


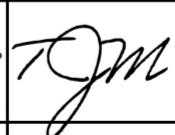



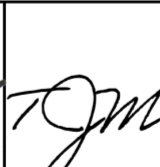







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1		2		3		4			
A	SHEET	DESCRIPTIONS					REV		
	00	COVER SHEET					27		
	01	THIS SHEET					1		
	02	DESCRIPTIONS					1		
	03	DESCRIPTIONS					1		
B	04	DESCRIPTIONS					0		
	C1	EARTH MAT AND TAILS					7		
	C2	EARTH MAT AND TAILS					6		
	C3	EARTH MAT AND TAILS					6		
	C3A	EARTH MAT AND TAILS/SURFACE LAYER COVERING					4		
B	C3B	EARTH MAT AND TAILS					4		
	C4	COPPER CRIMPET					4		
	C5	BRAZED COPPER JOINTS; CRIMPET JOINTS					5		
	C5A	EXOTHERMIC JOINTS					0		
	C5B	EXOTHERMIC JOINTS					0		
C	C6	EARTHTAIL CLAMP					2		
	C6A	EARTHTAIL CLAMPING PLATE					1		
	C7	EARTHTAIL CLAMP (TYPICAL APPLICATIONS)					3		
	C8	SADDLE FOR 2x ϕ 10mm, EARTHING Cu RODS					1		
	C9	BOLTED JOINTS: T-JOINT AND STRAIGHT JOINT					2		
C	C10	EARTH STRAP FIXING - DETAIL 'A' CONTROL ROOM TRENCH STRAP - DETAIL 'B'					2		
	C11	TYPICAL EARTH MAT CONNECTION TO COLUMN AND TAIL FOR EQUIPMENT EATHING					4		
	C12	METHOD OF EARTHING ALUMINIUM OR GALVANISED STEEL CLADDING					1		
	C13	SAFETY FENCE EARTHING: STEEL POST					3		
	C14	SAFETY FENCE EARTHING: CONCRETE POSTS WITH ALUMINIUM WIRE FENCE					3		
D	C15	FENCE EARTHING WOODPOLE WITH GALVANISED WIRE FENCE					1		
	C16	TANKS, BASES, ETC. & NEUTRALS OF ALL EQUIPMENT MOUNTED ON NON-METALLIC SUPPORTS					2		
	C17	PAINTED TANKS, BASES ETC. OF EQUIPMENT MOUNTED ON EARTHED STEELWORK					2		
	C18	GALVANISED TANKS, BASES ETC. OF EQUIPMENT MOUNTED ON EARTHED STEELWORK					2		
	C19	ALL SINGLE CORE CABLE SEALING ENDS					1		
E	C20	SWITCHBOARDS (WITH THERMOPLASTIC INSULATED CABLES)					2		
	C21	SWITCHBOARDS (WITH PAPER INSULATED CABLES)					1		
	C22	ARMOURED MULTICORE CONTROL, TELEPHONE AND POWER CABLES & G.P.O. UNARMOURED TYPE 'Z' CABLE					2		
	C23	EARTHING FOR JUCTION BOX					2		
	C24	ARMOURED TELEPHONE AND SCREENED CONTROL CABLES AT JUNCTION BOX					2		
E	C25	TYPICAL TRANSFORMER AND SA EARTHING					2		
	C26	BOLTED CONNECTION BETWEEN 50x3mm Cu STRAP AND 2 x ϕ 10 Cu RODS					1		
F	 Eskom Eskom Holdings SOC Limited REG No. 2002/015527/30		1	SHEET ADDED FOR TRANSMISSION SECTION.					30/05/2022
			0	FIRST ISSUE.		JMV	KN	TM	30/07/2019
			REV	REVISION DESCRIPTION		BY	CHKD	AUTH	DATE
			INDEX OF EARTHING STD'S		0.54/393				
					SHEET NUMBER		REVISION		
		01		1					
1		2		3		4 SIZE GROOTTE A4L			

