

Annexure- 1: List of Drawings & documents

Sl. No.	Project Document No.	BHEL-Document No.	Doc. Designation
ELECTRICAL DRAWINGS			
1	KSG-PYD03FS001	TB-3-329-510-101	220KV SWITCHYARD - SINGLE LINE DIAGRAM
2	KSG-PYD01GA002	TB-0-329-316-102	LAYOUT OF 220/33KV SWITCHYARD (02 SHEETS)
3	KSG-PYD01DD004	TB-0-329-316-104	220 KV SWITCHYARD - LAYOUT OF TRENCH, ROAD, FENCE, FOUNDATIONS & GATES
4	KSG-XLP01DD005	TB-0-329-316-105	220KV XLPE CABLE - LAYOUT OF CABLE TRAY / SUPPORT SYSTEM
4A	KSG-XLP01GA005	TB-0-329-316-105	220KV XLPE CABLE SUPPORT TYPES DRAWINGS, 20 sheets
5	KSG-PYD01LO006	TB-3-329-316-106	SWITCHYARD - STRUCTURE LOADING DIAGRAM
6	KSG-PYD01DD007	TB-0-329-509-107	SWITCHYARD - EARTH MAT LAYOUT
7	KSG-PYD01DD008	TB-4-329-509-108	SWITCHYARD - EQUIPMENT & STRUCTURE EARTHING DETAILS
8	KSG-PYD01WD009	TB-2-329-302-109	SWITCHYARD - LT AC/DC DISTRIBUTION SCHEME
9	KSG-PYD01DD011	TB-0-329-316-111	SWITCHYARD - ERECTION KEY DIAGRAM AND BILL OF QUANTITY (02 SHEETS)
10	KSG-PYD03CD013	TB-329-316-051	220/33KV SWITCHYARD : SAG TENSION CHARTS
11	KSG-PYD03CD014	TB-329-316-053	DSLP DESIGN & CALCULATIONS-220/33KV SWITCHYARD
12	KSG-PYD01CS019	TB-329-316-058	POWER CABLES - CABLE SCHEDULE - TO FOLLOW
13	KSG-PYD01CS022	TB-329-316-060	CONTROL CABLES - CABLE SCHEDULE- TO FOLLOW
CIVIL DRAWINGS			
14	KSG-PYD03DD026	TB-329-316-064	TOWER STRUCTURE DRAWINGS- TO FOLLOW
15	KSG-PYD03DD027	TB-329-316-065	BEAM DRAWINGS- TO FOLLOW
16	KSG-PYD03DD028	TB-329-316-066	EQUIPMENT STRUCTURE DRAWINGS- TO FOLLOW

[illegible][illegible]

ITEM CODE	DESCRIPTION	QTY (in lots)
484V, 250A, 3-PHASE, 98 CIRCUIT BREAKER		1
33V, 60A, 3-PHASE, DOUBLE BREAK DISCONNECTOR		2
(MICHIGANLY CANNOT, MOTOR OPERATED) IN/OUT CIRCUIT SWITCH		4
33V, 60A, 3-PHASE, DOUBLE BREAK DISCONNECTOR		6
(MICHIGANLY CANNOT, MOTOR OPERATED) IN/OUT CIRCUIT SWITCH		6
33V, 1-PHASE, CURRENT TRANSFORMER		12
33V, 1-PHASE POTENTIAL TRANSFORMER		12
33V, 60A, 1-PHASE LIGHTNING ARRESTOR		15
		12












[illegible][illegible]
MPLC

100

KEY SWITCH YARN

QUESTION

[illegible]

 N H P C LIMITED		REPTON ELEVATOR OF ZEPHYRUS SWITCH YARD	
KSHANGANGA CONSORTIUM		SECTION ELEVATOR OF ZEPHYRUS SWITCH YARD	
 N H P C LIMITED		SECTION ELEVATOR OF ZEPHYRUS SWITCH YARD	
 N H P C LIMITED		SECTION ELEVATOR OF ZEPHYRUS SWITCH YARD	
 N H P C LIMITED		SECTION ELEVATOR OF ZEPHYRUS SWITCH YARD	
 N H P C LIMITED		SECTION ELEVATOR OF ZEPHYRUS SWITCH YARD	
 N H P C LIMITED		SECTION ELEVATOR OF ZEPHYRUS SWITCH YARD	
 N H P C LIMITED		SECTION ELEVATOR OF ZEPHYRUS SWITCH YARD	
 N H P C LIMITED		SECTION ELEVATOR OF ZEPHYRUS SWITCH YARD	
 N H P C LIMITED		SECTION ELEVATOR OF ZEPHYRUS SWITCH YARD	
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 N H P C LIMITED		SECTION ELEVATOR OF ZEPHYRUS SWITCH YARD	

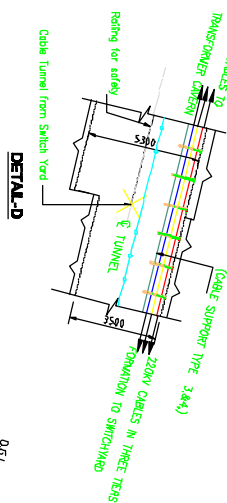


DETAIL-A
(FOR REFER SHEET 3 OF 4)

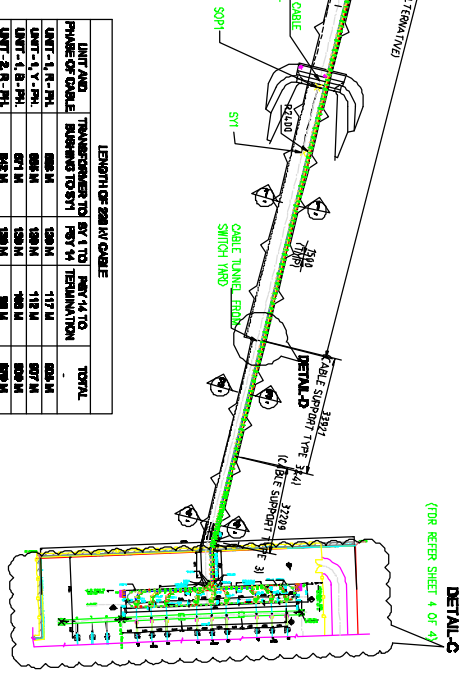
MINIMUM BENDING RADIUS OF 600MM SHALL BE PROVIDED FOR THE WALL OF TRANSFORMER CAVEN OF THIS SIDE



DETAIL-B
PLAN VIEW OF 220KV CABLES AT JUNCTION
POINT OF VENTILATION & CABLE TUNNEL
& TRANSFORMER CAVEN

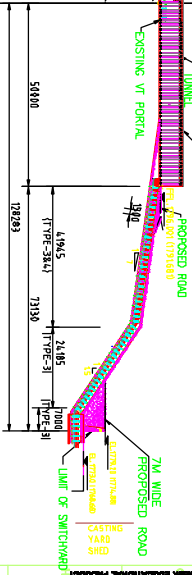


CABLE LAYOUT PLAN
(FOR SECTION 1:192.84 & 4.4 REFER SHEET 2A)



LENGTH OF 220KV CABLE			
LIMIT AND PHASE OF CABLE	TRANSFORMER TO SVT	SVT TO TAILRACE TUNNEL	TOTAL
UNIT - 1, A - PH	885 M	120 M	1005 M
UNIT - 1, B - PH	871 M	118 M	989 M
UNIT - 1, C - PH	871 M	118 M	989 M
UNIT - 2, A - PH	871 M	118 M	989 M
UNIT - 2, B - PH	871 M	118 M	989 M
UNIT - 2, C - PH	871 M	118 M	989 M
UNIT - 3, A - PH	871 M	118 M	989 M
UNIT - 3, B - PH	871 M	118 M	989 M
UNIT - 3, C - PH	871 M	118 M	989 M
SUMMARY	2655 M	354 M	3009 M
TOTAL	2655 M	354 M	3009 M

(I-SECTION OF PROPOSED CABLE TRENCH FROM VT FALSE PORTAL TO SWITCHYARD)



DATE: 18/05/20	SOP-9	END OF CURVE (SOP8)	START OF CURVE (SOP7)	END OF CURVE (SOP5)	START OF CURVE (SOP4)	END OF CURVE (SOP3)	START OF CURVE (SOP2)	END OF CURVE (SOP1)	START OF CURVE (SOP0)
BEARING 271.620°									
RADIUS 75 M									
STRAIGHT BEARING 4.207° R=25 M									
VERTICAL ALIGNMENT									
7568.4									
15.501									
STRAIGHT									
SLOPE 1V:10.10H									
44.0752									
20000									
SOFT GROUND CUTTING									

Longitudinal Section of 220KV Cable Route

- NOTES:-**
1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
 2. THIS DRAWING FIELD IN CONJUNCTION WITH DRG.NO U-KSC-RD-001 (SHEET 2 OF 4)

PROJECT INFORMATION

NAME OF PROJECT OR WORK

DATE OF DRAWING

DESIGNER

CHECKED BY

APPROVED BY

PROJECT INFORMATION

NAME OF PROJECT OR WORK

DATE OF DRAWING

DESIGNER

CHECKED BY

APPROVED BY

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PROJECT INFORMATION

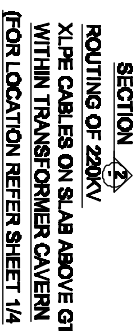
NAME OF PROJECT OR WORK

DATE OF DRAWING

DESIGNER

CHECKED BY

APPROVED BY



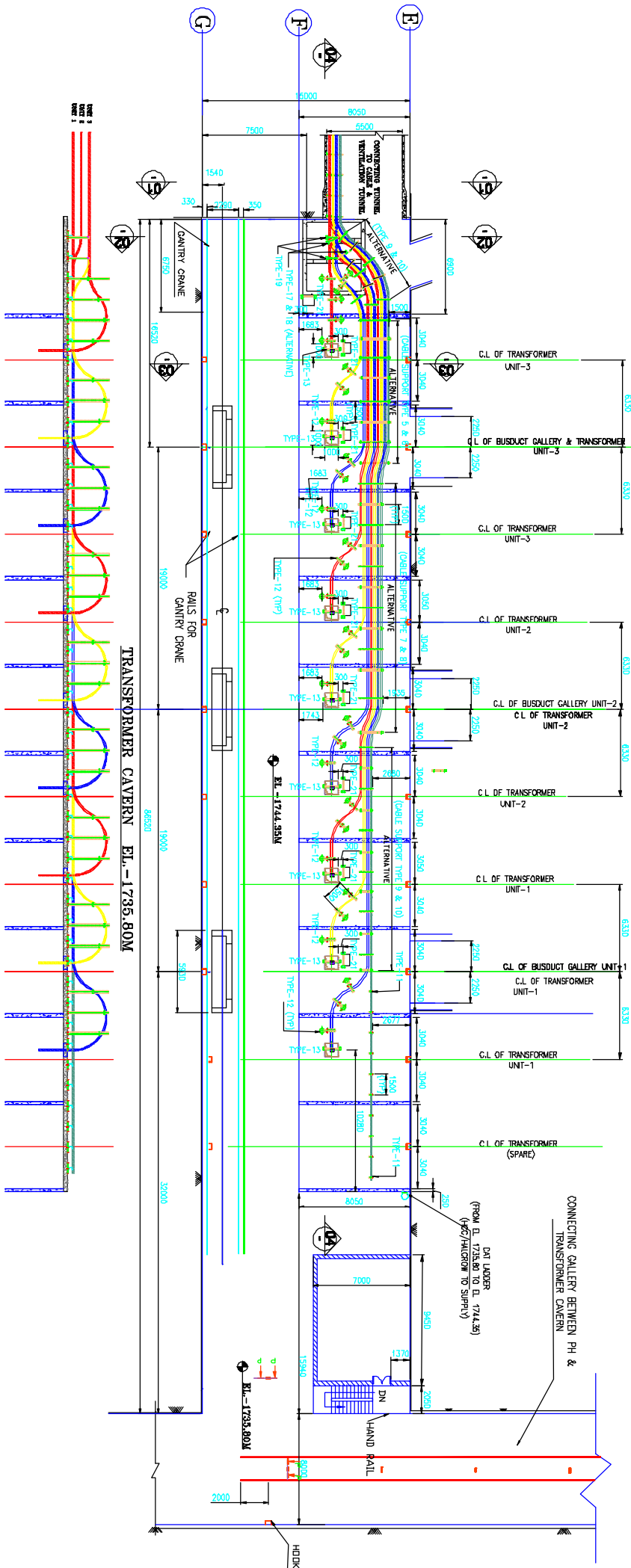
NOTES:-

- TYPICAL FIXING ARRANGEMENT OF CABLE RACK ASSEMBLY FOR 11KV CABLES, POWER AND CONTROL CABLES IN CABLE TUNNEL, FROM SWITCHYARD TO CVT PORTAL (TO BE PROVIDED AT 200MM CENTER TO CENTER)

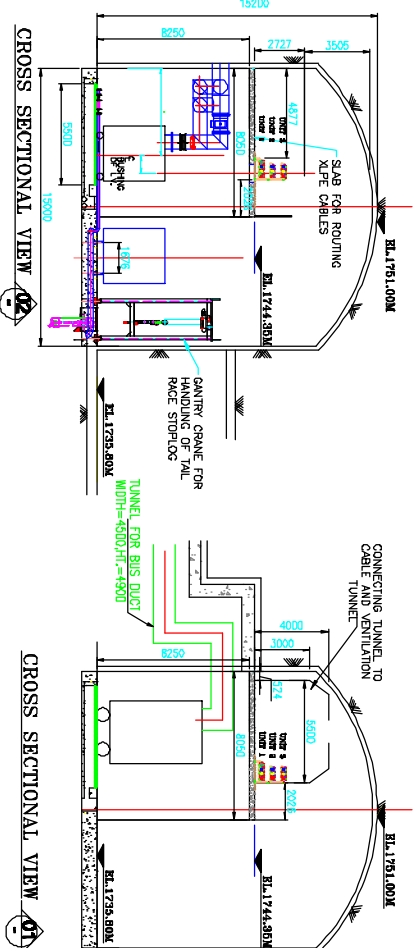
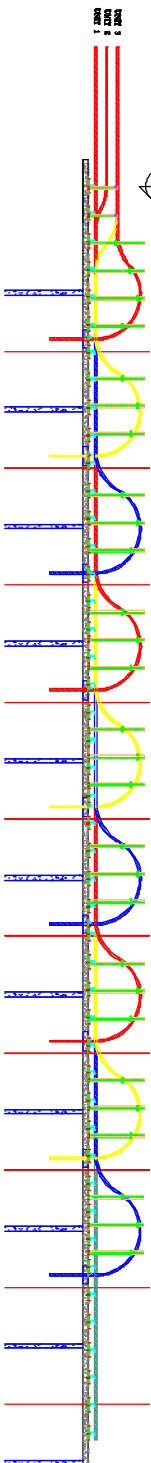
LOAD DATA FOR 11KV, POWER AND CONTROL CABLE RACK

P	=	61.25	kg/m
P (live load)	=	1.00	kg
Vertical load = Moment =		1.95 1.09	kN kN-m

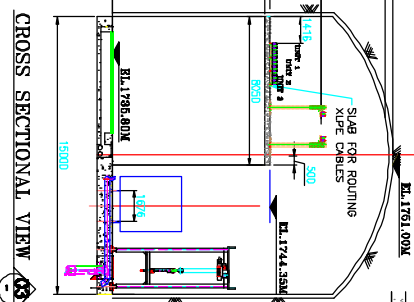
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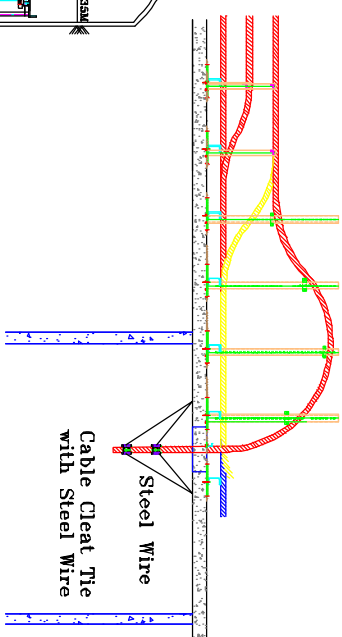
SECTION 04



CROSS SECTIONAL VIEW



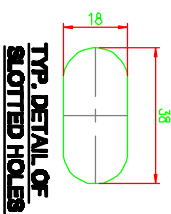
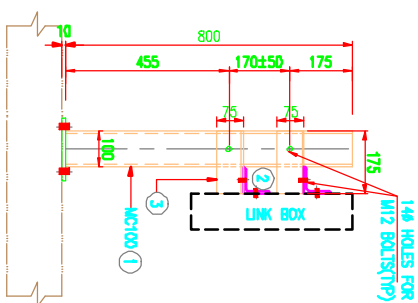
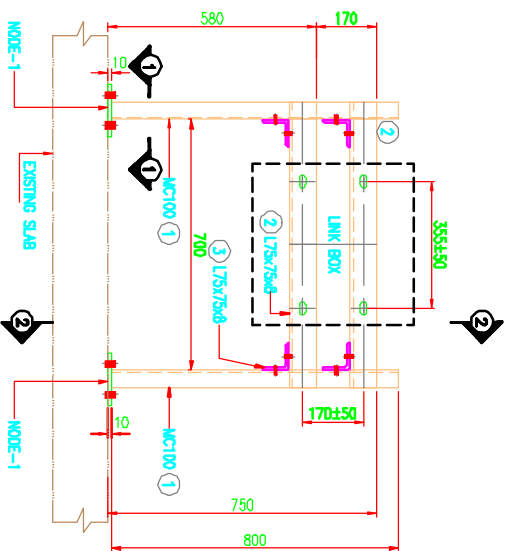
CROSS SECTIONAL VIEW



TYP. View for Arrangment at Below Slab
At the time of execution, this arrangement
will be made if required.

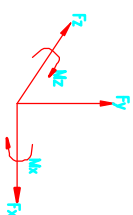


PRODUCED BY AN AUTOMATIC EDUCATIONAL PRODUCT

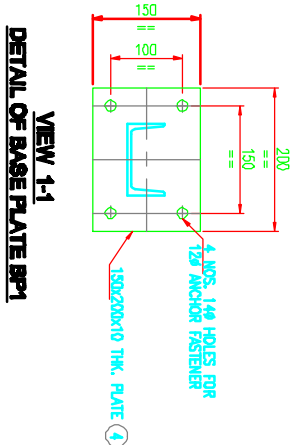


LOAD DATA @ TOP OF SLAB

NODE MARKED	F_x^b	F_y^b	F_z^b	M_x^b	M_y^b	M_z^b
1	±20	120	±20	±30	0	±30



F_y = VERTICAL POSITIVE DOWN WORDS DIRECTION
 F_z = PERPENDICULAR TO LINK BOX IN Z DIRECTION
 F_x = PERPENDICULAR TO LINK BOX IN X DIRECTION



BILL OF MATERIAL

ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT WT. (KG)	TOTAL WT. (KG)
1	MC100	2	-	800	9.20	14.72
2	L75x75x8	2	-	800	8.90	14.24
3	L75x75x8	4	-	175	8.90	6.23
4	10THK. PLATE	2	150	200	78.50	4.71
Grand Total						39.90

QUANTITY	NOS.	RQD.
21	10	

- NOTES:-**
1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
 2. ALL SUPPORTS SHALL BE PREPARED, HENCE THEY SHALL BE HOTDIP GALVANISED.
 3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.

REVISIONS

NO.	DATE	DESCRIPTION
1	2024/09/04/05	ISSUED FOR APPROVAL

APPROVALS

NAME	DESIGNATION	DATE
...

LINK BOX SUPPORT TYPE-21

NOTES

1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
2. ALL SUPPORTS SHALL BE PREPARED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.



DETAIL OF BASE PLATE BP1

QUANTITY	
SUPPORT TYPE	NOS. REQ.
20	2

NOTES:-

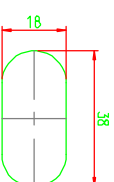
1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
2. ALL SUPPORTS SHALL BE PREFABRICATED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.



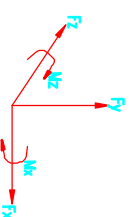
VIEW 2-2



TYP. DETAIL OF
SLOTTED HOLES



NOOE MARKED	kg Fx	kg Fy	kg Fz	kgm Mx	kgm My	kgm Mz
1	±35	105	±35	±25	0	±70



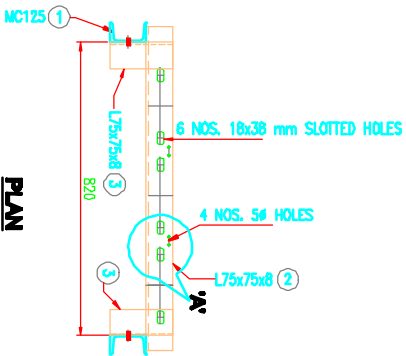
F_y = VERTICAL POSITIVE DOWN WORDS DIRECTION

F_z = ALONG CABLE

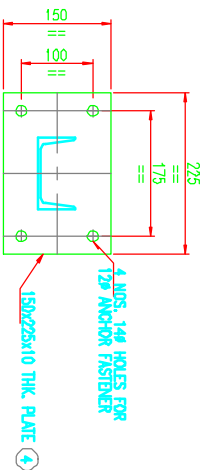
F_x = PERPENDICULAR TO CABLE

BILL OF MATERIAL						
ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT WGT.	TOTAL WGT (KG)
1	MC125	2	-	1400	12.70	35.56
2	L75x75x8	2	-	930	8.90	16.55
3	L75x75x8	4	-	200	8.90	7.12
4	10THK. PLATE	2	150	225	78.50	5.30
Grand Total						64.53

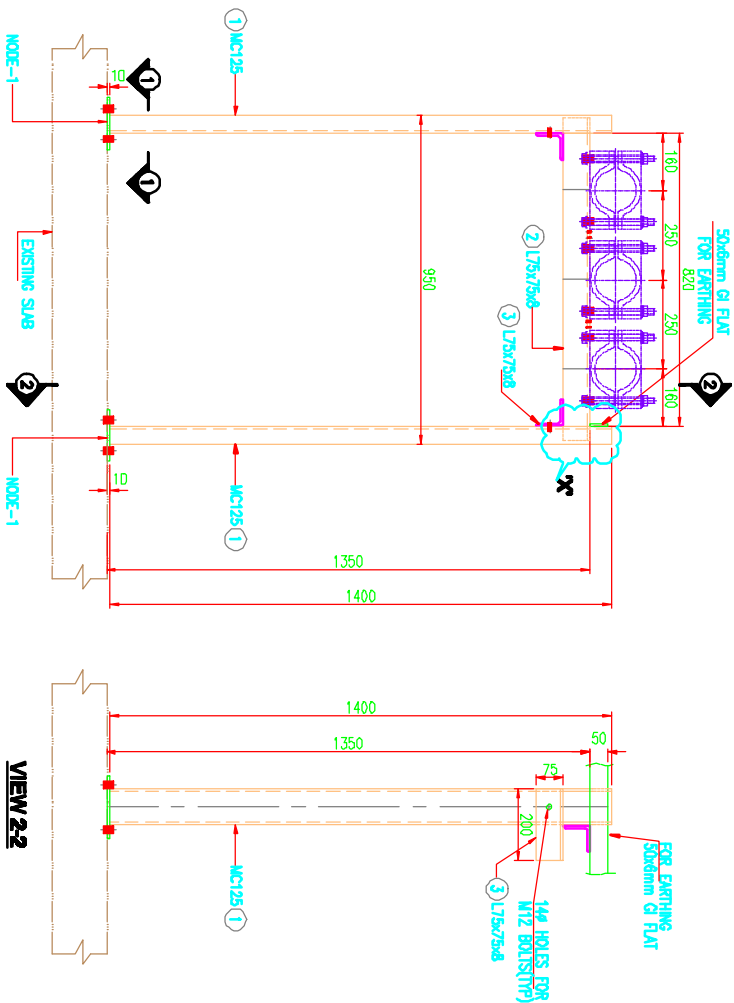
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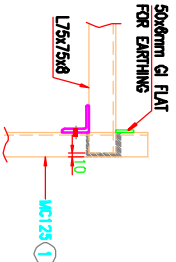
PLAN
TYP. G.A. DETAILS FOR
CABLE SUPPORT TYPE-19



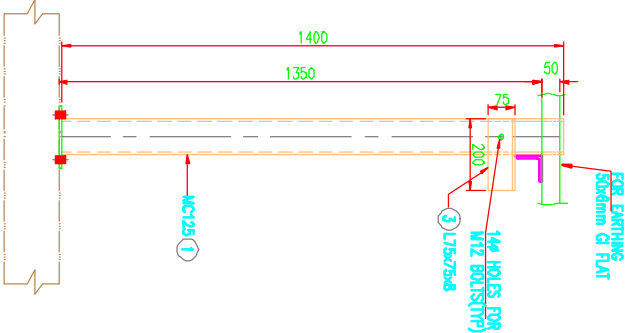
VIEW 1-1
DETAIL OF BASE PLATE BP1



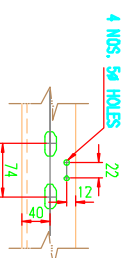
ELEVATION



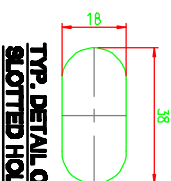
DETAIL -X



VIEW 2-2



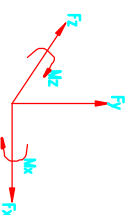
DETAIL -Y



TYP. DETAIL OF
SLOTTED HOLES

LOAD DATA @ TOP OF SLAB

NO	MARKED	kg	kg	kg	kg	kg	kg
1	F ₁	F ₂	F ₃	F ₄	M _x	M _y	M _z
		±20	55	±20	±25	0	±80



F_y = VERTICAL POSITIVE DOWN WORDS DIRECTION
F_z = ALONG CABLE
F_x = PERPENDICULAR TO CABLE

BILL OF MATERIAL

ITEM/ MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT WT. (KG)	TOTAL WT. (KG)
1	MC125	2	-	1400	12.70	35.56
2	L75x75x8	1	-	930	8.90	8.28
3	L75x75x8	2	-	200	8.90	3.56
4	10 THK. PLATE	2	150	225	78.50	5.30
Grand Total						52.70

NOTES:-

1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
2. ALL SUPPORTS SHALL BE PREPARED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.

