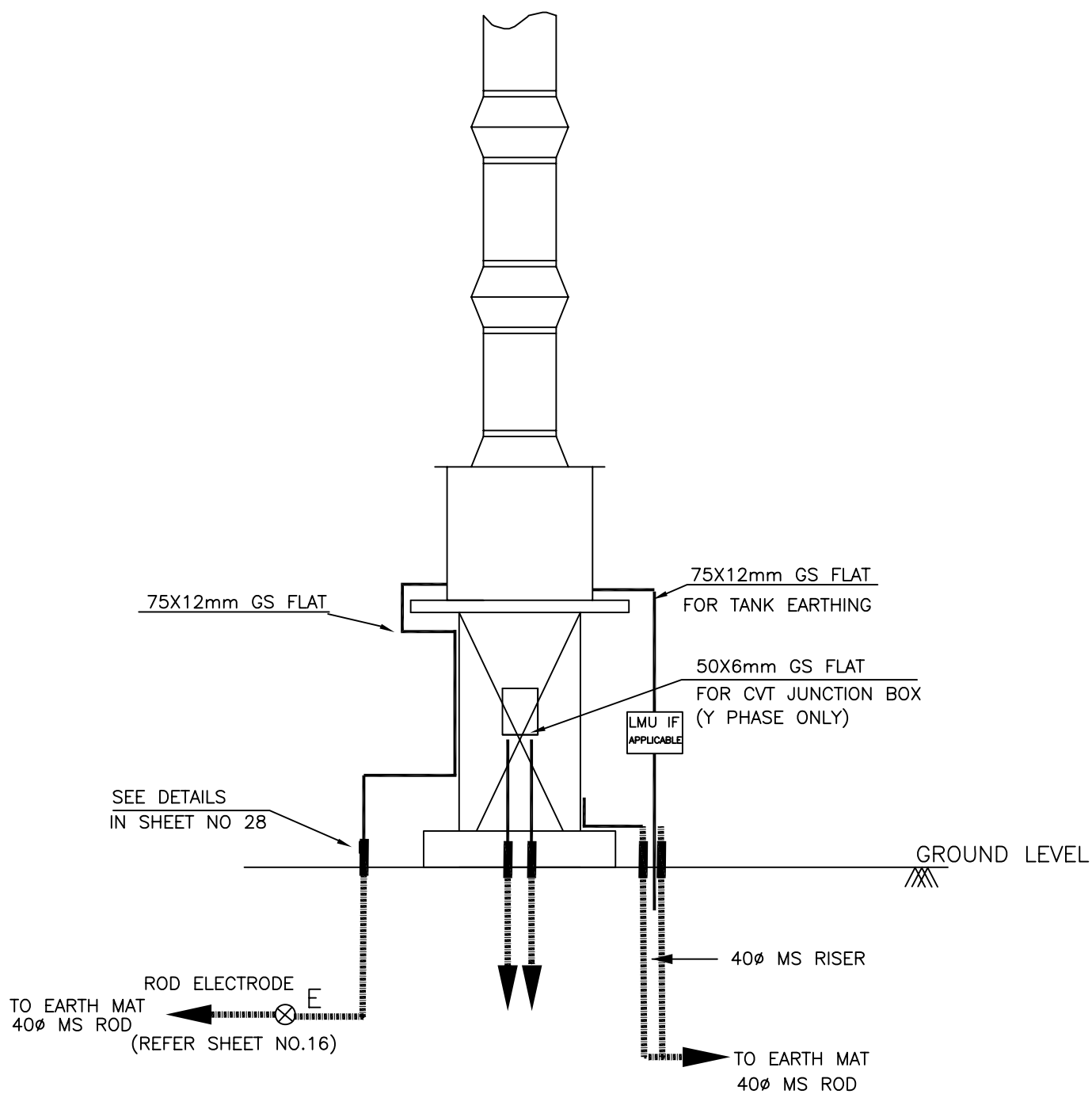
DRG. No.

TB-4-344-509-013

REV. 00

SHEET No.

2

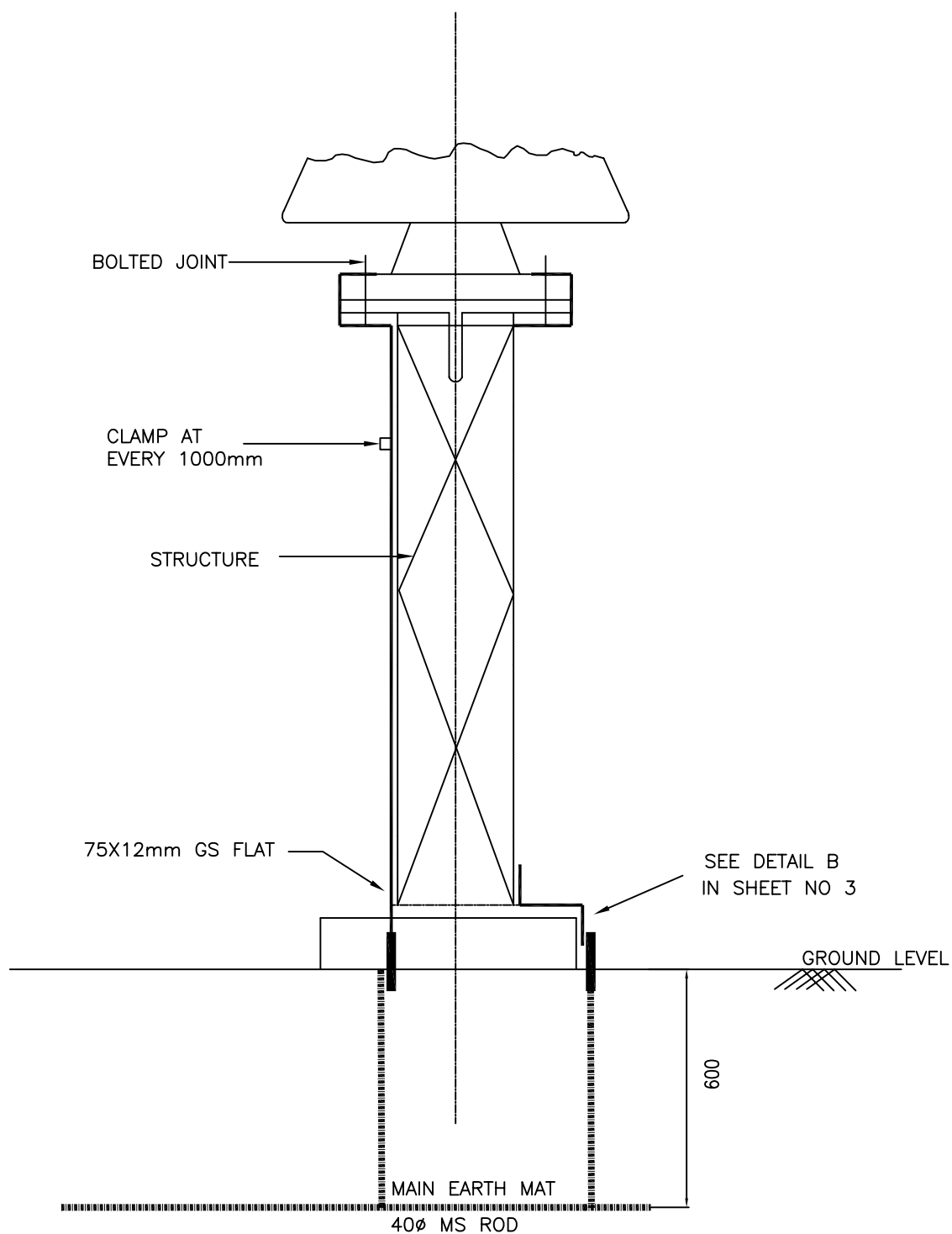


NOTE:

- 1) NO. OF RISERS FOR EQUIPMENT & STRUCTURE- 3 / PHASE
- 2) NO. OF RISERS FOR JUNCTION BOX - 2 / PHASE
- 3) NO. OF ROD ELECTRODE - 1 / PHASE



EQUIPMENT EARTHING DETAILS CVT



NOTE:

- 1) NO. OF RISERS FOR EQUIPMENT & STRUCTURE- 2 / PHASE



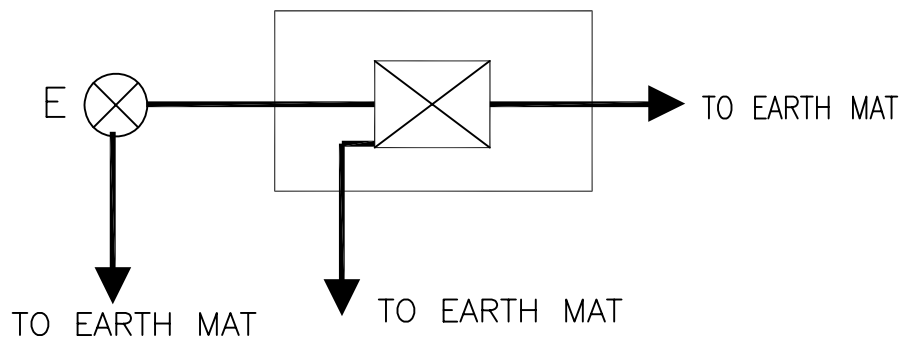
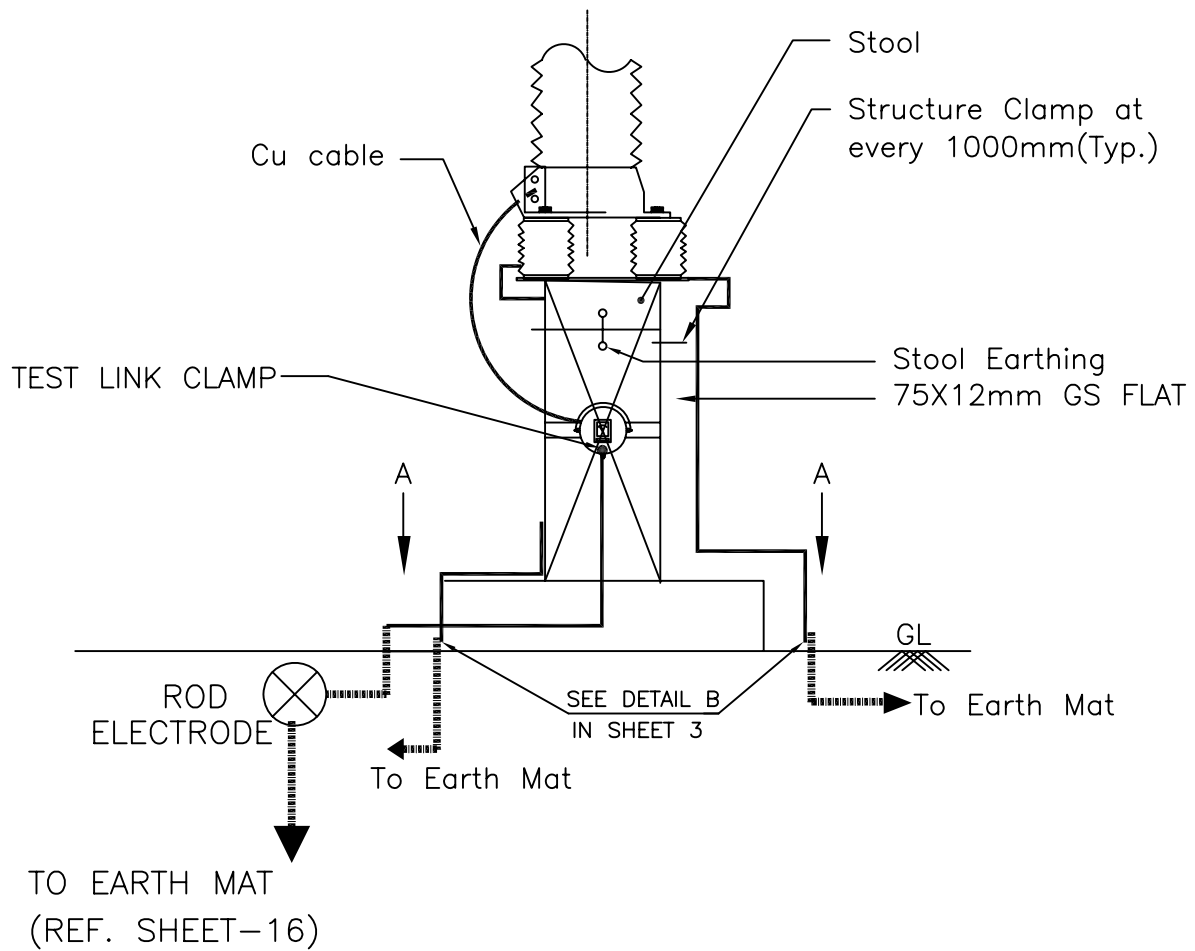
EQUIPMENT EARTHING DETAILS

POST INSULATOR (SOLID CORE TYPE)

DRG. No. TB-4-344-509-013

REV. 00

SHEET No.
4



VIEW A-A

NOTES;

1. LA SHALL BE EARTHED THROUGH EARTH TERMINAL OF SURGE COUNTER
2. NO. OF ROD ELECTRODE : 1 NO. PER PHASE.
3. NO. OF RISERS FOR EQUIPMENT & STRUCTURE- : 3 / PHASE.



EQUIPMENT EARTHING DETAILS
LIGHTNING ARRESTER

COMPU. DRG. REF.

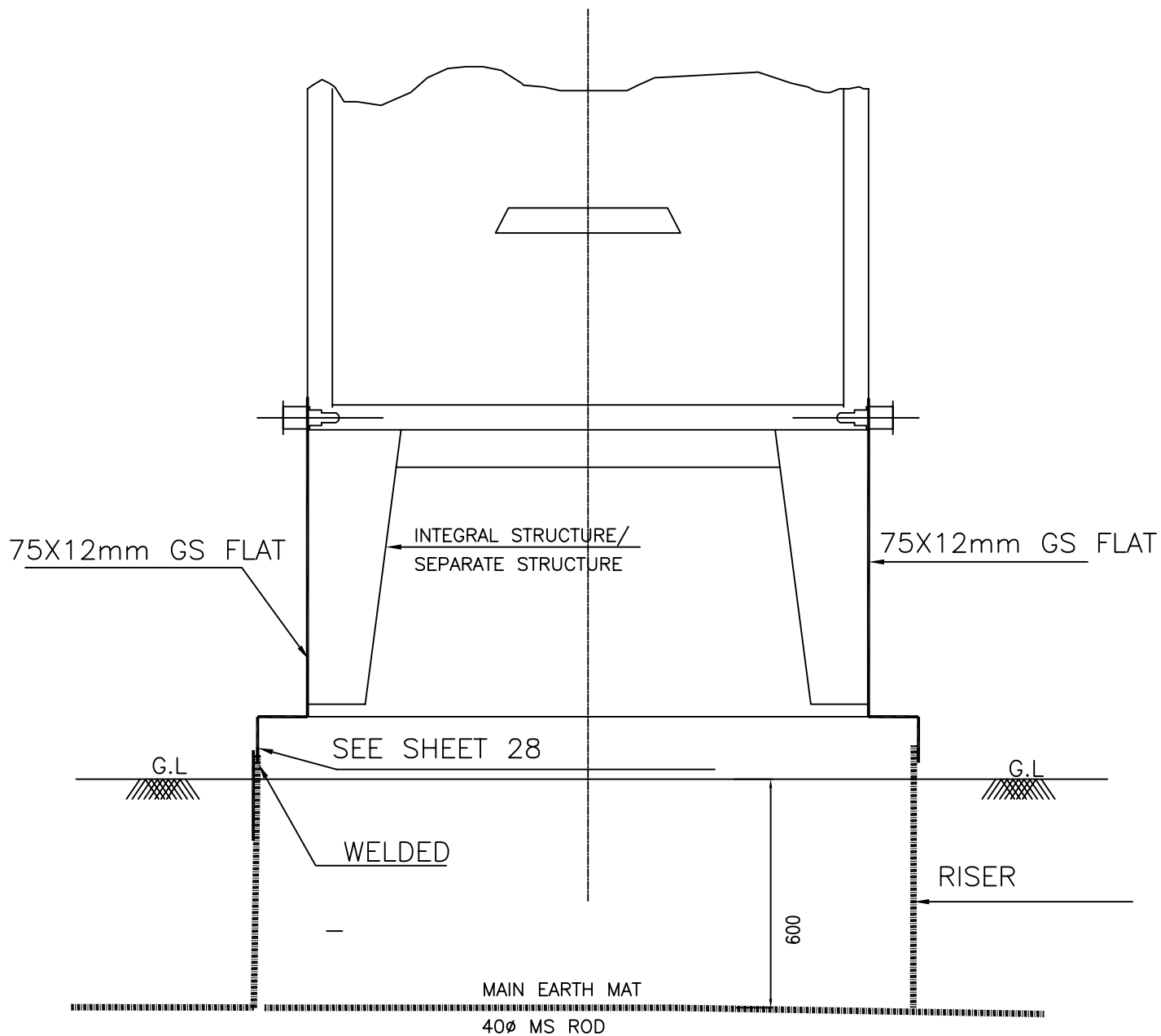
DRG.NO.

TB-4-344-509-013

REV. 00

SHEET No.

5



NOTES;

1. NO. OF RISERS FOR MK- : 2 / PHASE.



EQUIPMENT EARTHING DETAILS

MARSHALLING KIOSK

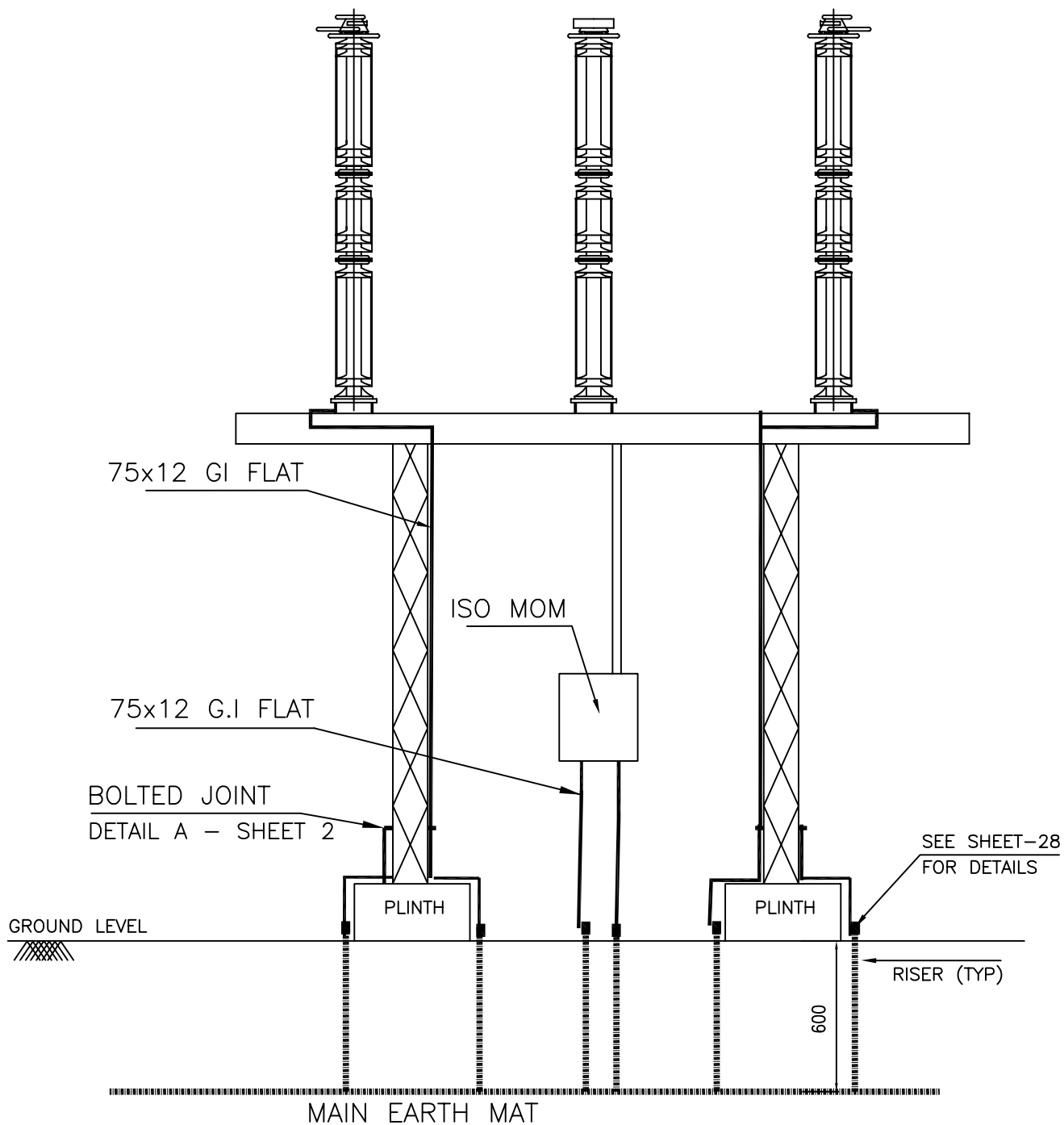
COMPUTERREF.NO.

DRG. No.