1		2		3		4			
A	SHEET	DESCRIPTION					REV		
	C27	TYPICAL LAYOUT OF SUBSTATION SHOWING REQUIRED EARTHING CONNECTIONS					1		
	C28	EARTHING OF TELEPHONE OR PROCESS CONTROL CABLES					1		
	C29	EARTHING OF PROCESS CONTROL COMPUTERS					1		
	C30	EARTHING OF ELECTRIC ENCLOSURES					1		
	C31	EARTHING OF STEEL STRUCTURES					1		
B	C32	EARTHMAT RUNNING UNDER EXISTING REVETMENT					1		
	C33	TYPICAL LAYOUT FOR EARTHING OF BARRIER FENCES WITH STONE VERGE					0		
	C34	SECURITY LIGHTING POLE EARTHING					0		
	C35	EARTHING TO TILED ROOF BUILDINGS					0		
	C36	EARTHING TO CLADDED STORE BUILDING COLUMN					0		
C							C		
D							D		
E							E		
F			1	MOVED POWER STATION (P1 TO P10) TO SHEET 03 AND TRANSMISSION SECTION (T1 TO T10) TO NEW SHEET 04.					30/05/2022
			0	FIRST ISSUE.		JMV	KN	TM	30/07/2019
			REV	REVISION DESCRIPTION		BY	CHKD	AUTH	DATE
	Eskom Holdings SOC Limited REG No. 2002/015527/30		INDEX OF EARTHING STD'S		0.54/393				F
					SHEET NUMBER		REVISION		
					02		1		
1		2		3		4		SIZE GROOTTE	A4L

1		2		3		4		
A	SHEET	DESCRIPTION					REV	
	P1	OIL TYPE AUXILIARY TRANSFORMERS IN POWER STATION & DRY TYPE AUXILIARY TRANSFORMERS IN POWER STATION					3	
	P2	MOTORS FED BY XLPE OR THERMOPLASTIC INSULATED CABLES					2	
	P3	MOTORS FED BY MICC, CONDUIT OR PILCSWA CABLES MOUNTED ON EARTHED MATERIAL					1	
	P4	MOTORS FED BY MICC, CONDUIT OR PILCSWA CABLES MOUNTED ON UNEARTHED MATERIAL					1	
B	P5	CONTROL EQUIPMENT & MOTOR STARTERS (CONNECTED BY ARMOURED OR UNARMOURED PVC INSULATED CABLES)					2	
	P6	CONTROL EQUIPMENT AND MOTOR STARTERS (CONNECTED BY MICC, CONDUIT OR PILCSWA CABLES)					1	
	P7	POWER STATION AUXILIARY BAY SIGNAL EARTH TERMINATION BOX					1	
	P8	EARTHING OF SIGNAL DISTRIBUTION FRAMES					1	
	P9	EARTHING OF SMALLER 3 PHASE CONSUMERS WITHOUT NEUTRAL WITH 4 CORE UNARMOURED CABLE					1	
C							C	
D							D	
E							E	
F		1	SHEET UPDATED WITH POWER STATION ONLY. MOVED TRANSMISSION SECTION TO NEW SHEET 04.					30/05/2022
		0	FIRST ISSUE.		JMV	KN	TM	30/07/2019
		REV	REVISION DESCRIPTION		BY	CHKD	AUTH	DATE
		INDEX OF EARTHING STD'S (POWER STATION SECTION ONLY)		0.54/393				
	SHEET NUMBER			REVISION				
	Eskom Holdings SOC Limited REG No. 2002/015527/30			03		1		
1		2		3		4 SIZE GROOTTE A4L		