QUANTITY	SUPPORT TYPE	NOS.	ROD.
19	2		

REVISIONS

NO.	DATE	DESCRIPTION
1	2023-10-10	ISSUED FOR TENDER

APPROVALS

NO.	DATE	NAME	DESIGNATION
1	2023-10-10	DR. S. S. SURESH	DESIGNER
2	2023-10-10	MR. S. S. SURESH	CHECKER
3	2023-10-10	MR. S. S. SURESH	APPROVER

PROJECT INFORMATION

PROJECT NO: 2023-10-10

PROJECT NAME: CABLE SUPPORT TYPE-19

PROJECT LOCATION: 100-100-100-100

PROJECT STATUS: 100-100-100-100



VIEW 1-1
DETAIL OF BASE PLATE BP1



DETAIL-X



NODE MARKED	kg F _x	kg F _y	kg F _z	kgm M _x	kgm M _y	kgm M _z
1	±20	55	±20	±15	0	±35

LOAD DATA @ TOP OF SLAB

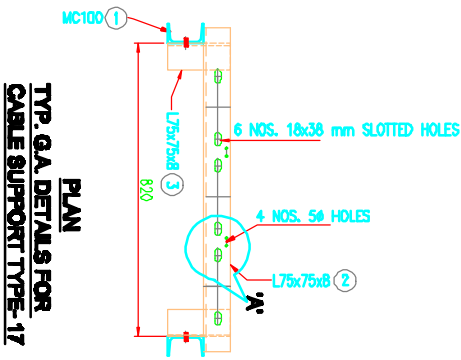
QUANTITY	
SUPPORT TYPE	NOS. REQD.
18	2

BILL OF MATERIAL							TOTAL WT (KG)
ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT WT.		
1	MC100	2	-	810	9.20	14.90	
2	L75x75x8	1	-	900	8.90	8.01	
3	L75x75x8	2	-	175	8.90	3.12	
4	10THK. PLATE	2	150	200	78.50	4.71	
Grand Total						30.74	

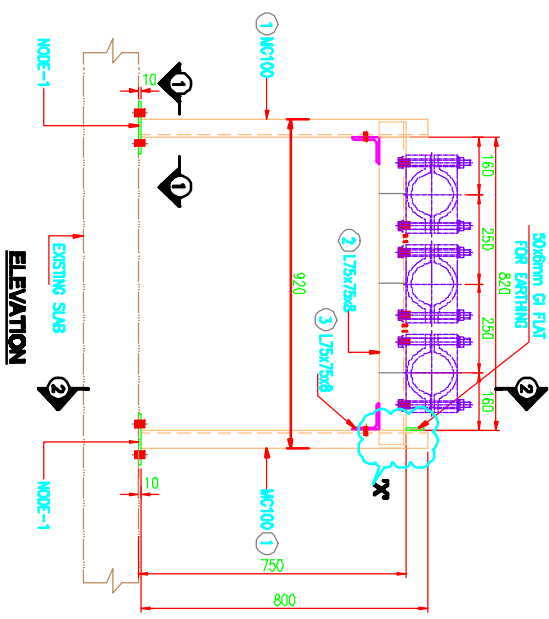
NOTES:-

1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
2. ALL SUPPORTS SHALL BE PREFABRICATED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE BIRM CONT. FILLET UNLESS NOTED.

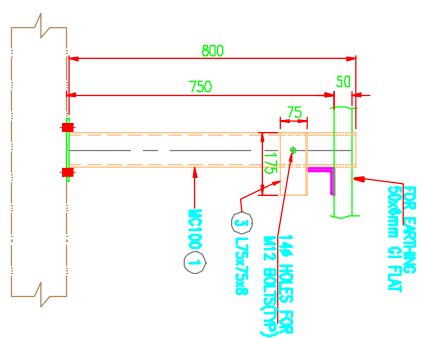
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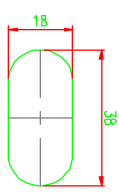
PLAN
TYP. GA. DETAILS FOR
CABLE SUPPORT TYPE-17



ELEVATION



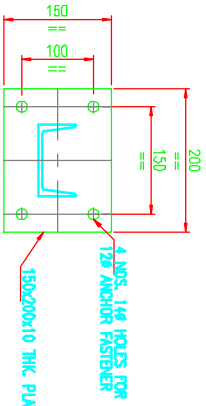
VIEW 2-2



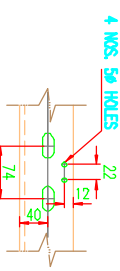
TYP. DETAIL OF
SLOTTED HOLES

NODE MARKED	kg	kg	kg	kgm	kgm	kgm
	F _x	F _y	F _z	M _x	M _y	M _z
1	±20	55	±20	±15	0	±35

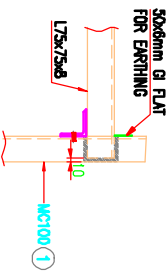
LOAD DATA @ TOP OF SLAB



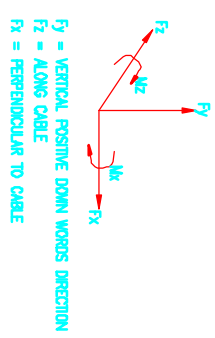
VIEW 1-1
DETAIL OF BASE PLATE BPM



DETAIL -Y'



DETAIL -X



QUANTITY	
SUPPORT TYPE	NOS. REQD.
17	2

BILL OF MATERIAL					
ITEM/ MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	TOTAL WT. (KG)
1	MC100	2	-	810	14.90
2	L75x75x8	1	-	900	8.90
3	L75x75x8	2	-	175	8.90
4	10 THK. PLATE	2	150	200	78.50
Grand Total					30.74

- NOTES:-**
1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
 2. ALL SUPPORTS SHALL BE PREPARED, HENCE THEY SHALL BE HOTDIP GALVANISED.
 3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.

NHPCL LIMITED

REVENUE CORPORATION

NEW DELHI

TYPE OF PROJECT

REVENUE CORPORATION

PROJECT NAME

NEW DELHI

PROJECT NO.

17-0-00-00-00-00

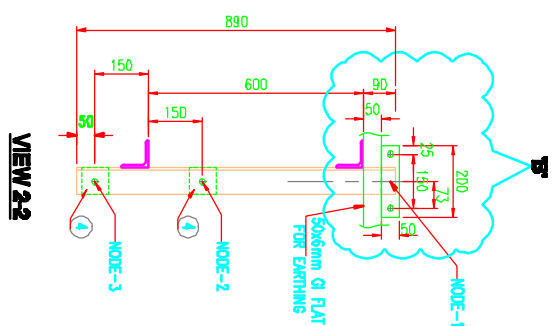
DATE OF PREPARED

17-0-00-00-00-00

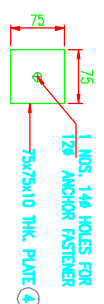
BY

17-0-00-00-00-00

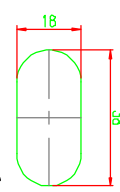
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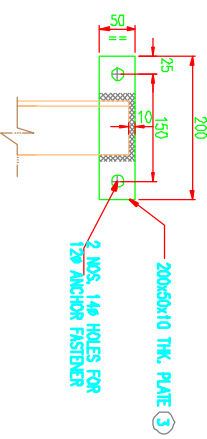
DETAIL OF ITEM MARKED 4



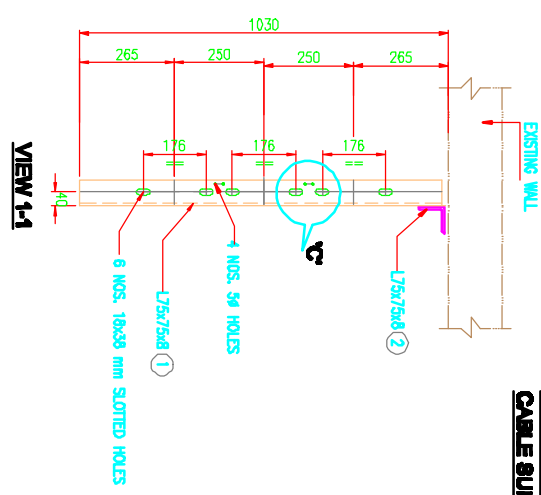
TYP. DETAIL OF
SLOTTED HOLES



DETAIL -B



TYP. G.A. DETAILS FOR
CABLE SUPPORT TYPE-14



LOAD DATA @ NODES ON WALLS & SLAB

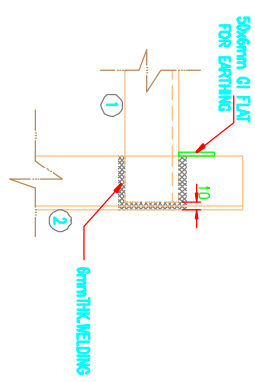
MODE MARKED	kg F _x	kg F _y	kg F _z
1	±135	105	±35
2	±65	55	±20
3	±65	55	±20

QUANTITY	
SUPPORT TYPE	NOS. REQD.
14	4

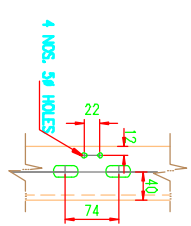
BILL OF MATERIAL

BILL OF MATERIAL						TOTAL WT.
ITEM	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT WT. (KG)	
1	L75x75x8	2	-	1010	8.50	17.98
2	L75x75x8	1	-	890	8.50	7.92
3	10 THK. PLATE	1	50	200	78.50	0.79
4	10 THK. PLATE	2	75	75	78.50	0.88
				Grand Total		27.57

DETAIL -X



DETAIL JC



NOTES:-

1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
2. ALL SUPPORTS SHALL BE PREFABRICATED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.



LOAD DATA @ NODES ON WALLS & SLAB

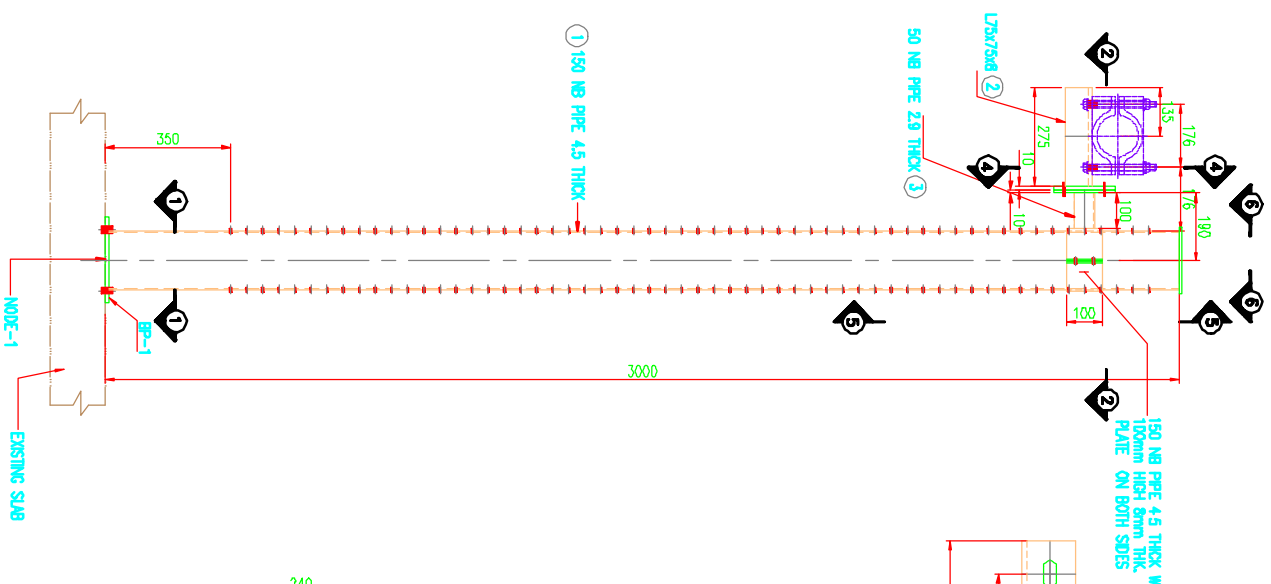
NODE MARKED	kg F_x	kg F_y	kg F_z
1	25	65	25

QUANTITY	
SUPPORT TYPE	NOS. RQD.
13	10

BILL OF MATERIAL						
ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT W.T. (KG)	TOTAL W.T.
1	MC125	1	-	1280	13.10	16.77
2	10 THK. PLATE	2	100	200	78.50	3.14
Grand Total						19.91



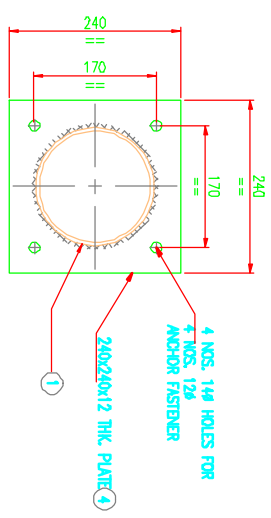
1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
2. ALL SUPPORTS SHALL BE PREFABRICATED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE BIRM CONT. FILLET UNLESS NOTED.



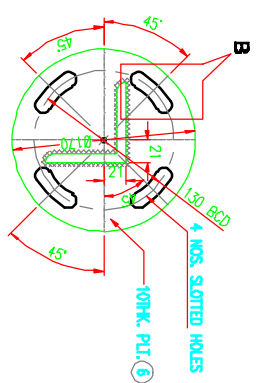
ELEVATION

- NOTES:-**
1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
 2. ALL SUPPORTS SHALL BE PREPARED, HENCE THEY SHALL BE HOTDIP GALVANISED.
 3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.

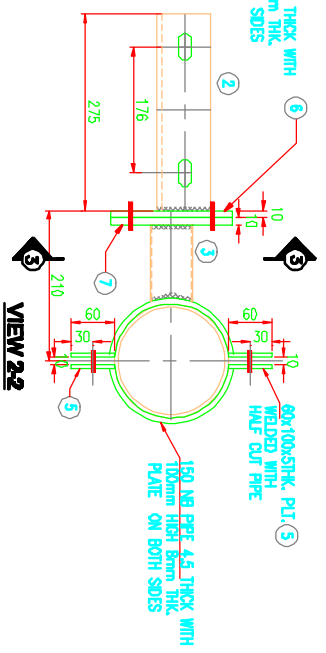
QUANTITY	SUPPORT TYPE	NOS. RQD.
12	36	



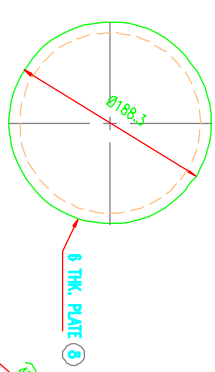
VIEW 1-1
DETAIL OF BASE PLATE BP1 FOR
CABLE SUPPORT TYPE- 12



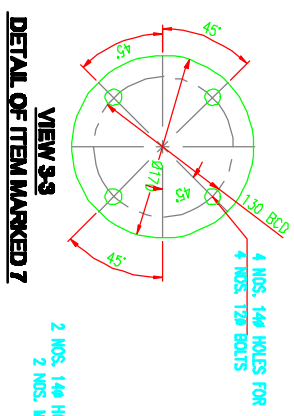
VIEW 4-4
DETAIL OF ITEM MARKED 6



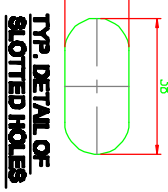
VIEW 2-2



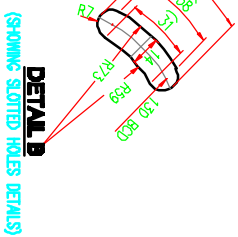
VIEW 6-6
DETAIL OF ITEM MARKED 8



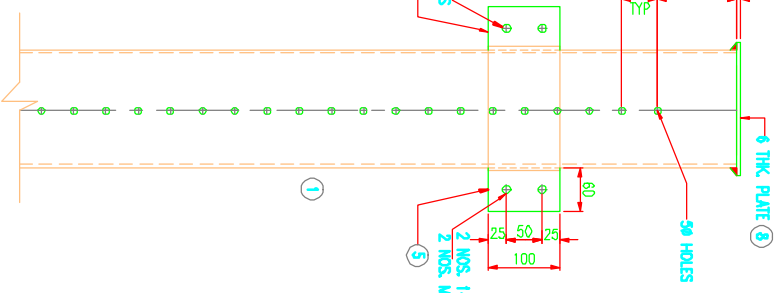
VIEW 3-3
DETAIL OF ITEM MARKED 7



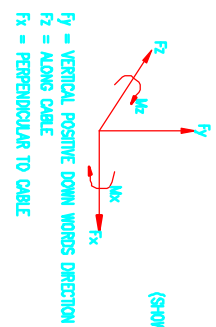
TYP. DETAIL OF
SLOTTED HOLES



DETAIL B
(SHOWING SLOTTED HOLES DETAILS)



VIEW 6-6



LOAD DATA @ NODES ON WALLS

NODE MARKED	kg Fx	kg Fy	kg Fz	kgm Mx	kgm My	kgm Mz
1	445	135	445	4130	4130	4130

BILL OF MATERIAL

ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT WT. (KG)	TOTAL WT. (KG)
1	150NB PIPE	1	3000	17.80	53.40	
2	175x75x8	1	275	8.90	2.45	
3	50NB PIPE	1	100	4.08	0.41	
4	12 THK. PLATE	1	240	94.20	5.43	
5	5 THK. PLATE	2	60	39.25	0.47	
6	10 THK. PLATE	1	170	78.50	2.27	
7	10 THK. PLATE	1	170	78.50	2.27	
8	6 THK. PLATE	1	188.3	47.10	1.57	
Grand Total						68.36

PREPARED BY

CHECKED BY

APPROVED BY

DATE

PROJECT NAME

PROJECT NO.

SCALE

REVISIONS

NO.	DESCRIPTION	DATE
1	ISSUED FOR TENDER	
2	FOR APPROVAL	
3	FOR APPROVAL	
4	FOR APPROVAL	



LOAD DATA @ NODES ON SLAB

MODE MARKED	kg F_x	kg F_y	kg F_z
1	± 10	35	± 10

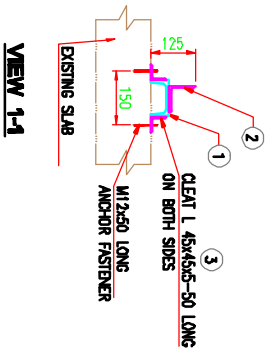
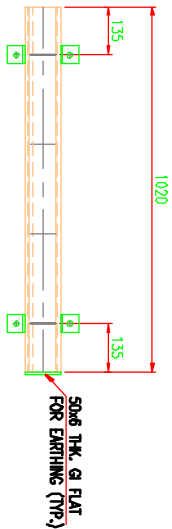
QUANTITY	
SUPPORT TYPE	NOS. REQ.
11	71

[illegible]

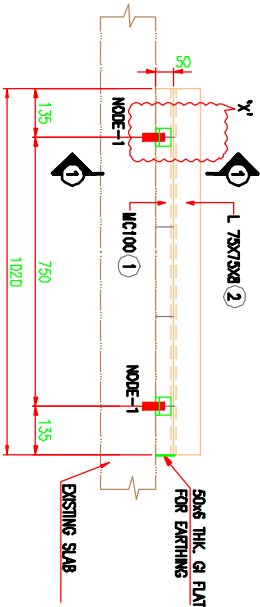
NOTES:-

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2. ALL SUPPORTS SHALL BE PREFABRICATED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE BIRM CONT. FILLET UNLESS NOTED.

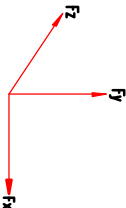
[illegible]



TYP. G.A. DETAILS FOR CABLE SUPPORT TYPE- 10
PLAN



ELEVATION



F_y = POSITIVE VERTICAL DOWNWARDS DIRECTION
 F_z = ALONG CABLE
 F_x = PERPENDICULAR TO CABLE

LOAD DATA @ NODES ON SLAB

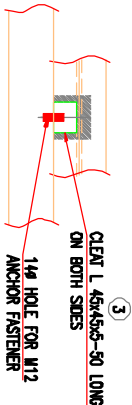
NODE MARKED	kg F_x	kg F_y	kg F_z
1	±20	70	±20

SUPPORT TYPE	QUANTITY	NOS	ROD.
10	18		

ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT WT. (KG)	TOTAL WT. (KG)
1	MC100	1	-	1020	9.20	9.38
2	L75x75x6	1	-	1020	8.90	9.08
3	L45x45x5	4	-	50	4.00	0.80
Grand Total						19.26

NOTES:-

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3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.



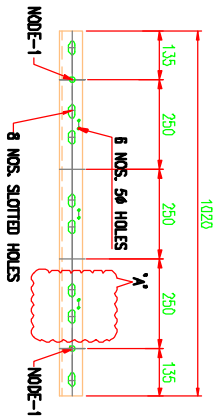
DETAIL - X

M P & L LIMITED
INDUSTRIAL CONSTRUCTION
DESIGN & CONSTRUCTION
ESTIMATION & BIDDING
PROJECT MANAGEMENT
QUALITY CONTROL
SALES & MARKETING

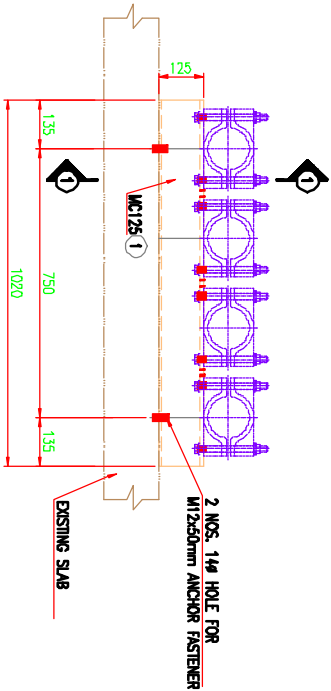
DESIGN & CONSTRUCTION
ESTIMATION & BIDDING
PROJECT MANAGEMENT
QUALITY CONTROL
SALES & MARKETING

DESIGN & CONSTRUCTION
ESTIMATION & BIDDING
PROJECT MANAGEMENT
QUALITY CONTROL
SALES & MARKETING

DESIGN & CONSTRUCTION
ESTIMATION & BIDDING
PROJECT MANAGEMENT
QUALITY CONTROL
SALES & MARKETING



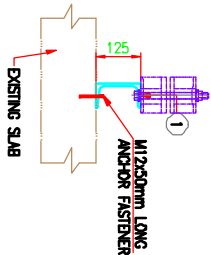
TYP. 9A. DETAILS FOR CABLE SUPPORT TYPE - 9
PLAN



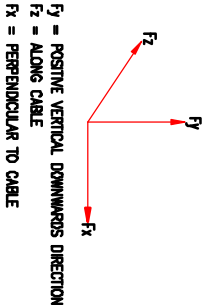
ELEVATION

BILL OF MATERIAL				
ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)
1	MC125	1	-	1020
Grand Total			12.70	12.95

- NOTES:-**
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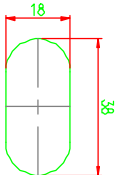
VIEW 1-1



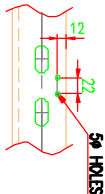
LOAD DATA @ NODES ON SLAB

MODE MARKED	kg	kg	kg
1	F_x	F_y	F_z
	£20	70	£20

QUANTITY	
SUPPORT TYPE	NOS. REQ.
9	20



TYP. DETAIL OF SLOTTED HOLES



DETAIL - A

INFPCL LIMITED

INTERNATIONAL CONSULTING

DESIGN & CONSTRUCTION

PROJECT NO. 13

CLIENT: M. S. SINGH & SONS

PROJECT: CABLE SUPPORT TYPE-9

DATE: 10/10/2023

BY: M. S. SINGH & SONS

CHECKED: M. S. SINGH & SONS

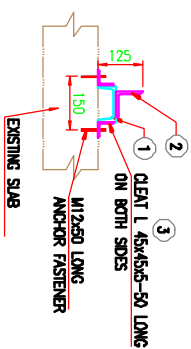
APPROVED: M. S. SINGH & SONS

SCALE: 1:1

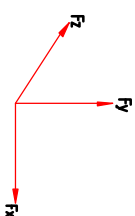
REVISIONS:

NO. REV. DESCRIPTION

1 1



TYP. G.A. DETAILS FOR CABLE SUPPORT TYPE-8
PLAN



14mm HOLE FOR M12 ANCHOR FASTENER

Fy = POSITIVE VERTICAL DOWNWARDS DIRECTION
Fz = ALONG CABLE
Fx = PERPENDICULAR TO CABLE

LOAD DATA @ NODES ON BLAB

QUANTITY	
SUPPORT TYPE	NOS. REQD.
8	8

QUANTITY	
SUPPORT TYPE	NOS. REQD.
8	8

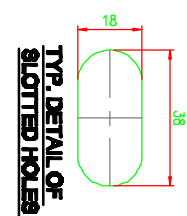
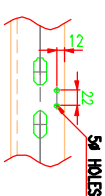
1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
2. ALL SUPPORTS SHALL BE PREFABRICATED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE BIRM CONT. FILLET UNLESS NOTED.

[illegible]



Fy = POSITIVE VERTICAL DOWNWARDS DIRECTION
Fz = ALONG CABLE
Fx = PERPENDICULAR TO CABLE
LOAD DATA @ NODES ON SLAB

DETAIL-A

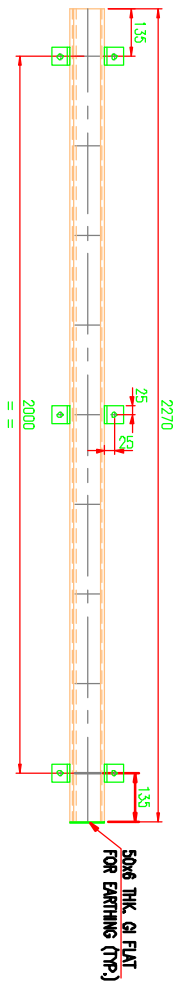


NOTES:-

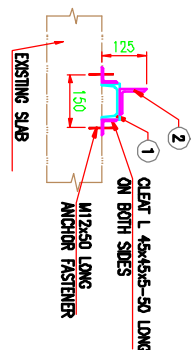
1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
2. ALL SUPPORTS SHALL BE PREFABRICATED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.

QUANTITY	
SUPPORT TYPE	NOS. ROAD
7	6

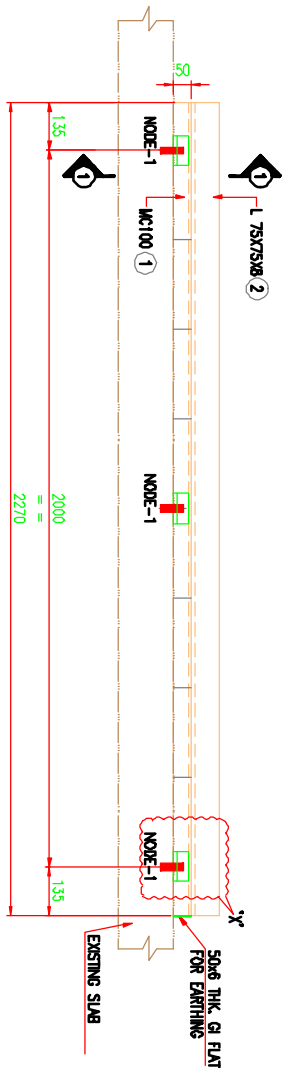
STATION												DATE												TIME												WIND												SEA												TEMP												HUMID												VISIB												PRESS												TEND												REMARKS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												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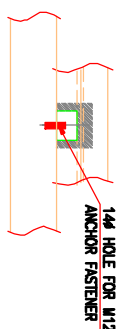
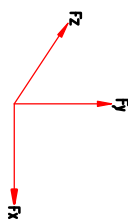
TYP. GA DETAILS FOR CABLE SUPPORT TYPE-6
PLAN



VIEW 1-1



ELEVATION



DETAIL - X

LOAD DATA @ NODES ON SLAB

NODE MARKED	kg F _x	kg F _y	kg F _z
1	±30	100	±30

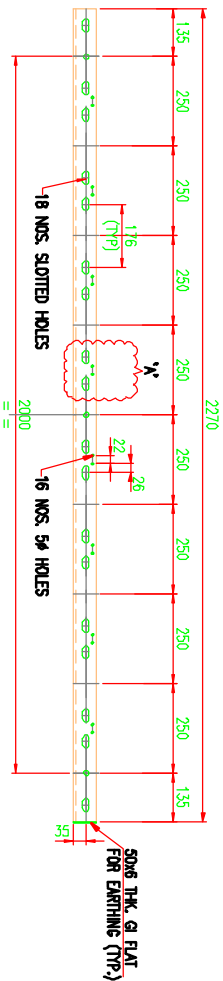
QUANTITY	SUPPORT TYPE	NOS.	ROD.
6		4	

BILL OF MATERIAL				
ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)
1	MC100	1	-	2270
2	L75x75x8	1	-	2270
3	L45x45x5	6	-	50
Grand Total				42.29

- NOTES:-**
1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
 2. ALL SUPPORTS SHALL BE PREPARED, HENCE THEY SHALL BE HOTDIP GALVANISED.
 3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.