TB-4-344-509-013

REV. 00

SHEET No.
6

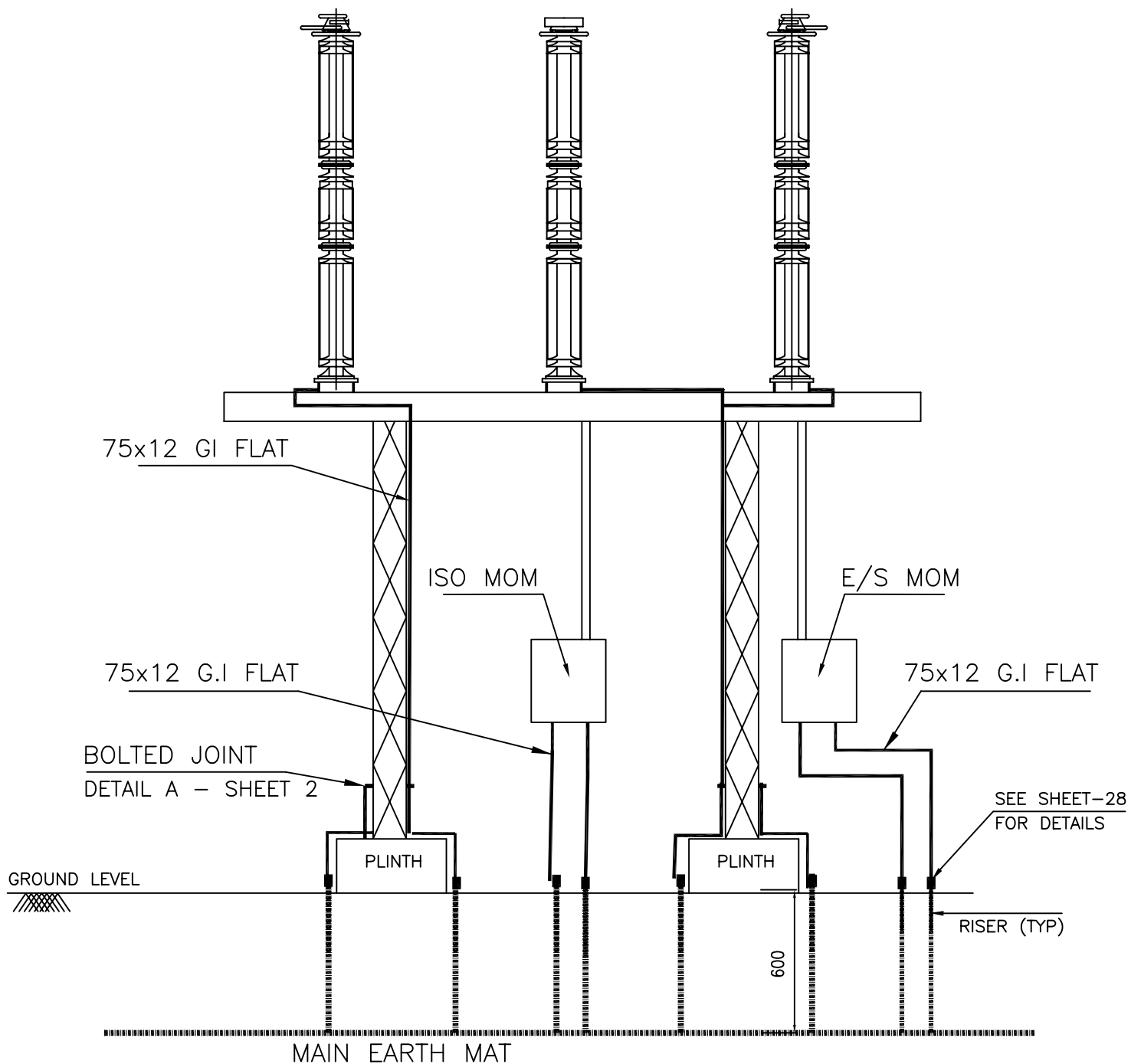


No. OF RISERS FOR ISOLATOR = 4 Nos./PHASE
 No. OF RISERS FOR ISOLATOR MECH. BOX = 2 Nos.



EQUIPMENT EARTHING DETAILS

ISOLATER HORIZONTAL DOUBLE BREAK WITHOUT E/S

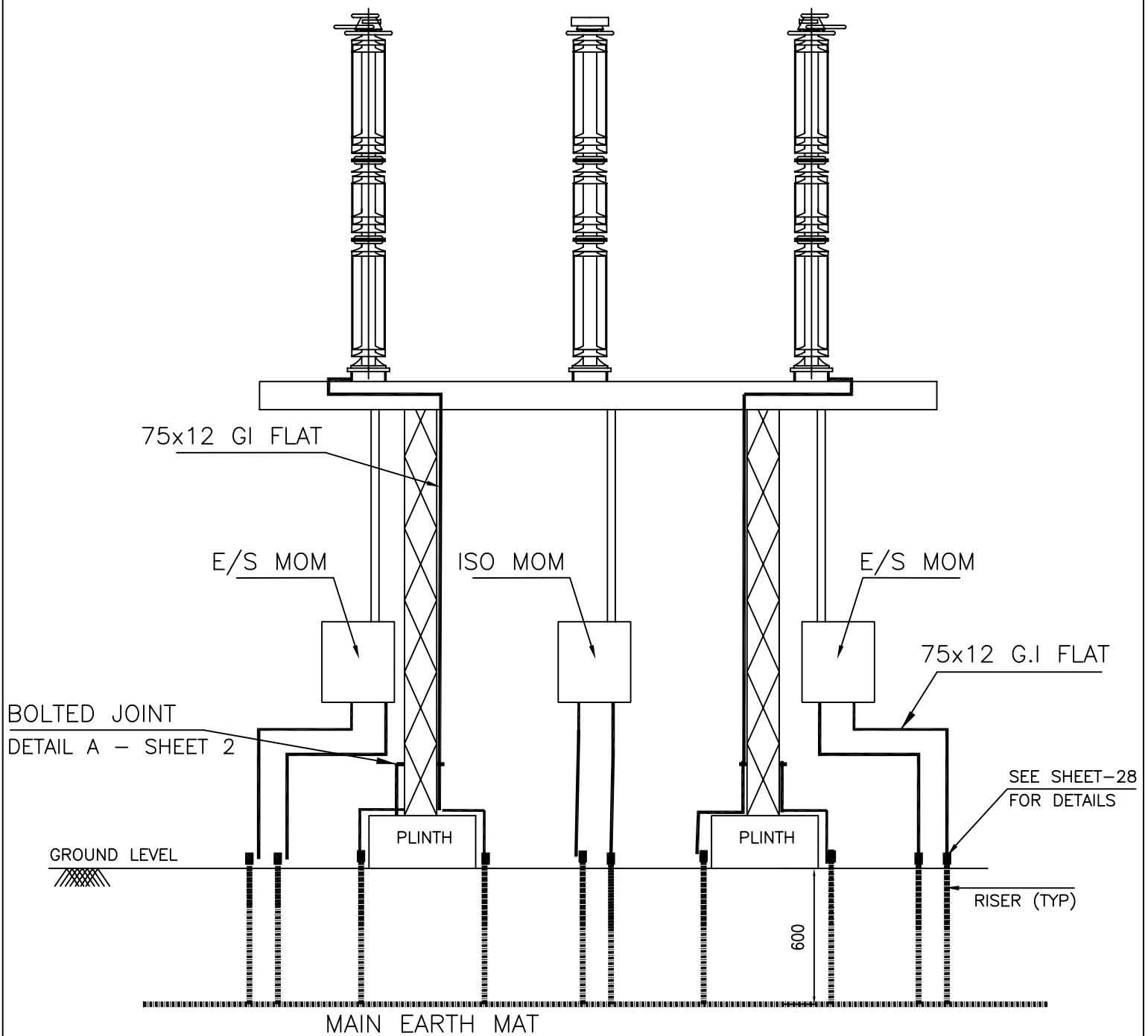


No. OF RISERS FOR ISOLATOR = 4 Nos./PHASE
 No. OF RISERS FOR ISOLATOR MECH. BOX = 2 Nos.
 No. OF RISERS FOR EARTH SWITCH MECH. BOX = 2 Nos.



EQUIPMENT EARTHING DETAILS

ISOLATER HORIZONTAL DOUBLE BREAK WITH ONE E/S

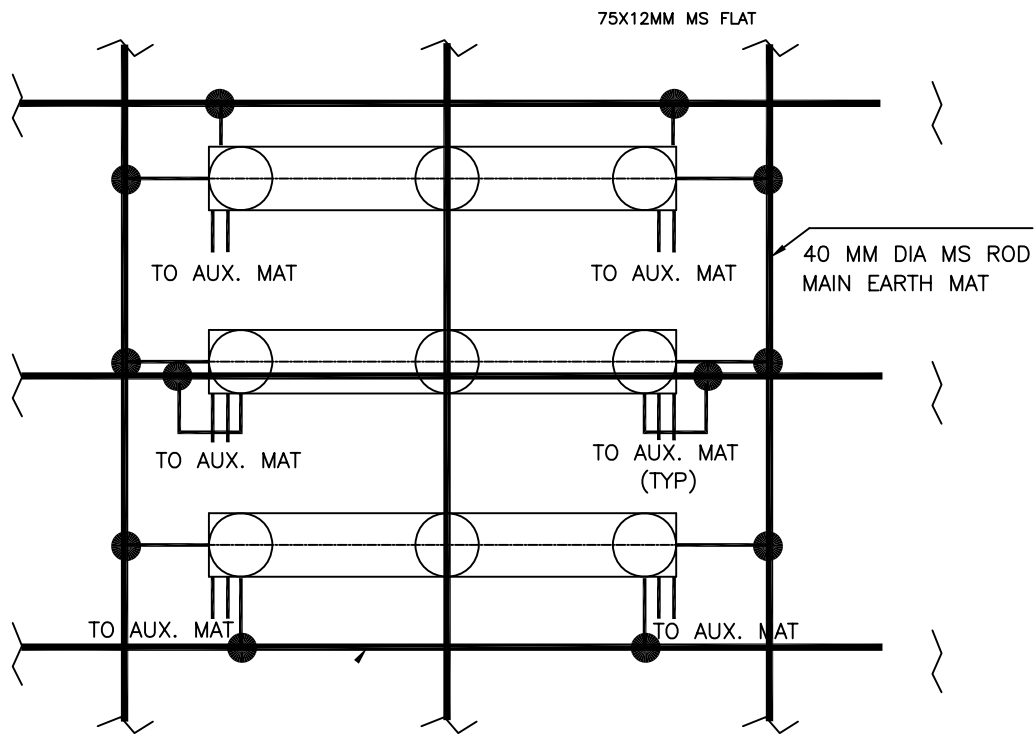


No. OF RISERS FOR ISOLATOR = 4 Nos./Phase
 No. OF RISERS FOR ISOLATOR MECH. BOX = 2 Nos.
 No. OF RISERS FOR EARTH SWITCH MECH. BOX = 4 Nos.



EQUIPMENT EARTHING DETAILS

ISOLATER HORIZONTAL DOUBLE BREAK WITH TWO E/S



NOTES

1. AUXILIARY EARTH MAT SHALL BE PROVIDED BELOW EVERY MOM BOX (REFER SHEET 20)

● RISER



EQUIPMENT EARTHING DETAILS ISOLATOR TYPICAL PLAN

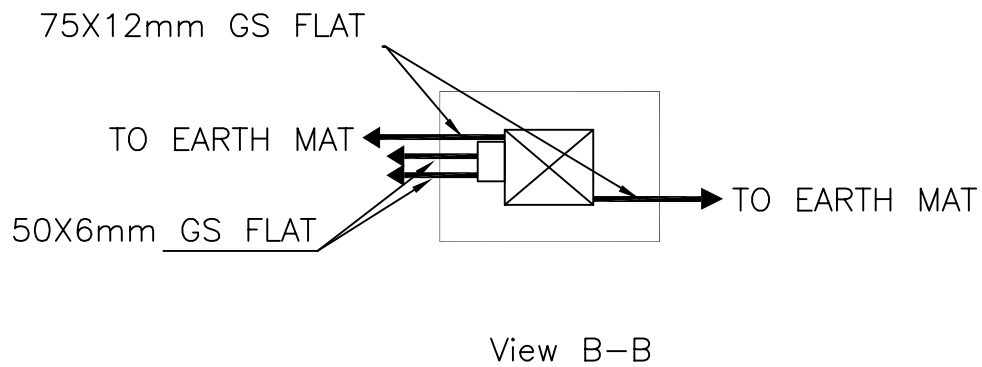
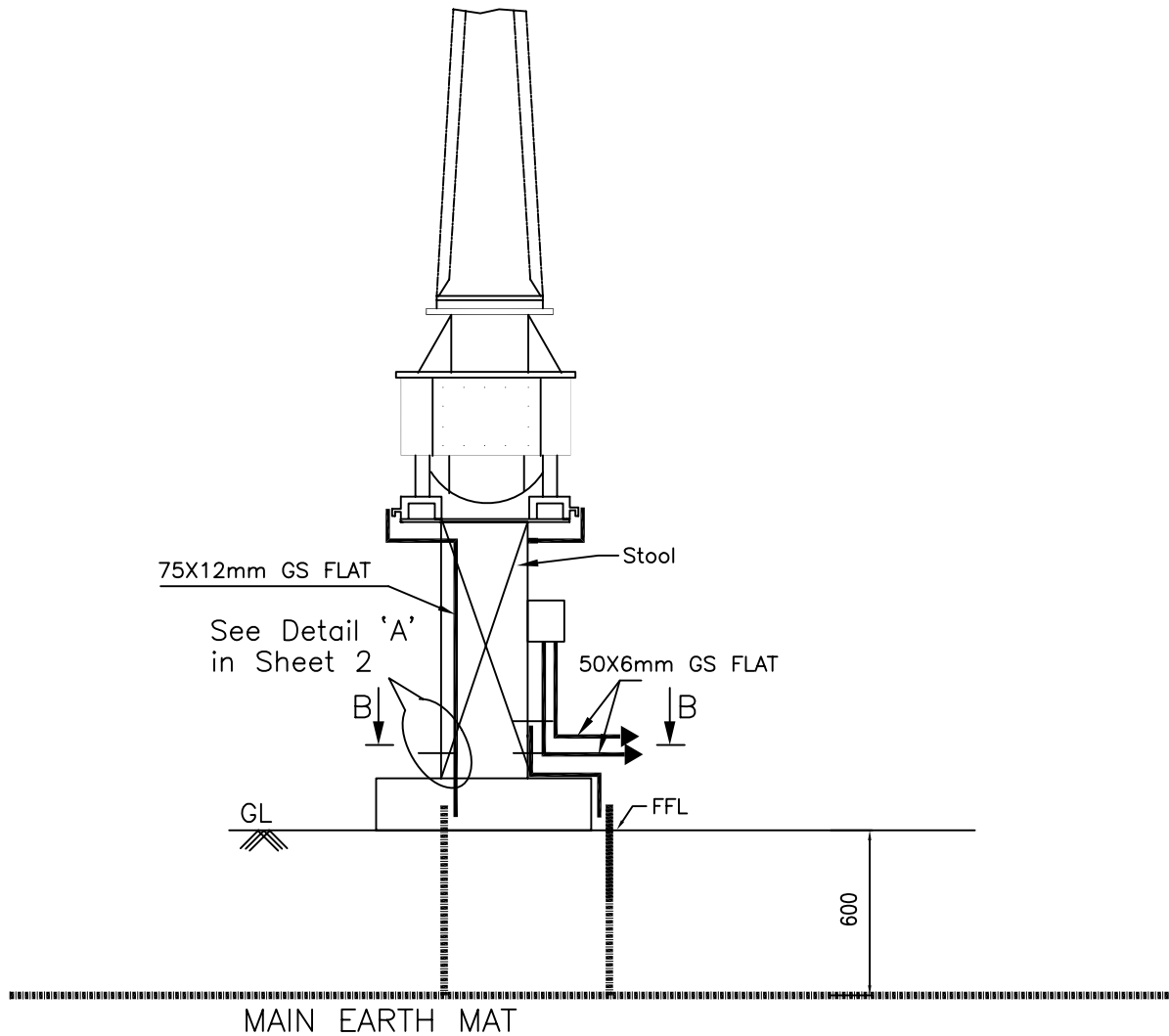
COMPU. DRG. REF.

DRG.NO.

TB-4-344-509-013

REV. 00

SHEET No.
10



No. OF RISERS FOR CT = 2 Nos./Phase
 No. OF RISERS FOR JUNCTION BOX = 2 Nos.



EQUIPMENT EARTHING DETAILS

Current Transformer

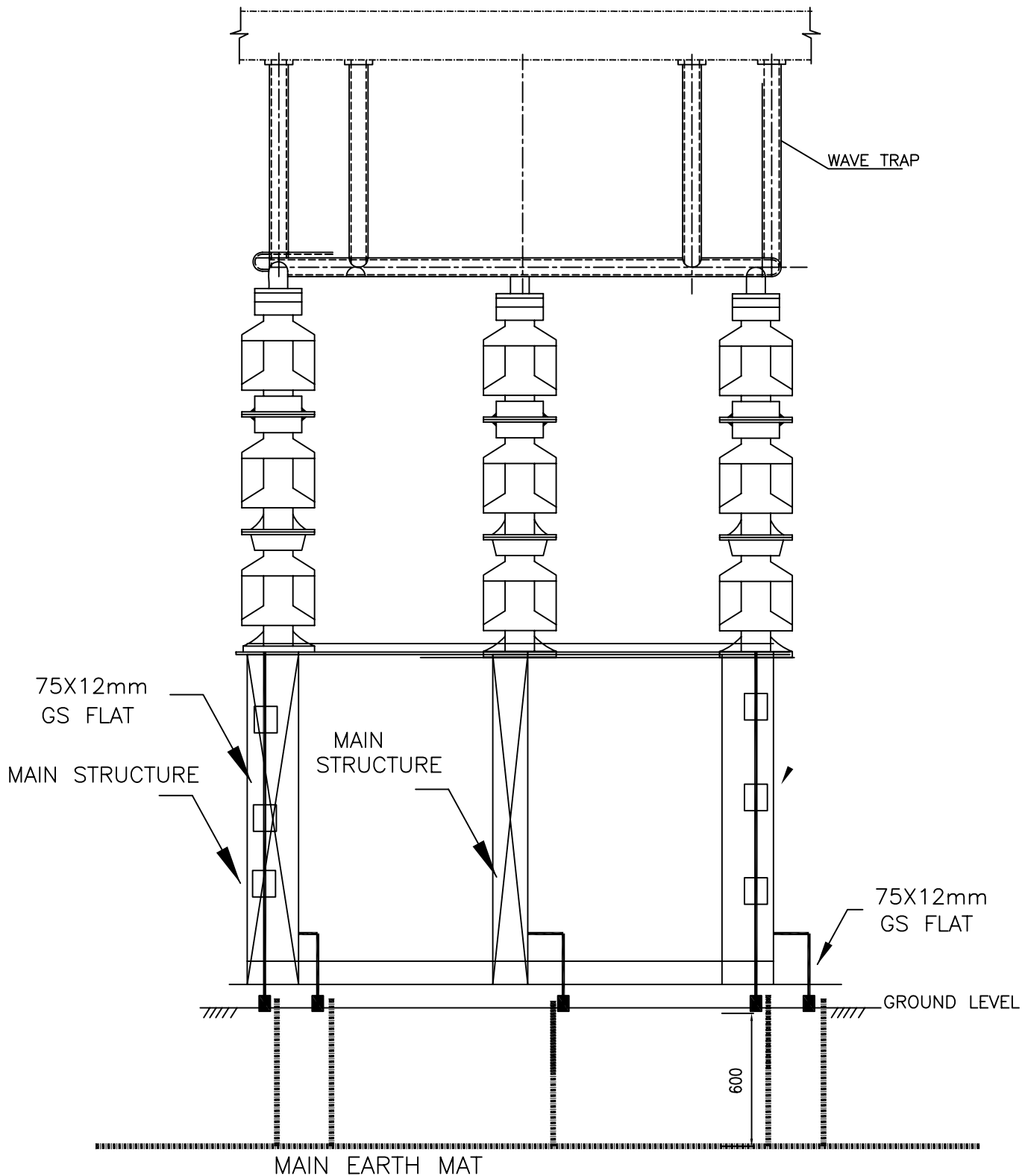
COMPU. DRG. REF.

DRG.NO.

TB-4-344-509-013

REV. 00

SHEET No.
11



No. OF RISERS FOR WAVE TRAP = 5 Nos./Phase



EQUIPMENT EARTHING DETAILS WAVE TRAP

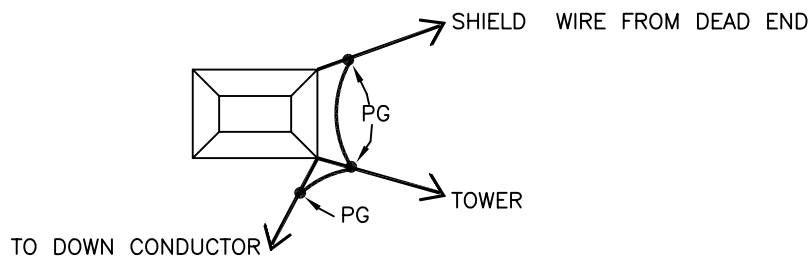
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DRG. No.