1		2		3		4		
A	SHEET	DESCRIPTION					REV	
	T1	ISOLATOR WITHOUT EARTHING BLADES					3	
	T2	ISOLATOR WITH ONE EARTHING BLADE					3	
	T3	ISOLATOR WITH TWO EARTHING BLADES					3	
	T4	EARTHING SWITCH					3	
B	T5	NEUTRALS OF EQUIPMENT MOUNTED ON EARTHED STEELWORK					3	
	T6	CVT (GALVANISED & PAINTED TANKS) MOUNTED ON EARTHED STEELWORK WITHOUT CARRIER COUPLING EQUIPMENT (LME)					2	
	T7	CVT (GALVANISED & PAINTED TANKS) MOUNTED ON EARTHED STEELWORK WITH CARRIER COUPLING EQUIPMENT (LME)					2	
	T8	EARTHING OF SURGE ARRESTERS FITTED WITH DISCHARGE COUNTERS					2	
	T9	EARTHING OF SURGE ARRESTERS FITTED WITH CONDITION MONITORING DEVICE					3	
C	T10	HV YARD AUXILIARY TRANSFORMER					2	
	T11	BASIC EARTHING ARRANGEMENT IN COMMS ROOMS					1	
	T12	SACRIFICIAL EARTHMAT ANODE					5	
	T13	CAPACITOR BANK EARTH STUD ADAPTOR PLATE					1	
	T13A	CAPACITOR BANK EARTH STUD ADAPTOR PLATE					1	
D	T14	EARTHING OF SURGE ARRESTER MOUNTED ON INSULATED BASE WITH PROVISION FOR CONDITION MONITORING DEVICE					3	
	T14A	EARTHING OF SURGE ARRESTER MOUNTED ON INSULATED BASE WITH PROVISION FOR CONDITION MONITORING DEVICE					1	
	T14B	EARTHING OF SURGE ARRESTER MOUNTED ON INSULATED BASE WITH PROVISION FOR CONDITION MONITORING DEVICE					1	
	T15	EARTH STUD					1	
	T16	ADAPTOR PLATE FOR EARTH STUD					1	
E	T17	TYPICAL LAYOUT OF OPERATING EARTHING SHOWING REQUIRED CONNECTIONS					0	
	T18	CLADDED STORE EARTHING DETAIL AND SPECIFICATION					0	
	T19	CONTROL BUILDING EARTHING DETAIL AND SPECIFICATION					0	
F	1		SHEET UPDATED WITH TRANSMISSION ONLY. SHEETS T18 AND T19 ADDED.		JMV	KN	TM	30/05/2022
	0		FIRST ISSUE.		JMV	KN	TM	30/07/2019
	REV		REVISION DESCRIPTION		BY	CHKD	AUTH	DATE
	 Eskom Holdings SOC Limited REG No. 2002/015527/30		INDEX OF EARTHING STD'S (TRANSMISSION SECTION ONLY)		0.54/393			
					SHEET NUMBER		REVISION	
				04		1		

1

2

3

4

SIZE GROOTTE A4L

EARTH MAT AND TAILS

- A

1. ALL EARTHING CONDUCTOR TO COMPLY WITH EN13601 (2013 OR LATER)
ITEM ANNEALED Cu-OFE (CW009A)

A
2. EARTHING CONDUCTOR APPLICATION.
- 2.1 MAIN EARTH MAT SHOWN — — — — — TO BE $\phi 10\text{mm}$
ANNEALED COPPER (UNLESS OTHERWISE INDICATED) BURIED AT LEAST
1000mm BELOW FINISHED GROUND LEVEL WHEREVER POSSIBLE. WHERE PASSING
UNDER DEEPER FOUNDATIONS AND DRAINS, IT IS TO BE 150mm BELOW CONCRETE.
BACKFILLING AROUND SUCH EARTH RODS TO BE WELL COMPACTED WITH SIFTED
SELECTED SOIL.

B
- WHERE A CONCRETE BLINDING IS CAST UNDER BUILDING FOUNDATIONS THE
EARTH MAT MESHES ARE TO BE INSTALLED ON TOP OF THE BLINDING AND
UNDER THE CONCRETE FOOTING OF COLUMNS ETC.

B
- WHERE PASSING OVER DRAINS WITH LESS THAN 1000mm OF COVER, IT IS TO BE
BURIED AS DEEPLY AS POSSIBLE, TO BE 600mm OUTSIDE SAFETY FENCE, AS
INDICATED ON FOUNDATION AND/OR EARTH MAT LAYOUT.

B
- ROD TRANSVERSE CROSSINGS ARE INDICATED THUS \oplus AND THESE CROSSINGS
MUST BE JOINTED USING CRIMPET, (SEE NOTE 5) BY THE METHOD SHOWN ON
SHEET C5/3.

C
- ROD TO ROD PERIMETER JOINTS (TEE) MUST BE MADE USING THE METHOD SHOWN
ON SHEET C5/2 AND ARE INDICATED THUS \oplus .

C
- 2.2 EARTH TAILS SHOWN THUS ————— TO BE 2x SEPARATE $\phi 10\text{mm}$
ANNEALED COPPER RODS (UNLESS OTHERWISE INDICATED). TAILS TO BE
VERTICAL AT COLUMN OR EQUIPMENT SUPPORT EARTHING POINTS (SHEET C31)
CLAMPED TO THE STEELWORK USING CLAMP (SHEET C31) BY THE METHOD SHOWN
ON SHEET C7, DROPPING DOWN AND JOINTED TO MAIN EARTH MAT AT POINTS
SHOWN THUS \oplus USING CRIMPETS (SHEET NOTE 5) AND BY THE METHOD SHOWN
ON SHEET C5/2.