ITEM	DESCRIPTION	QUANTITY	UNIT
1	MC100	1	NO.
2	L75x75x8	1	NO.
3	L45x45x5	6	NO.
4	ANCHOR FASTENER	4	NO.
5	CLEAT	4	NO.
6	WELD	100	CM

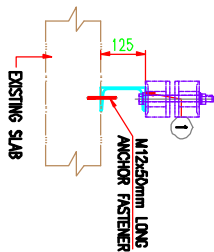
ITEM	DESCRIPTION	QUANTITY	UNIT
1	MC100	1	NO.
2	L75x75x8	1	NO.
3	L45x45x5	6	NO.
4	ANCHOR FASTENER	4	NO.
5	CLEAT	4	NO.
6	WELD	100	CM



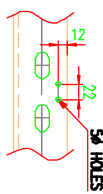
TYP. GA. DETAILS FOR CABLE SUPPORT TYPE - 5

PLAN

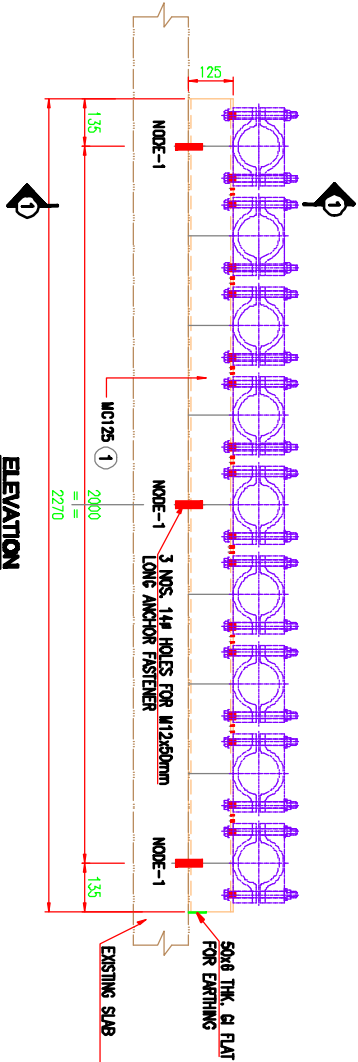
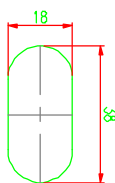
VIEW 1-1



DETAIL - A



TYP. DETAIL OF SLOTTED HOLES



ELEVATION

BILL OF MATERIAL					
ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT WT. (KG)
1	MC125	1	-	2270	12.70
Grand Total					28.83

LOAD DATA @ NODES ON SLAB

F_y = POSITIVE VERTICAL DOWNWARDS DIRECTION
 F_z = ALONG CABLE
 F_x = PERPENDICULAR TO CABLE

NODE MARKED	F_x	F_y	F_z
1	±30	100	±30

QUANTITY	SUPPORT TYPE	NOS.	RQD.
5	4		

NOTES:-

1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
2. ALL SUPPORTS SHALL BE PREPARED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.

REVISIONS

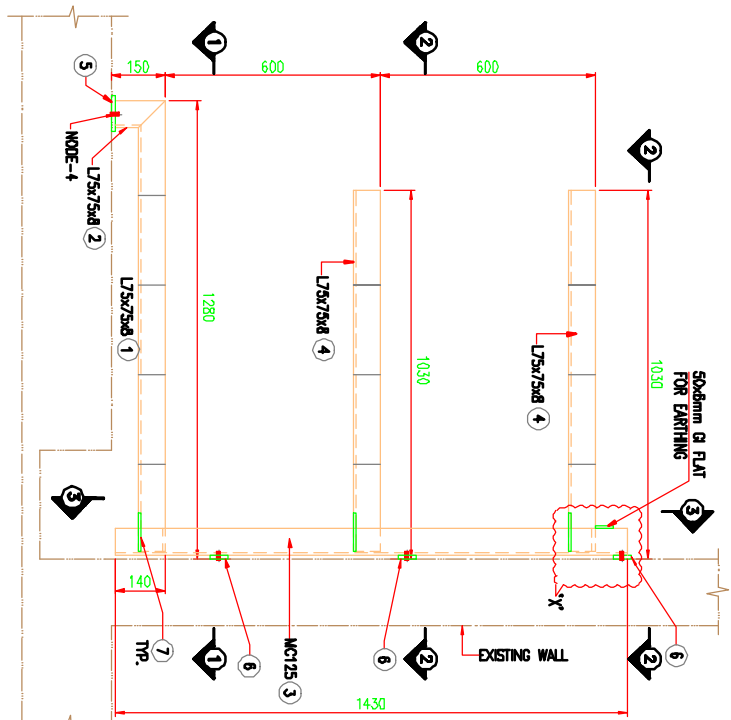
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1	2023-10-10	ISSUED FOR TENDER
2	2023-10-10	REVISIONS

APPROVED FOR TENDER

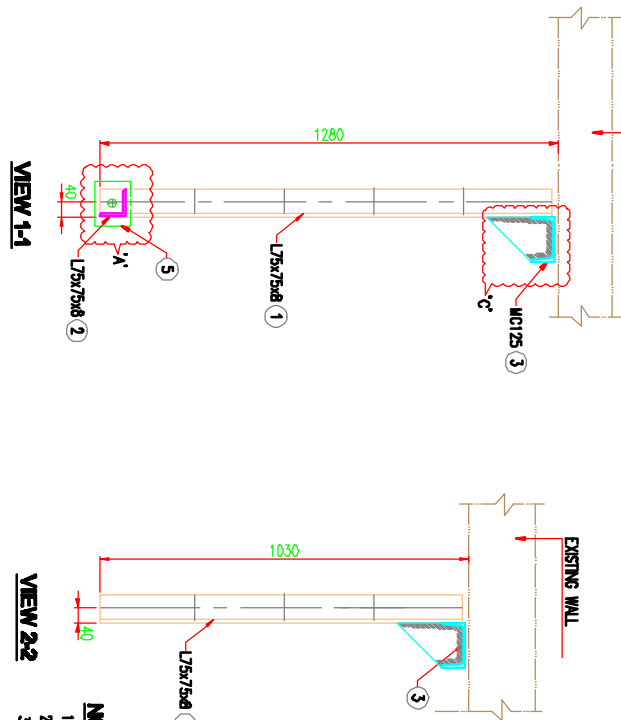
DESIGNED BY ...

CHECKED BY ...

DATE ...

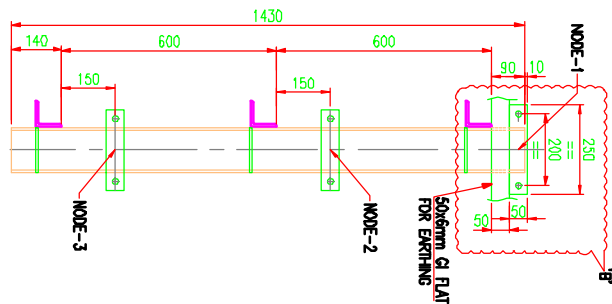


TYP. GA DETAIL 9 FOR CABLE SUPPORT TYPE - 4

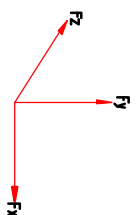


VIEW 1-1

VIEW 2-2



VIEW 3-3



Fy = POSITIVE DOWNWARDS DIRECTION
Fz = ALONG CABLE
Fx = PERPENDICULAR TO CABLE

LOAD DATA @ NODES ON WALLS & SLAB

FOR SLOPE 1:1.5

NODE MARKED	kg Fx	kg Fy	kg Fz
1	±155	90	±125
2	±80	45	±85
3	±35	90	±105
4	±35	90	±105

QUANTITY	SUPPORT TYPE	NOS. REQ.
4		12

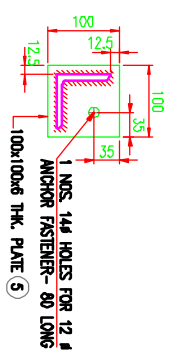
LOAD DATA @ NODES ON WALLS & SLAB

FOR SLOPE 1:7

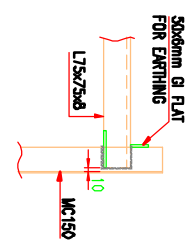
NODE MARKED	kg Fx	kg Fy	kg Fz
1	±180	105	±35
2	±90	55	±20
3	±40	105	±30
4	±40	105	±30

ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT WT. (KG)	TOTAL WT. (KG)
1	L75x75x8	1	-	1260	8.90	11.21
2	L75x75x8	1	-	144	8.90	1.28
3	MC125	1	-	1430	12.70	18.16
4	L75x75x8	2	-	1010	8.90	17.98
5	6 THK. PLATE	1	100	100	47.10	0.47
6	10 THK. PLATE	4	250	50	78.50	3.93
7	6 THK. PLATE	3	125	185	47.10	3.27
Grand Total						56.30

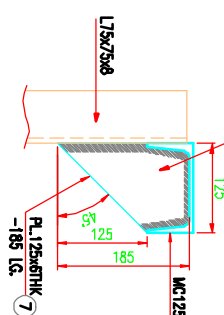
DETAIL - A



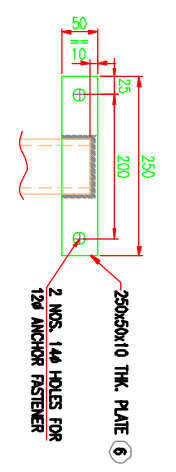
DETAIL - X



DETAIL - C



DETAIL - B



REVISIONS

NO.	DATE	DESCRIPTION
1	10/10/2023	ISSUED FOR TENDER
2	10/10/2023	REVISIONS
3	10/10/2023	REVISIONS
4	10/10/2023	REVISIONS

APPROVED

DESIGNED BY: [Signature]
CHECKED BY: [Signature]
APPROVED BY: [Signature]

PROJECT INFORMATION

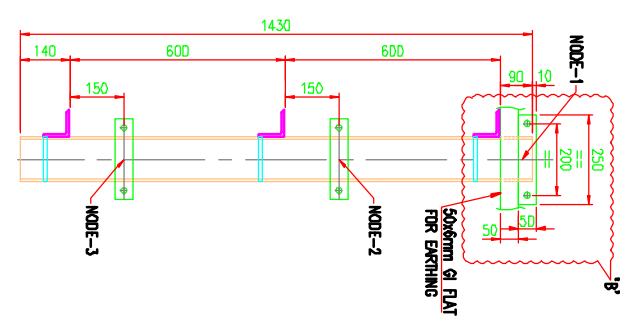
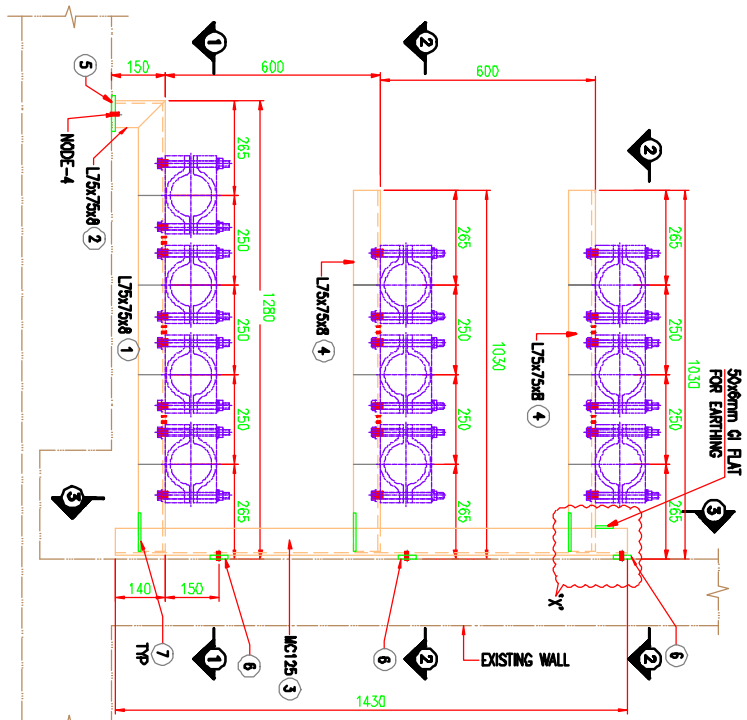
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PROJECT NO: [Text]
PROJECT DATE: [Text]

CLIENT INFORMATION

CLIENT NAME: [Text]
CLIENT ADDRESS: [Text]
CLIENT PHONE: [Text]
CLIENT EMAIL: [Text]

DESIGNER INFORMATION

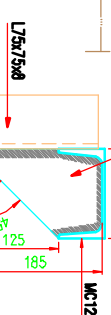
DESIGNER NAME: [Text]
DESIGNER ADDRESS: [Text]
DESIGNER PHONE: [Text]
DESIGNER EMAIL: [Text]



VIEW 3-3

CUT TO SHAPE

TYP. GA DETAILS FOR CABLE SUPPORT TYPE -3



DETAIL - D

F_y = POSITIVE DOWNWARDS DIRECTION
F_z = ALONG CABLE
F_x = PERPENDICULAR TO CABLE

LOAD DATA @ NODES ON WALLS & SLAB FOR SLOPE 1:1.5

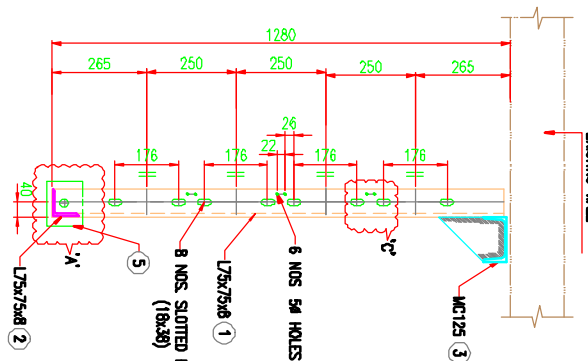
NODE MARKED	kg F _x	kg F _y	kg F _z
1	±155	90	±125
2	±80	45	±65
3	±35	80	±105
4	±35	80	±105

LOAD DATA @ NODES ON WALLS & SLAB FOR SLOPE 1:7

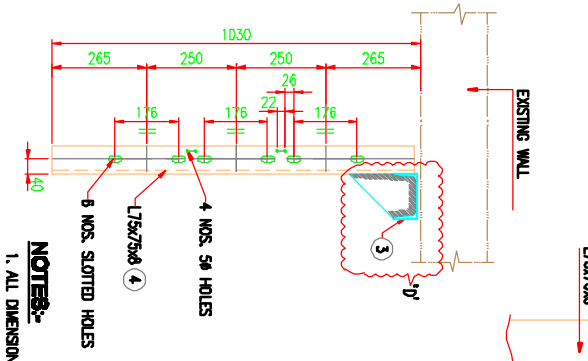
NODE MARKED	kg F _x	kg F _y	kg F _z
1	±180	105	±35
2	±90	55	±20
3	±40	105	±30
4	±40	105	±30

QUANTITY
SUPPORT TYPE NOS. ROD.
3 41

VIEW 1-1



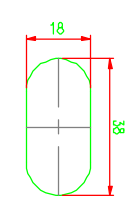
VIEW 2-2



NOTES:-

1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
2. ALL SUPPORTS SHALL BE PREFABRICATED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE GRIND CONIT. RILET UNLESS NOTED.

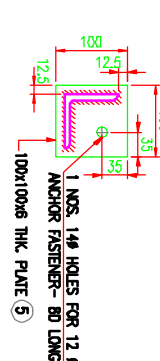
TYP. DETAIL OF SLOTTED HOLES



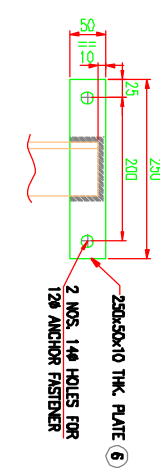
DETAIL - C

DETAIL - X

DETAIL - A

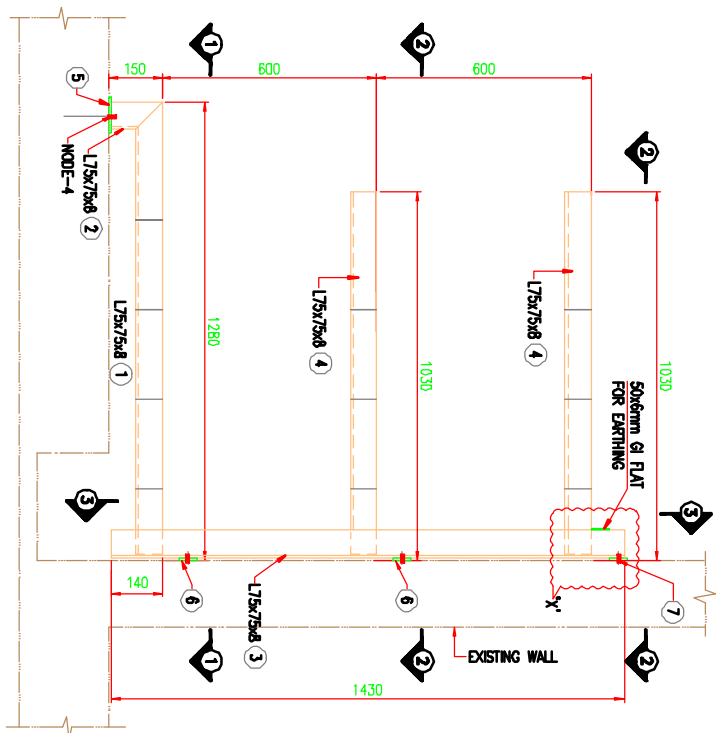
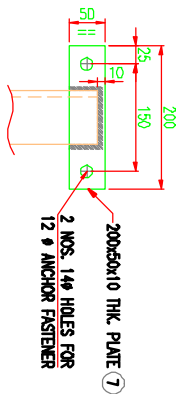
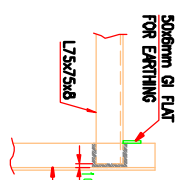
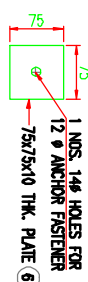
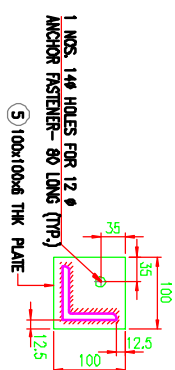
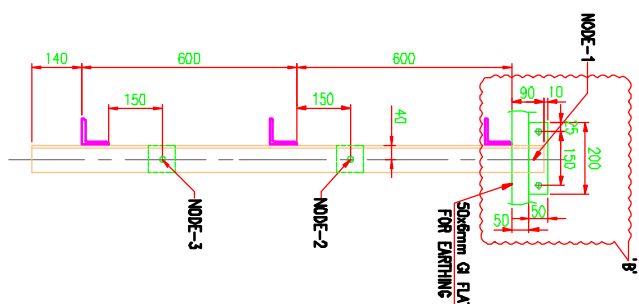


DETAIL - B

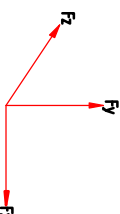


ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT WT. (KG)	TOTAL WT. (KG)
1	L75x75x8	1	-	1260	8.90	11.21
2	L75x75x8	1	-	144	8.90	1.28
3	MC125	1	-	1430	12.70	18.16
4	L75x75x8	2	-	1010	8.90	17.98
5	6THK. PLATE	1	-	100	47.10	0.47
6	10THK. PLATE	4	250	50	78.50	3.93
7	6THK. PLATE	3	125	185	47.10	3.27
Grand Total						56.30

MRP LIMITED
 100% QUALITY ASSURANCE
 100% CUSTOMER SATISFACTION
 100% DELIVERY ON TIME
 100% COMPLIANCE WITH ALL STANDARDS
 100% SAFETY
 100% ENVIRONMENTAL PROTECTION
 100% SOCIAL RESPONSIBILITY
 100% ETHICAL Sourcing
 100% INNOVATION
 100% LEADERSHIP
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 100% OPPORTUNITY



VIEW 2-3



BILL OF MATERIAL						
ITEM MARK	PROFILE NAME	QUANTITY	WIDTH (MM)	LENGTH (MM)	UNIT WT.	TOTAL WT. (KG)
1	L75x75x8	1	-	1760	8.90	11.21
2	L75x75x8	1	-	144	8.90	1.28
3	L75x75x8	1	-	1430	8.90	12.73
4	L75x75x8	2	-	1010	8.90	17.98
5	6THK. PLATE	1	100	100	47.10	0.47
6	10 THK. PLATE	3	75	75	78.50	1.32
7	10THK PLATE	1	50	200	78.50	0.79
				Grand Total		45.78

MODE MARKED	kg F _x	kg F _y	kg F _z
1	±1.5	105	±5
2	±60	55	±20
3	±135	105	±5
4	±25	65	±25

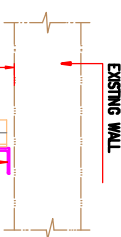
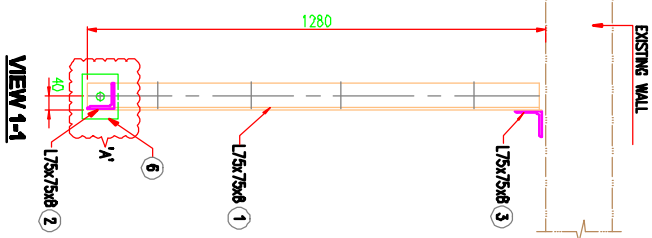
QUANTITY	
SUPPORT TYPE	NOS. REQ.
2	205

LOAD DATA @ NODES ON WALLS & SLAB

F_y = POSITIVE VERTICAL DOWNWARDS DIRECTION
F_z = ALONG CABLE
F_x = PERPENDICULAR TO CABLE

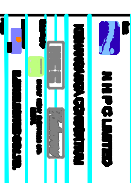
NOTES:-

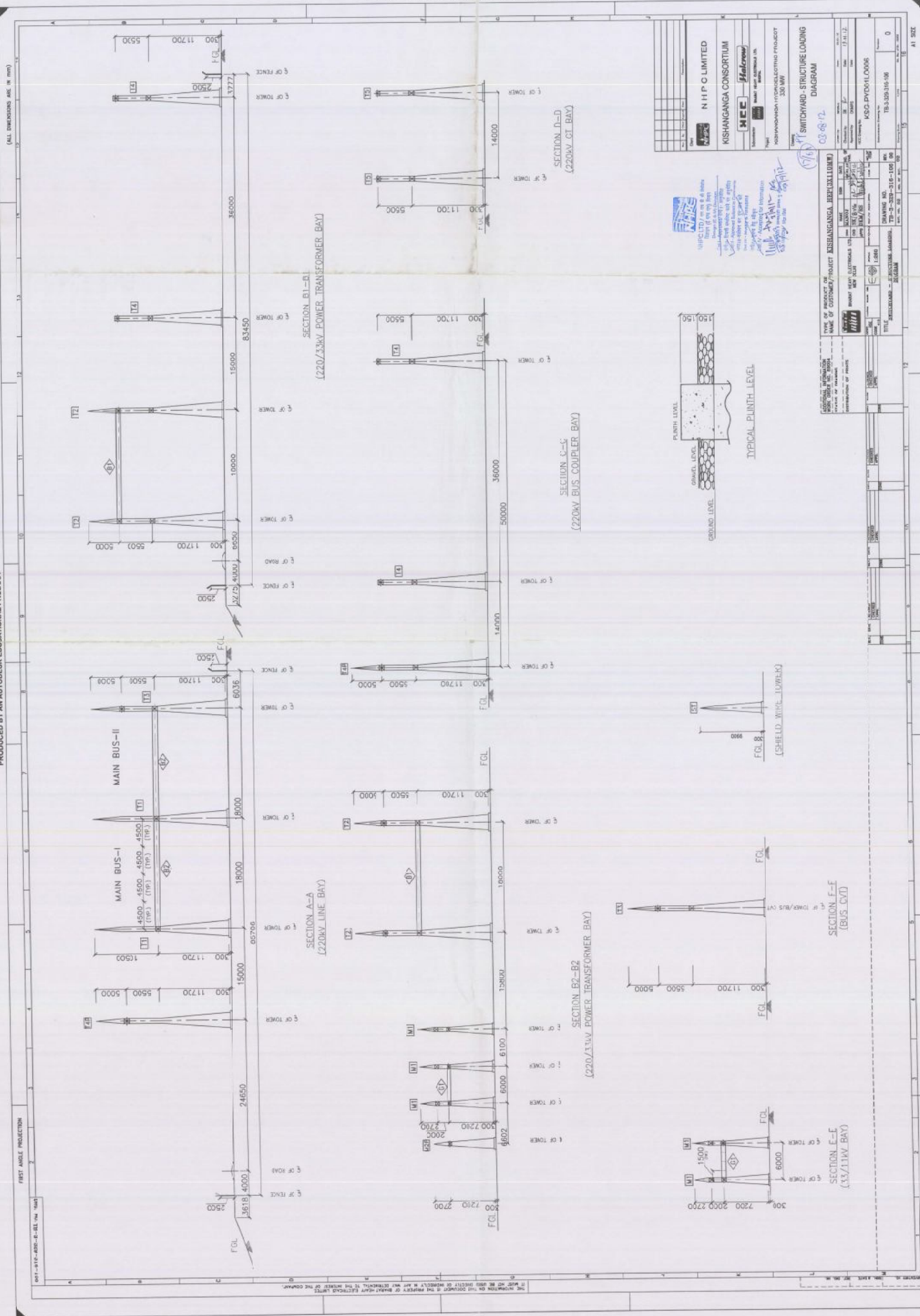
1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METER.
2. ALL SUPPORTS SHALL BE PREFABRICATED, HENCE THEY SHALL BE HOTDIP GALVANISED.
3. ALL WELDS SHALL BE 6mm CONT. FILLET UNLESS NOTED.

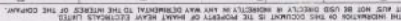


TYP. G.A DETAILS FOR
CABLE SUPPORT TYPE - 2

VIEW 2-2







POINTS	EASTING	NORTHING
SY1	18063.138	7024.414
SY2	18061.464	6909.426
SY3	17061.195	6912.245
SY4	17862.159	7027.333

CO-ORDINATES:

POINTS	EASTING	NORTHING
SV1	18063.138	7024.414
SV2	18061.464	6909.426
SV3	17001.195	6012.245
SV4	17862.159	7027.333

1. ALL DIMENSIONS ARE IN MM.
2. DRAWING SHOWS THE MAXIMUM STATIC STRAINING TENSION IN KG ONLY
3. DO NOT INCLUDE THE EFFECTS OF DEAD & LIVE LOADS, WIND, SHOCK LOADING, SEISMOLOGICAL CONDITIONS ETC.
4. THE STRUCTURE SHALL BE DESIGNED FOR A FACTOR OF SAFETY OF 2 FOR NORMALLY BROKEN WIRE CONDITION & 1.5 FOR SHORT GRIP OR CONDITION OF THE TRANSVERSE, VERTICAL LONGITUDINAL LOADS SHALL BE CONSIDERED AS PER IS 802 / 1977
5. WEIGHT OF THE MAN WITH TOOLS AT ANY POINT OF TIME SHALL BE CONSIDERED ON BASIS OF 150 Kg
6. ALL HEIGHTS ARE WITH REFERENCE TO PLINTH LEVEL
7. PLINTH LEVEL IS 300 MM ABOVE GROUND LEVEL
8. DEVIATION ANGLE FOR TOWER / TAIL OF GANTRY SHALL BE $\pm 30^\circ$
9. THE CONDUCTOR/SHEILD WIRE IN HORIZONTAL & VERTICAL PLANE, THE DISTANCE BETWEEN TERMINAL & DEAD END GANTRY WILL BE TAKEN

	Unit	Amount
...