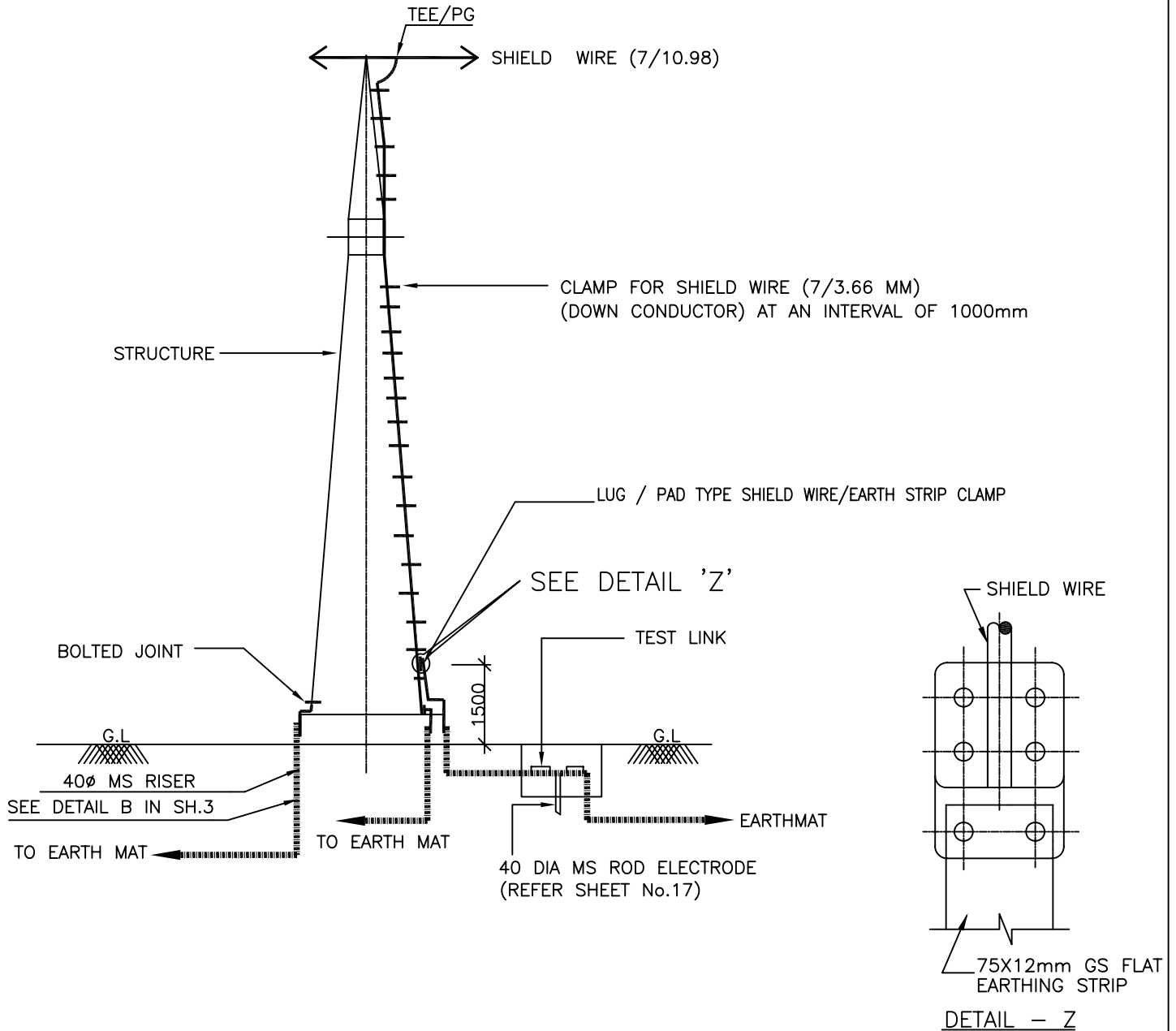
TB-4-344-509-013

REV. 00

SHEET No.
12



DETAIL WHEN 2 & E/WIRE TERMINATES A TOWER



NOTE:

1. NO. OF ROD ELECTRODE WITH TEST LINK : 1 NO. / TOWER
2. NO. OF RISERS : 3 NO. / TOWER



EQUIPMENT EARTHING DETAILS

SHIELD WIRE TOWER

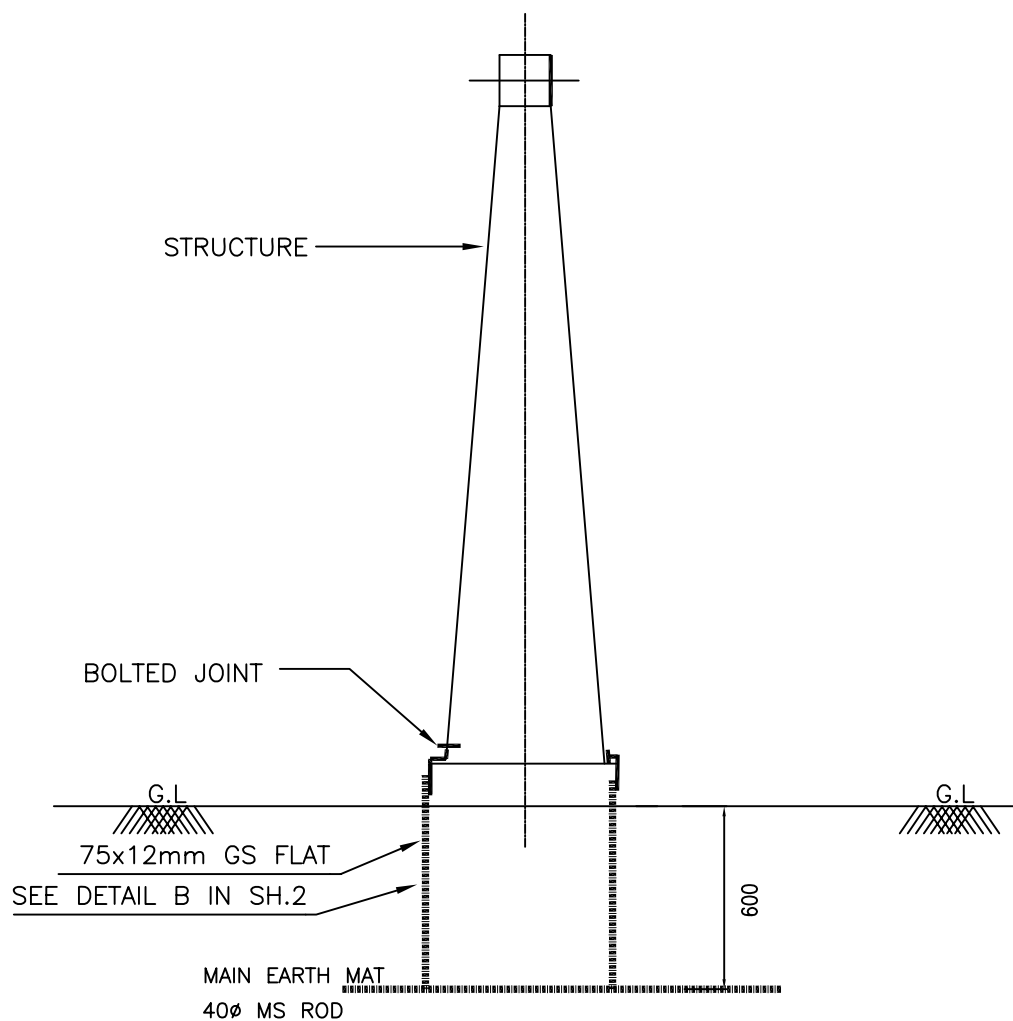
COMPUTERREF.NO.

DRG. No.

TB-4-344-509-013

REV. 00

SHEET No.
13



EQUIPMENT EARTHING DETAILS TOWER WITHOUT PEAK

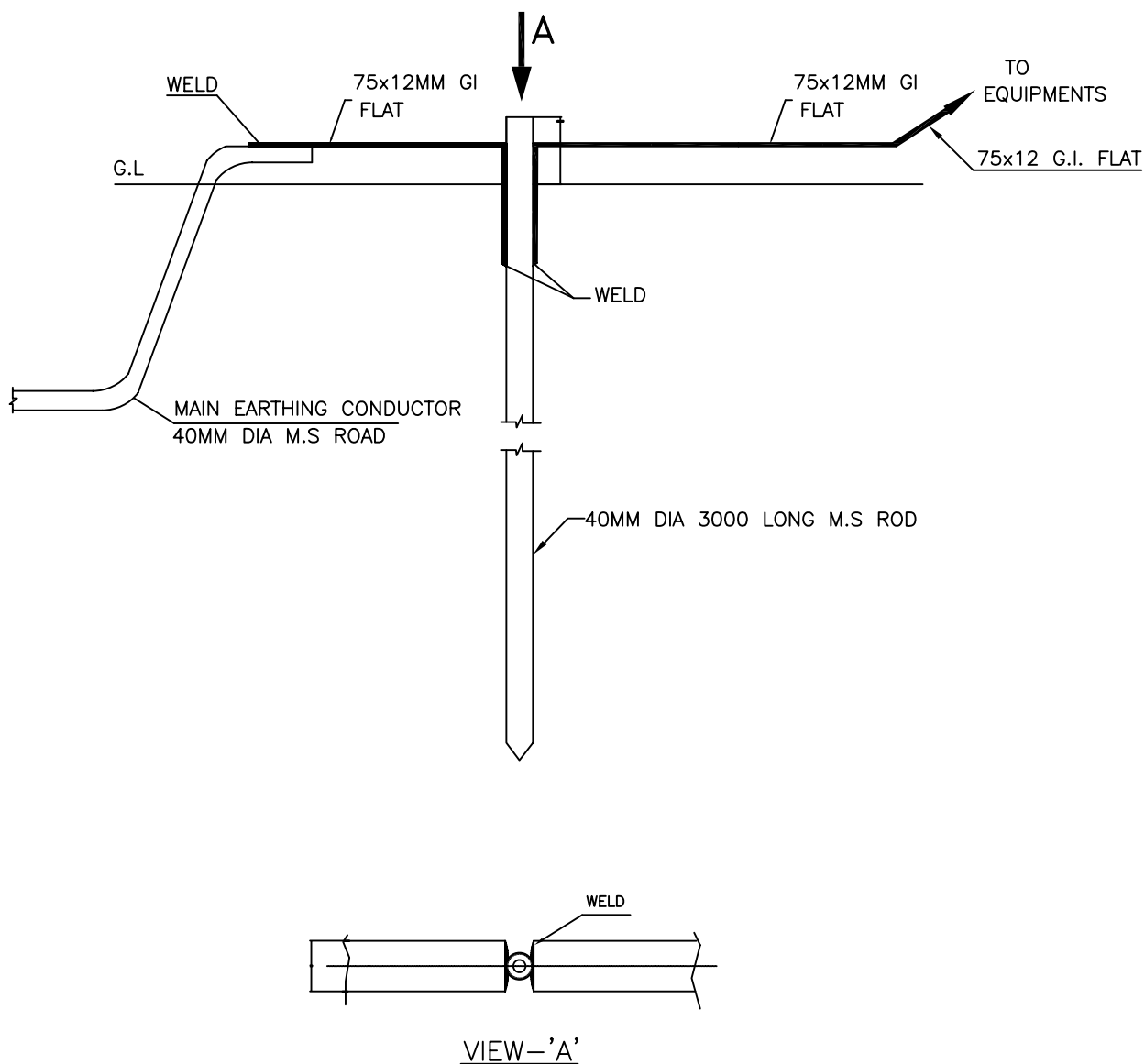
COMPUTERREF.NO.

DRG. No.

TB-4-344-509-013

REV. 00

SHEET No.
14



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 CVT, LA.
3. ALL NUTS, BOLTS & WASHERS SHALL BE GALVANISED.



EQUIPMENT EARTHING DETAILS
ROD EARTH ELECTRODE WITHOUT TEST PIT

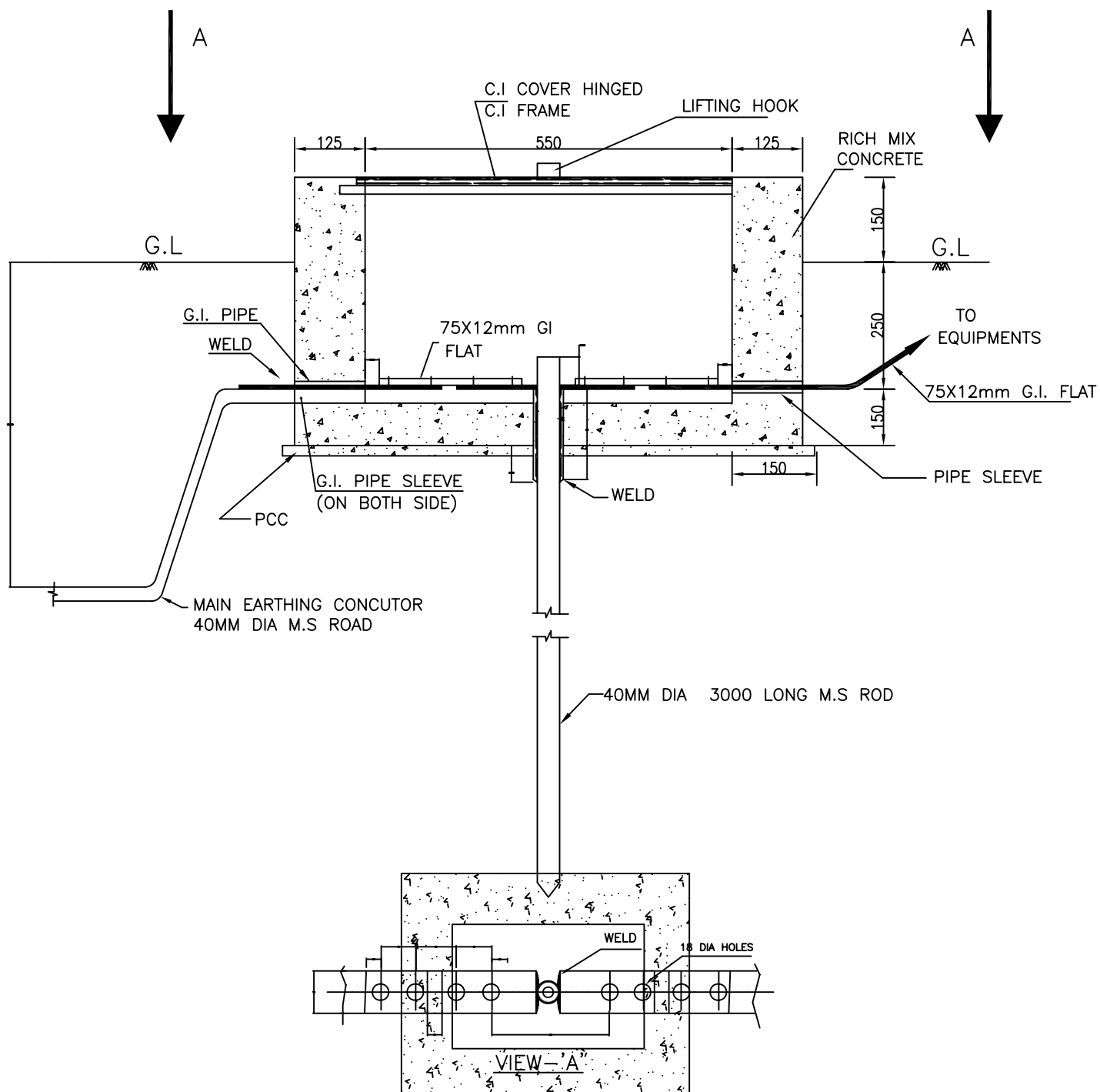
COMPU. DRG. REF.

DRG. No.

TB-4-344-509-013

REV. 00

SHEET No.
16



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.
3. PIPE SLEEVE ENDS SHALL BE SEALED AFTER COMPRETION OF WORK.



EQUIPMENT EARTHING DETAILS

ROD ELECTRODE WITH TEST PIT & LINK

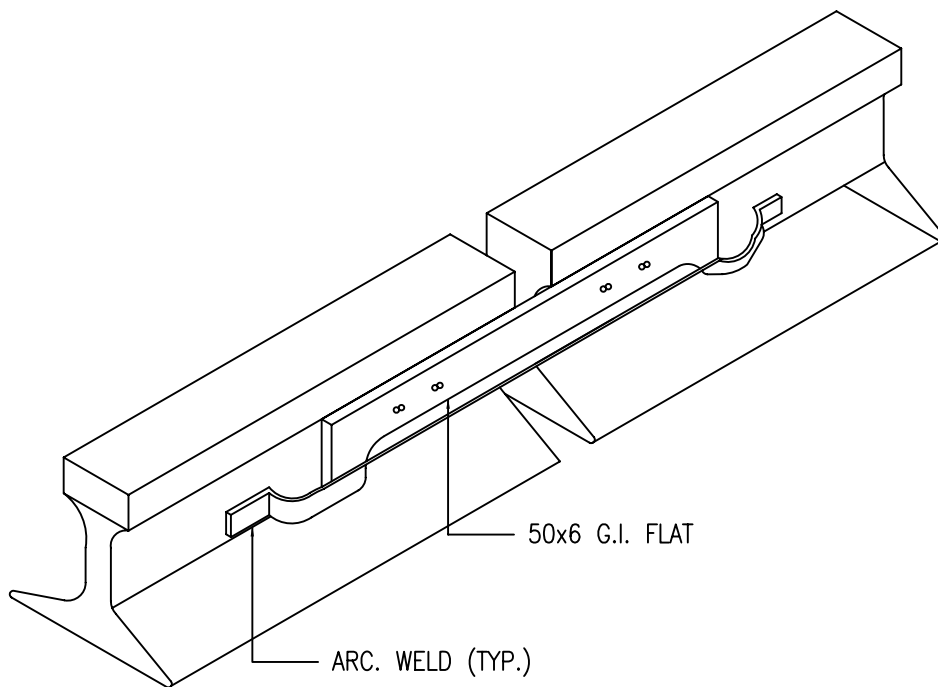
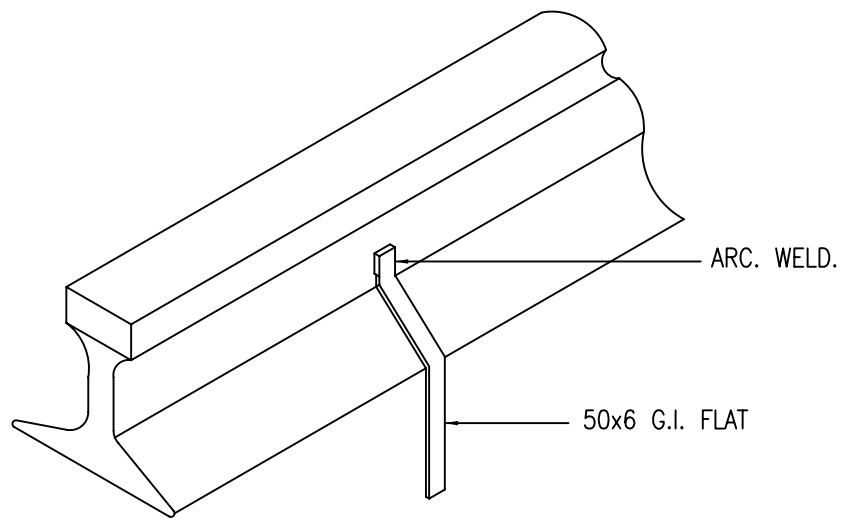
COMPU. DRG. REF.

DRG. No.

TB-4-344-509-013

REV. 00

SHEET No.
17



NOTE:—

EACH SECTION OF RAIL WITHIN SWITCHYARD &
TRANSFORMER YARD SHALL BE EARTHED AT BOTH ENDS.



EQUIPMENT EARTHING DETAILS

RAIL BONDING

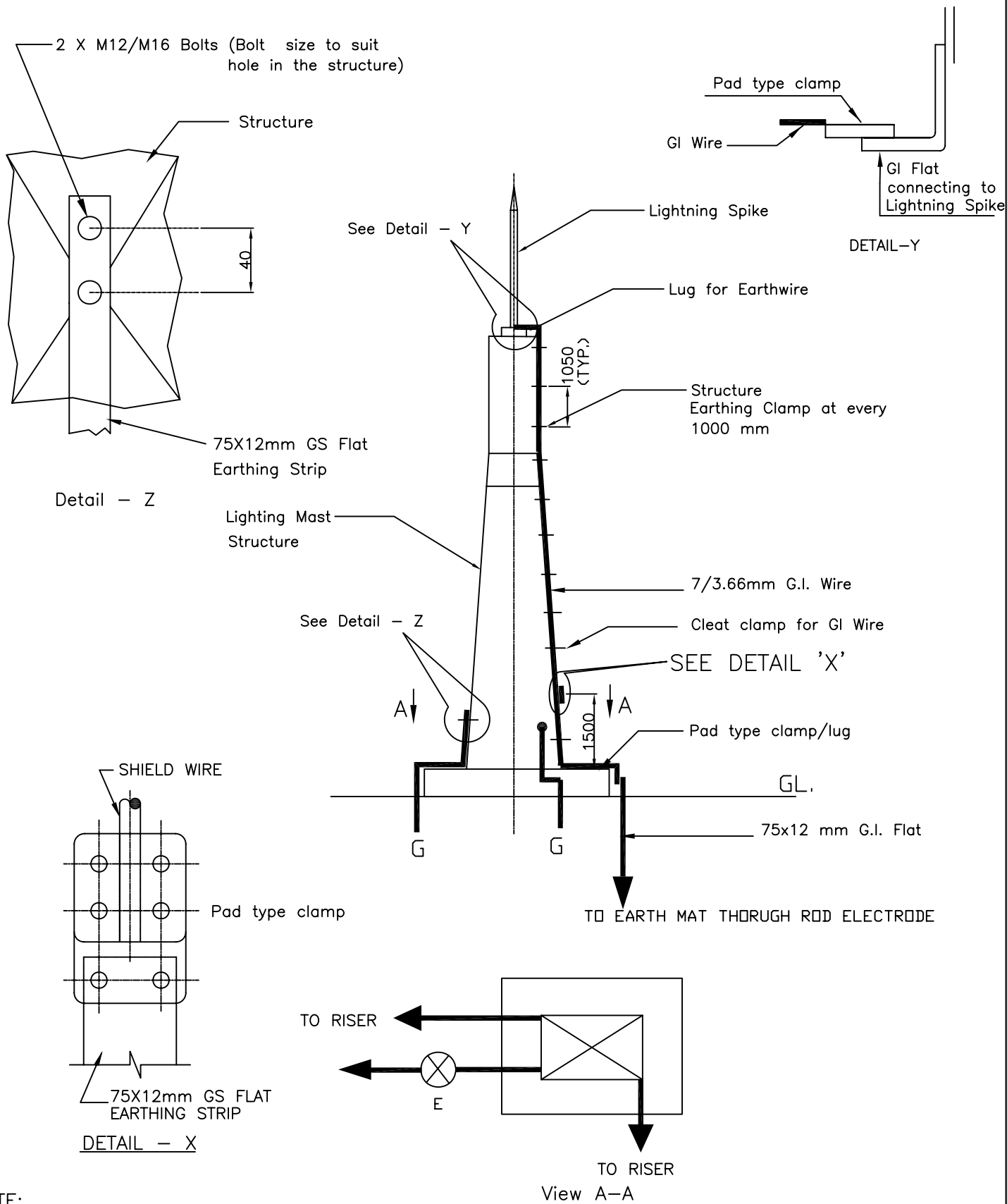
COMPU. DRG. REF.