LINE NO.	QUANTITY	DESCRIPTION	SUB. HT. DETAILS	QTY.
1	11		11.7MA-10.5MP	07 Nos.
2	9		11.7MA-5.5M+5.0MP	0.4 Nos.
3	13		11.7MA-5.5M+5.0MP	0.4 Nos.
4	14		11.7MA-5.5M	02 No.
5	16P		11.7MA-5.5M+5.0MP	06 Nos.
6	16		11.7MA-5.5M	04 Nos.
7	15P		11.7MA-5.5M+5.0MP	01 No.
8	M1		7.2M+2.0M+2.7MP	01 Nos.
9	STP		7.2M+2.7MP	03 Nos.
10	9.9M			Nos.

BEAMS: 220kV AND 33kV

LINE NO.	STR. DESIGNATION	SPAN	QTY.
1	B1	18M	09 Nos.
1	B2	18M	20 Nos.
1	G1	06M	07 Nos.

STRUCTURE LOADING : 220KV AND 33KV

NOTATION	No. & Type of Cond./ Shield Wires per Phase	Normal Tension Per Phase (kg)	C/F Tension Per Phase (kg)
$\pm 2.0T$	THIN ACSR MOOSE	2000	3010
$\rightarrow 2.0T$	SINGLE ACSR MOOSE	2000	2562
$\rightarrow 1.0T$	SINGLE ACSR MOOSE	1000	1225
$\rightarrow 2.0T1$	SINGLE ACSR MOOSE	2000 with 30 deflection	8162
$\rightarrow 2.25T$	SINGLE ACSR MOOSE	2500	282
$\rightarrow 2.25T1$	SINGLE ACSR MOOSE	2500 with 30 deflection	282
$\rightarrow t$	SHIELD WIRE	800 with 30 deflection	Not applicable

NAIPE
NAIPE LTD. 1000 10th St. NW
Suite 1000, NW, Washington, DC 20004
Tel: (202) 462-1000
Fax: (202) 462-1001
Web: www.naipe.org

N H P C LIMITED	KISHANGANGA CONSORTIUM	HEC	Hafslund	SHANGHAI ELECTRIC LTD.	KISHANGANGA HYDROELECTRIC PROJECT
					320 MW

[illegible]

ADDITIONAL INFORMATION	TYPE OF PRODUCT OR SERVICE	SESIAN/CANICA SEP(20150Mw)
ASK ORDER NO. 85004		

[illegible]

A1 SIZE

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHECKED			CHECKED			CHECKED
		APPD			APPD			APPD

LEGEND

→	CONNECTION TO GROUND MAT THROUGH RISER
—⊗—	CONNECTION TO ROD ELECTRODE WITH TEST PIT
—⊗—	CONNECTION TO PIPE ELECTRODE
—○—	CONNECTION TO ROD ELECTRODE WITHOUT TEST PIT

GENERAL NOTES:

- 1 EARTH STRIP CLEATED TO LATTICE TYPE STRUCTURE WITH CLEAT TYPE CLAMP AT AN INTERVAL OF 1.0M SUITABLE PROVISION SHALL BE MADE WITH SUPPORT STRUCTURE.
- 2 ALL EARTH STRIPS SHALL BE TAKEN ALONG EDGE OF STRUCTURE. ALL DRAWING SHOWS TYPICAL ARRANGEMENT ONLY.
- 3 ALL STRUCTURES/EQUIPMENTS SHALL BE EARTHED AS SHOWN IN THE FOLLOWING SHEETS.
- 4 BOLT SIZE FOR CONNECTING EARTHING FLAT TO THE EQPT/STRUCTURE SHALL BE TO SUIT RESPECTIVE HOLE SIZE.
- 5 FOR NOTES REFER SHEET2.
- 6 ALL EARTHING SHALL BE DONE IN ACCORDANCE WITH IS:3034 UNLESS OTHERWISE STATED IN TECHNICAL SPECIFICATION
- 6A EACH RISER OF A PARTICULAR EQUIPMENT SHALL BE CONNECTED TO A DIFFERENT EARTHROD (EITHER HORIZONTAL OR VERTICAL EARTHROD)
- 7 FOR BOLTING AND WELDING DETAILS REFER SHEET #18 , 19 & 20 .
- 8 E/WIRE DOWN CONDUCTOR SHALL BE CLEATED WITH CLEAT TYPE CLAMP AT AN INTERVAL OF 2000MM ALONG WITH STRUCTURE
- 9 ALL WELDING JOINT BELOW GROUND SHALL PAINTED WITH ANTICOROSSION PAINTS AS PER SPECIFICATION.

SHT. NO. DESCRIPTION

01.	COVER SHEET	25.	220KV CABLE SEALING END
02.	NOTES	26.	PIPE EARTH ELECTRODE IN TREATED EARTH PIT
03.	220KV CVT & 33KV PT		
04.	220KV & 66KV SFB CIRCUIT BREAKER		
05.	220KV POST INSULATOR (SOLID CORE TYPE)		
06.	LIGHTNING ARRESTER 198KV & 30KV		
07.	MARSHALLING KIOSK		
08.	220KV HORIZONTAL CENTER BREAK ISOLATOR (TYPICAL)		
09.	SHIELD WIRE TOWER		
10.	TOWER WITHOUT PEAK		
11.	220KV & 33KV CURRENT TRANSFORMER		
12.	WAVE TRAP		
13.	CABLE TRENCH		
14.	ROD EARTH ELECTRODE WITHOUT TEST PIT (UNTREATED).		
14A.	ROD EARTH ELECTRODE WITH TEST PIT (UNTREATED).		
15.	AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH./S MECH. BOX & CB (TYP.)		
16.	SWITCHGEAR / MCC / CONTROL AND RELAY BOARD		
17.	FENCE POST		
18.	TYPICAL ARRANGEMENT OF BOLTED JOINTS		
19.	WELDING DETAILS		
20.	WELDING DETAILS		
21.	33KV ISOLATOR		
22.	RAIL BONDING		
23.	AUTO / POWER TRANSFORMER		
24.	312KVA, 11/433KV LT TRANSFORMER		

ADDITIONAL INFORMATION
WORK ORDER NO. 89004

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

REV.	DATE	ALTERED	CHECKED	APPD.
001				

TYPE OF PRODUCT OR
NAME OF CUSTOMER/PROJECT **KISHANGANGA HEP(3X110MW)**



BHARAT HEAVY ELECTRICALS LTD.
NEW DELHI

DEPT.	HSE	UNTO. DIMS. GR.	SCALE	WEIGHT(K.G.)	REF. TO ASST.DRG.	ITEM NO.	NO. OF ITEM
CODE	415						

TITLE
**SWITCHYARD-
EQUIPMENT & STRUCTURE
EARTHING DETAILS**

NAME	SIGN	DATE	NO. OF VAR.
DRN	ME	18.04.15	
CHKD	ME		
APPD	DK M/S		
DRAWING NO.	REV.	SHT. NO.	NO. OF SMT.
TB-4-329-509-108	00	01	27

Rev	By	Chd	Apprd	Date	Description
Client					
		N H P C LIMITED			
KISHANGANGA CONSORTIUM					
Subcontractor					
		BHARAT HEAVY ELECTRICALS LTD. BHOPAL			
Project					
KISHANGANGA HYDROELECTRIC PROJECT 330 MW					
Drawing					
SWITCHYARD- EQUIPMENT & STRUCTURE EARTHING DETAILS					
Drawn by:		SK		Date: 18.04.15	
Checked by:		SK		Date: 18.04.15	
Approved by:		AS NSR		Date: 19.04.15	
NHPCL Drawing No.					
KSG-PYD01DD008					
Subcontractor Drawing No.				Revision	
TB-4-329-509-108				0	
Drawing Scale: NTS					
Sh. No. of Sh.:					

NOTE :

1. EARTH WIRE DOWN CONDUCTORS SHALL BE CLEATED AT 2 M INTERVAL.
2. EARTH STRIPS TO BE LAID FLAT ALONG THE STRUCTURE AS FAR AS POSSIBLE.
3. CONNECTION TO ALL EQUIPMENT AND TOWERS SHALL BE BY BOLTED JOINTS.
4. THE SURFACES TO BE WELDED SHALL BE CLEANED OF DIRT, OIL, GREASE AND OXIDES BEFORE WELDING.
5. ANY OXIDE FILMS THAT MAY HAVE FORMED DURING WELDING MUST BE REMOVED FROM THE WELDED JOINT.
6. EARTHING CONDUCTOR FOR EQUIPMENT AND TOWER EARTHING SHALL BE GALVANIZED M.S. OF SIZE 65x10 MM. THE CONDUCTOR BELOW THE GROUND LEVEL SHALL BE 32MM DIA BLACK MS ROD.
7. IN THE ATTACHED DRAWINGS GL REPRESENTS GRAVEL LEVEL.
8. ALL THE EQUIPMENTS SHALL BE EARTHED AT TWO POINTS WITH 65x10 MM GS FLAT EVEN THOUGH THEY ARE SHOWN OR NOT IN THE DRAWING DUE TO CLARITY.
9. ALL JUNCTION BOXES, OPERATING MECHANISM BOXES ETC. SHALL BE EARTHED AT ONE POINT WITH 50X6MM GS FLAT AND MARSALLING KIOSKS, GROUND CONTROL CABINETS, PANELS SHALL BE EARTHED AT TWO POINTS WITH 50X6 MM GS FLAT.
10. ALL WELDED JOINTS ABOVE GROUND LEVEL SHALL BE COATED WITH 2 COATS OF RED OXIDE.
11. EARTHING CONDUCTORS FROM EQUIPMENT STRUCTURES SHALL BE CONNECTED TO THE NEAREST POSSIBLE EARTH MAT RISER. EQUIPMENT EARTHING SHALL BE AS PER IS:3043.
12. ALL JOINTS BETWEEN 32 DIA MS ROD AND 65x10 MM GS FLAT SHALL BE BELOW GRAVEL LEVEL.
13. ALL TOWERS SHALL BE DIRECTLY CONNECTED TO GROUND MAT BY TWO SEPARATE GROUND CONDUCTORS DIAGONALLY.

PIG TAIL RISERS (RISERS OF $0.6M+0.15M=0.75M$ HEIGHT, JUST ABOVE MAIN EARTH MAT) SHALL BE 75X12MM. BEYOND PIG TAIL RISERS, RISERS ABOVE GROUND FOR EQUIPMENTS SHALL BE 65X10MM.

THE SIZES OF CONDUCTORS FOR BELOW GROUND GROUNDING (FOR SWITCHYARD) ARE TABULATED BELOW:

S.NO.	PARAMETER	UNITS	DATA
1	SIZE OF EARTHING CONDUCTOR BURIED IN GROUND (MAIN EARTH MAT GRID)	MM	32 DIA MS ROD
2	EARTHING OF LT BOARD, RISER FOR EQUIPMENT	MMXMM	65X10 GS FLAT
3	EARTHING OF CABLE TRAY, FENCE, CONTROL AND RELAY PANEL, RISER FOR EQUIPMENT	MMXMM	50X6 GS FLAT



EQUIPMENT EARTHING DETAILS NOTES

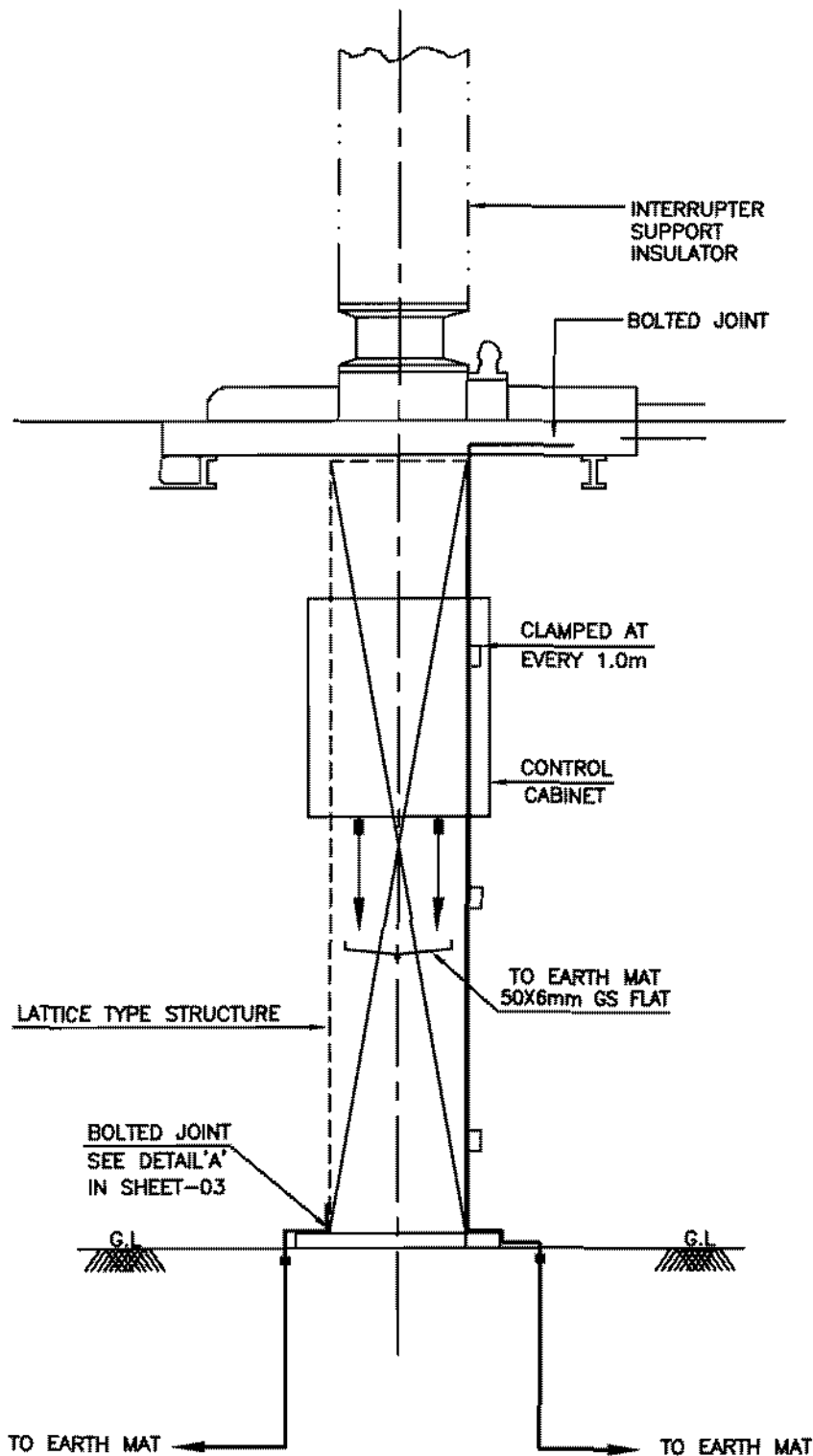
COMPUTER REF. NO.

DRG. No.

TB-4-329-509-108

REV. 00

SHEET No.
02



NOTE:

- 1) LOCAL CONTROL CABINET SHALL BE EARTHED SEPARATELY.
- 2) * BOLT SIZE AND HOLE SIZE SHALL BE TO SUIT RESPECTIVE EQPT./STRUCTURE.
- 3) NO. OF RISERS FOR 220KV CB = 2 PER POLE + 2 PER MB + 2 PER CONTROL CUBICLE +1 PER LADDER.
NO. OF RISERS FOR 66KV CB = 2 PER POLE



EQUIPMENT EARTHING DETAILS

220KV & 66KV SF6 CIRCUIT BREAKER

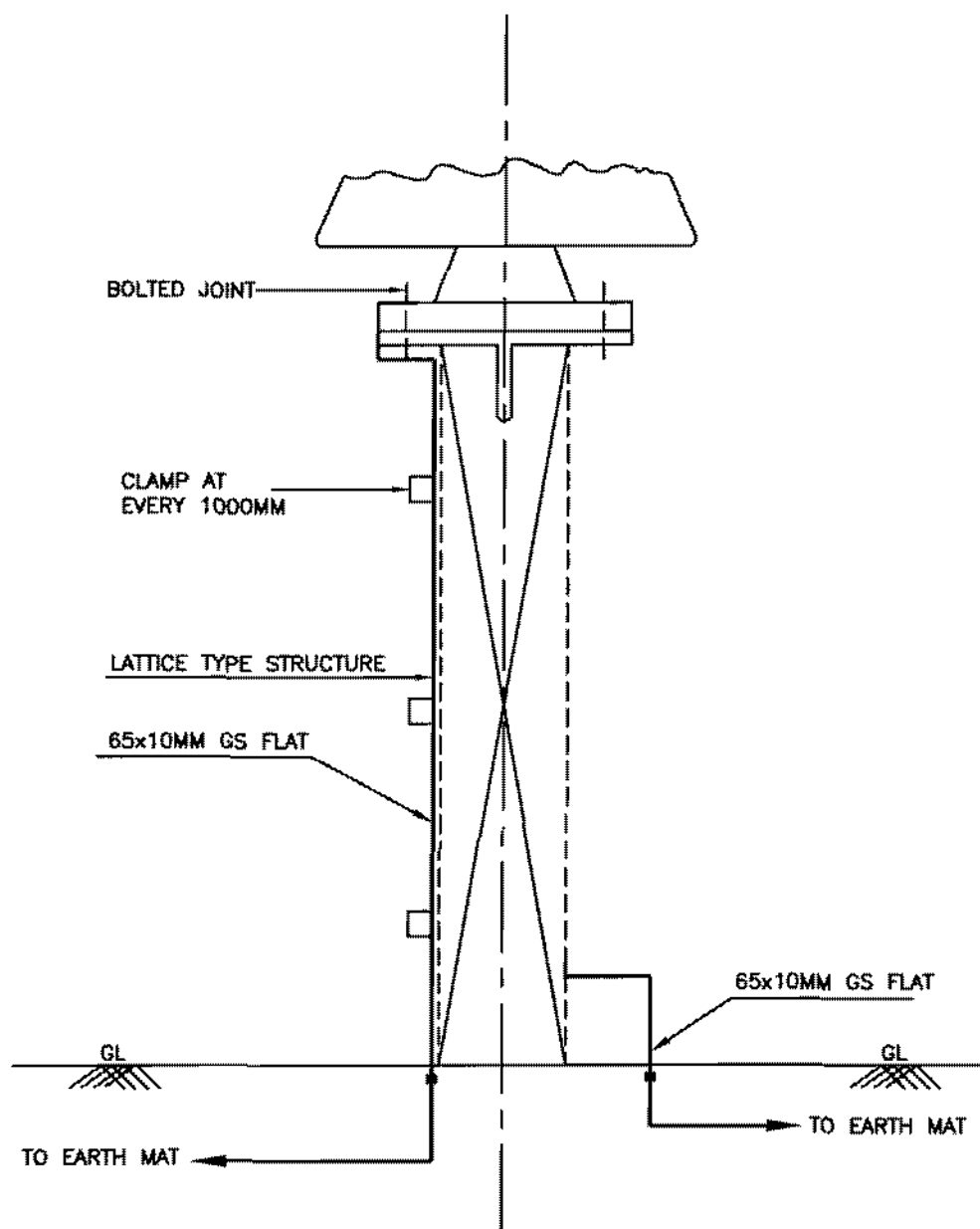
COMPUTER REF. NO.

DRG. No.

TB-4-329-509-108

REV. 00

SHEET No.
04



NOTE :

1. NO. OF RISERS = 2 PER PI



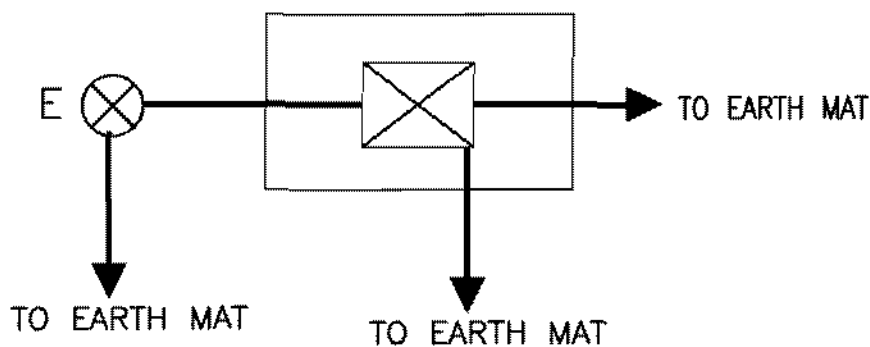
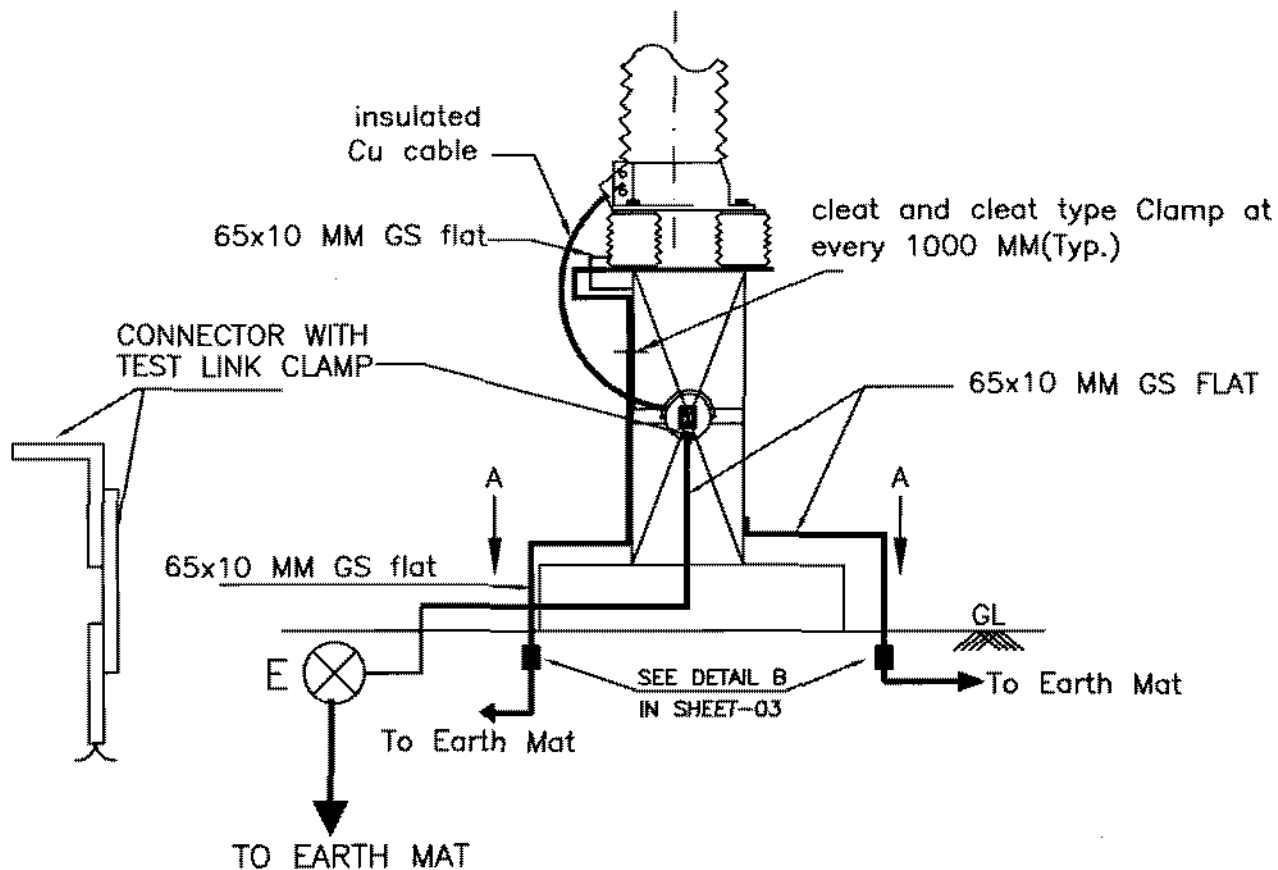
EQUIPMENT EARTHING DETAILS

220 POST INSULATOR (SOLID CORE TYPE)

DRG. No. TB-4-329-509-108

REV. 00

SHEET No.
05



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. TEST LINK CLAMP SHALL HAVE PROVISION TO BOLT TEST LEAD BEFORE ISOLATING THE MAIN EARTHING CONNECTIONS (AS PER SKETCH ABOVE) = 1NO.
4. THE EARTHING CABLE SHALL BE NEATLY CLAMPED TO THE STRUCTURE
5. NO. OF RISERS = 2 PER LA + 1 PER SURGE MONITOR



EQUIPMENT EARTHING DETAILS
LIGHTNING ARRESTER 198kV & 30kV

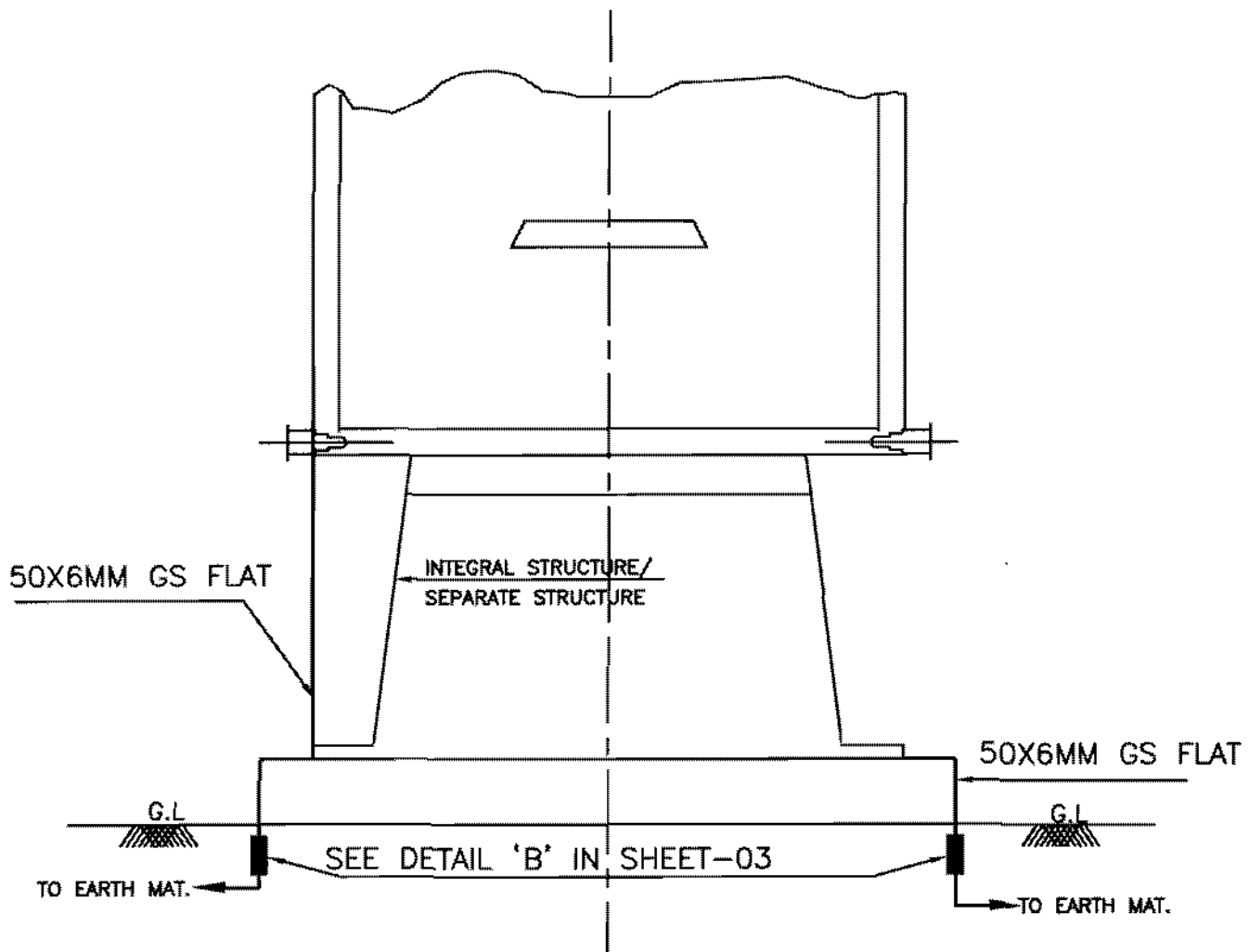
COMPU. DRG. REF.

DRG.NO.

TB-4-329-509-108

REV. 00

SHEET No.
06



NOTE :

1. NO. OF RISERS = 2 PER MB



EQUIPMENT EARTHING DETAILS

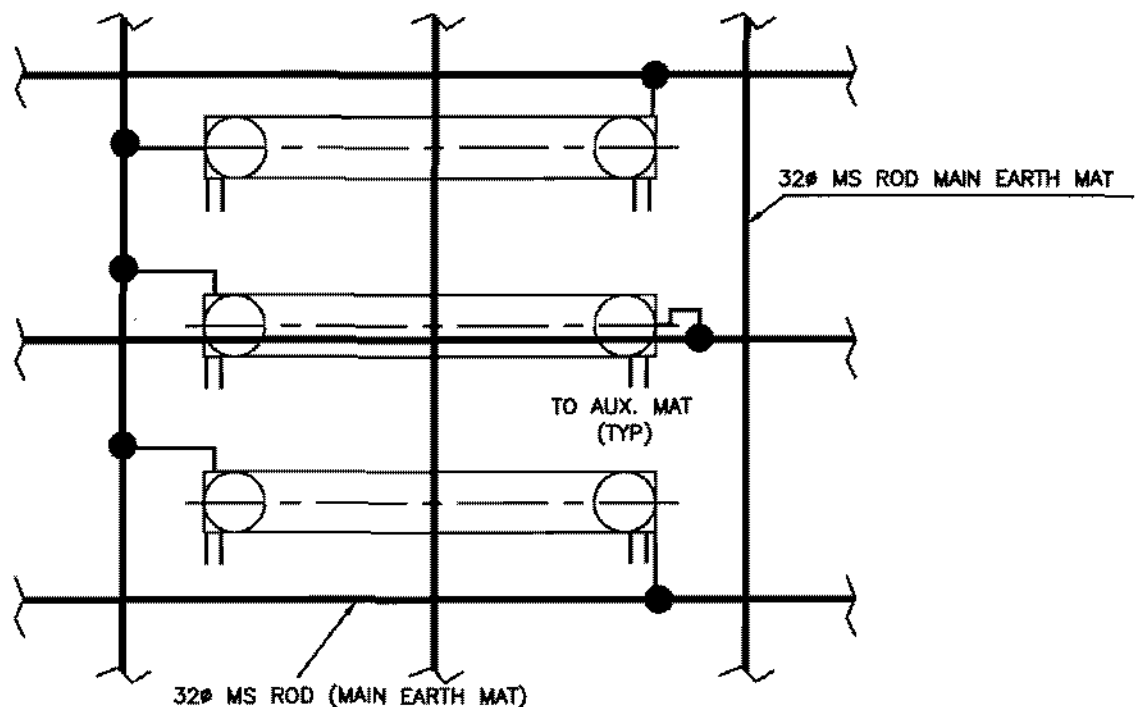
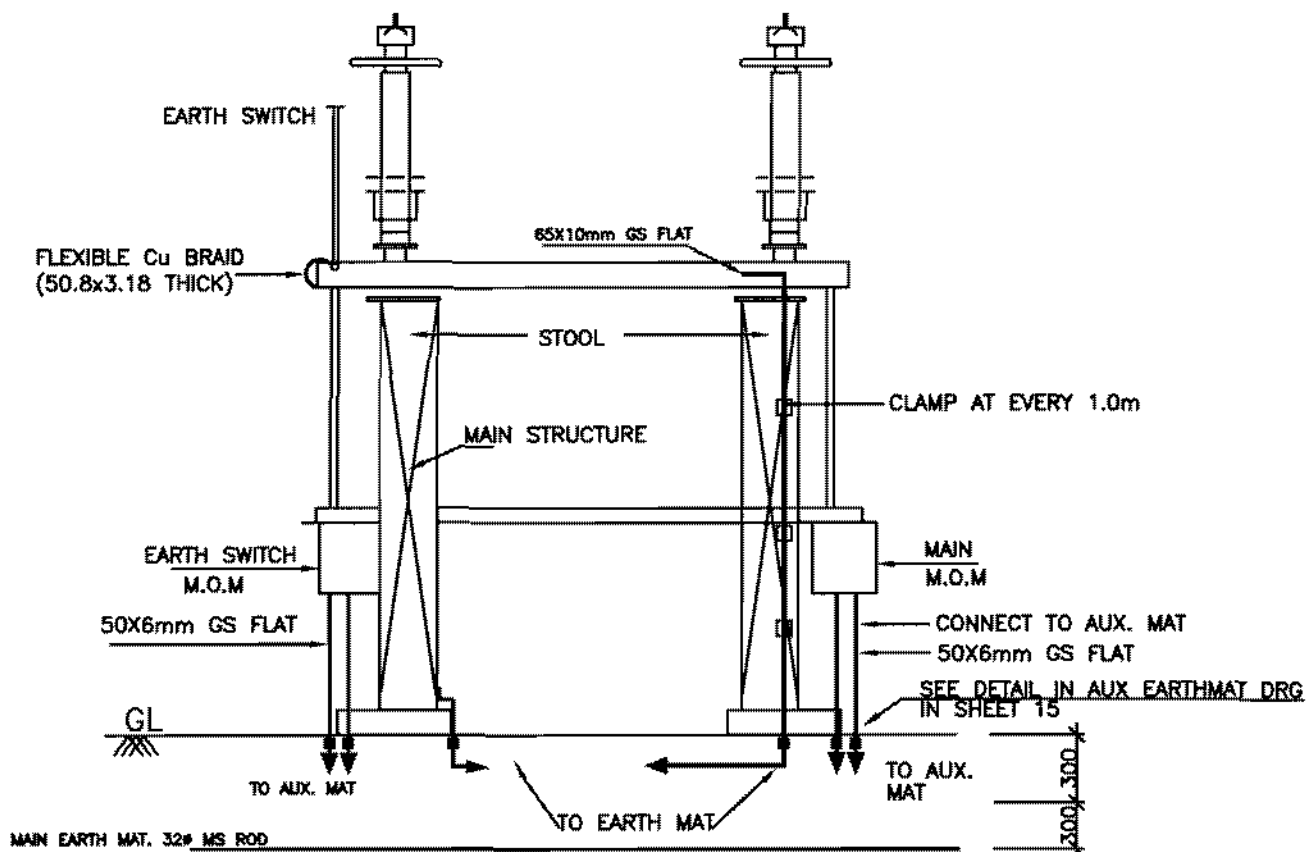
MARSHALLING KIOSK

COMPUTER REF. NO.

DRG. No. TB-4-329-509-108

REV. 00

SHEET No.
07



NOTES

1. AUXILIARY EARTH MAT SHALL BE PROVIDED BELOW EVERY MOM BOX (REFER SHEET 15)
2. NO. OF RISERS 2-PER PHASE AND 2-PER ES/MOM BOX.



COMPUTER REF. NO.

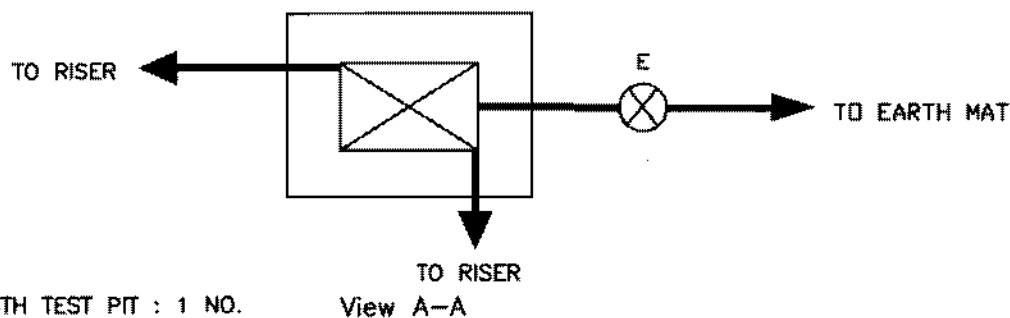
EQUIPMENT EARTHING DETAILS

220kV DOUBLE BREAK ISOLATOR WITH ONE E/S (TYP.)

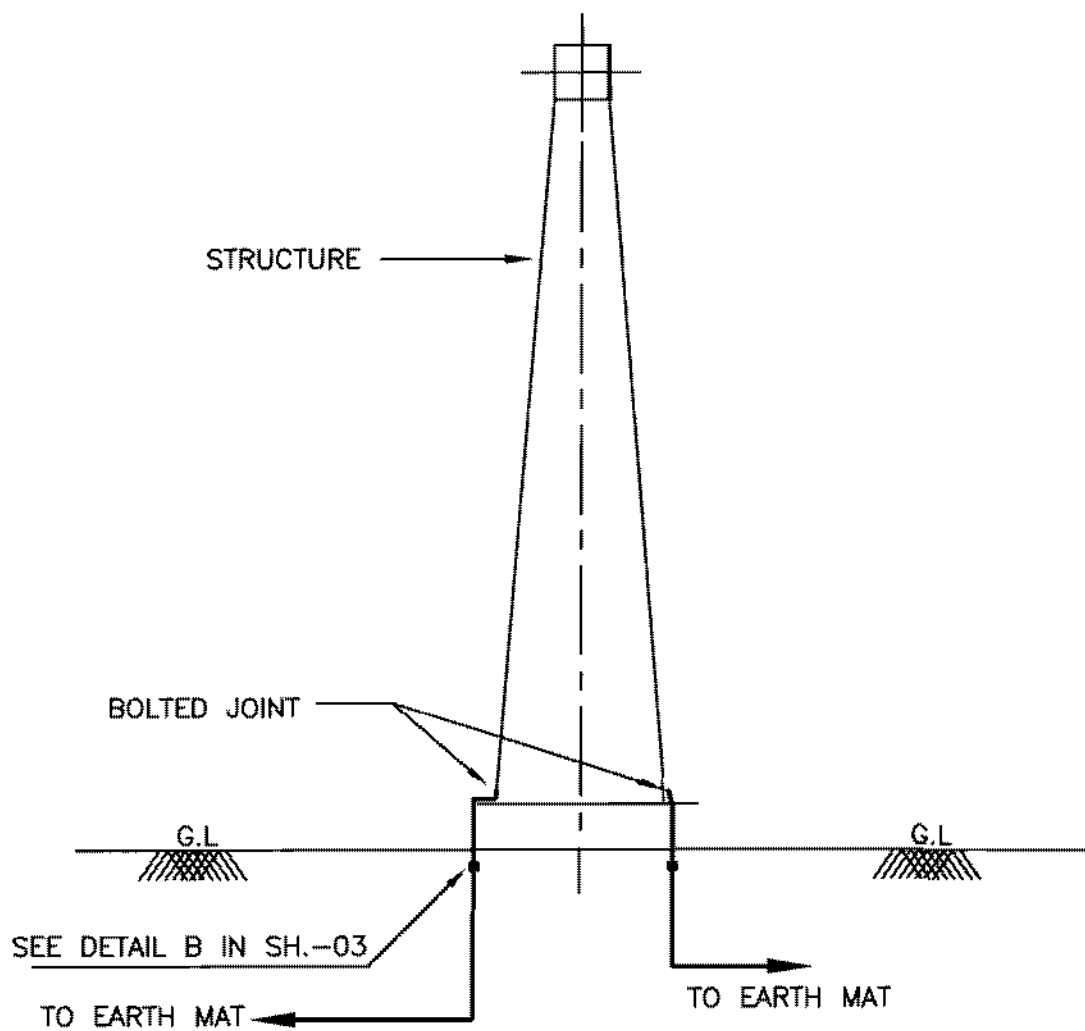
DRG. No. TB-4-329-509-108

REV. 00

SHEET No.
08



⊗ ROD ELECTRODE WITH
TEST PIT



NOTE:

1. NO. OF RISERS : 2 NO. PER TOWER.



EQUIPMENT EARTHING DETAILS
TOWER WITHOUT PEAK

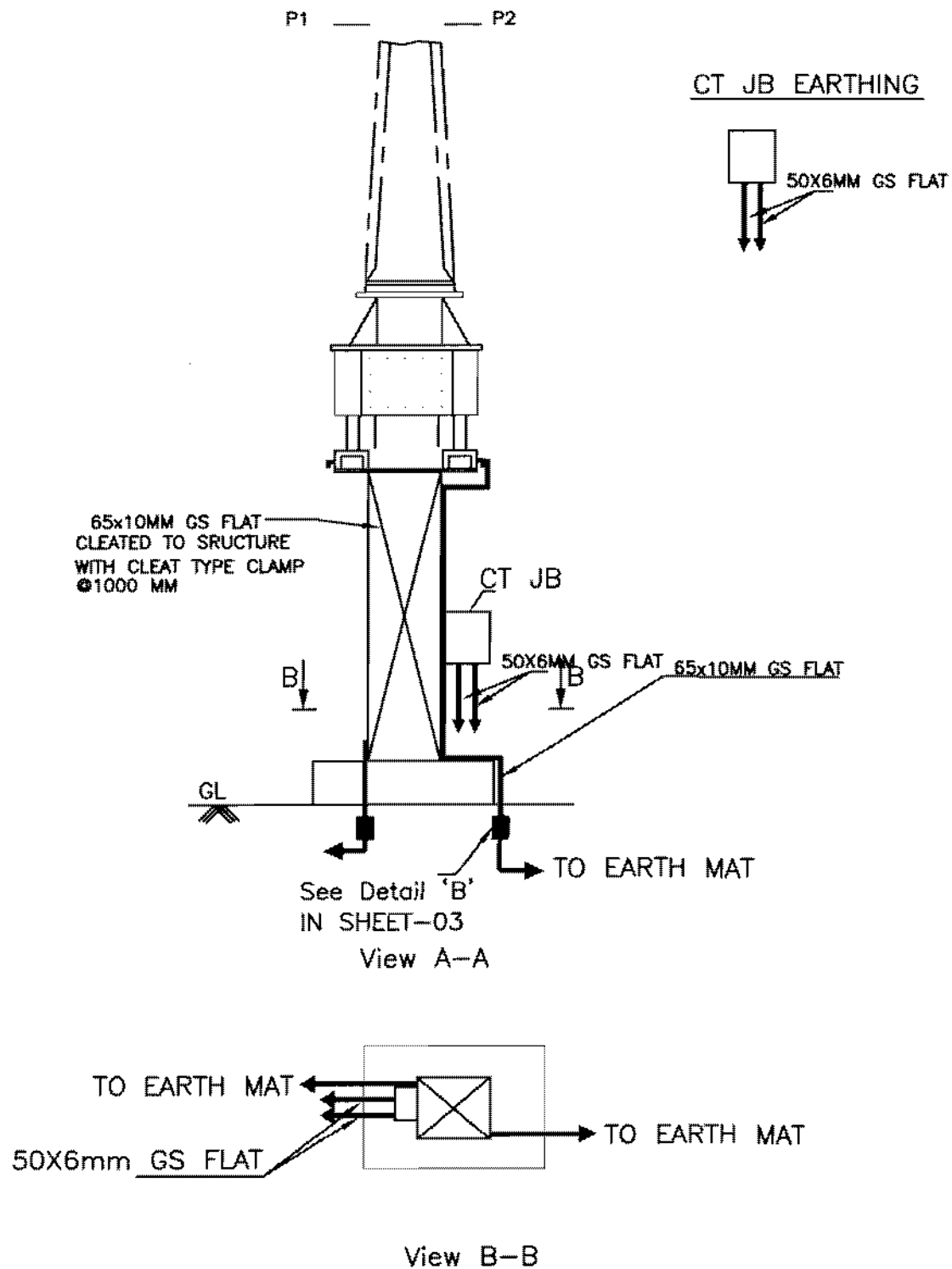
COMPUTER REF. NO.

DRG. No.

TB-4-329-509-108

REV. 00

SHEET No.
10



NOTE :

1. NO. OF RISERS = 2 PER CT & 2 PER JB



EQUIPMENT EARTHING DETAILS 220kV & 33kV Current Transformer

COMPU. DRG. REF.

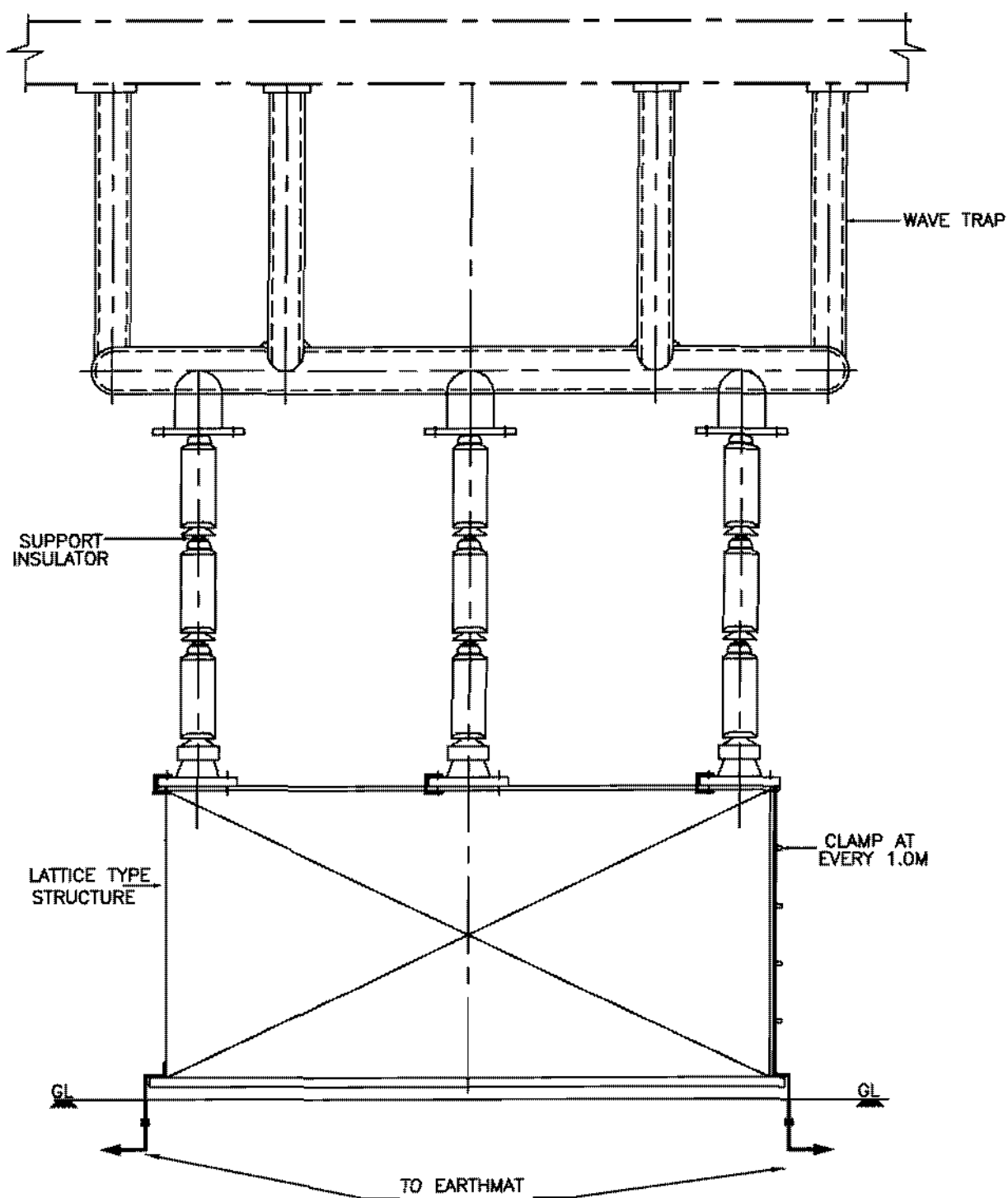
DRG.NO.

TB-4-329-509-108

REV. 00

SHEET No.

11



NOTE :
NO. OF RISERS = 2 PER WT



EQUIPMENT EARTHING DETAILS 220 kV WAVE TRAP

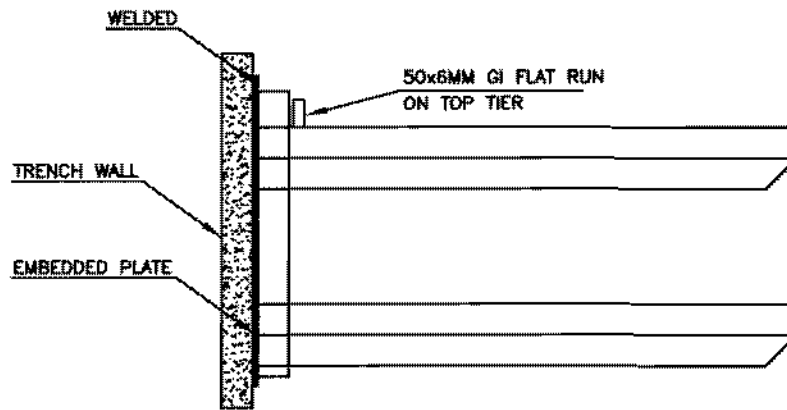
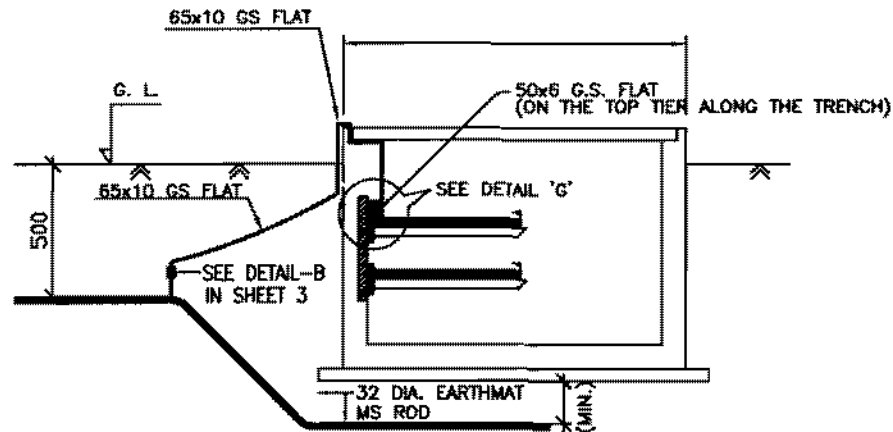
COMPUTER REF. NO.

DRG. No.

TB-4-329-509-108

REV. 00

SHEET No.
12



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 TAG WELDED ALONG THE TRENCH RUN & CONTROL ROOM AT EVERY 2M 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

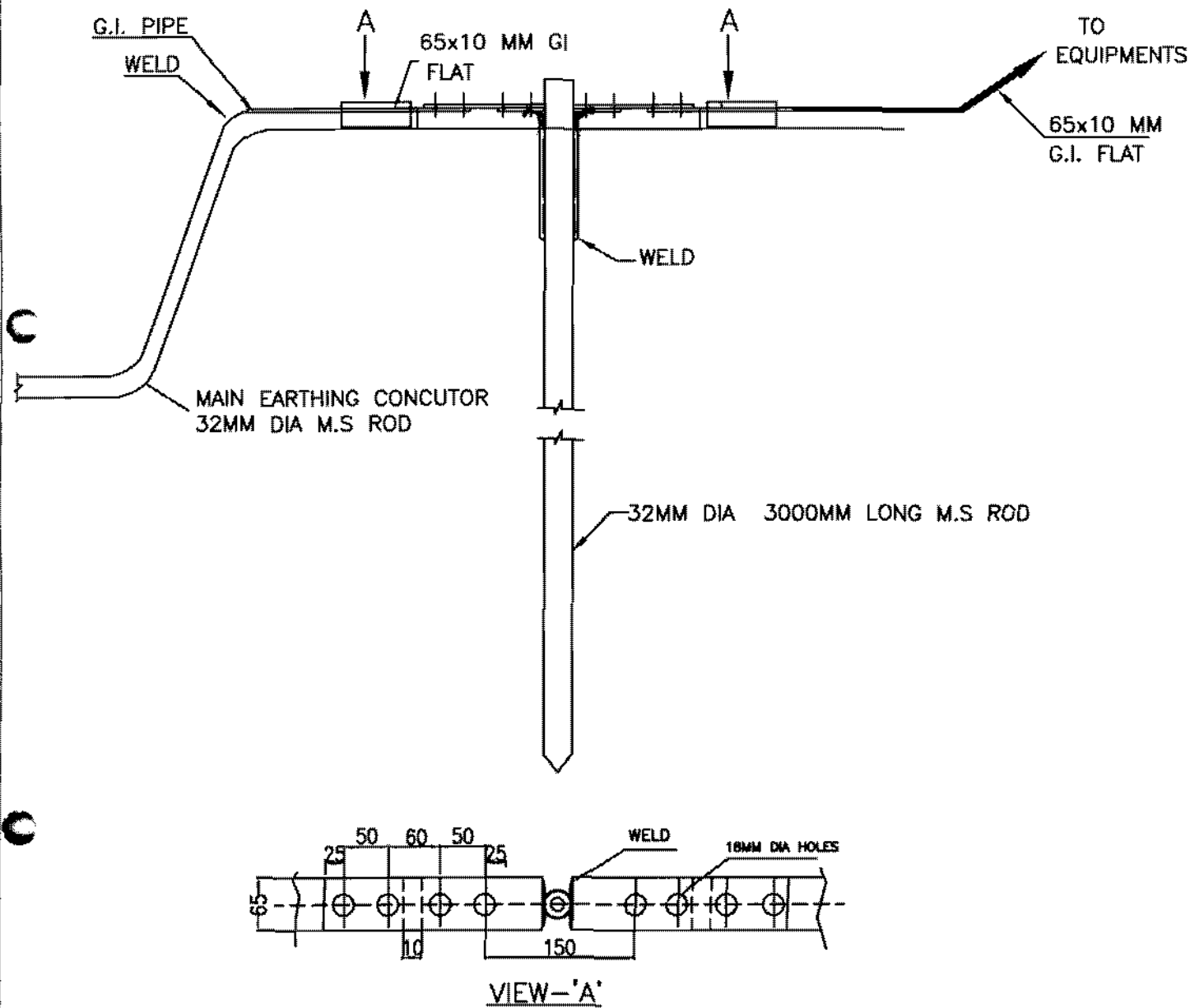
COMPU. DRG. REF.

DRG. NO.

TB-4-329-509-108

REV. 00

SHEET
13



NOTE:-

1. TO BE USED FOR CONNECTING NEUTRAL OF CVT AND FENCE CORNERS.



EQUIPMENT EARTHING DETAILS ROD EARTH ELECTRODE WITHOUT TEST PIT (UNTREATED)

COMPU. DRG. REF.