DRG. NO.

TB-4-344-509-013

REV. 00

SHEET No.
18



NOTE:

1. NO. OF ROD ELECTRODE : 1 NO.
2. NO. OF RISERS : 3 NO.



EQUIPMENT EARTHING DETAILS

Lightning Mast

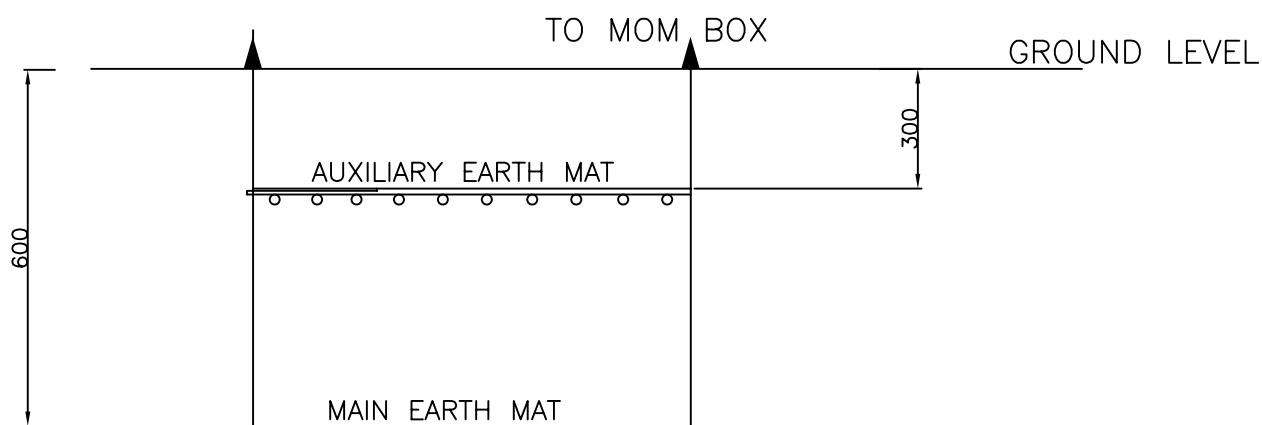
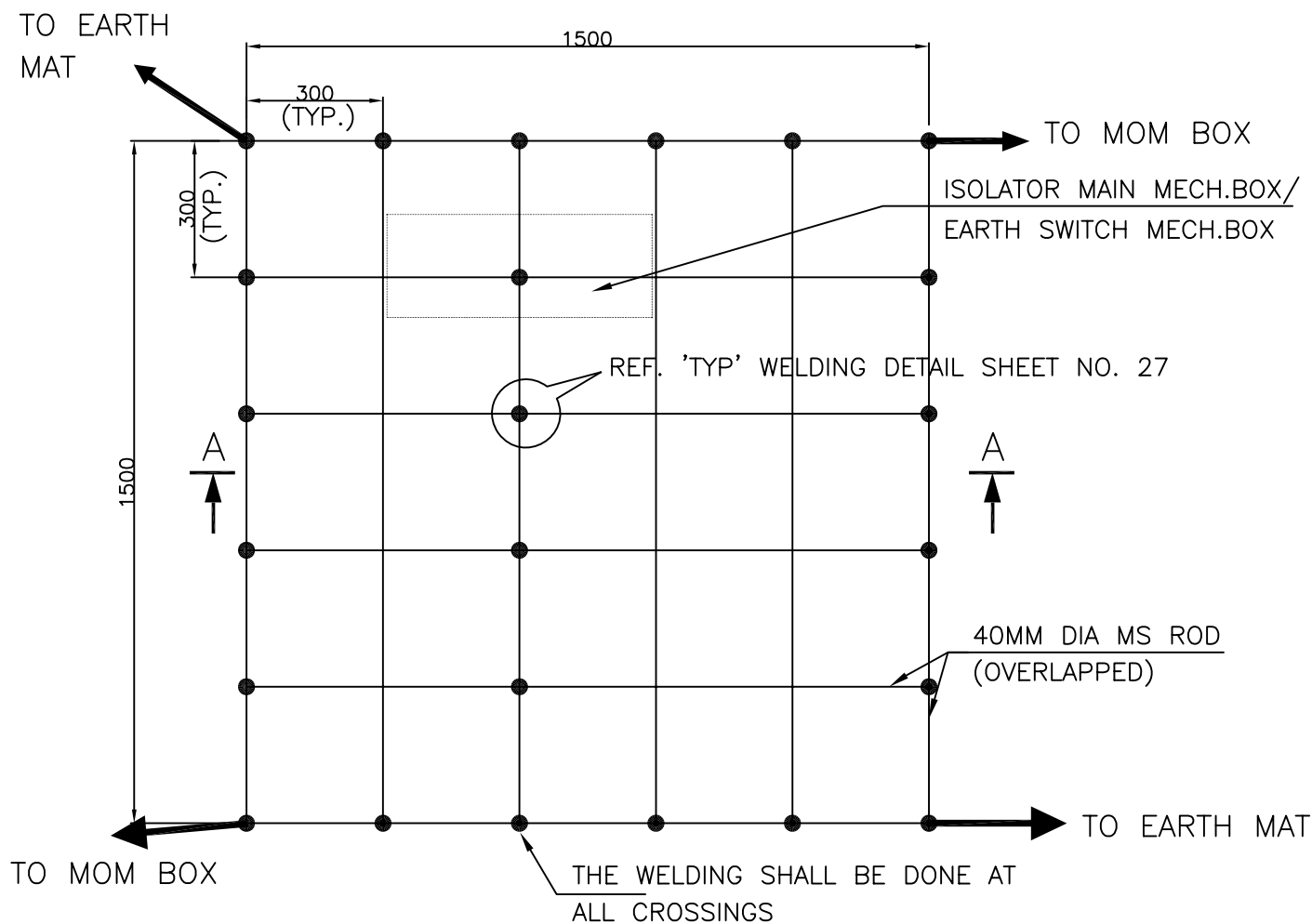
COMPU. DRG. REF.

DRG.NO.

TB-4-344-509-013

REV. 00

SHEET No.
19



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.



EQUIPMENT EARTHING DETAILS

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

COMPU. DRG. REF.

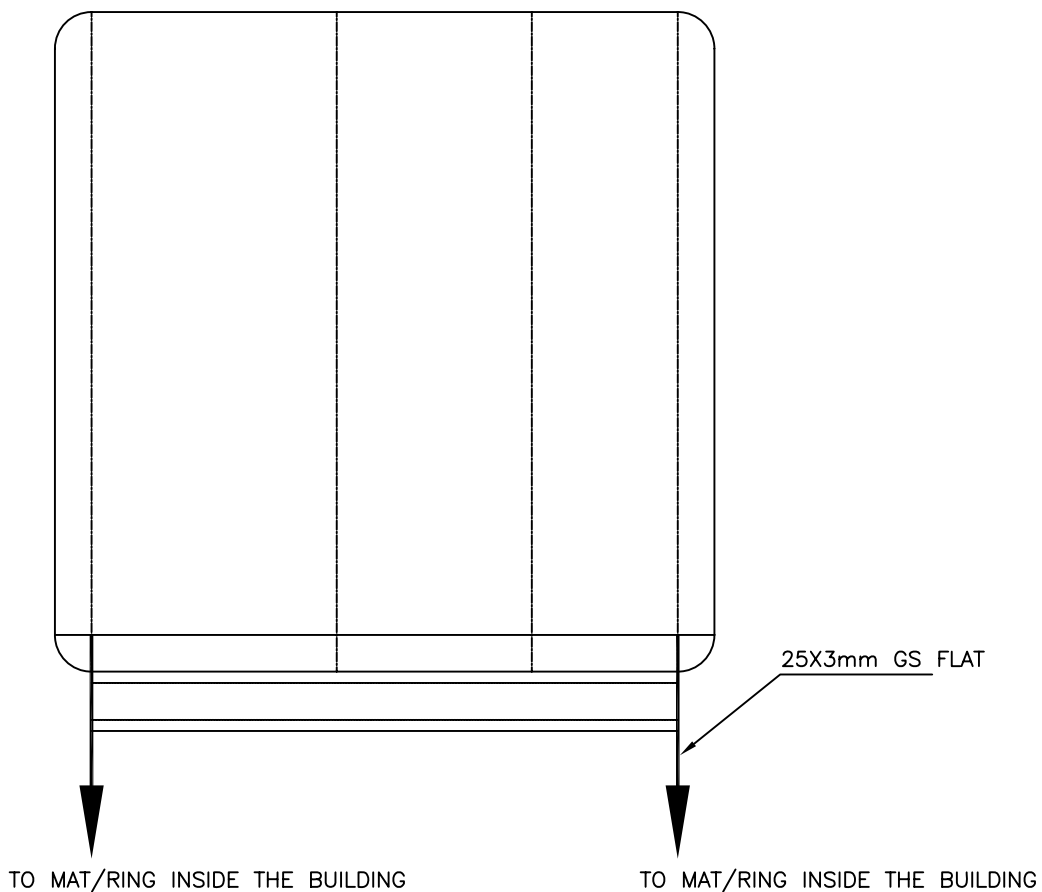
Report No.

TB-4-344-509-013

REV. 00

SHEET No.

20



EQUIPMENT EARTHING DETAILS

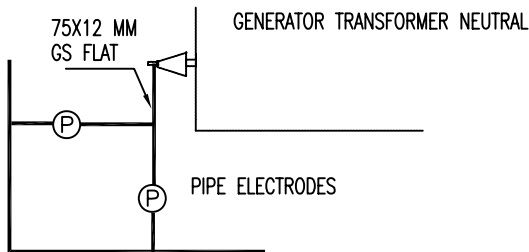
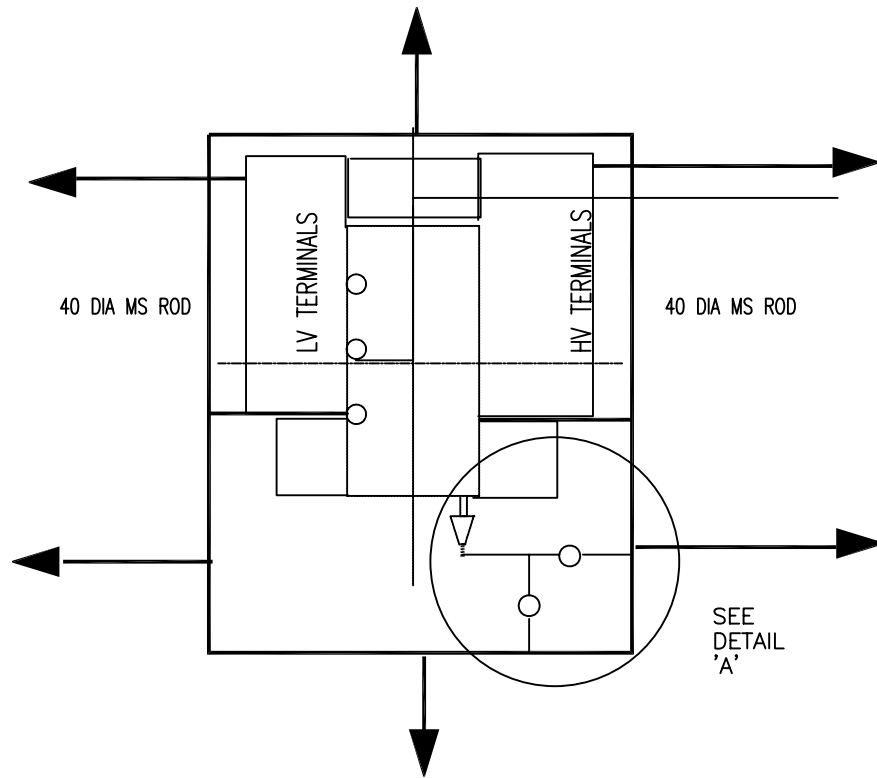
SWITCHGEAR / MCC / CONTROL AND RELAY BOARD /ACDCDB/LDB
PANELS MOUNTED INSIDE CONTROL ROOM

DRG. No.

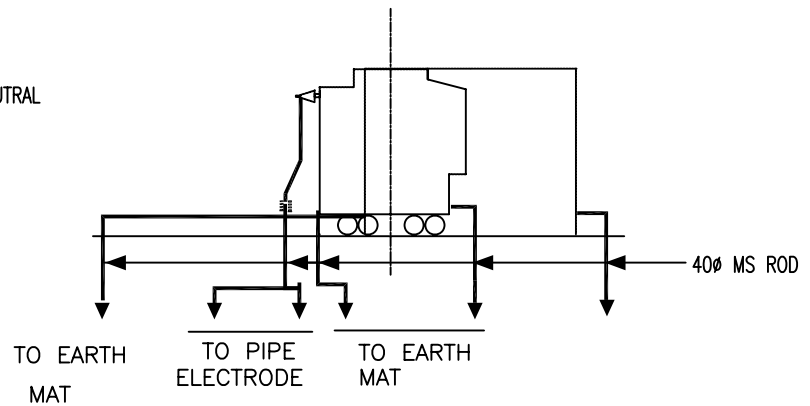
TB-4-344-509-013

REV. 00

SHEET No.
21



DETAIL A



No. OF RISERS FOR OUTDOOR AUX TRANSFORMER = 6 Nos.
 No. OF PIPE ELECTRODES WITH TEST PIT = 2 Nos.



EQUIPMENT EARTHING DETAILS

Aux TRANSFORMER

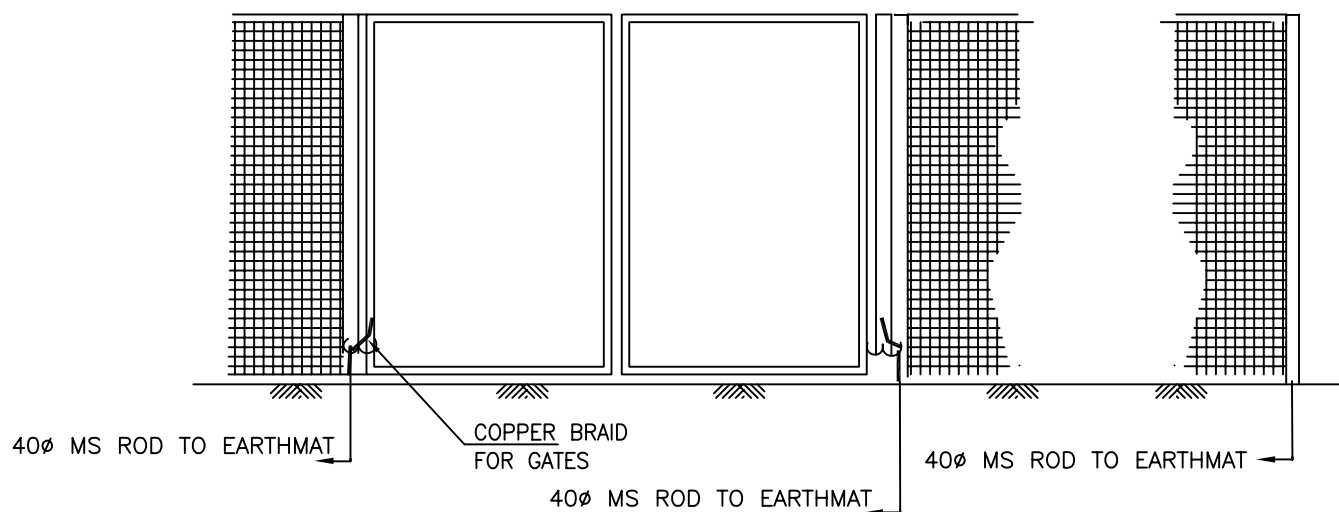
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REV. 00

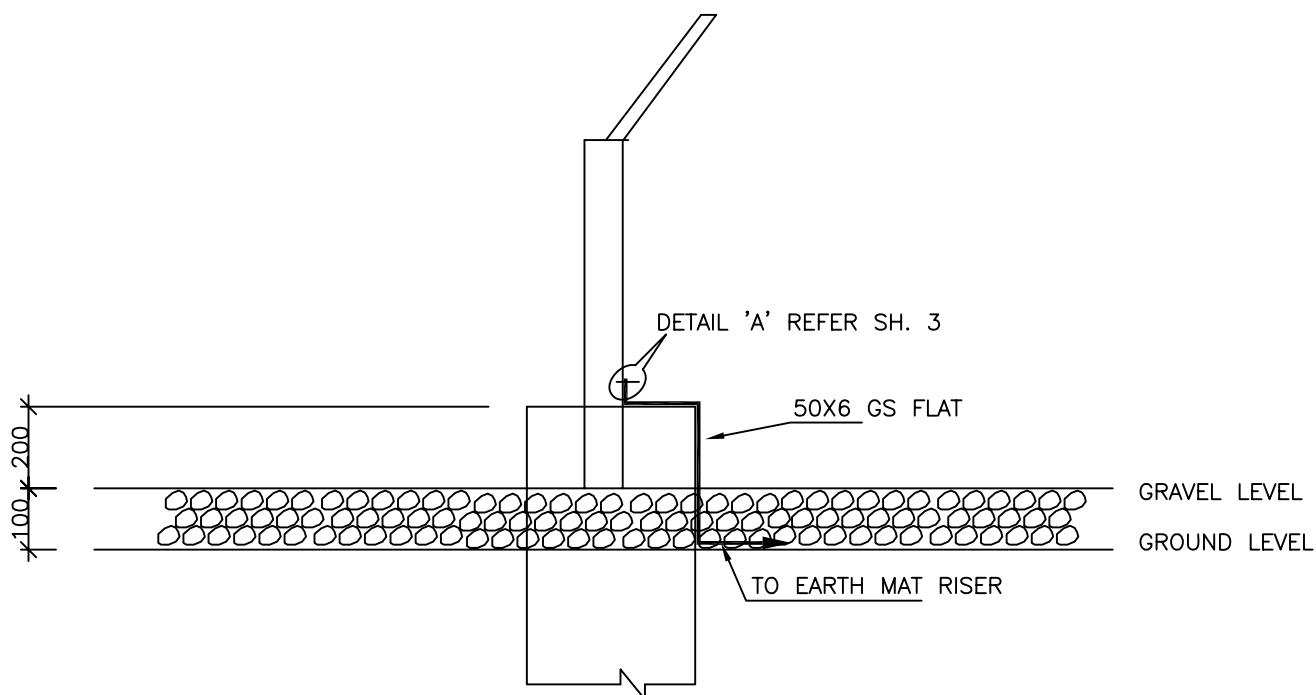
SHEET No.
22

FENCE GATE

FENCE GROUNDING



FENCE EARTHING



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



EQUIPMENT EARTHING DETAILS

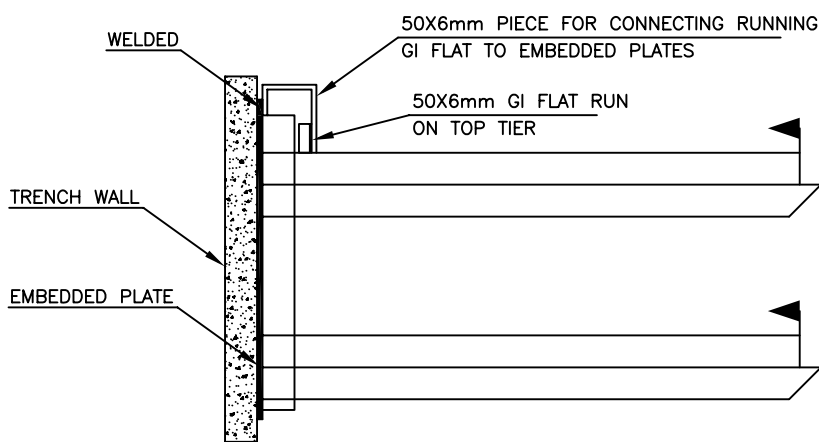
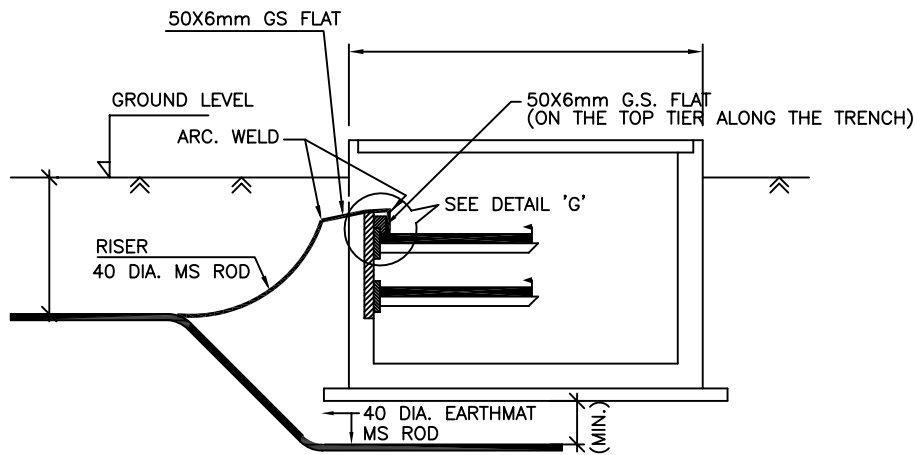
FENCE POST

DRG. No.