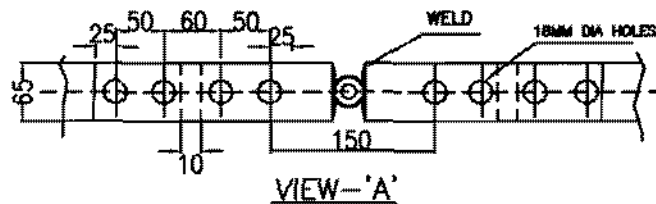
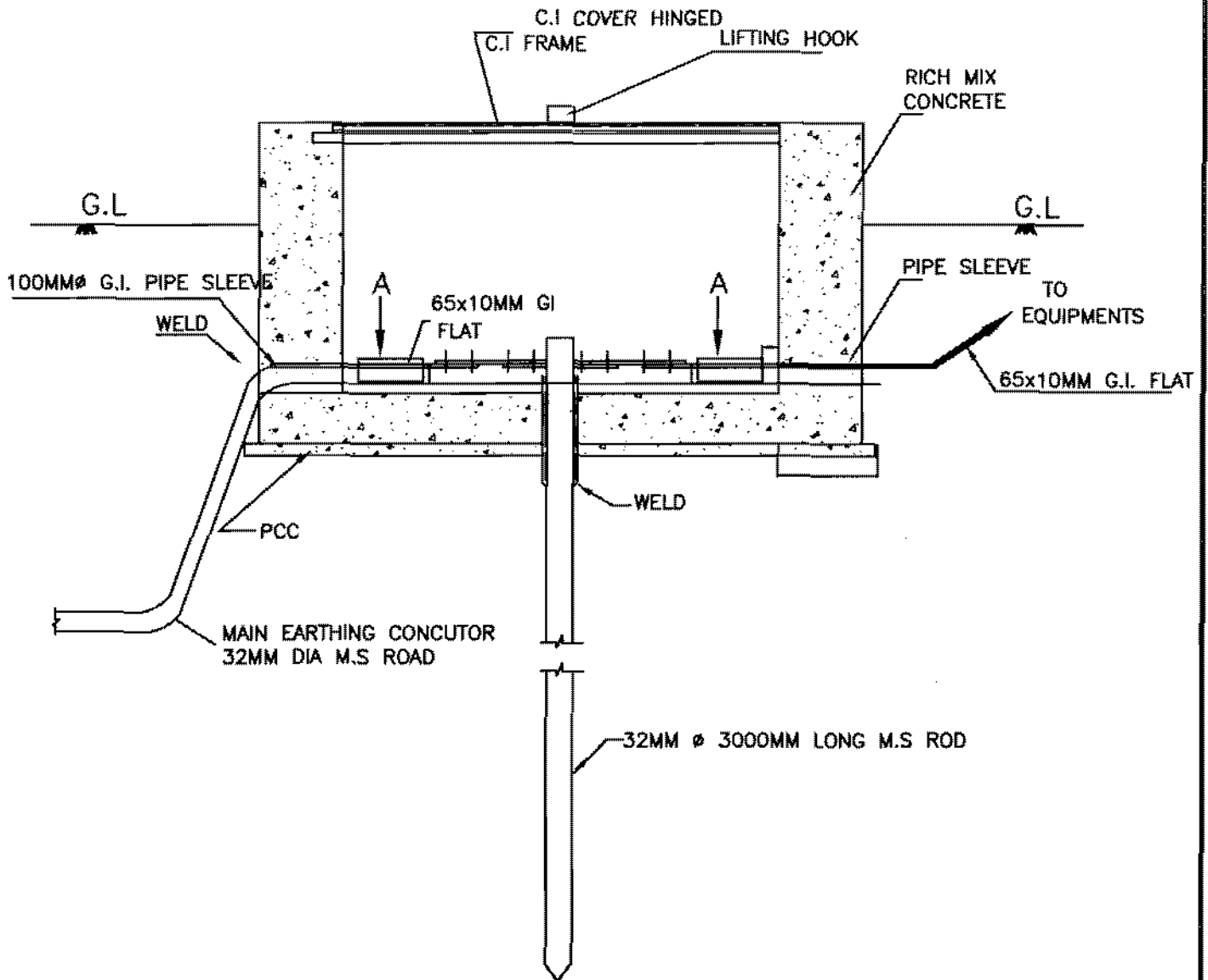
DRG. No.

TB-4-329-509-108

REV. 00

SHEET No.

14



NOTE:—

1. SUPPLY OF FIXING BOLTS, NUTS & WASHERS FOR GI FLAT EARTHING CONDUCTOR ALSO FORMS PART OF THE SCOPE
2. TO BE USED FOR CONNECTING DOWN CONDUCTOR OF LIGHTNING-PROTECTION SYSTEM FOR PEAK TOWERS, GRID CORNERS AND EARTH POINT OF SURGE MONITORS OF SURGE ARRESTERS.

as per spec



EQUIPMENT EARTHING DETAILS

ROD EARTH ELECTRODE WITH TEST PIT (UNTREATED)

COMPU. DRG. REF.

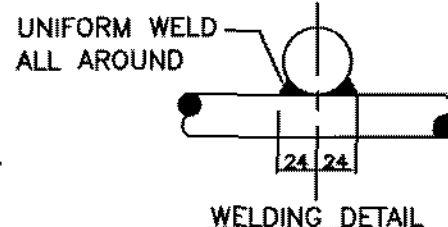
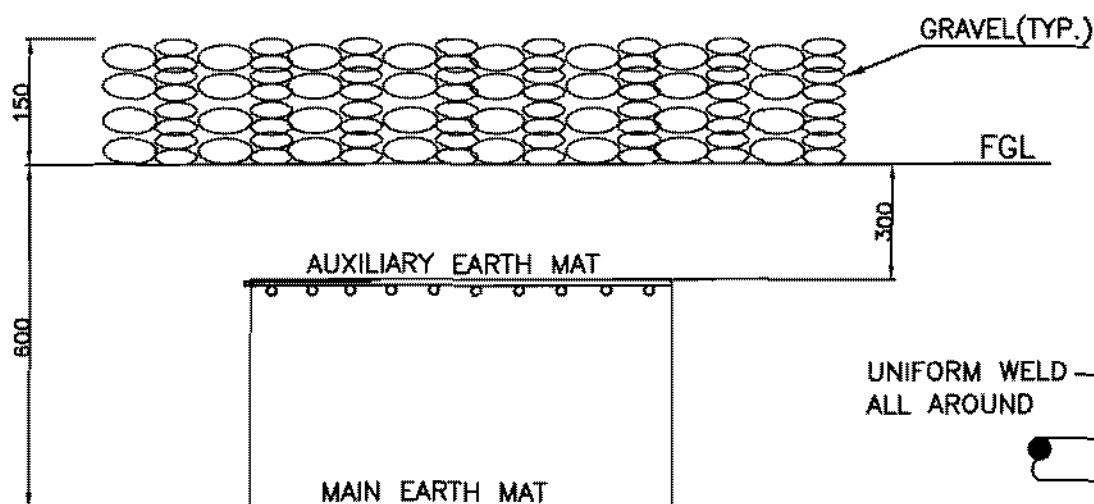
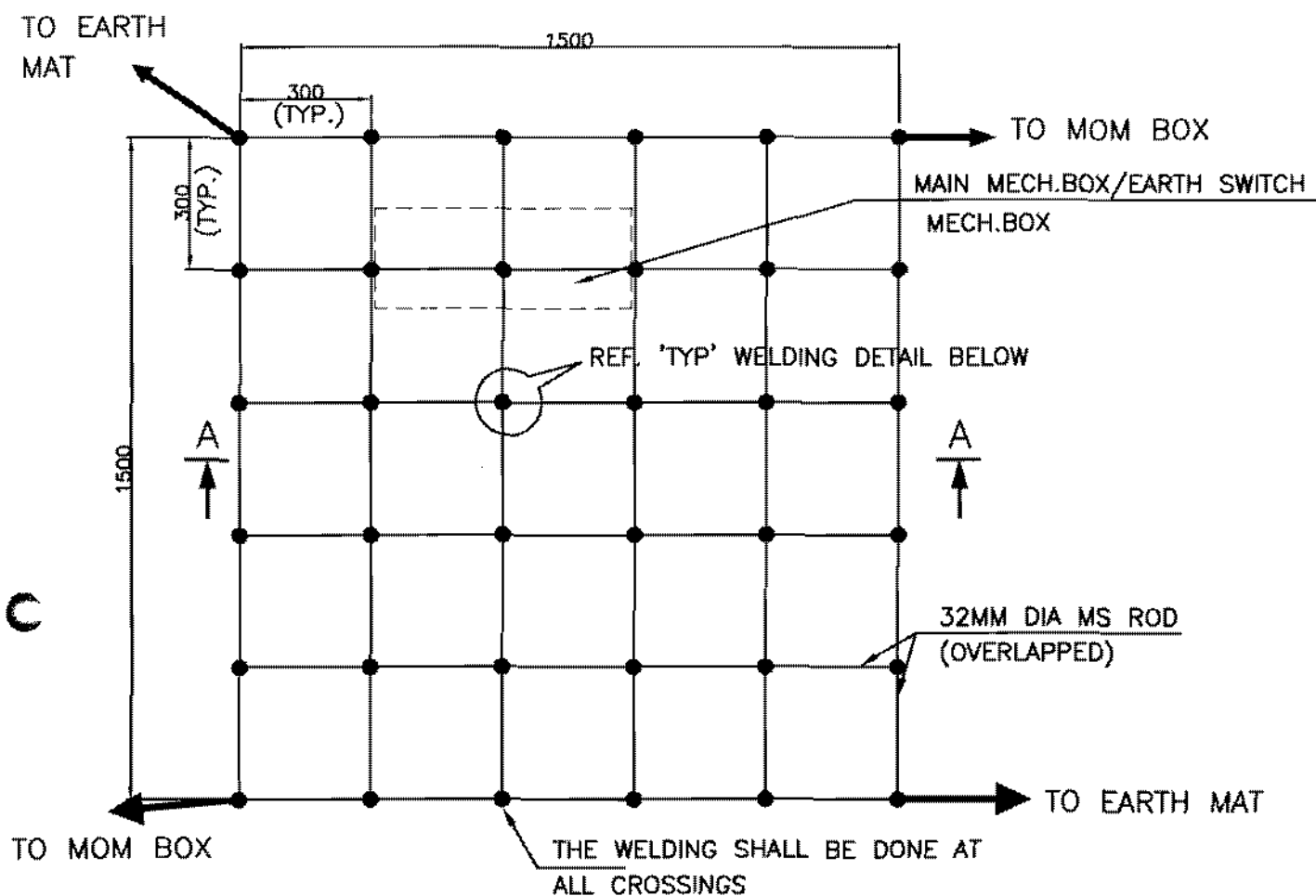
DRG. No.

TB-4-329-509-108

REV. 00

SHEET No.

14A



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

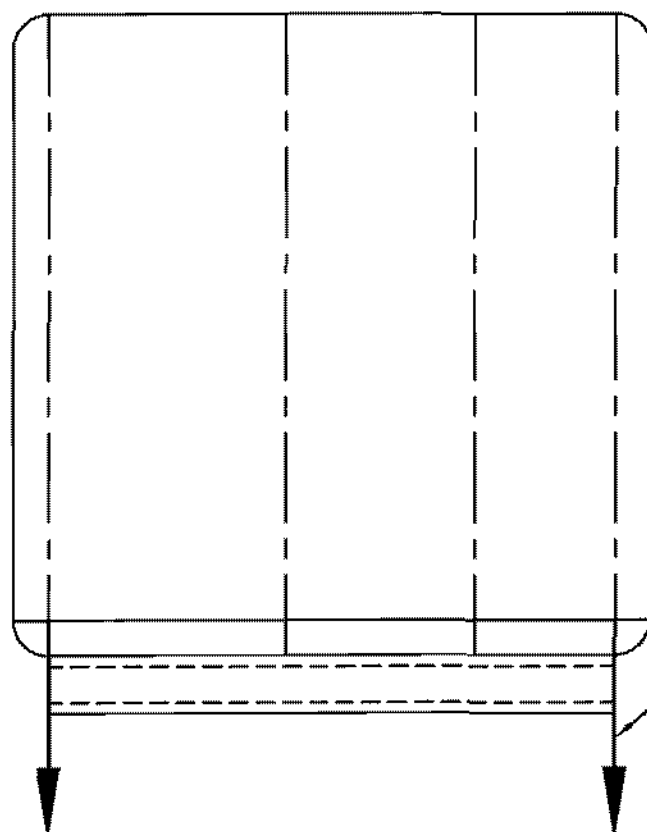
AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH. E/S MECH. BOX (TYP.)

COMPU. DRG. REF.

Report No. TB-4-329-509-108

REV. 00

SHEET No.
15



TO EARTH FLAT IN THE TRENCH BELOW

TO EARTH FLAT IN THE TRENCH BELOW

65 X 10 MM GS FLAT/
50 X 6 MM GS FLAT
(SEE TABLE -1 BELOW)

TABLE-1

EQUIPMENT	FLAT SIZE
SWITCHGEAR/ MCC	65x10 MM
AC / DC DISTRIBUTION BOARDS	65x10 MM
CONTROL & RELAY PANELS	50X6 MM



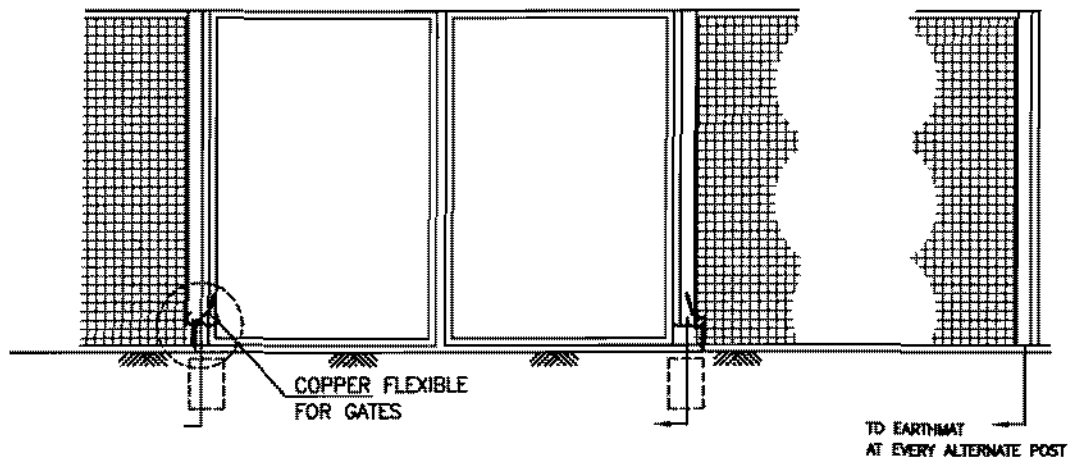
EQUIPMENT EARTHING DETAILS
SWITCHGEAR / MCC / CONTROL AND RELAY BOARD
INSIDE THE CONTROL ROOM

DRG. No. TB-4-329-509-108

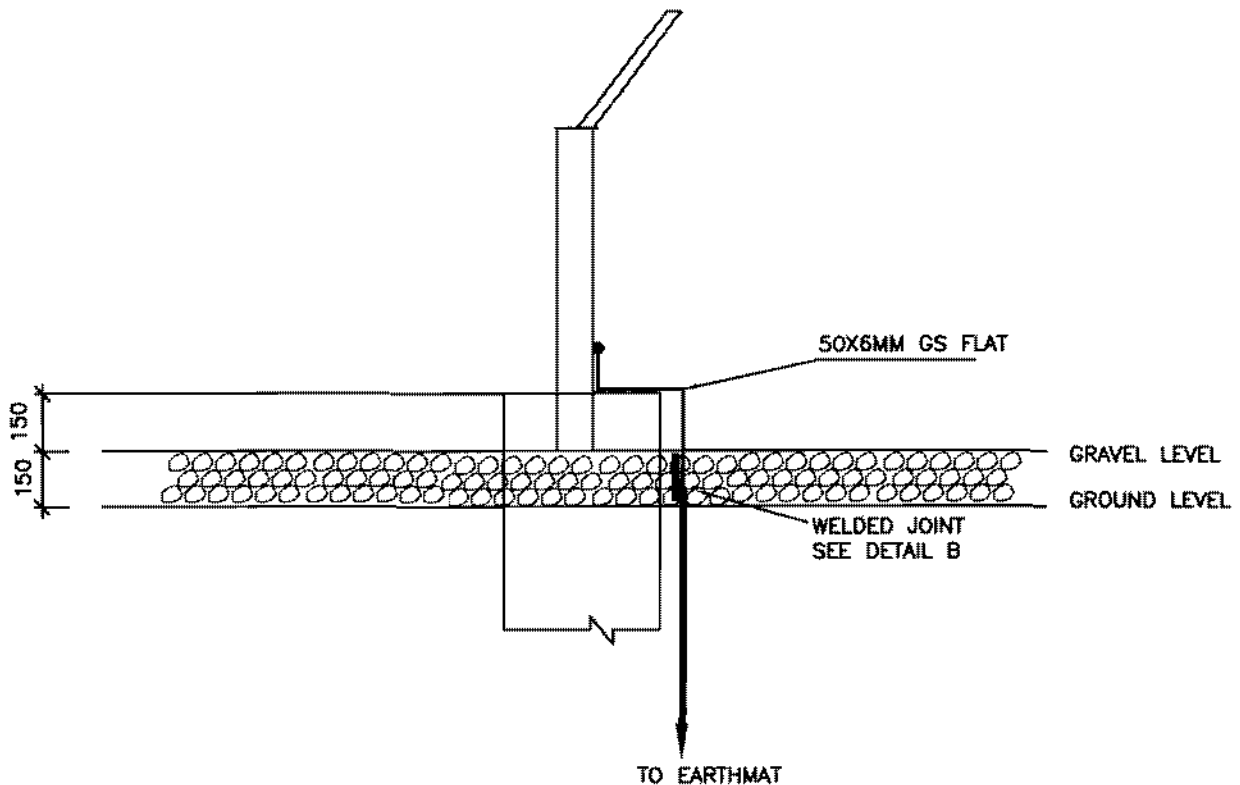
REV. 00

SHEET No.
16

FENCE GROUNDING



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



FENCE EARTHING

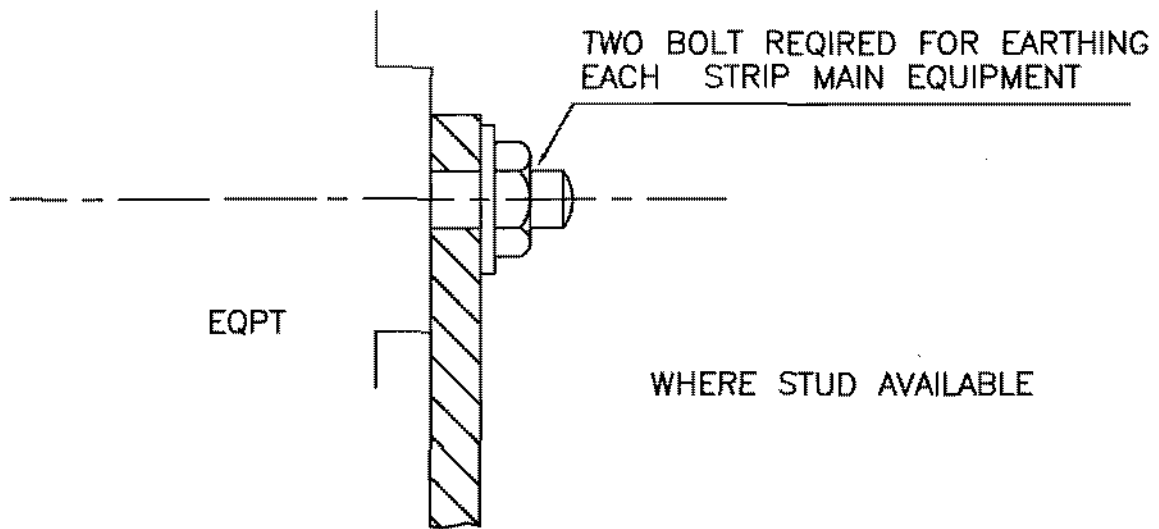


EQUIPMENT EARTHING DETAILS FENCE POST

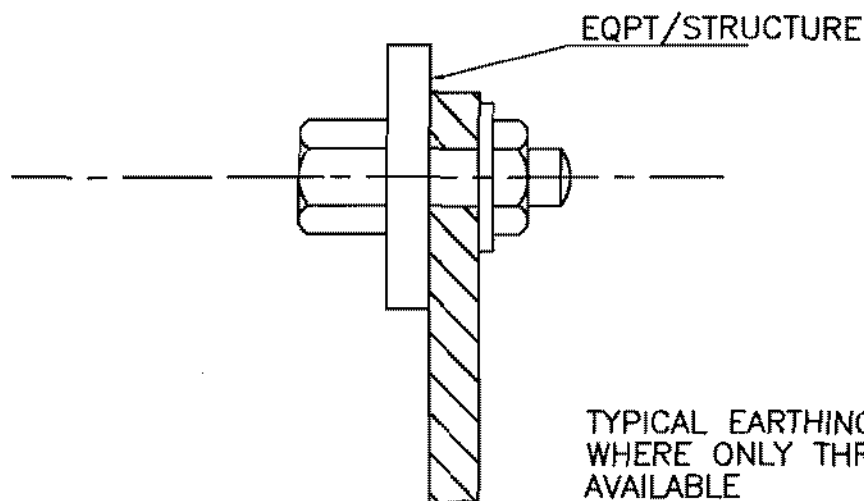
DRG. No. TB-4-329-509-108

REV. 00

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

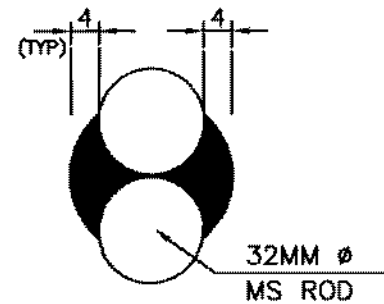
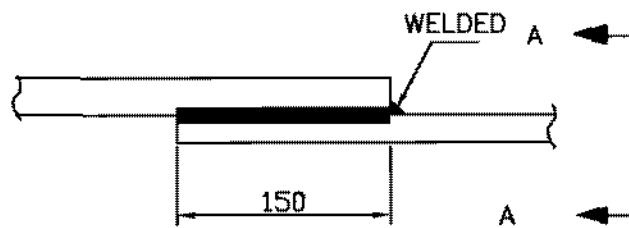
DRG. No. TB-4-329-509-108

REV. 00

SHEET No.
18

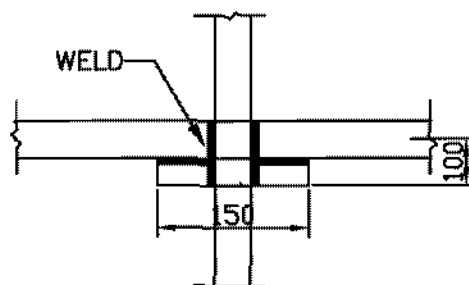
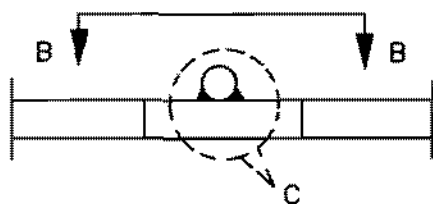
(A) ROD TO ROD & (B) STRIP TO ROD

1. STRAIGHT LAP JOINT/RISER

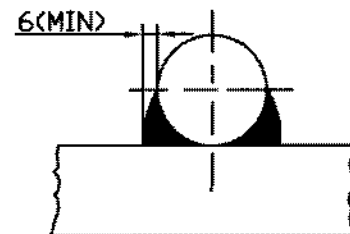


VIEW A-A

2. RIGHT ANGLED JOINT

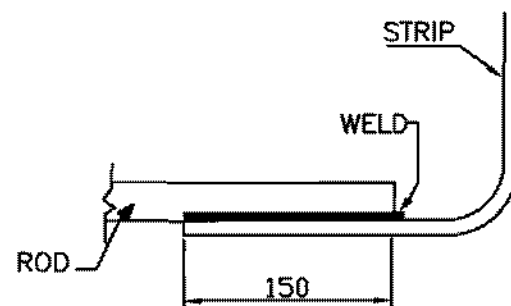
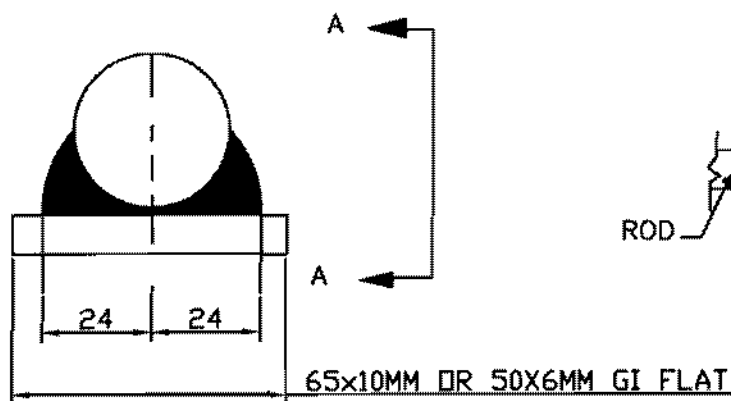


VIEW B-B



VIEW C

3. ROD TO STRIP



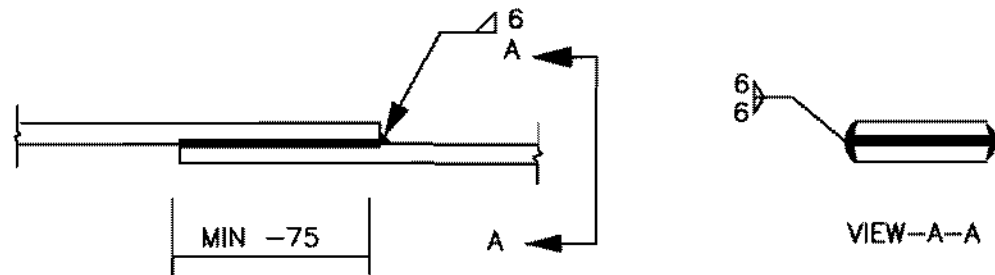
VIEW A-A



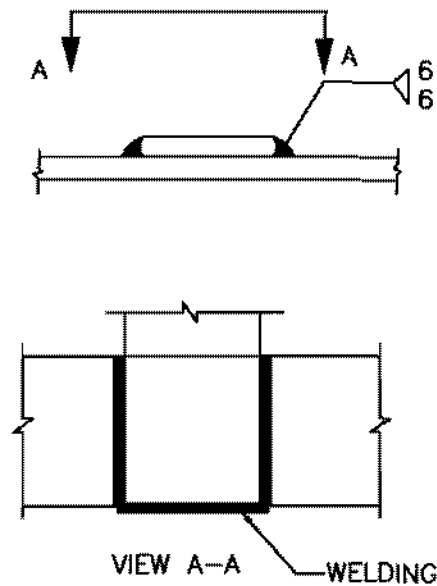
EQUIPMENT EARTHING DETAILS WELDING DETAILS

(C) STRIP TO STRIP (65X10MM/50X6MM GS FLAT)

1. STRAIGHT LAP JOINT/RISER



2. CROSS LAP JOINT



EQUIPMENT EARTHING DETAILS
WELDING DETAILS

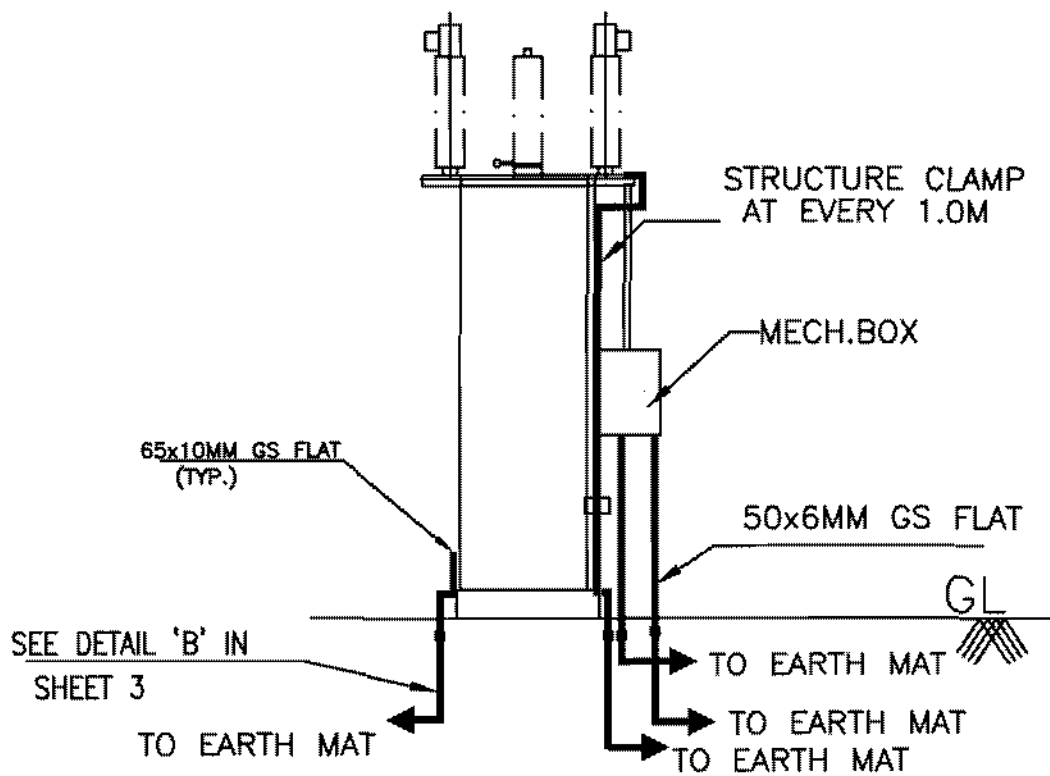
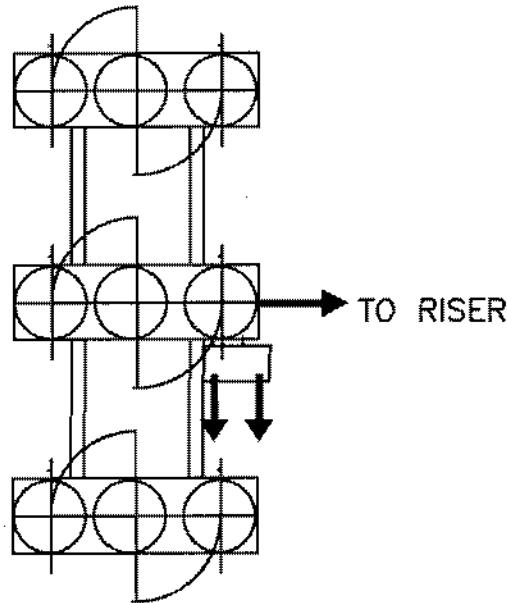
COMPUTER REF. NO.

DRG. No.

TB-4-329-509-108

REV. 00

SHEET No.
20



NOS.OF RISERS = 04 NOS.

NOTE:

1. AUXILIARY MAT SHALL BE PROVIDED BELOW MOM AND ES BOX (REFER SHEET-15)



EQUIPMENT EARTHING DETAILS

33KV ISOLATOR

COMPU. DRG. REF.

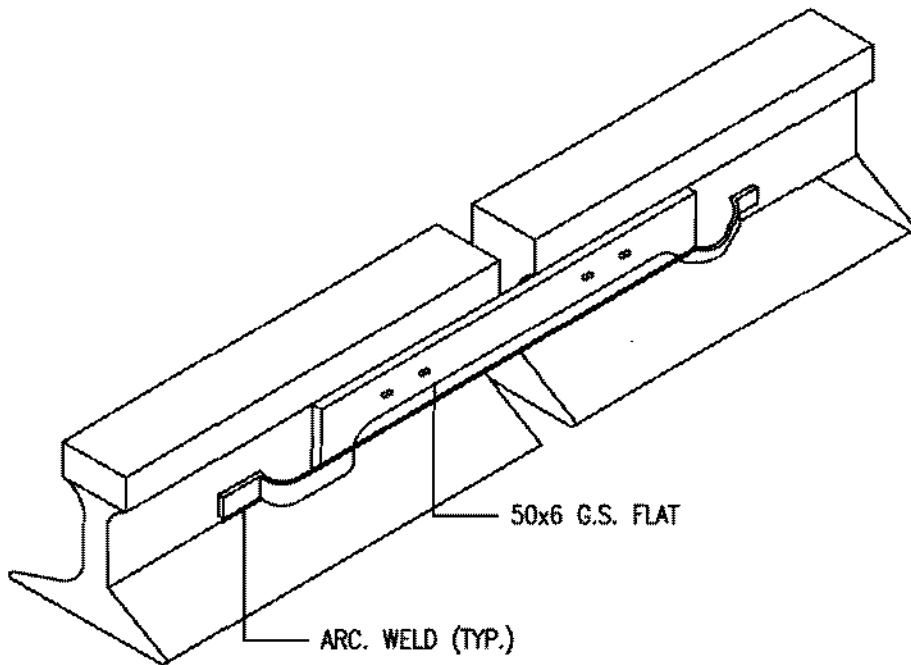
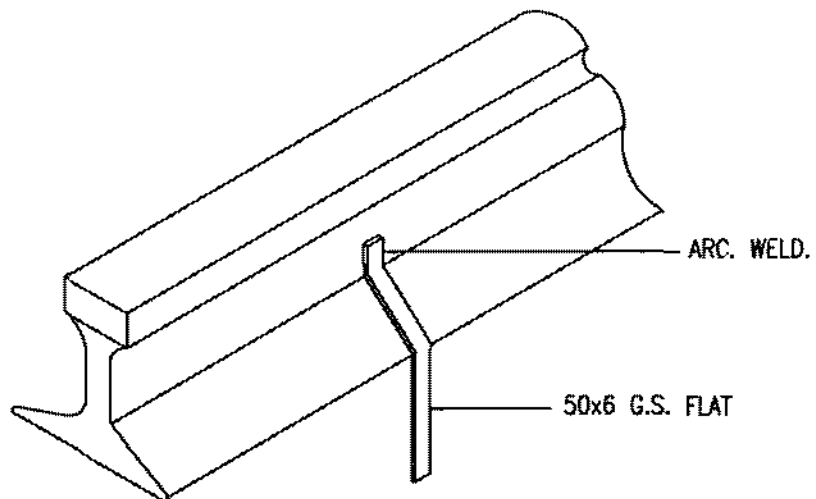
DRG.NO.

TB-4-329-509-108

REV. 00

SHEET No.

21



NOTE:—

1. EACH SECTION OF RAIL WITHIN SWITCHYARD SHALL BE EARTHED AT BOTH ENDS.
2. NO. OF RISERS = 1 RISERS AT EVERY RAIL JUNCTION.



EQUIPMENT EARTHING DETAILS

RAIL BONDING

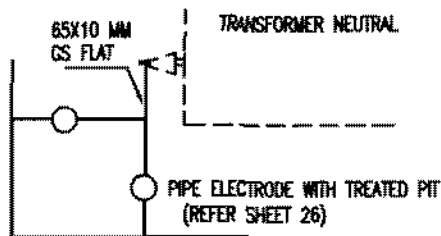
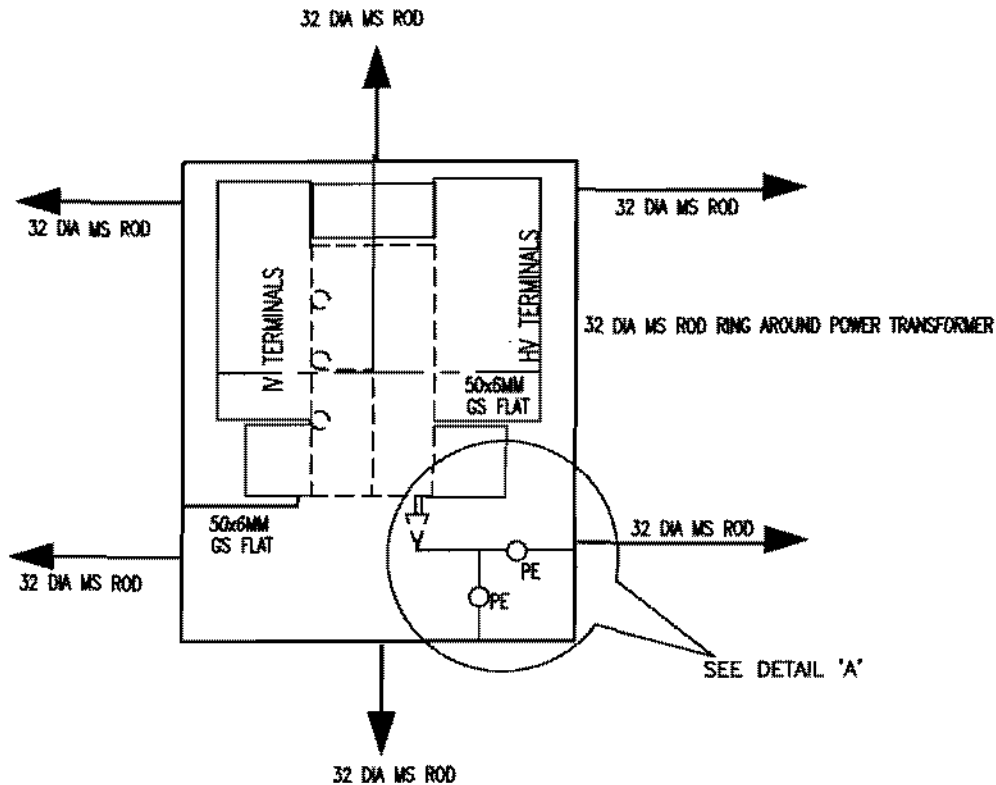
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DRG. NO.

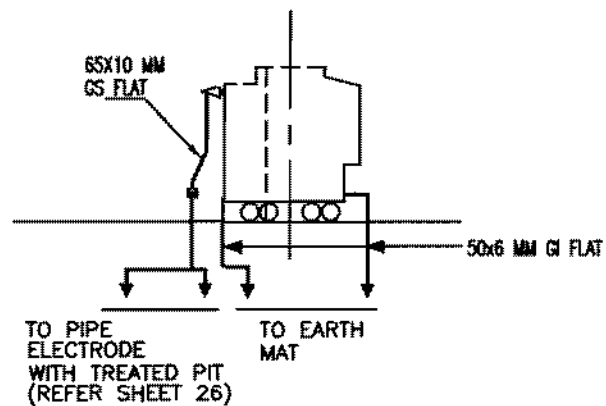
TB-4-329-509-108

REV. 00

SHEET No.
22



DETAIL A



NOTES;

1. POWER TRANSFORMER BODY AND MARSHALLING BOX SHALL BE EARTHED THROUGH 50X6 GI FLAT.
2. NO. OF PIPE ELECTRODE : 2 NOS. PER POWER TRANSFORMER

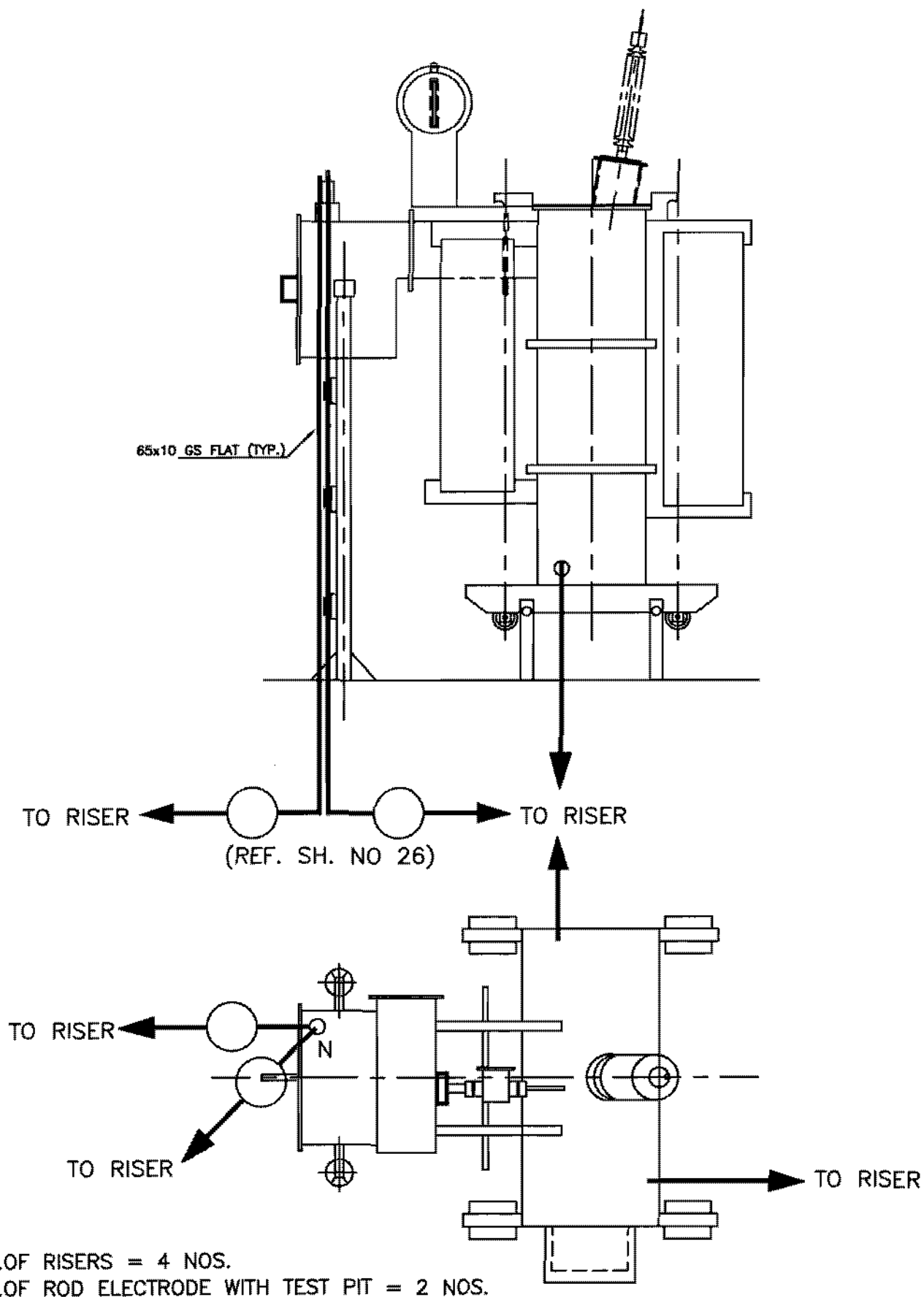


EQUIPMENT EARTHING DETAILS
12MVA AND 6MVA POWER TRANSFORMER

DRG. No. TB-4-329-509-108

REV. 00

SHEET No.
23



EQUIPMENT EARTHING DETAILS AUXILIARY TRANSFORMER

COMPU. DRG. REF.

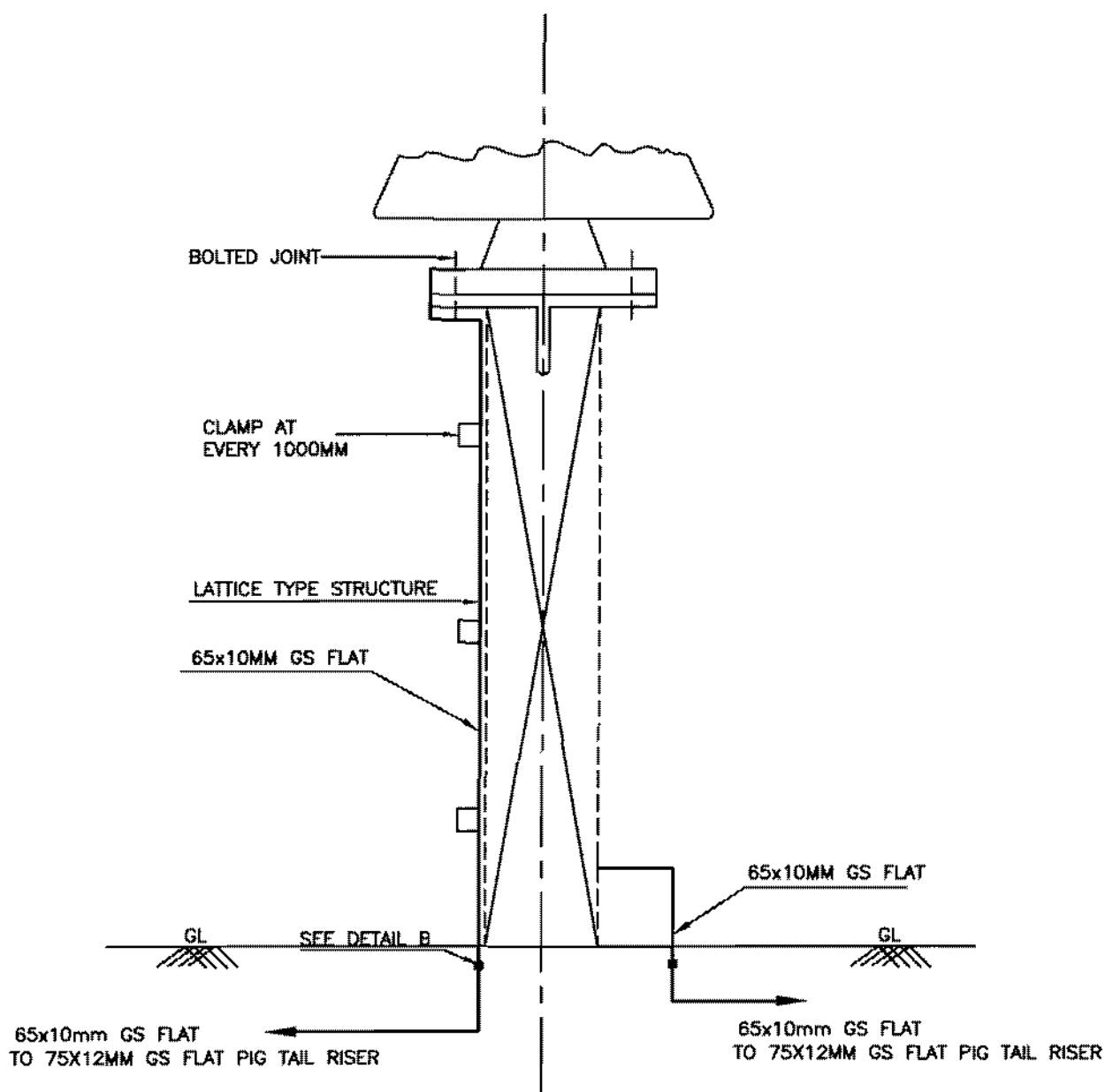
Report No.

TB-4-329-509-108

REV. 00

SHEET No.

24



NOTE :

1. NO. OF RISERS = 2 PER CABLE SEALING END
2. EARTHING DETAILS OF METALLIC SCREEN/SHEATH & NO. OF RISERS FOR 220KV CABLE SHALL BE AS PER APPROVED 220KV CABLE SYSTEM DRAWINGS.

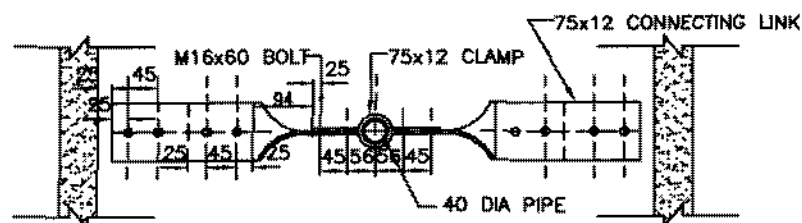
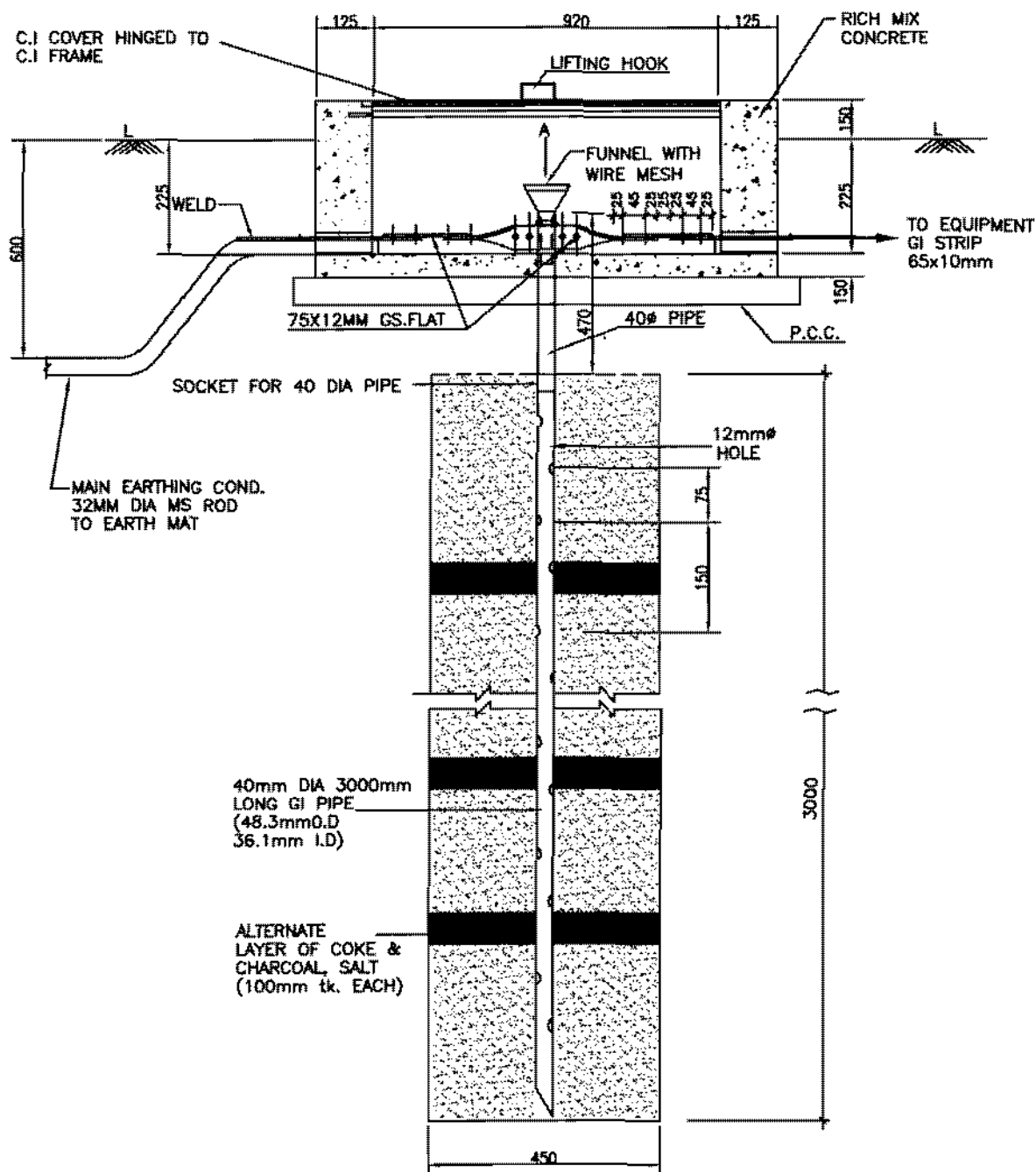


EQUIPMENT EARTHING DETAILS
220KV CABLE SEALING END

DRG. No. TB-4-329-509-108

REV. 00

SHEET No.
25



VIEW-A

NOTE:

1. ALL NUTS, BOLTS AND WASHERS, FUNNEL GI PIPE AND WIRE MESH SHALL BE GALVANISED AS PER SPECIFICATION.
2. FUNNEL SHALL BE SECURELY HELD TO THE PIPE.
3. TO BE USED FOR CONNECTING TO NEUTRAL OF TRANSFORMER/AUX. TRANSFORMER



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

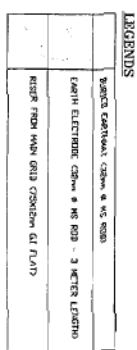
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DRG. No.