TB-4-344-509-013

REV. 00

SHEET No.
23



DETAIL 'G'

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

NOTE:

1. ALL TRENCHES SHALL BE EARTHED AT AN INTERVAL OF 30M ALONG THE LENGTH OF TRENCH & FREE ENDS.
2. THE EARTH STRIP (50X6mm G.S. FLAT) SHALL BE WELDED TO EMBEDDED PLATE AT EVERY 3M INTERVAL.
3. WHERE THE CABLE RACKS ARE PROVIDED ON BOTH SIDES OF THE TRENCH, BOTH SIDES SHALL BE EARTHED AS PER ABOVE.
4. CABLE AND CABLE TRAYS EARTHING WILL BE DONE AS PER SPECIFICATION.



EQUIPMENT EARTHING DETAILS CABLE TRENCH

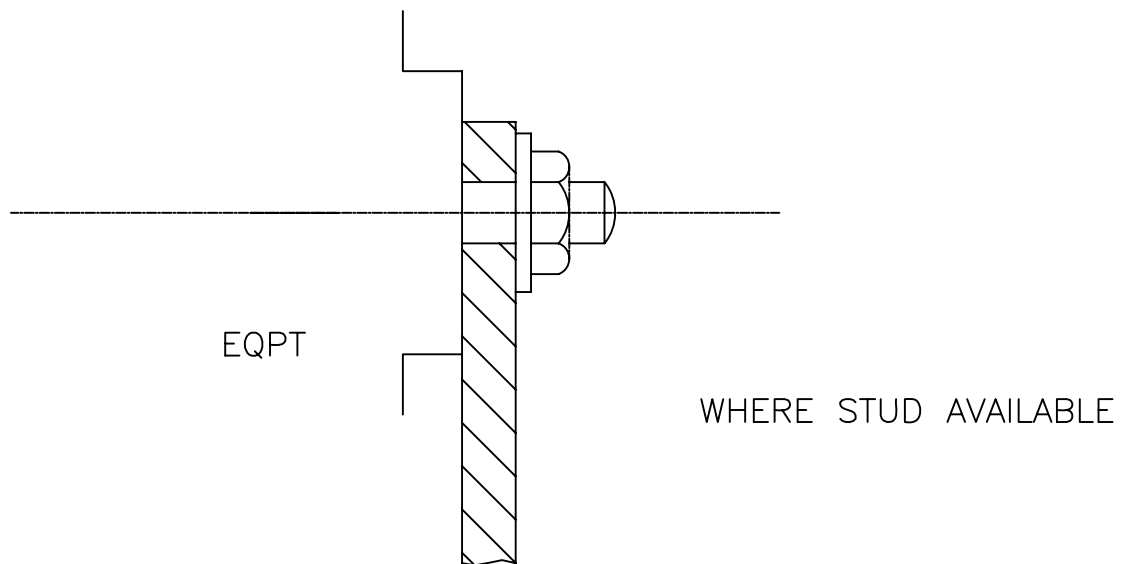
COMPU. DRG. REF.

DRG. NO.

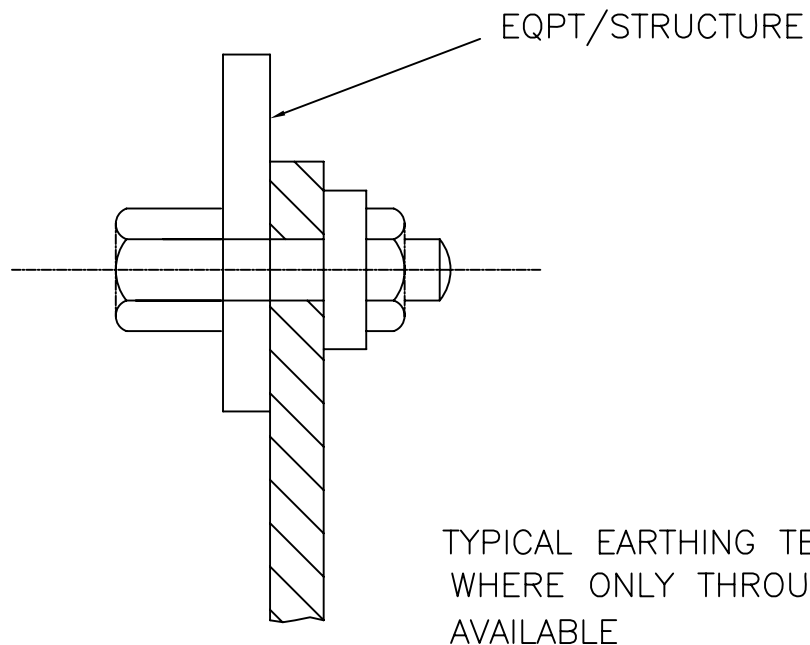
TB-4-344-509-013

REV. 00

SHEET
24



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.

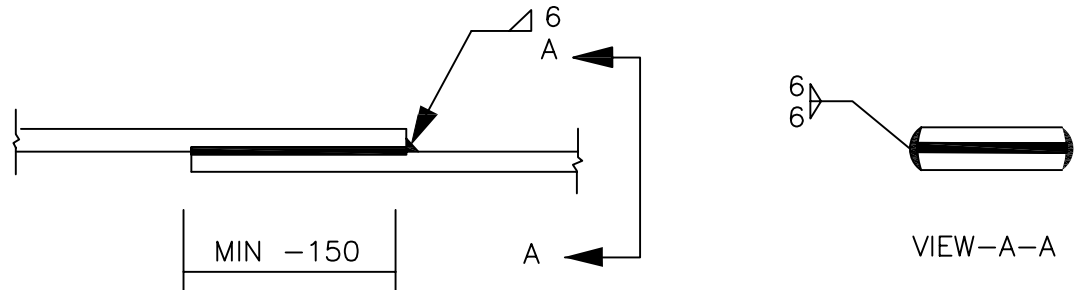
TB-4-344-509-013

REV. 00

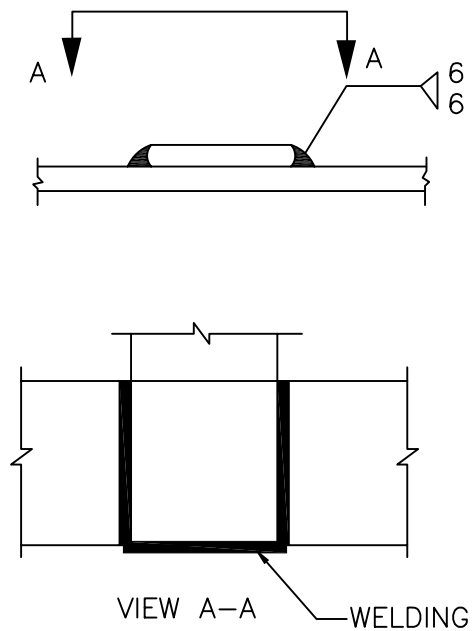
SHEET No.
25

STRIP TO STRIP (50X6mm or 75x12 mm FLAT ONLY)

1. STRAIGHT LAP JOINT/RISER



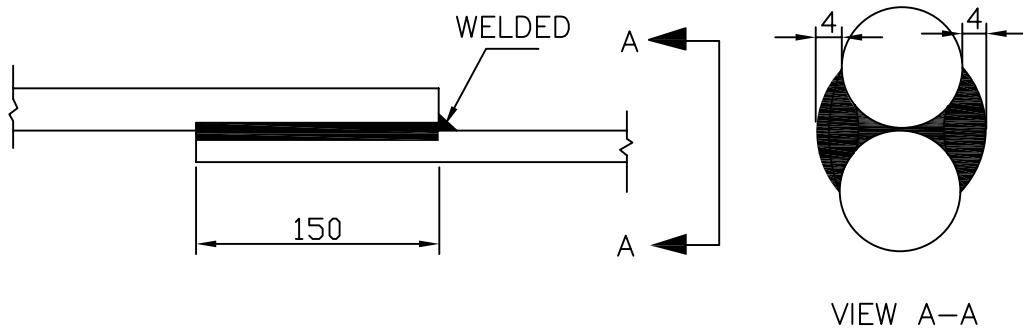
2. CROSS LAP JOINT



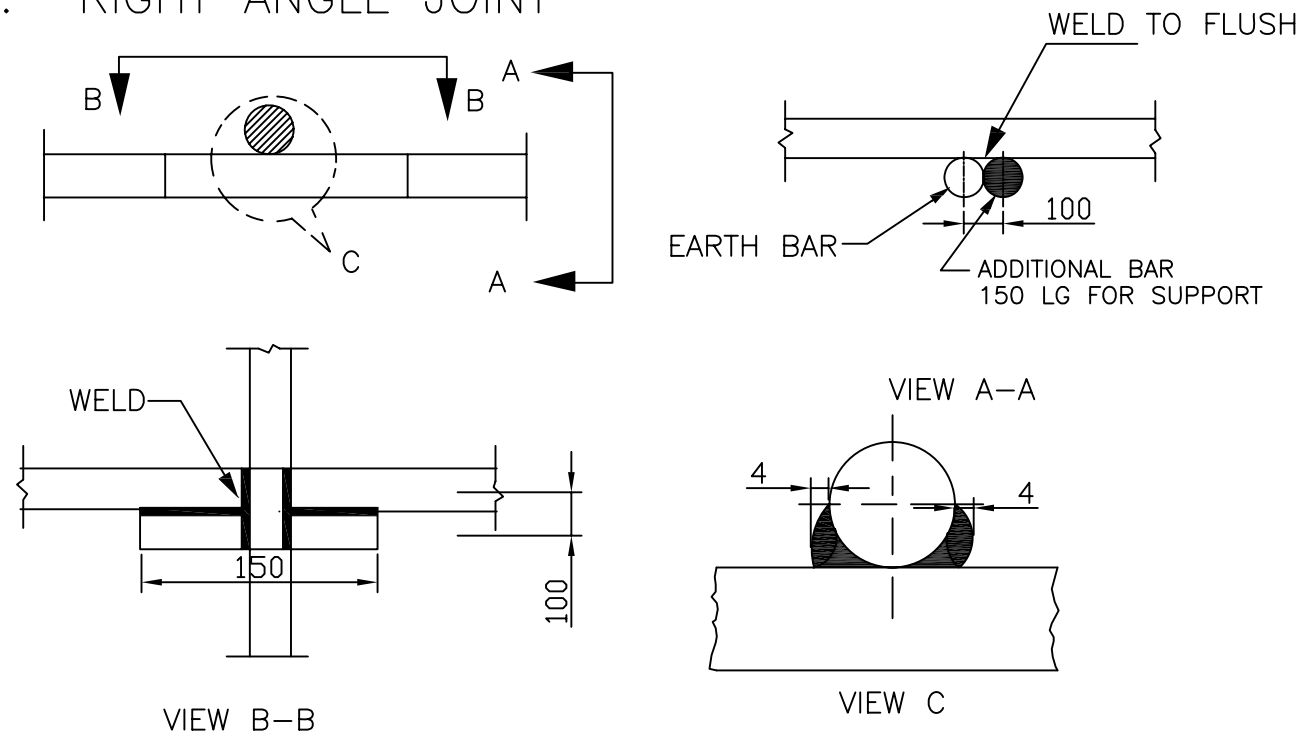
EQUIPMENT EARTHING DETAILS WELDING DETAIL-1

ROD TO ROD

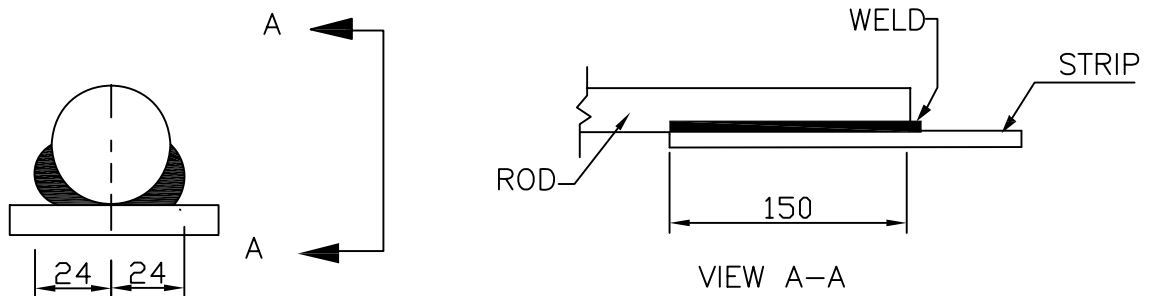
1. STRAIGHT LAP JOINT/RISER



2. RIGHT ANGLE JOINT

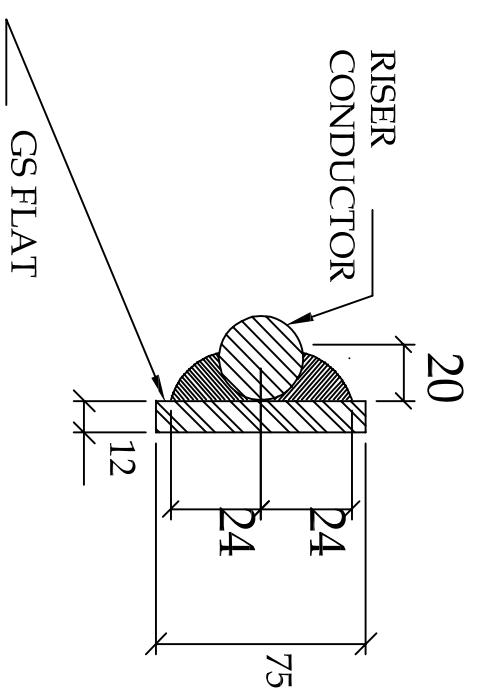
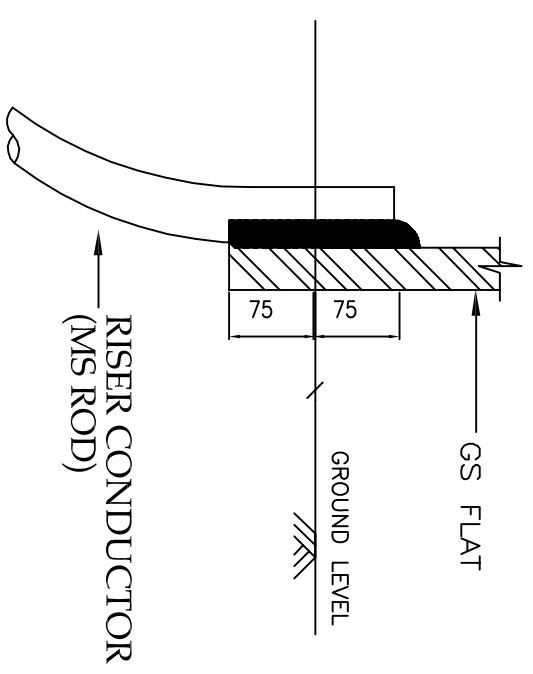
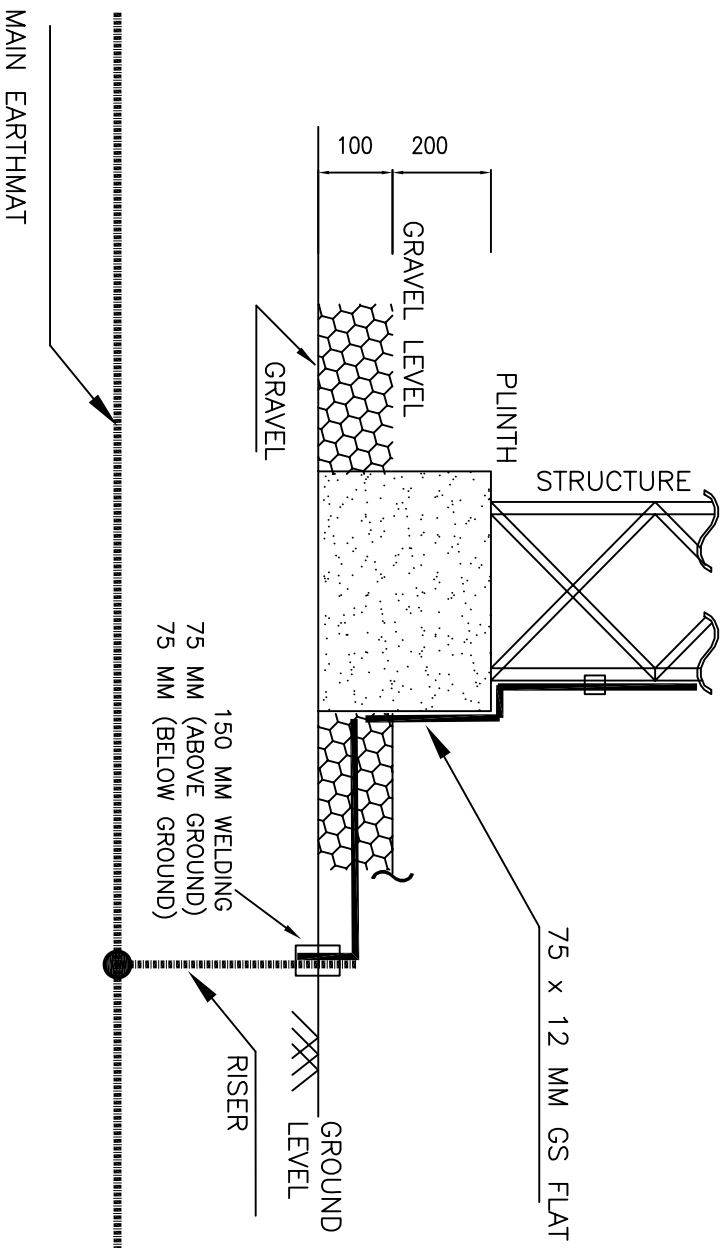


3. ROD TO STRIP



EQUIPMENT EARTHING DETAILS

WELDING DETAIL-2



EQUIPMENT EARTHING DETAILS RISER & FLAT WELDING ARRANGMENT

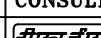
COMPUTERREF.NO.

DRG. No.

TB-4-344-509-013

REV. 00

SHEET No.
28

ADDITIONAL INFORMATION W.D.No. 60012		AGPCENCO 400/220 KV SWITCHYARD- RAYALSEEMA T.P.PLANT STAGE-IV, UNIT#6 (1X80MW)																	
STATUS OF DRAWING = CONTRACT		CONSULTANT: Desein Consulting Engineers																	
DISTRIBUTION PRINTS APGENCO - 2 CB(O&M), RTPP - 3 DESGIN - 5		 नियंत्रण प्रमाणित वारा नई इलेक्ट्रिकल्स लिमिटेड भारत भारी इलेक्ट्रिकल्स लिमिटेड TRANSMISSION PROJECTS DIVISION <table border="1" style="width:100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th>कागज का नाम</th> <th>उप्रा / NAME</th> <th>हस्ताक्षर / SIGN.</th> <th>दिनांक / DATE</th> </tr> </thead> <tbody> <tr> <td>कॉपी</td> <td>MANGU</td> <td>S/-</td> <td>22.06.2012</td> </tr> <tr> <td>कॉपी</td> <td>DOM</td> <td>S/-</td> <td></td> </tr> <tr> <td>कॉपी</td> <td>RS</td> <td>S/-</td> <td></td> </tr> </tbody> </table>		कागज का नाम	उप्रा / NAME	हस्ताक्षर / SIGN.	दिनांक / DATE	कॉपी	MANGU	S/-	22.06.2012	कॉपी	DOM	S/-		कॉपी	RS	S/-	
कागज का नाम	उप्रा / NAME	हस्ताक्षर / SIGN.	दिनांक / DATE																
कॉपी	MANGU	S/-	22.06.2012																
कॉपी	DOM	S/-																	
कॉपी	RS	S/-																	
REV.	DATE	ALTERED BY DESIGNED BY APPROVED RS	किया गया TBM टीबीएम ➡ अनुपात / SCALE 1 : 220 ऑर्डर को																
ZONE	REVISD AS PER DESIGN COMMENTS VIDE THEIR LETTER REF. NO. 448 DATED: 18.07.2012.		पृष्ठ/REVISION NO. DB-1-544-316-221 01																
EARTHMAT LAYOUT PLAN 220 KV SWITCHYARD EXTENSION			पृष्ठ क्र./ SHEET No. 01 अंतिम पृष्ठ/NEXT SHEET _____																

507-605-44C-0-TB

DRAWING No.

7

6

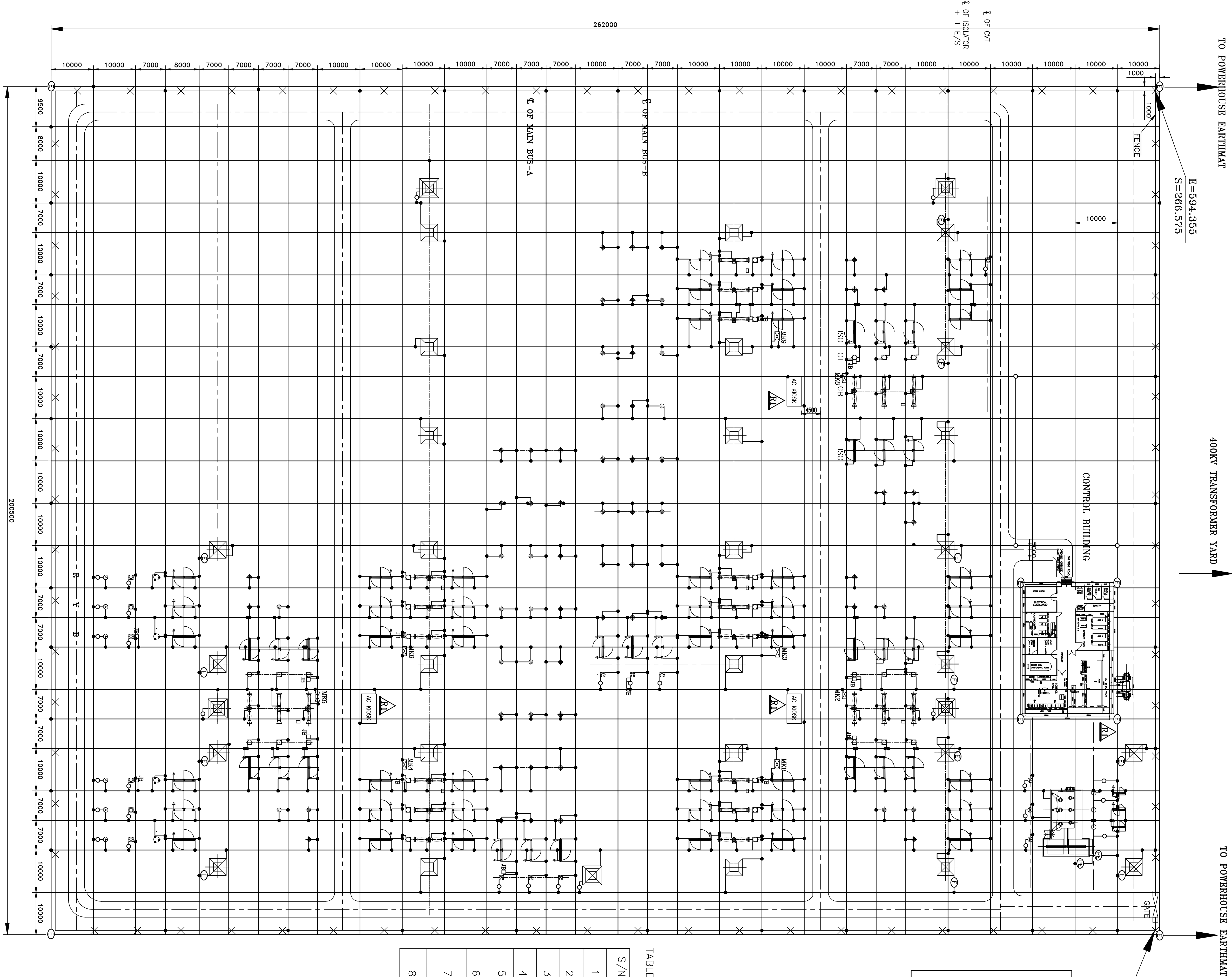
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TO POWERHOUSE EARTHMAT

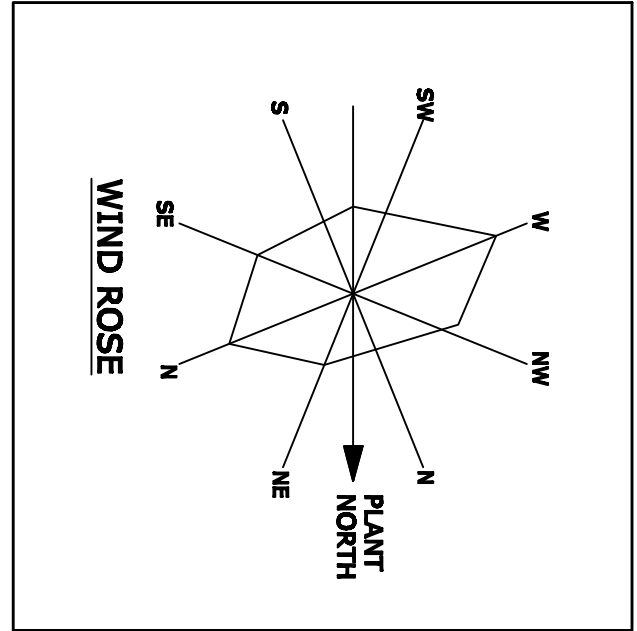
400KV TRANSFORMER YARD

TO POWERHOUSE EARTHMAT

E=594.365
S=266.375

E=594.365
S=68.075

ℓ OF CONDUCTOR
ℓ OF RISER
ℓ OF P.T. & IS



EARTHING NOTES:-

- 1) ALL EQUIPMENTS AND STRUCTURES SHALL, IN GENERAL, BE GROUNDED AT TWO POINTS AT OPPOSITE CORNERS WHETHER SHOWN IN DRAWING OR NOT.
- 2) ALL EARTHING DETAILS AS PER TYPICAL DETAIL & STRUCTURE EARTHING DRAWING NO. TB-4-344-509-013.
- 3) GROUNDING CONDUCTORS IN OUTDOOR AREAS SHALL BE BURIED 600MM BELOW FINISHED GROUND LEVEL.
- 4) WHEREVER A GROUNDING CONDUCTOR CROSSES ROADS, CABLE TRENCHES, UNDERGROUND SERVICE DUCTS, PIPE TUNNELS, RAILWAY TRACKS, OR RECOVERY TANK, TRANSFORMER SHAFT PIT ETC. SHALL BE LAID AT LEAST 300mm BELOW THEM, BUT NOT LESS THAN 600MM BELOW FILL OR SHALL BE REBUTED ROUND THE EQUIPMENT/STRUCTURE FOUNDATIONS.
- 5) GROUNDING CONDUCTOR AROUND THE BUILDING SHALL BE BURIED IN GROUND AT A MINIMUM DISTANCE OF 200mm FROM THE OUTER BOUNDARY OF THE BUILDING.
- 6) THE GROUNDING CONDUCTOR SHALL BE EXTENDED MINIMUM 1000MM BEYOND SWITCHYARD FENCE AREA.
- 7) CONNECTION WITH EQUIPMENT EARTHING PAD SHALL BE BOLTED TYPE. CONNECTION BETWEEN EQUIPMENT GROUNDING LEADS AND MAIN GROUND CONDUCTORS SHALL BE WELDED TYPE. FOR RUST PROTECTION, THE WELDS SHALL BE CLEANED WITH WIRE BRUSH, TREATED WITH RED PRIMER, TREATED WITH AFTERWARDS THICKLY COATED WITH BITUMEN COMPOUND TO PREVENT CORROSION.
- 8) ALL GROUND CONNECTIONS SHALL BE MADE BY ELECTRIC ARC WELDING. ALL WELDED JOINTS SHALL BE ALLOWED TO COOL DOWN GRADUALLY TO ATMOSPHERIC TEMPERATURE BEFORE COOL DOWN BEFORE PUTTING ANY LOAD ON THEM. ARTIFICIAL COOLING SHALL NOT BE ALLOWED.
- 9) BITUMEN COMPOUND TO BE APPLIED ON ALL WELDED JOINTS.
- 10) BENDING OF LARGE DIAMETER RSD/THICK CONDUCTOR SHALL BE DONE PREFERABLY BY GAS HEATING OR ANY OTHER APPROVED METHOD.
- 11) 50x6MM STEEL GI FLAT SHALL BE USED FOR EARTHING OF CABLE TRENCHES. ALL TRENCHES SHALL BE EARTHED AT AN INTERVAL OF 30M ALONG THE LENGTH OF THE TRENCH. RISERS SHALL BE PROVIDED FOR TRENCH EARTHING AT EVERY 30 M.
- 12) MAXIMUM SPACING OF HORIZONTAL GRID CONDUCTOR SHALL BE 10MTR. IN BOTH DIRECTION.
- 13) SWITCHYARD EARTHMAT GROUNDING CONDUCTOR SHALL BE CONNECTED TO TRANSFORMER YARD EARTHMAT GRID AT TWO POINTS.
- 14) SUITABLE CLAMP SHALL BE USED FOR CONNECTION OF SHIELD WIRE AND GS FLAT FOR PEAK TOWER AND SAME CLAMP SHALL WORK AS A TEST LINK FOR MEASUREMENT OF SHIELD WIRE RESISTANCE AND CONTINUITY.
- 15) EARTHING LAYOUT SHOWN IN THE DRAWING IS DIAGRAMMATIC ONLY. THE CONDUCTOR SPACING CAN BE CHANGED SLIGHTLY TO SUIT THE SITE CONDITIONS.
- 16) ALL STEEL COLUMNS, METALLIC STAIRS ETC. SHALL BE CONNECTED TO THE NEAREST GROUNDING CONDUCTOR BY GROUNDING LEADS. ELECTRICAL CONTINUITY SHALL BE ENSURED BY BONDING THE DIFFERENT SECTIONS OF HAND RAILS AND METALLIC STAIRS.
- 17) A SEPARATE GROUNDING CONDUCTOR SHALL BE PROVIDED FOR GROUNDING LIGHTING FIXTURES, RECEPTACLES, SWITCHES, JUNCTION BOXES, LIGHTING CONDUITS, ETC.
- 18) WHEREVER GROUNDING CONDUCTOR CROSSES OR RUNS ALONG METALLIC STRUCTURES SUCH AS GAS/WATER/STEAM CONDUIT/PIPES ETC. AND STEEL REINFORCEMENT OF CONCRETE, IT SHALL BE BONDED TO THE SAME.
- 19) EVERY ALTERNATE POST OF FENCE SHALL BE CONNECTED TO EARTH MAT THROUGH RISERS.
- 20) SURGE ARRESTERS DIRECTED IN 400KV TRANSFORMER YARD SHALL BE CONNECTED TO TRANSFORMER YARD EARTHMAT GRID.
- 21) EARTHING CONDUCTOR SHALL BE COVERED ON ALL SIDES BY A LAYER OF GOOD SOIL, FREE FROM ROCKS, STONES, LOGS AND THEN FILLED UP.
- 22) LOCATION OF ROD ELECTRODES WITH TEST LINK, PIPE ELECTRODES WITH TREATED EARTH PIT & ROD ELECTRODES SIMPLY BURIED ARE SHOWN TENTATIVELY. ELECTRODES FOR TRANSFORMER NEUTRALS SHALL BE LOCATED NEAREST TO RESPECTIVE EQUIPMENT.
- 23) EACH RISER SHALL PROJECT UP TO GRAVEL LEVEL OF SUB STATION.
- 24) WHEREVER THE EARTH CONDUCTOR PASSES THROUGH WALL, IT SHALL TAKEN DIRECTLY THROUGH WALL, WITHOUT INSERTS.
- 25) EARTHMAT SHALL BE LAID PREFERABLY AFTER COMPLETION OF FOUNDATIONS AND BEFORE CASTING OF TRENCHES.
- 26) THE EARTHMAT SHALL BE CONSTRUCTED AFTER THE BURNAL OF ELECTRODE.
- 27) FOR BORING THE ELECTRODES A PIT SHALL BE DUG UP, ELECTRODE LOCATED AND FILLED WITH ALTERNATE LAYER OF SALT AND CHARCOAL.

TABLE 1 : EARTHING DETAILS

S/N	DESCRIPTION	CONDUCTOR
1	EARTHING FOR EQUIPMENT	75X12 MM GI FLAT
2	EARTHING FOR EQUIPMENT STRUCTURE	75X12 MM GI FLAT
3	TOWERS & LM STRUCTURE	75X12 MM GI FLAT
4	CABLE TRENCH MATERIAL	50X6 MM GI FLAT
5	INDOOR PANELS AND BOARDS	25X3 MM GI FLAT
6	OUTDOOR MK, JB, CONTROL CABINET	50X6 MM GI FLAT
7	CONTROL CABINET, OPERATING MECHANISM BOX	50X6 MM GI FLAT
8	RISERS AND EARTHMAT (BELOW GROUND)	40 MM DIA MS ROD

TABLE 2 : BILL OF QUANTITY FOR EARTH ELECTRODES

S/N	DESCRIPTION	EQUIPMENTS	QUANTITY
1	ROD ELECTRODE WITHOUT TEST LINK	LIGHTNING ARRESTERS	15 NOS.
2	ROD ELECTRODE WITHOUT TEST LINK	CAPACITIVE VOLTAGE TRANSFORMER	13 NOS.
3	ROD ELECTRODE WITH TEST LINK	CORNERS OF EARTHMAT	4 NOS.
4	ROD ELECTRODE WITH TEST LINK	PERIPHERY OF CONTROL ROOM	4 NOS.
5	ROD ELECTRODE WITH TEST LINK	TOWER WITH PEAK	12 NOS.
6	PIPE ELECTRODE WITH TEST LINK AND TREATED PIT	TRANSFORMERS	6 NOS.
7	ROD ELECTRODE WITHOUT TEST LINK	LIGHTNING MAST	5 NOS.

LEGEND:-

- EARTHMAT CONDUCTOR SIZE 40MM DIA MS ROD.
- ⊖ ROD ELECTRODES WITH TEST LINK
- ROD ELECTRODES WITHOUT TEST LINK
- ⊖ PE PIPE ELECTRODES WITH TREATED EARTH PIT
- RISER LOCATION (INDICATIVE)
- FENCE

REF. DRAWINGS : -
LAYOUT PLAN OF 400KV SWITCHYARD- TB-0-344-316-403 REV.00
DESIGN CALCULATION FOR EARTHMAT- TB-344-509-406 REV.00
EQUIPMENT EARTHING DRAWING- TB-4-344-509-013 REV.00

ADDITIONAL INFORMATION	80012	APGENCO भारत/परियोजना का नाम NAME OF CUSTOMER/PROJECT 400/220 KV SWITCHYARD- RAYAISBEMA T.P. PLANT STAGE-IV, UNIT#6 (1X600MW)					
STATUS OF DRAWING	CONTRACT	CONSULTANT:	Desein Consulting Engineers				
DISTRIBUTION OF PRINTS	APGENCO - 7 PEM - 1 DESEIN - 5	भारत हेवी इलेक्ट्रिकल्स लिमिटेड भारत भारती परियोजना विभाग BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION डा. रमेश कुमार डि. / NAME डि. / NK डि. / DATE डि. / NK डि. / DATE डि. / NK डि. / DATE डि. / NK डि. / DATE डि. / NK डि. / DATE					

EARTHMAT LAYOUT FOR
400KV SWITCHYARD

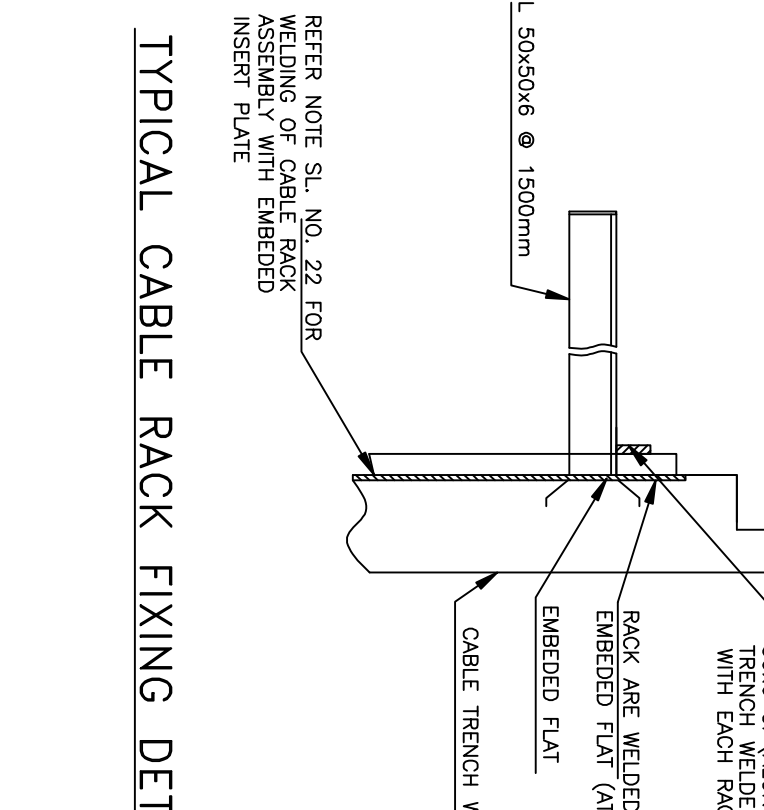
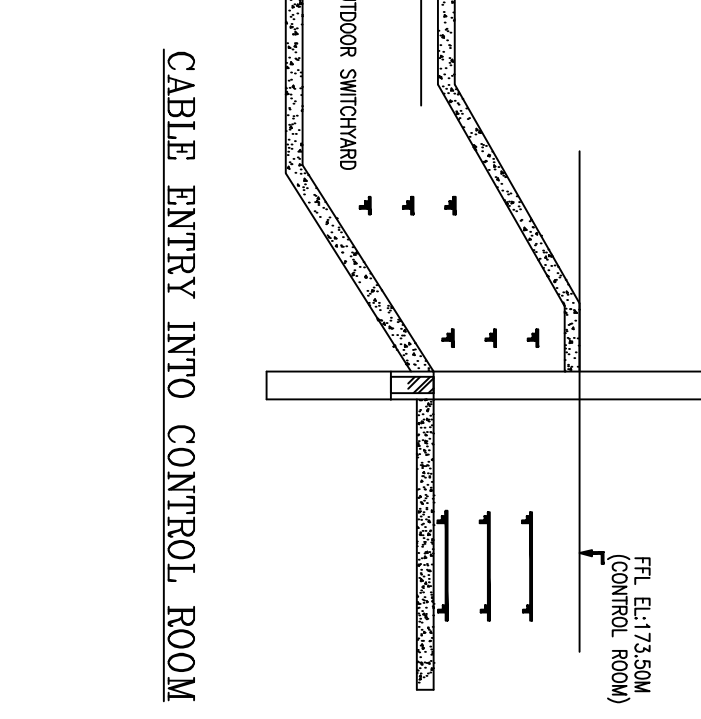
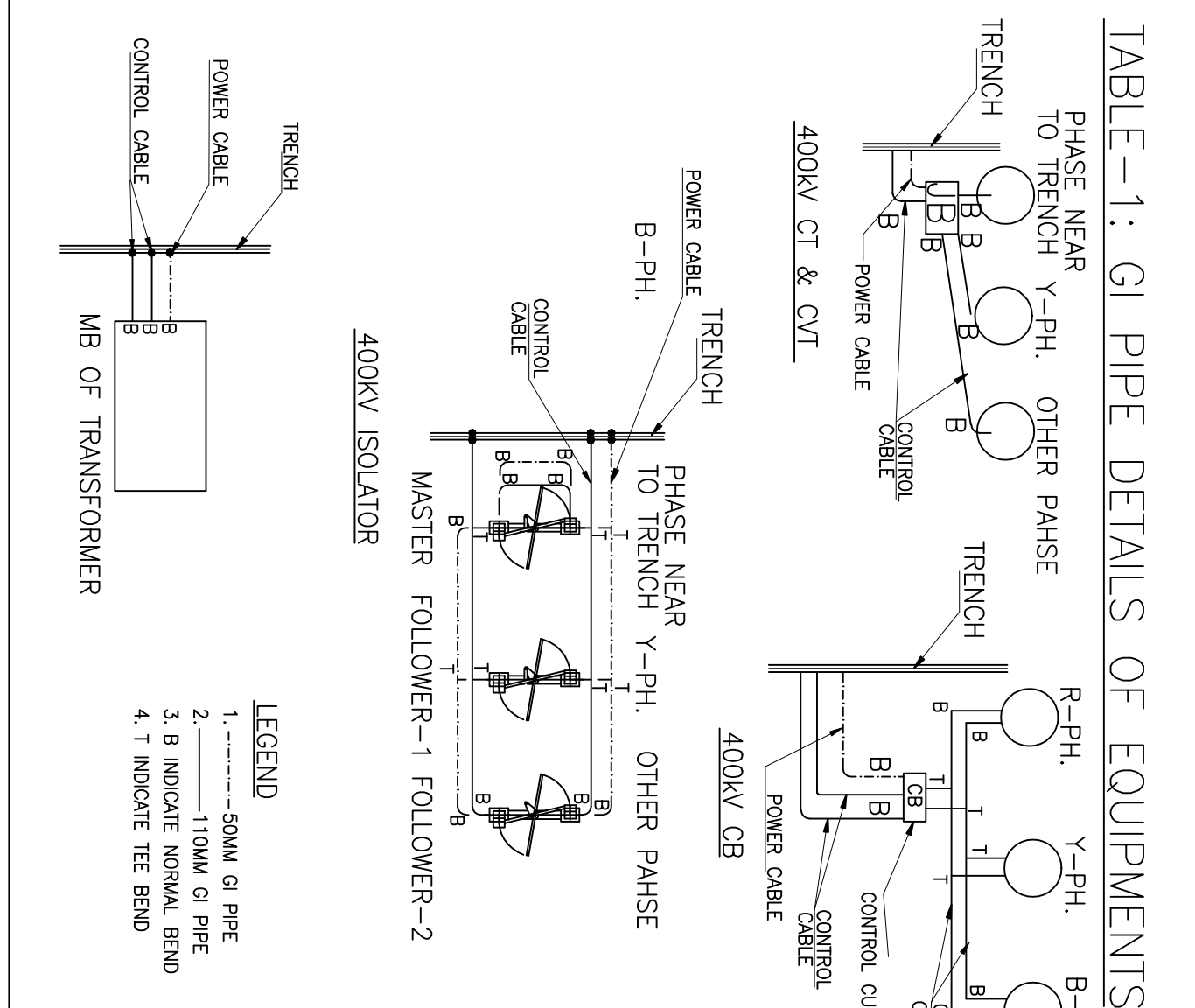
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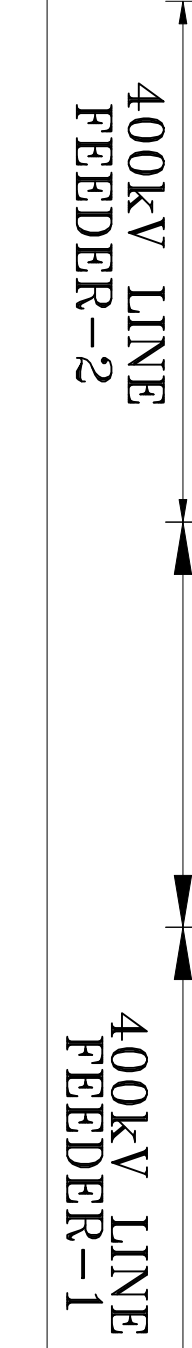
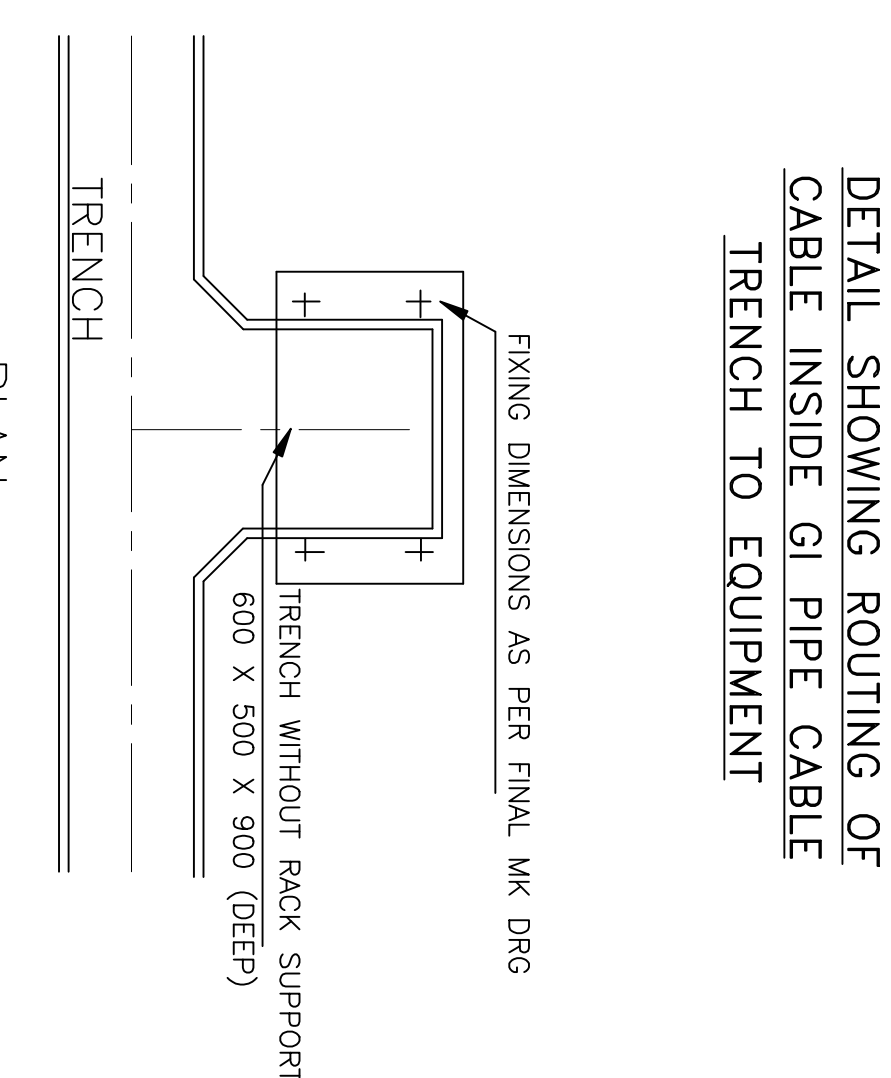
REF. DRG. No.