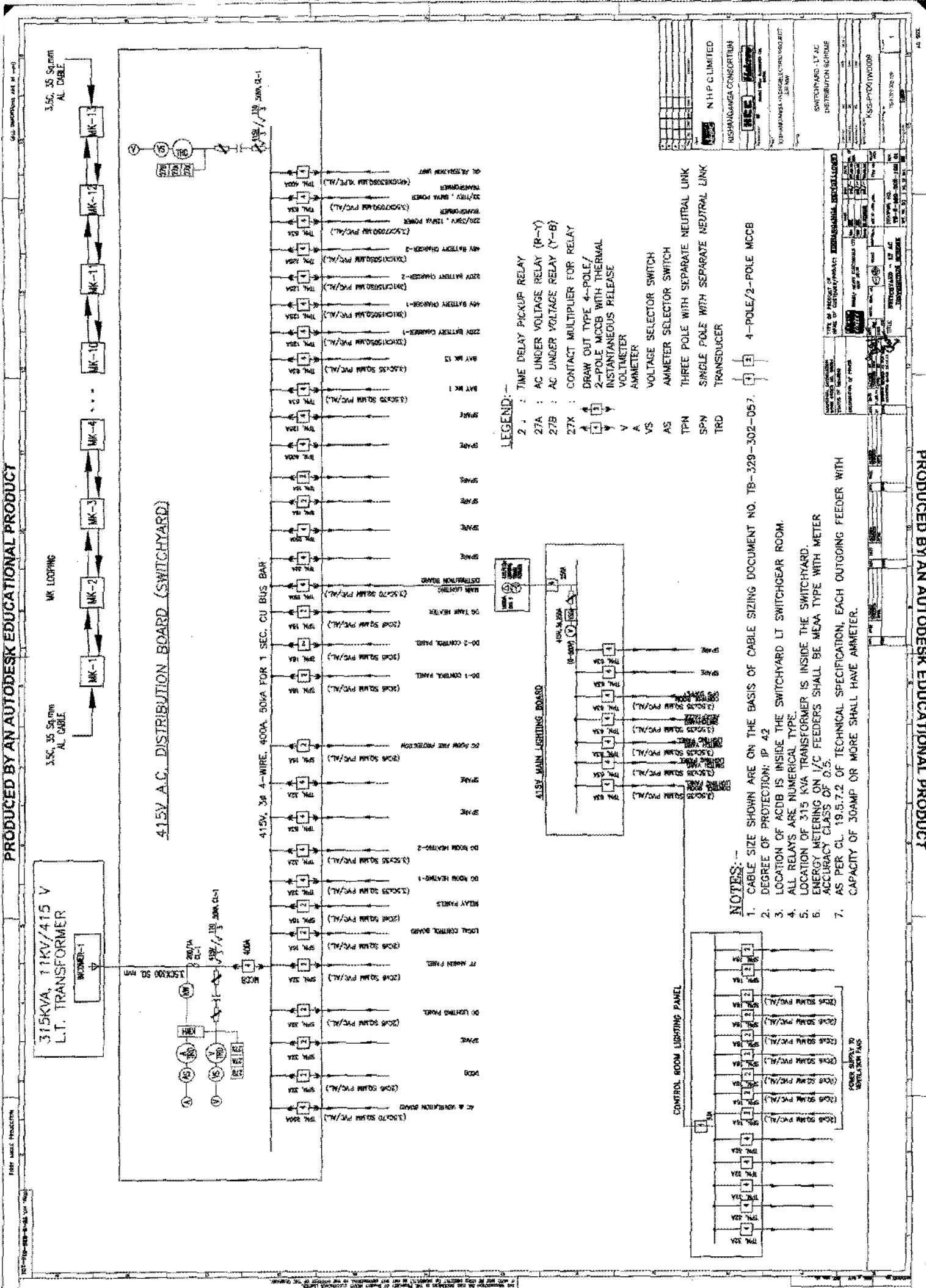
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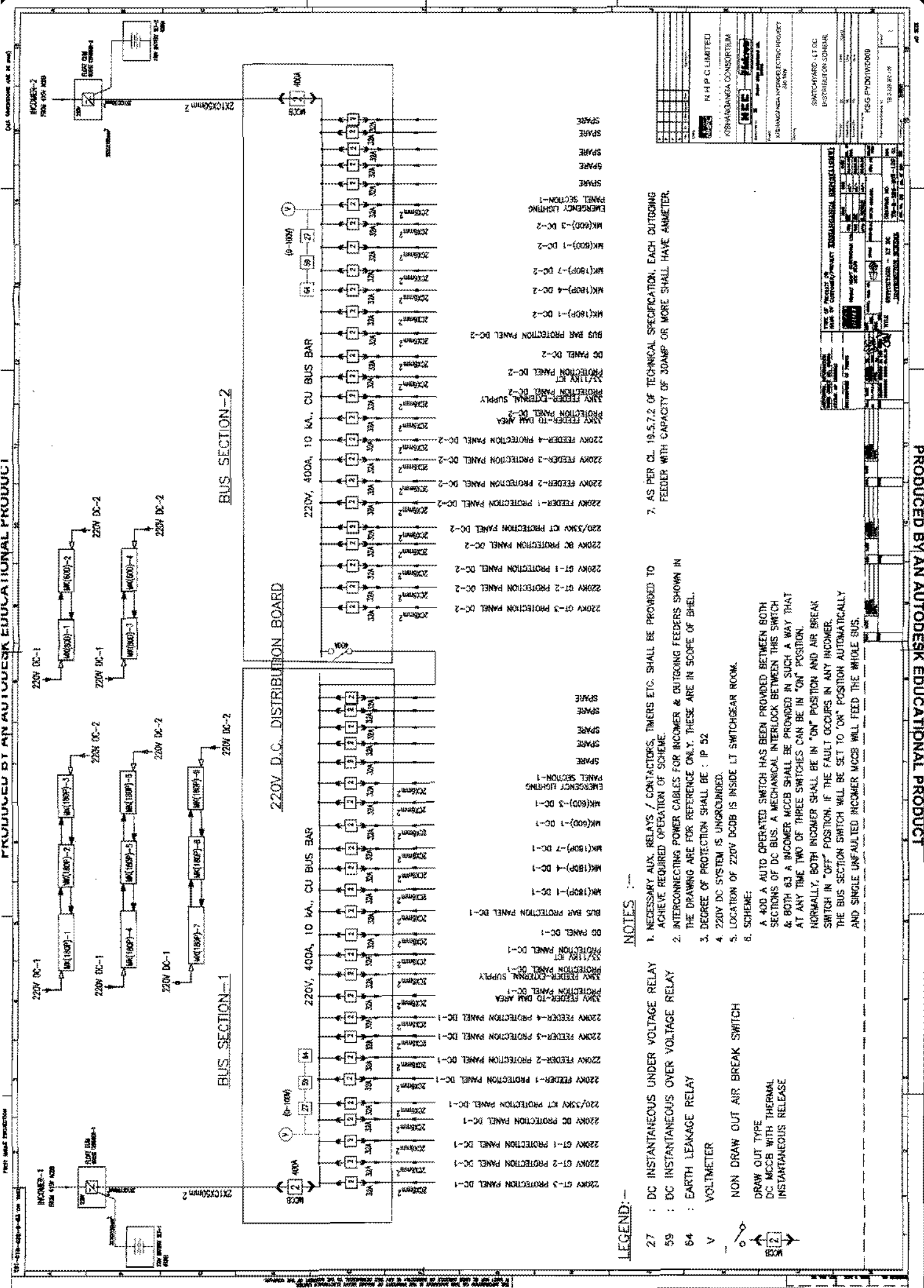
REV. 00

SHEET No.
26



<p>14 GOVT. OF INDIA ENTERPRISE</p>	
<p>KISHANGANGA CONSORTIUM</p>	
<p>Project</p>	
<p>KISHANGANGA HYDROELECTRIC PROJECT</p>	
<p>350 MW</p>	
<p>Drawing Title</p>	
<p>POWER HOUSE</p>	
<p>EARTHMAT LAYOUT</p>	
<p>Drawn by: JH. BHUSHAN</p>	
<p>Checked by: S. SHARMA</p>	
<p>Approved by: J.A.S. GUPTA</p>	
<p>HCS Drawing No.</p>	
<p>KSG-EGS-01-CA-001</p>	
<p>Revision</p>	
<p>9</p>	
<p>Subcontract Drawing No.</p>	
<p>2E93113001</p>	
<p>Revision</p>	
<p>03</p>	
<p>Drawing Scale: 1/15</p>	
<p>Sheet No. of Sheet: 01/04</p>	





LEGEND:-

- 27 : DC INSTANTANEOUS UNDER VOLTAGE RELAY
- 59 : DC INSTANTANEOUS OVER VOLTAGE RELAY
- 84 : EARTH LEAKAGE RELAY
- V : VOLTMETER
- NON DRAW OUT AIR BREAK SWITCH
- DRAW OUT TYPE
- DC MCCB WITH THERMAL INSTANTANEOUS RELEASE

NOTES:-

1. NECESSARY AUX. RELAYS / CONTACTORS, TIMERS ETC. SHALL BE PROVIDED TO ACHIEVE REQUIRED OPERATION OF SCHEME.
2. INTERCONNECTING POWER CABLES FOR INCOMER & OUTGOING FEEDERS SHOWN IN THE DRAWING ARE FOR REFERENCE ONLY. THESE ARE IN SCOPE OF BHEL.
3. DEGREE OF PROTECTION SHALL BE : IP 52
4. 220V DC SYSTEM IS UNGROUNDED.
5. LOCATION OF 220V DCDB IS INSIDE LT SWITCHGEAR ROOM.
6. SCHEME:
A 400 A AUTO OPERATED SWITCH HAS BEEN PROVIDED BETWEEN BOTH SECTIONS OF DC BUS. A MECHANICAL INTERLOCK BETWEEN THIS SWITCH & BOTH 63 A INCOMER MCCB SHALL BE PROVIDED IN SUCH A WAY THAT AT ANY TIME TWO OF THREE SWITCHES CAN BE IN "ON" POSITION.
NORMALLY, BOTH INCOMER SHALL BE IN "ON" POSITION AND AIR BREAK SWITCH IN "OFF" POSITION. IF THE FAULT OCCURS IN ANY INCOMER, THE BUS SECTION SWITCH WILL BE SET TO "ON" POSITION AUTOMATICALLY AND SINGLE UNFAULTED INCOMER MCCB WILL FEED THE WHOLE BUS.

7. AS PER CL 19.5.7.2 OF TECHNICAL SPECIFICATION, EACH OUTGOING FEEDER WITH CAPACITY OF 30AMP OR MORE SHALL HAVE AMMETER.

PROJECT DATA

PROJECT NAME: 220V D.C. DISTRIBUTION BOARD

PROJECT NO: 1

DATE: 15-03-2017

DESIGNED BY: N H P C LIMITED

CHECKED BY: N H P C LIMITED

APPROVED BY: N H P C LIMITED

SCALE: 1:1

PROJECT LOCATION: KISHANGANGA CONSTRUCTION

PROJECT TYPE: ELECTRICAL PROJECT

PROJECT VALUE: 1000000

PROJECT STATUS: IN PROGRESS

PROJECT MANAGER: N H P C LIMITED

PROJECT ENGINEER: N H P C LIMITED

PROJECT SUPERVISOR: N H P C LIMITED

PROJECT ASSISTANT: N H P C LIMITED

PROJECT CLERK: N H P C LIMITED

PROJECT OFFICE: N H P C LIMITED

PROJECT PHONE: N H P C LIMITED

PROJECT FAX: N H P C LIMITED

PROJECT E-MAIL: N H P C LIMITED

PROJECT WEBSITE: N H P C LIMITED

PROJECT ADDRESS: N H P C LIMITED

PROJECT COUNTRY: N H P C LIMITED

PROJECT CITY: N H P C LIMITED

PROJECT STATE: N H P C LIMITED

PROJECT ZIP: N H P C LIMITED

PROJECT COUNTRY CODE: N H P C LIMITED

PROJECT CITY CODE: N H P C LIMITED

PROJECT STATE CODE: N H P C LIMITED

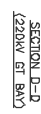
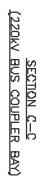
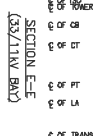
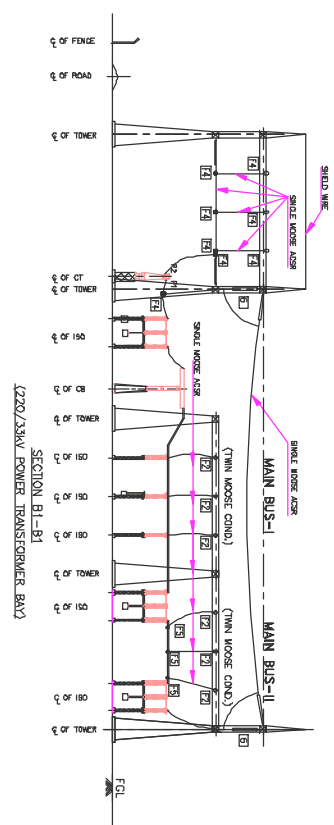
PROJECT ZIP CODE: N H P C LIMITED

PROJECT COUNTRY CODE: N H P C LIMITED

PROJECT CITY CODE: N H P C LIMITED

PROJECT STATE CODE: N H P C LIMITED

PROJECT ZIP CODE: N H P C LIMITED



101	DATE	1989	102	DATE	1989
103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605					

PROJECT: 220/33KV Switchyard for Kishanganga (3x110MW) HEP

245 KV SYSTEM : SHORT CIRCUIT CURRENT : 31.5KA/1S

BILL OF QUANTITY FOR 220KV CONNECTORS TO BE ORDERED

S.No	EQUIPMENT	CLAMP TYPE	MATERIAL	VOLTAGE	CURRENT	TERMINAL TYPE	Line- 4 Nos	12MVA, 220/33KV POWER TRANSFORMER BAY- 1 No	GT - 3 Nos	BC- 1No (including BUS CVT Bay)	USED	SPARE	TOTAL
				(KV)	AMP								
B11	220KV CURRENT BREAKER	TEH	AL ALLOY	245	1600	Palm - Al	12	3	9	0	24	2	26
B12	220KV CIRCUIT BREAKER	2SH	AL ALLOY	245	1600	Palm - Al	0	0	0	0	0	0	0
B13	220KV CIRCUIT BREAKER	SH	AL ALLOY	245	1600	Palm - Al	12	3	9	0	24	2	26
B14	220KV DISINTEGRATION	TRH	AL ALLOY	245	1600	Palm - Al	24	6	12	0	48	0	48
B15	220KV DISINTEGRATION	2SH	AL ALLOY	245	1600	Palm - Al	0	0	0	12	12	0	12
B16	220KV DISINTEGRATION	TEH	AL ALLOY	245	1600	Palm - Al	12	3	9	0	15	0	15
B17	220KV DISINTEGRATION	THROUGHI	AL ALLOY	245	1600	Palm - Al	12	3	9	0	24	0	24
B18	220KV DISINTEGRATION	SH	AL ALLOY	245	1600	Palm - Al	45	12	11	0	71	0	71
B19	220KV CURRENT TRANSFORMER	2SH	AL ALLOY	245	1600	Stud - Cu	0	0	0	12	12	0	12
B20	220KV CURRENT TRANSFORMER	SH	AL ALLOY	245	1600	Stud - Cu	24	6	0	0	30	0	30
B21	220KV CURRENT TRANSFORMER	SH	AL ALLOY	245	400	Stud - Cu	0	0	18	0	18	0	18
B22	220KV CAPACITOR VOLTAGE TRANSFORMER	SH	AL ALLOY	245	NA	Palm-HDG	12	0	0	0	12	1	13
B23	12MVA/220/33KV POWER TRANSFORMER (Primary Side)	SH	AL ALLOY	245	800	Glass	0	3	0	0	3	0	3
B24	150KV I.A	SH	AL ALLOY	245	NA	Glass	12	3	0	0	24	1	25
B25	220KV WT	SH	AL ALLOY	245	800	Glass	12	0	0	0	12	0	12
B26	220KV POST INSULATION	THROUGHI	AL ALLOY	245	NA	PCD 127	12	3	0	0	15	0	15
B27	220KV POST INSULATION	2SH	AL ALLOY	245	NA	PCD 127	12	0	0	0	12	0	12
B28	220KV T.L. CLAMP	2S-2S-2S	AL ALLOY	245	1600	---	0	0	0	0	0	0	0
B29	220KV T.L. CLAMP	2S-2S-2S	AL ALLOY	245	800	---	24	6	16	0	46	3	49
B30	220KV T.L. CLAMP	2S-2S-2S	AL ALLOY	245	400	---	24	0	0	0	24	3	27
B31	220KV T.L. CLAMP	S-S-S	AL ALLOY	245	400	---	0	0	0	0	0	0	0
B32	220KV T.L. CLAMP	T-S-T	AL ALLOY	245	800	---	0	0	0	0	0	0	0
B33	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	12	0	0	0	12	0	12
B34	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B35	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B36	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B37	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B38	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B39	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B40	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B41	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B42	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B43	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B44	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B45	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B46	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B47	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B48	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B49	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0
B50	CLAMP FOR STRIP ON PIPE STR	EASTRP 75x12	MSHDG	NA	NA	---	0	0	0	0	0	0	0

BILL OF QUANTITY FOR BUS BAR ERECTION ITEMS TO BE ORDERED

S.No	EQUIPMENT	CLAMP TYPE	MATERIAL	VOLTAGE	CURRENT	TERMINAL TYPE	Line- 4 Nos	12MVA, 220/33KV POWER TRANSFORMER BAY- 1 No	GT - 3 Nos	BC- 1No (including BUS CVT Bay)	USED	SPARE	TOTAL
				(KV)	AMP								
G1	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G2	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G3	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G4	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G5	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G6	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G7	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G8	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G9	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G10	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G11	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G12	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G13	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G14	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G15	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G16	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G17	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G18	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G19	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G20	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0

BILL OF QUANTITY FOR BILL OF QUANTITY OF MISCELLANEOUS ITEMS TO BE ORDERED

S.No	EQUIPMENT	CLAMP TYPE	MATERIAL	VOLTAGE	CURRENT	TERMINAL TYPE	Line- 4 Nos	12MVA, 220/33KV POWER TRANSFORMER BAY- 1 No	GT - 3 Nos	BC- 1No (including BUS CVT Bay)	USED	SPARE	TOTAL
				(KV)	AMP								
G21	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G22	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G23	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G24	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G25	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G26	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G27	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G28	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G29	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G30	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G31	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G32	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G33	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G34	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G35	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G36	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G37	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G38	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G39	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0
G40	CLAMP FOR SHIELD WIRE	SWWHL	MSHDG	NA	NA	---	0	0	0	0	0	0	0

PROJECT: 220/33KV Switchyard for Kishanganga (3x110MW) HEP

36 KV SYSTEM : SHORT CIRCUIT CURRENT : 12.5KA/1S

BILL OF QUANTITY FOR 33KV CONNECTORS TO BE ORDERED

S.No.	EQUIPMENT	CLAMP TYPE	MATERIAL	VOLTAGE	CURRENT	TERMINAL TYPE	Line- 2 Nos	12MVA,220/33KV POWER TRANSFORMER BAY- 1 No	12MVA,220/33KV POWER TRANSFORMER BAY- 1 No(including BUS CVT Bay)	USED	SPARE	TOTAL
				(KV)	AMP							
H1	33KV SHFACB CIRCUIT BREAKER	SH	AL ALLOY	36	800	Palm- Al	12	0	0	24	0	24
H2	33KV DIS INSULATOR	SH	AL ALLOY	36	800	Palm- Al	24	0	0	36	0	36
H3	33KV CURRENT TRANSFORMER	SH	AL ALLOY	36	800	Stud- Cu	12	0	0	24	0	24
H4	33KV POTENTIAL TRANSFORMER	SH	AL ALLOY	36	NA	Palm-HDG	0	3	3	12	0	12
H5	12MVA/220/33KV POWER TRANSFORMER (Secondary Side)	SH	AL ALLOY	36	400	Stud Plain- Brass	0	3	0	3	0	3
H6	6MVA/220/33KV POWER TRANSFORMER (Primary Side)	SH	AL ALLOY	36	800	Stud Plain- Brass	0	0	3	3	0	3
H7	33KV I.A	SH	AL ALLOY	36	NA	Glass	0	3	0	3	0	3
H8	33KV T.L CLAMP	2-S-2	AL ALLOY	36	800		12	0	0	12	0	12
H9	33KV T.L CLAMP	S-S-S		36	800		0	0	0	0	0	0
H10	33KV T.L CLAMP	S-S		36	800		0	3	3	12	0	12

1. 4" EXTRA HEAVY AL TUB
2. ACOR MOOSE
3. ACOR MOOSE
SHIELD WIRE : 7/35 SWG

SUB-CONDUCTOR SPACING : 250MM
ALL CLAMPS SHALL BE BOLTED TYPE

R - R/SID
E - EXPANSION
H - HORIZONTAL

Santosh
24.08.13 Santosh Kumar
Manager TBEM

PROJECT: 220/33kV Switchyard for Kishanganga (3x110MW) HEP
BILL OF QUANTITY FOR 220KV AND 33KV DISC AND STRING INSULATOR HARDWARE TO BE ORDERED

220kV Kishanganga

S No	Item Description	INSULATOR HARDWARE QUANTITY			DISC INSULATOR QUANTITY	
		Main	Spare	Total	Per String	Total
	No. Of Bays					
1	220kV single tension single anchoring 120 kN disc string insulator each string comprising 1 x 18 discs complete with hardware suitable for twin "moose" conductor with sub conductor spacing of 250 mm with turn-buckle	21	4	25	18	450
2	Same as 1 above but without turn-buckle	21	4	25	18	450
3	220kV single tension single anchoring 120 kN disc string insulator each string comprising 1 x 18 discs complete with hardware suitable for single "moose" conductor with turn-buckle	30	4	34	18	612
4	Same as 3 above but without turn-buckle	30	4	34	18	612
5	220kV single suspension 120 kN disc string insulator each string comprising 1 x 17 discs complete with hardware with drop clamps suitable for twin "moose" conductor with sub conductor spacing of 250mm	3	1	4	17	68
6	220kV single suspension 120 kN disc string insulator each string comprising 1 x 17 discs complete with hardware with drop clamps suitable for single "moose" conductor	42	4	46	17	782
7	220kV single suspension 120 kN disc string insulator each string comprising 1 x 17 discs complete with hardware with straight clamps suitable for twin "moose" conductor with sub conductor spacing of 250mm	12	3	15	17	255
			24			3229

33kV Kishanganga

S No	Item Description	INSULATOR HARDWARE QUANTITY			DISC INSULATOR QUANTITY	
		Main	Spare	Total	Per String	Total
	No. Of Bays					
8	33kV single tension single anchoring 90 kN disc string insulator each string comprising 1 x 3 discs complete with hardware suitable for single "moose" conductor with turn-buckle	9	3	12	3	36
9	Same as 1 above but without turn-buckle	9	2	11	3	33
			5			69

Santosh
24.08.13

Santosh Kumar
 Manager, TBEM



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Design (E & M) Division

Cat I - Approved for Information

Cat II - Approved for Comments

Cat III - Approved for Comments

Cat IV - Modify & Resubmit

Cat V - Accepted for Information

26/12/11

26/12/11

26/12/11

C	SK	DKM	RS	25.11.11	REVISED AS PER NHPC COMMENTS DATED 01.11.11
B	SK	SK	DKM	17.06.11	REVISED AS PER NHPC COMMENTS DATED 13.05.11 & 06.06.11
A	SK	DKM	DS	04.04.11	REVISED AS PER NHPC COMMENTS DATED 22.03.11
Rev	By	Chkd	Apprvd	Date	Description

Client



N H P C LIMITED

KISHANGANGA CONSORTIUM

7/61 PYD
09.12.11

HCC

Halcrow

Subcontractor



Project

KISHANGANGA HYDROELECTRIC PROJECT
330 MW

Drawing Title

1. Short Circuit force calculation for flexible conductor
2. Sag Tension, Swing calculation and Sag Chart

Drawn : SK

Date: 04-04-11

Checked : DKM

Date: 04-04-11

Approved by: DS

Date: 04-04-11

HCC Drawing No.

KSG-PYD03CD013-02

Subcontractor Drawing No.

TB-329-316-051 & TB-329-316-052

Revision

C

Drawing Scale : NA

Sh. / No. of Sh. : 1/79

1. Short Circuit force calculation for flexible conductor
2. Sag Tension, Swing calculation and Sag Chart

SAG TENSION CHARTS

1.0 DESIGN BASIS

Sag - tension charts give sag and tension in a conductor at specific temperature intervals. These charts are required for proper stringing of a stranded conductor at site. The sag and tension in the conductor are adjusted corresponding to the site ambient temperature at the time of installation.

2.0 DESIGN PROCEDURE

The following layout and elevation drawings may be referred:

TB-0-329-316-102 Sheet 1 of 2: Layout plan of 220/33kV Switchyard

TB-0-329-316-102 Sheet 2 of 2: Section Elevation of 220/33kV Switchyard

The input data of cases A to E are fed into computer Program "Sag Tension Charts". The output of case is given in the same sheet.

3.0 REFERENCES

- (i) IS 802 Part I – 1977: 'Code of practice for use of structural steel in overhead transmission line towers. Part I loads and permissible stresses.
- (ii) Book on overhead line practice by John Mc Combe.
- (iii) 'Aluminium overhead lines' Book issued by M/s Aluminium wire & cable Co Ltd.

4.0 ENCLOSURES

- (i) Results of Sag-Tension Chart for cases A to H.



SAG TENSION CHART

NAME OF PROJECT:

220kV KG CASE -A

GENERAL DATA

CONDUCTOR TYPE: MOOSE
 NAME OF BAY: 0.00
 SPAN LENGTH (Centre Line distance between beams): 50.00 m
 MINIMUM STRINGING TEMPERATURE: 10.00 Deg C
 TEMPERATURE RANGE FOR DRAWING STRINGING CHART:
 MINIMUM: 12.00 °C MAXIMUM: 40.00 °C
 WIND PRESSURE ON CONDUCTOR PER M RUN: 0.00 kg/m

CONDUCTOR DATA

OVERALL DIA OF THE CONDUCTOR: 3.177 cm
 CROSS SECTIONAL AREA OF CONDUCTOR: 5.970 cm²
 WEIGHT OF CONDUCTOR PER METER: 2.007 kgf/m
 COEFFICIENT OF LINEAR EXPANSION: 0.00001991 per °C
 NO. OF CONDUCTORS PER PHASE: 2
 TENSION PER CONDUCTOR UNDER MIN TEMP & MAX WIND CONDITION: 1000.00 kg
 MODULUS OF ELASTICITY: 686000.00 kg/cm²

INSULATOR AND TURNBUCKLE DATA

NUMBER OF INSULATOR STRING(S): 1.00
 LENGTH OF INSULATOR: 2.860 m
 DIAMETER OF INSULATOR: 0.280 m
 WEIGHT OF INSULATOR: 164.400 kg

RESULTS

MAXIMUM CLEAR SPAN OF CONDUCTOR: 42.78 m

S.NO.	TEMPERATURE	TENSION PER CONDUCTOR	CONDUCTOR SAG	INSULATOR SAG	TOTAL SAG
1	10	740.11	0.75	0.36	1.11
2	12	724.57	0.77	0.36	1.14
3	14	709.8	0.79	0.37	1.16
4	16	695.87	0.8	0.38	1.18
5	18	682.66	0.82	0.39	1.2
6	20	670.13	0.83	0.39	1.23
7	22	658.21	0.85	0.4	1.25
8	24	646.87	0.86	0.41	1.27
9	26	636.05	0.88	0.41	1.29
10	28	625.73	0.89	0.42	1.31
11	30	615.87	0.91	0.43	1.33
12	32	606.43	0.92	0.43	1.35
13	34	597.39	0.93	0.44	1.37
14	36	588.72	0.95	0.45	1.39
15	38	580.41	0.96	0.45	1.41
16	40	572.41	0.97	0.46	1.43



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डिजाइन (ई एंड एम) विभाग

Design (E & M) Section

~~Cat I - Approved/ स्वीकृत~~

~~Cat II - Revision/ संशोधन~~

~~Cat II - Approved/ स्वीकृत~~

~~Cat III - Modification/ संशोधन~~

~~Cat III - Modify & Resubmit~~

~~Cat IV - सुचना हेतु स्वीकृत~~

~~Cat IV - Accepted for Information~~

26/12/11

26/12/11

IA/DM Mgr/SM

26/12/2011

Rev	By	Chkd	Apprvd	Date	Description
C		SK	DKM/RS	14.11.11	REVISED AS PER NHPC COMMENTS DATED 01.11.11
B	RANJIT	SK	DKM/RS	13.05.11	REVISED AS PER NHPC COMMENTS DATED 13.05.11
A	SK	DKM	DS	04.04.11	REVISED AS PER NHPC COMMENTS DATED 22.03.11

Client



N H P C LIMITED

6/61

PYD

09.12.11

KISHANGANGA CONSORTIUM

HCC — Malcrow

Subcontractor



Project

KISHANGANGA HYDROELECTRIC PROJECT
330 MW

Drawing Title

DSLP DESIGN & CALCULATIONS -
220/33 KV SWITCHYARD

Drawn

SK

Date: 04-04-11

Checked

DKM

Date: 04-04-11

Approved by

DS

Date: 04-04-11

HCC Drawing No.

KSG-PYD030D014

Subcontractor Drawing No.

TE-029-010-050

Revision

0

Drawing Scale: N/A

Sh. / No. of Sh. / 1/1

DESIGN OF THE LIGHTNING PROTECTION 220/33KV SWITCHYARD FOR KISHANGANGA (3X110MW) HEP

1.0 INTRODUCTION

This Design Document is generated for the following project.

Name of Customer : NHPC Ltd.

Name of Consultant : HALCROW Noida

Name of the project : 220/33kV Switchyard for Kishanganga
(3x110MW) HEP

This document covers the design calculations made to verify the adequacy of the shield wire for providing lightning protection at 220/33kV Switchyard for Kishanganga (3x110MW) HEP. The calculations have been made by Razevig method. The calculations and results are enclosed under Annexure – A.

Lightning protection drawing TB-0-329-316-102 Rev 03 is also enclosed.

2.0 DESIGN INPUTS

1. The maximum bus height for the switchyard is 17.5 meters from the finished ground level.
2. All the outgoing line towers have been designed with a peak at (17.5 + 5.0) m. from the finished ground level.



3.0 RESULTS

1. Shield wire is used for lightning protection of all the switchyard equipments. Areas protected by shield wires are indicated.

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COLLIER, LAWRENCE, and JAMES

Methods of Protection

h	height of tower peak								
S	spacing between two shield wires								
h_o	$= h - S$, height protected within two shield wires								
b_x	Distance from peak centreline upto which h_x high objects are protected from side strokes								
Formula for b_x									
if for 2/3 h , $b_x = 0.6h(1 - (h_x/h))$, (FORMULA 9)									
if for 2/3 h , $b_x = 1.2 h(1 - (h_x/0.8h))$, (FORMULA 10)									
h	S	h_o	h_x	b_x	Remarks				
22.5	18	18	8	15					
12.2	6	10.7	7	4.12	Height of 220kV CSE is taken as 8M in 220kV S/S				
10.2	0		4.3	5.79	Height of 33/11kV Transformer is taken as 7M in 33kV S/S				
					Side protection of equipments of 33kV outgoing lines.				

All figures are in millions