COMPUTER DRG. PATH NAME :

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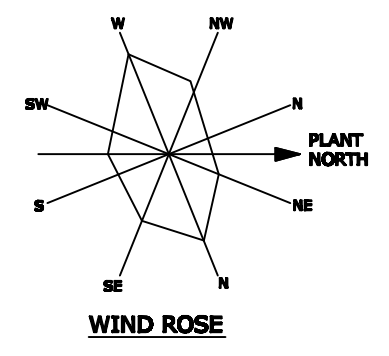


6. 1XVU CABLE SHALL BE PLACED IN MULTILAYER ON LADDER TYPE TRAYS FIXED ON GI CABLE RACK ASSEMBLY.
7. ALUMINUM POWER CABLES SHALL BE LAID IN TOP TIERS AND CONTROL CABLES IN BOTTOM TIERS.
8. FIBER OPTIC CABLE BETWEEN BAY CONTROL ROOM/BOILER AND CONTROL ROOM SHALL BE LAID IN 50mm DIA GI PIPE AND SAME SHALL BE ROUTED THROUGH BOTTOM OF CABLE TRENCH.
9. BURED CABLES FOR LIGHTING PURPOSE SHALL BE AS PER LIGHTING LAYOUT.
10. LOCATION OF CABLE TRENCHES INSIDE CONTROL ROOM SHALL BE SHOWN IN SEPARATE DRAWING NO. TB-1-344-316-418.
11. EARTH CONDUCTOR 50sq G FLAT TO BE WELDED IN VERTICAL ON THE CABLE SUPPORT BEFORE INSTALLATION OF CABLES.
12. CABLES CROSSING ROAD SHALL BE LAID IN CUB CULTIVARY.
13. FOR POWER & CONTROL CABLES, SEPARATE PIPES SHALL BE USED CONSIDERING 60% VOID FOR EACH PIPE I.E., 40% FILLING ORIENTED 60% VOID FOR EACH PIPE.
16. ALL OTHER DETAILS PERTAINING TO CIVIL WORKS SHALL BE REFLECTED IN THE RESPECTIVE CIVIL DRAWINGS.
17. AFTER LAYING THE CABLES THE ENDS OF GI PIPES SHALL BE FULLY SEALED TO PREVENT INGRESS OF WATER INSIDE THE PIPE.
18. THE PURPOSE OF TRENCH LAYOUT DRAWING IS FOR USE AS FOLLOWS:
 - TO BE USED AS CIVIL INPUT FOR CABLE TRENCHES.
 - FOR ERECTION OF CABLE RACKS AT SITE.

[illegible]

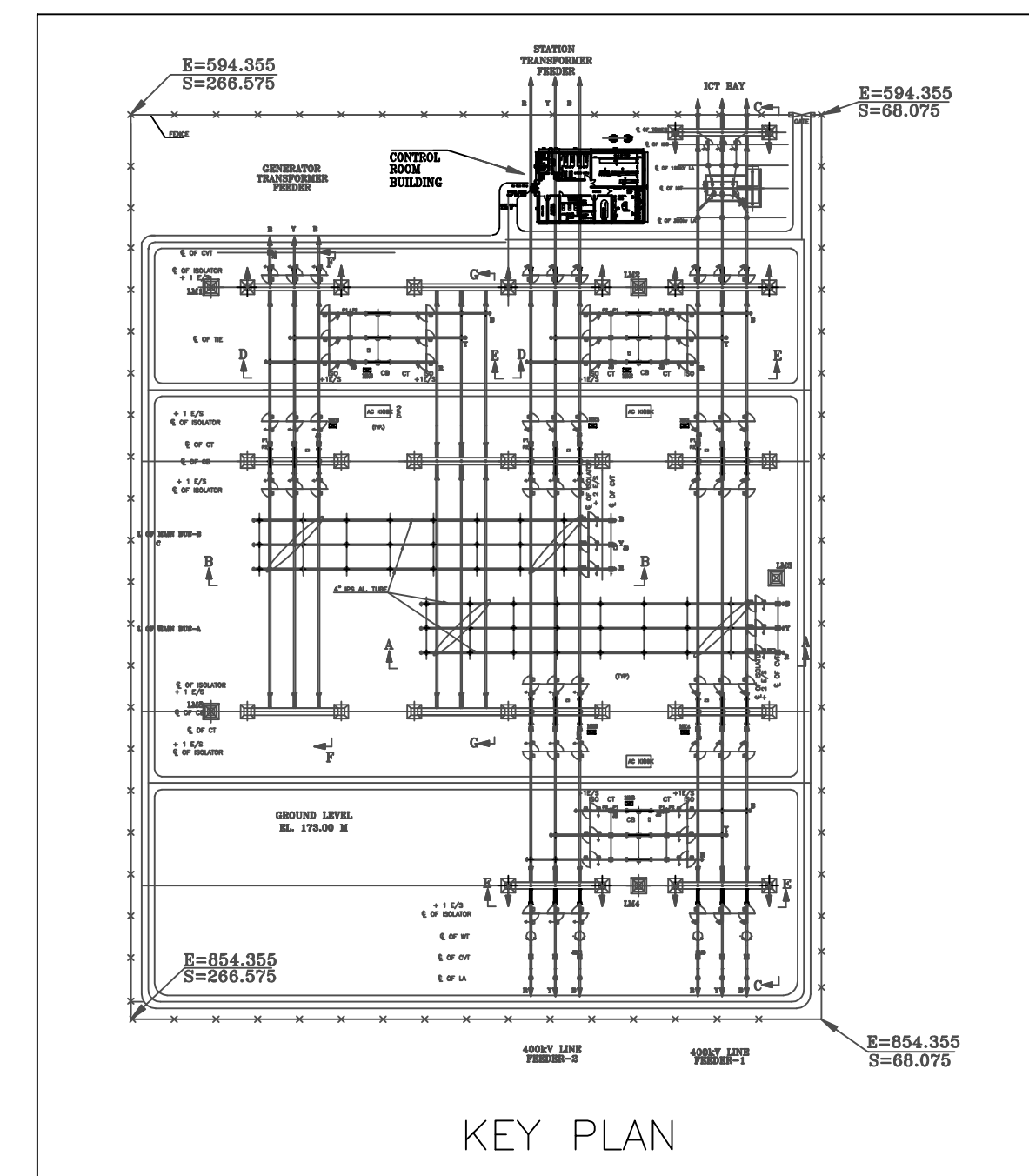
TB-2-344-316-410

DRAWING NO.



CIRCULAR OPENING ϕ 200MM FOR EXHAUST FANS
SHALL BE PROVIDED AT AN ELEVATION OF
2500MM (BOTTOM OF OPENING) FROM FFL.

CIRCULAR OPENING ϕ 450MM FOR VENTILATION FANS SHALL BE PROVIDED AT AN ELEVATION OF 2500MM (BOTTOM OF OPENING) FROM FFL.

$$\begin{array}{r} S=119.325 \\ \hline E=605.155 \end{array}$$


MLDB = MAIN LIGHTING DISTRIBUTION BOARD
ELDB = EMERGENCY LIGHTING DISTRIBUTION BOARD
ACDB = AC DISTRIBUTION BOARD
DCDB = DC DISTRIBUTION BOARD
AHU = AIR HANDLING UNIT
P1,P2,P3= PACKAGE UNITS
PH = PAN HUMIDIFIER
PDB = POWER DISTRIBUTION BOARD
FFL = FINISHED FLOOR LEVEL
FGL = FINISHED GROUND LEVEL
SAP = SUBSTATION AUXILIARY PANEL
TMP = TARIFF METERING PANEL
BCP = BACK UP CONTROL PANEL
ABT = ABT METERING PANEL
CH = CHARGER
HMI = HUMAN MACHINE INTERFACE(MAIN OWS, BACKUP OWS, METERING WORK STATION)
LVS = LARGE VIDEO SCREEN
PFST = PRINTER CUM FILE STORAGE TABLE

NOTE:-
OPGW SYSTEM SHALL BE PROVIDED IN AC KIOSK IN 400KV OUTDOOR SWITCHYARD

SN	DOOR NO.	WIDTH	HEIGHT	
1.	MD	2.2 M	2.4 M	MAIN DOOR
2.	D1	1.2 M	2.4 M	
3.	D2	1.2 M	2.4 M	OPENING OUTSIDE
4.	D3	0.8 M	2.1 M	
5.	D4	2.0 M	2.4 M	
6.	RS	3.0 M	3.5 M	ROLLING SHUTTER

1. ALL DIMENSION ARE IN mm.
2. 400KV SWITCHYARD CONTROL ROOM BUILDING IS A SINGLE STOREY BUILDING WITH TRENCHES BELOW FLOOR LEVEL FOR CABLE LAYING.

ADDITIONAL INFORMATION W.O.No.					ग्राहक/परियोजना का नाम NAME OF CUSTOMER/PROJECT					APGENCO 400/220 KV SWITCHYARD- RAYALSEEMA T.P.STN. STAGE-IV, UNIT#6 (1X600MW)							
STATUS OF DRAWING					CONTRACT					CONSULTANT:- Desein Consulting Engineers							
DISTRIBUTION OF PRINTS APGENCO - 3 CE(O&M), RTPP - 3 DESEIN - 5					 भारत हेवी इलेक्ट्रिकल्स लिमिटेड दूरसंचालन परियोजना विभाग BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION					कगडा DRAWN जैवा CHECKED स्विकृत APPROVED		नाम /NAME RK/NK DKM RS		हस्ता./SIGN. -SD- -SD- -SD-		दि./DATE 14.06.12 14.06.12 14.06.12	
REV.	DATE	ALTERED	RK/NK	Sd/-	विभाग	TBEM	 अनुपात / SCALE कार्ड कोड CARD CODE										
01	28.08.12	CHECKED	DKM	Sd/-	कोड	422											
		APPROVED	RS	Sd/-	कोड												
ZONE		DRAWING REVISED AS PER M/s DESEIN COMMENTS VIDE THEIR LETTER REF. NO. 523 DATED 14.08.12				शीर्षक/TITLE 400KV SWITCHYARD CONTROL ROOM BUILDING LAYOUT				ड्राइंग.क./DRAWING NO. TB-1-344-316-410				पुनः/REV. 03			
										पृष्ठ क्र./SHEET No. 1		उगला पृष्ठ/NEXT SHEET 2					

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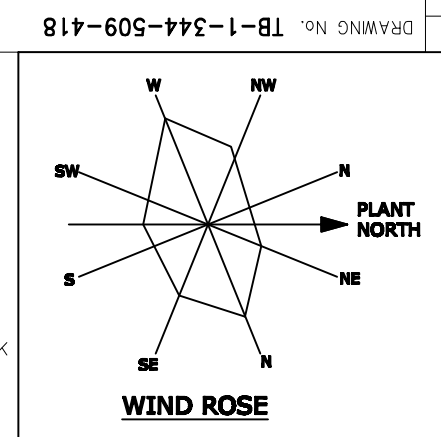
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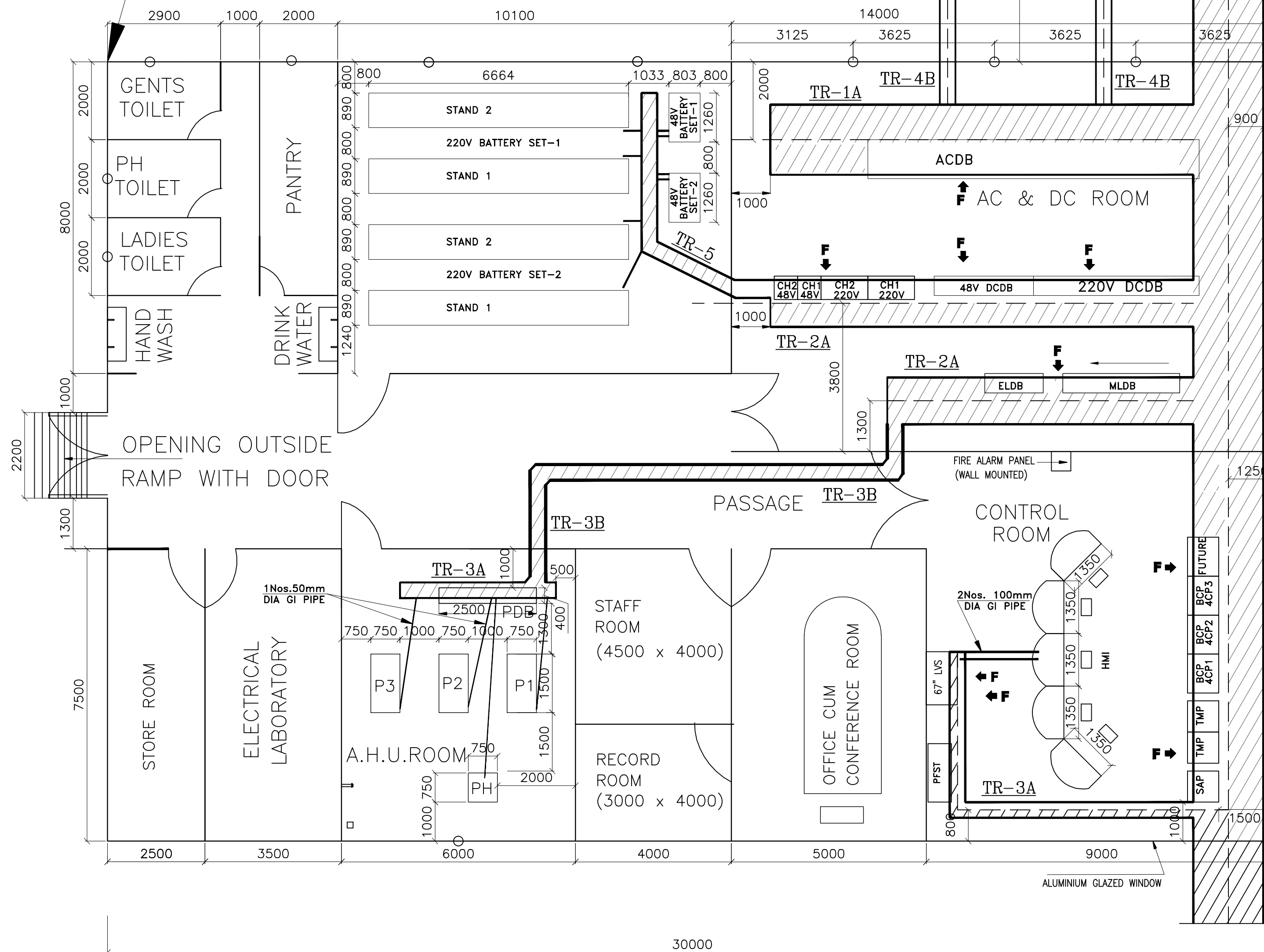
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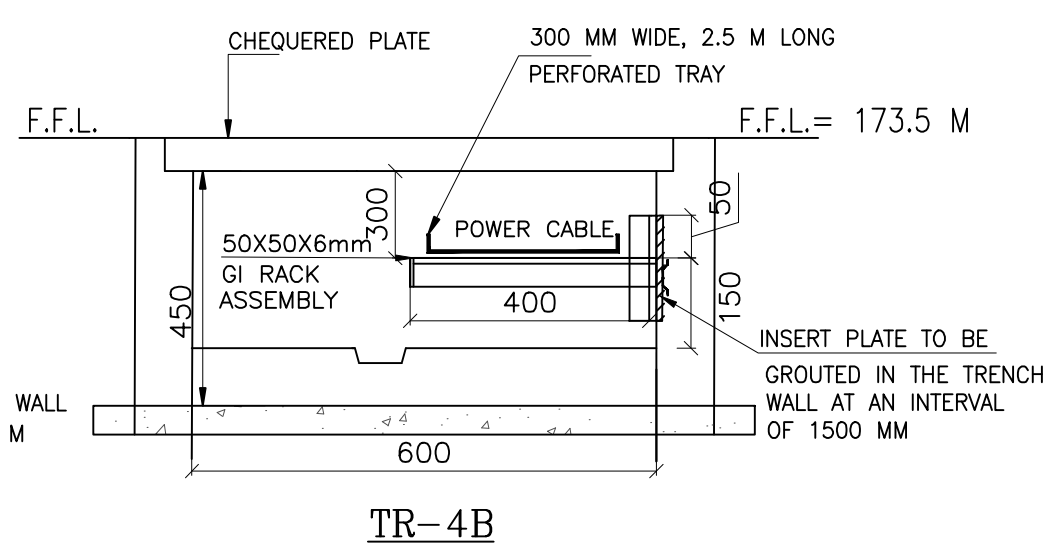
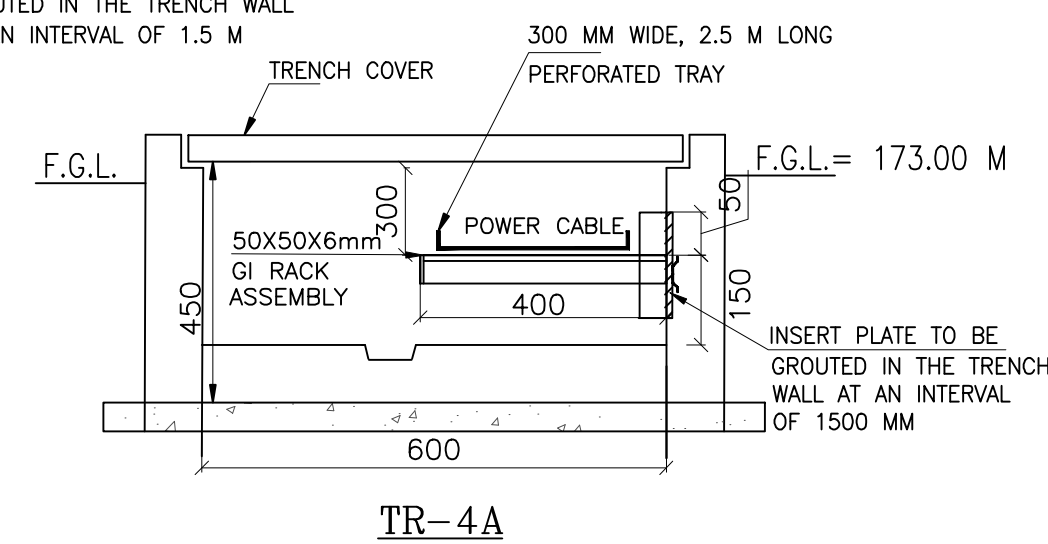
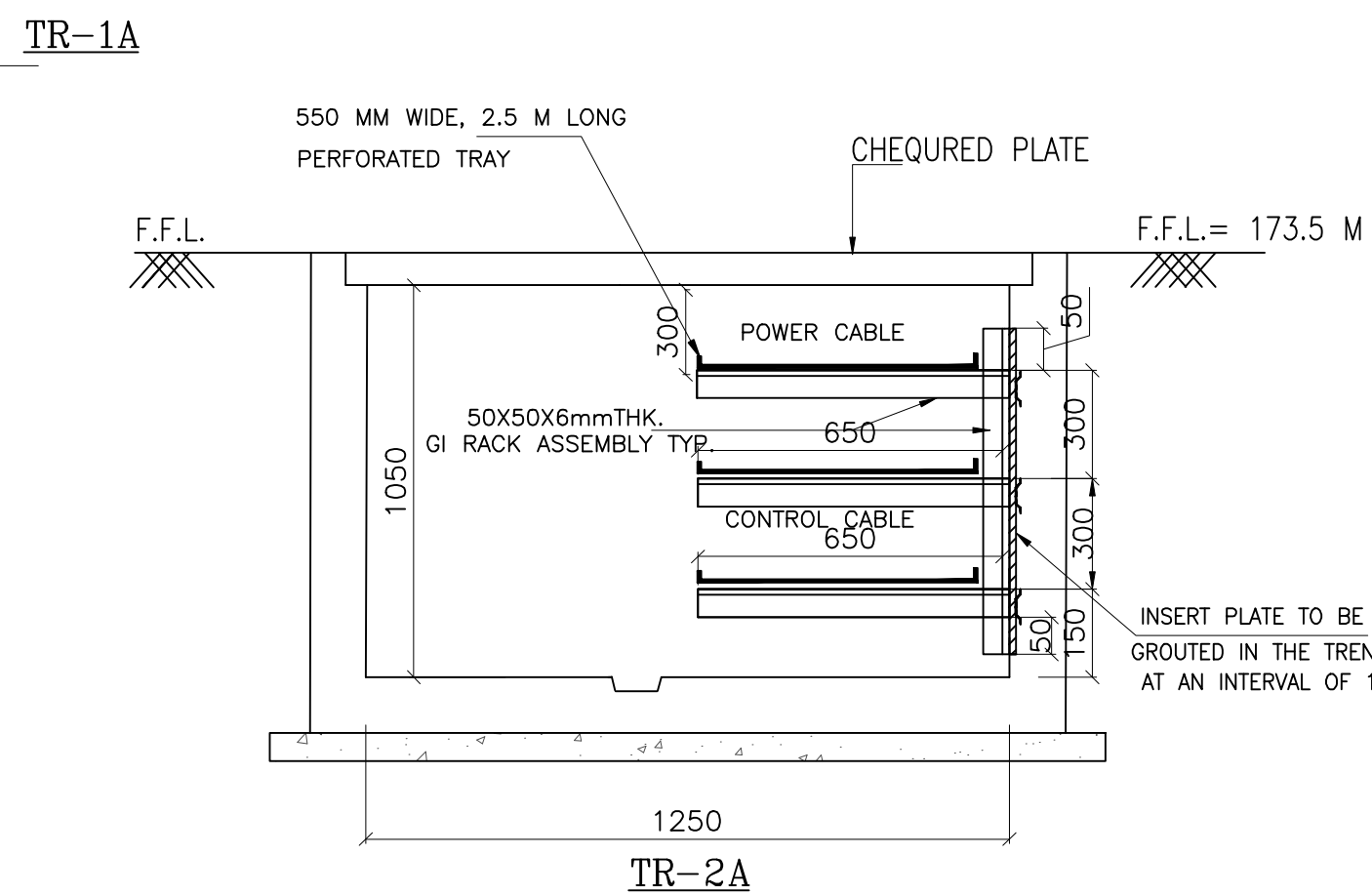
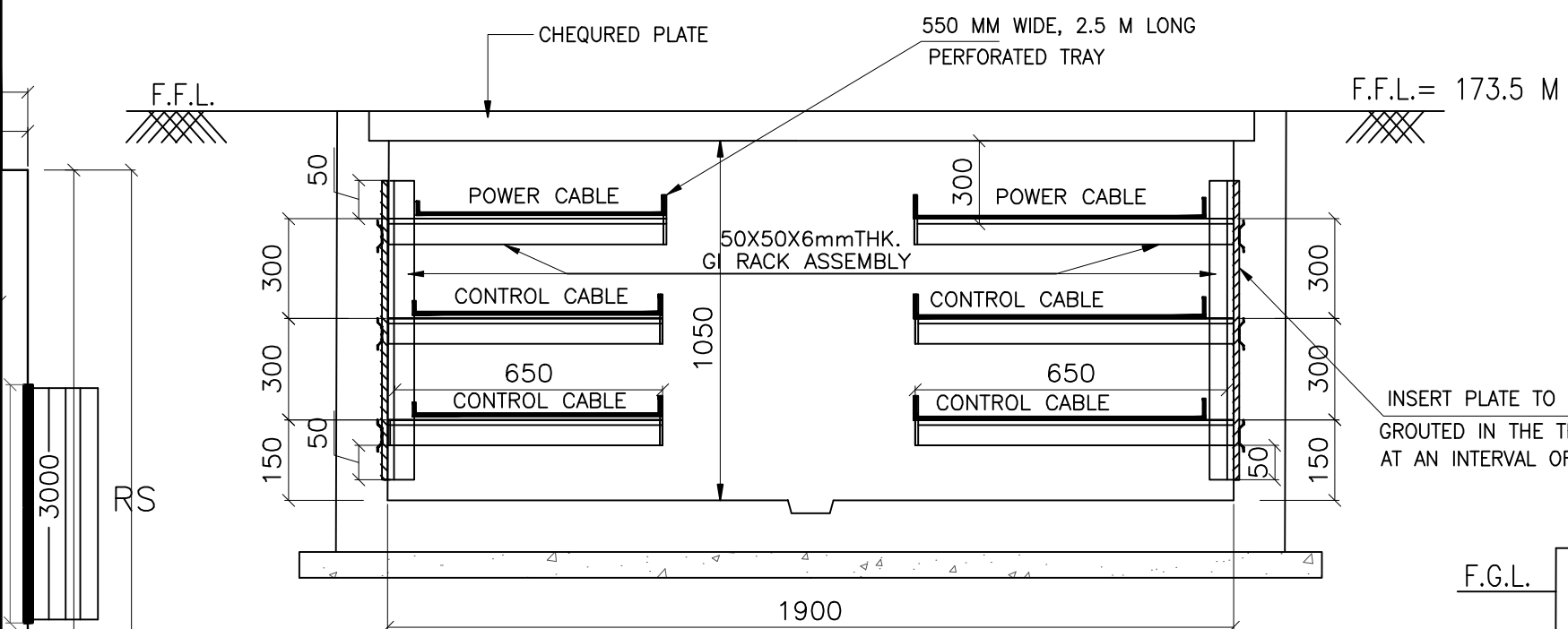
52



630KVA, 11KV/415V
OUTDOOR AUXILIARY
TRANSFORMER-1

$$\begin{array}{l} S=149.325 \\ \hline E=605.155 \end{array}$$


400KV SUBSTATION AREA

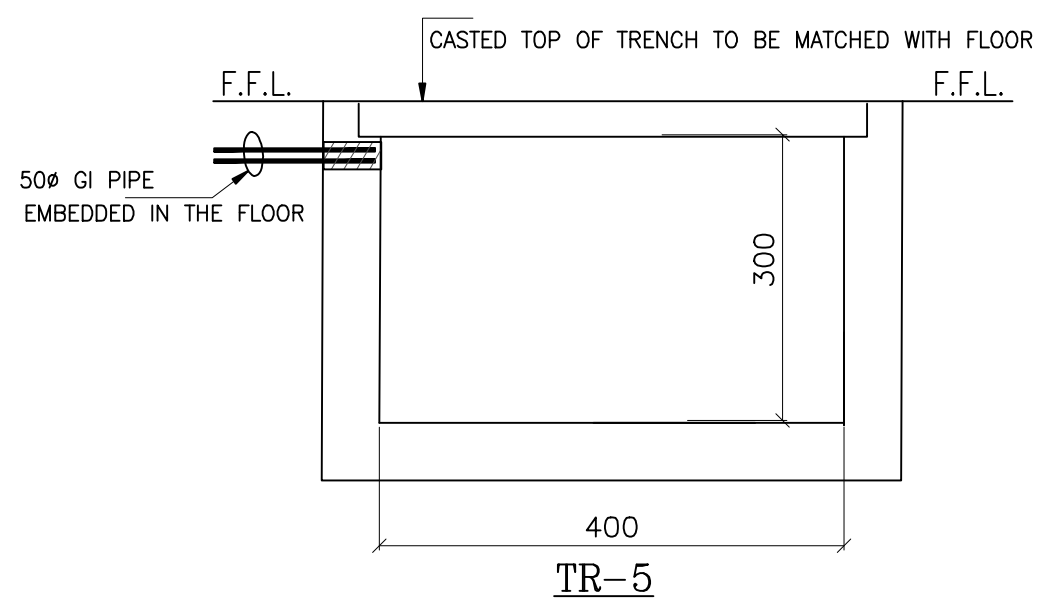
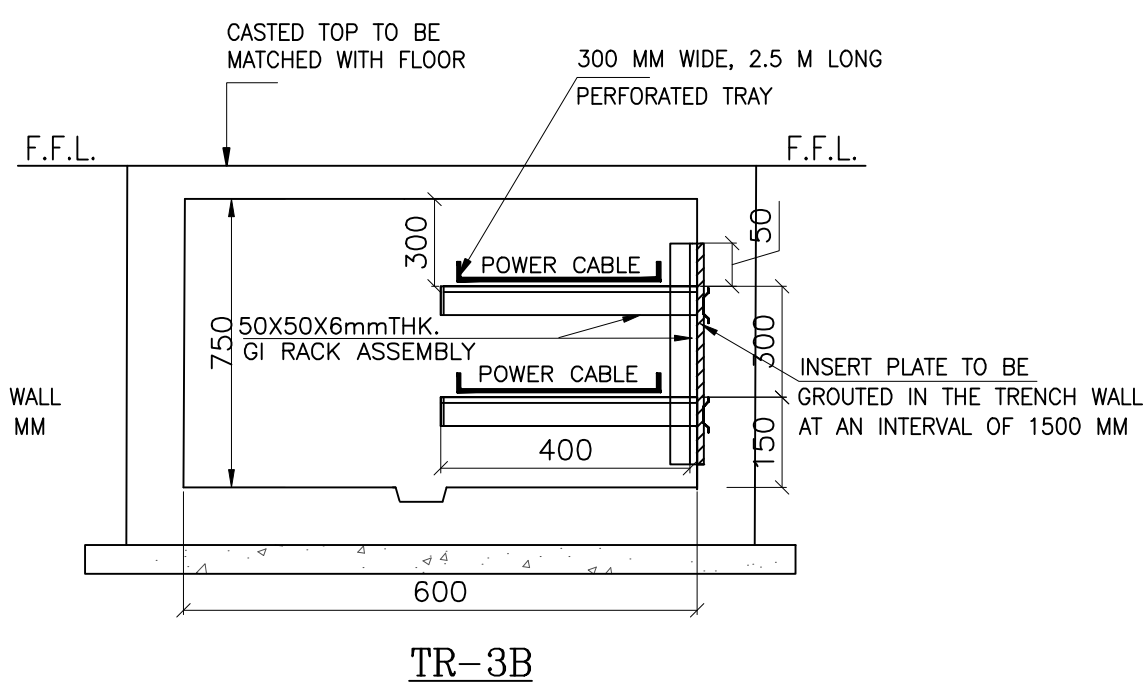
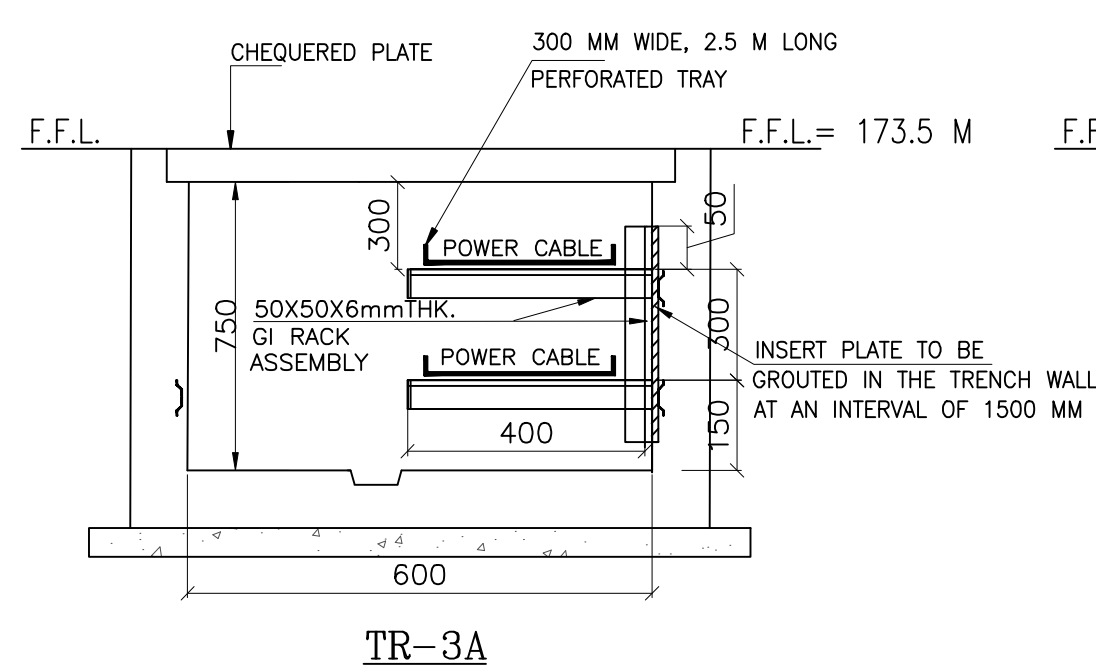


NOTE:-

1. ALL DIMENSIONS ARE FROM THE INSIDE FACE OF THE WALLS .
2. THIS DRAWING IS TO BE REFERRED FOR TRENCH LAYOUT & PANEL PLACEMENT DETAILS ALSO.
3. AUXILIARY POWER CABLES SHALL BE LAID IN TOP TIERS AND CONTROL CABLES IN BOTTOM TIERS.
4. ALL OTHER DETAILS PERTAINING TO CIVIL WORKS SHALL BE REFLECTED IN THE RESPECTIVE CIVIL DRAWINGS.
5. CHEQUERED PLATE TO BE PROVIDED FOR THE TRENCHES INSIDE THE CONTROL ROOM.
6. PANELS COMING TO TRENCHES SHALL BE SUPPORTED ON CHANNELS FIXED OVER TRENCH
FLUSHED WITH FFL. 50MM FRONT SIDE OF PANEL SHALL BE SUPPORTED ON FINISHED FLOOR LEVEL.
7. PANEL SUPPORT ANGLES/CHANNELS SHALL BE PROVIDED BY BHEL (ELECT CONTRACTOR).
8. PLACEMENT OF EQUIPMENTS IN AHU ROOM IS TENTATIVE & MAY UNDERGO CHANGE SUITING SITE
REQUIREMENT. FOR EXACT LOCATION REFER THE AC DUCTING LAYOUT.
9. 100MM DIA GI PIPE SHALL BE FLOOR EMBEDDED FOR LAYING OF CABLE.
10. THE CABLE RACK ASSEMBLY SHALL BE WELDED TO EMBEDDED INSERT PLATE AS MENTIONED BELOW.
"6mm WELD 50mm LONG ON BOTH SIDES OF VERTICAL ANGLE AT TOP AND BOTTOM AND NEAR
EVERY INTERMEDIATE HORIZONTAL CABLE SUPPORT ANGLE, IT MEANT THAT IF CABLE RACK ASSEMBLY
HAS THREE TIERS THEN IT SHALL BE WELDED TO FIVE LOCATION AT BOTH SIDE".
11. 630 SQ. MM SINGLE CORE CABLE SHALL RUN IN TRENCH-4 ON THE SURFACE NOT ON THE RACK.
12. INSERTS SHALL BE PROVIDED ON THE SIDE OF TRENCH SHOWING ARROW MARK. 
13. NOS. 4, 150 X 100 MM CUTOUTS TO BE PROVIDED IN THE TRENCH-5 FOR ENTERING THE DC POWER CABLE FROM 220V &
CONTROL CABLES FROM 110V CHANGING THE TRENCH-5 WILL BE SEALED AND MATCHED WITH FLOOR LEVEL.
14. CABLE AND PIPE SLEEVES ENTERING IN TO THE BUILDING SHALL BE SEALED BY FIRE PROOF AND WATER PROOF MATERIAL.
15. RS STANDS FOR ROLLING SHUTTER [2.4(W) X 3(H) M], PROVIDED FOR THE ENTRY OF DISTRIBUTION BOARDS.

REFERENCE DRAWINGS :

1. 400KV SWITCHYARD CONTROL ROOM BUILDING LAYOUT- TB-1-344-316-410
2. OUTDOOR TRENCH LAYOUT FOR 400KV SWITCHYARD TB-0-344-316-417

[illegible][illegible]

ADDITIONAL INFORMATION W.O.No.		80012		ग्राहक/प्रतिष्ठान का नाम APGENCO 400/220 KV SWITCHYARD- RAYALSEEMA T.P.PLANT STAGE-IV, UNIT#6 (X600MM)	
		NAME OF CUSTOMER/PROJECT			
STATUS OF DRAWING - CONTRACT		CONSULTANT:- Dessin Consulting Engineers			
DISTRIBUTION OF PRINTS		 भारत भारी बिजलीय वस्तु लिमिटेड BHARTI HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION ग्राहक की प्रतिष्ठान निदेशिका इंजीनियरिंग डिपार्टमेंट भारतीय विद्युत नियंत्रण बोर्ड एन सी ई डी सी ड्राफ्ट स्टाफ PW/NK DNM RS शीट / NAME PW/NK DNM RS दस्तावेज़ / SERIAL --SD-- --SD-- --SD-- दिनांक / DATE 26.06.11 26.06.11 26.06.11			
APGENCO - 3 RTPP Site - 2 DESIGN - 5					
REV.	DATE	CHANGED BY/ DRAWN BY/ APPROVED RS	Sd/- Date	REVISION	
01	22.08.12	LATERED BY NK	/	TBM	
ZONE		CASE NO.	422	अनुपात / SCALE  1 : 80	कार्य को CASE CODE
DRAWING HAS BEEN REVISED AS PER CONDITIONS GIVEN BY M/S DESIGNER YOUR LETTER REF: 523 DATE: 14.08.2012				शीटों की संख्या/TITLE TRENCH LAYOUT PLAN FOR SWITCHYARD CONTROL ROOM BUILDING	
				ड्राईंग्स No./DRAWING No. TB-1-344-509-418	
				पृष्ठ सं./SHEET No. (अंशों में प्रथम पृष्ठ/NEXT SHEET) 03	