C
3. WHERE EARTH TAILS CROSS THEY SHOULD BE CRIMPED TOGETHER.
4. WHERE MAIN EARTH MAT IS NOT DIMENSIONED, IT IS TO BE PLACED AS CLOSE
TO THE MAIN COLUMN FOUNDATIONS AS POSSIBLE.

D
5. ONLY CONNECTIONS COMPLYING TO IEEE STD 837-1989 "IEEE STANDARD FOR
QUALIFYING PERMANENT CONNECTIONS USED IN SUBSTATION GROUNDING" OR
APPROVED EQUIVALENT ARE ACCEPTABLE. CRIMPED CONNECTIONS THAT COMPLY ARE
SHOWN IN THE TABLE WITH IT'S ASSOCIATED COMPRESSION TOOL AND DIE.

D

MAKE	CONNECTOR	COMPRESSION TOOL	DIE	NO. OF CRIMPING OPERATIONS
SIMEL	C75E	SIMABLOC C12	12SX260CU	1
SIMEL	C75E	BURNDY Y35	U-F	1
BURNDY	YGHC26C26	BURNDY Y35	U-O	1
BURNDY	YC26C26	BURNDY Y35	U-O	1
BURNDY	YC26C26	BURNDY Y35	U-E	3



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7

DRG SHEET REPLACED. FONT CHANGED
TO FONT 80.

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EARTHING
STANDARDS

0.54/393

SHEET NUMBER

REVISION

C1

7

EARTH MAT AND TAILS

A

- 5.1 COMPRESSION TOOL SHALL NOT RELEASE UNTIL THE FULL COMPRESSION OF 12 TON HAS BEEN ACHIEVED.
 5.2 THE CORRECT TOOL AND DIE, AS GIVEN IN THE TABLE, SHALL BE USED FOR CRIMPING THE CHOSEN CONNECTOR.
 5.3 INTERNAL SURFACES OF THE CONNECTOR SHALL BE WIPED CLEAN BEFORE INSTALLATION, EXCEPT IN CASES WHERE CONNECTORS ARE FILLED WITH ANTI-OXIDISING GREASE.

A

B

6. BRAZED JOINTS TO BE OXY -ACETYLENE BRAZED USING A 3MM FILLER METAL ROD AS PER SPECIFICATION EN 1044 ITEM 105, NO FLUX IS REQUIRED.
 7. WHERE AN EARTH CLAMP (SHEET C6) IS USED TO CLAMP EARTH TAILS TO EQUIPMENT STEELWORK A BOLT TORQUE OF 75NM IS TO BE USED.
 8. ALL ABOVE GROUND CONNECTIONS TO BE MADE WITH STEEL BOLTS, WASHERS AND NUTS THAT ARE HOT DIP GALVANISED FOR OUTDOOR INSTALLATIONS, (SUPPLIED BY CIVIL CONTRACTOR) AND ELECTROGALVANISED FOR INDOOR INSTALLATIONS (SUPPLIED BY THE CONTRACTOR RESPONSIBLE FOR RELEVANT EARTH MAT PORTIONS). THE MINIMUM THICKNESS OF ZINC COATING TO BE IN ACCORDANCE WITH THE LATEST ISSUE OF SANS 121.

B

C

9. NUMBER OF SUPPORT STEEL EARTHING CONNECTIONS (UNLESS OTHERWISE STATED) TO BE:

C

12,5 KA - ONE CONNECTIONS PER SUPPORT

16KA
20KA
25KA } - TWO CONNECTIONS PER SUPPORT

31,5KA
40KA } - THREE CONNECTION PER SUPPORT

50KA
63KA } - FOUR CONNECTION PER SUPPORT

MAIN STEEL
GANTRY SYSTEM } - ONE CONNECTION PER COLUMN FOR ALL FAULT LEVELS

NOTE - EACH CONNECTION TO BE 150mm² MIN. CROSS SECTIONAL AREA.
 ONE CONNECTION CONSISTS OF 2X ϕ 10mm CU RODS OR
 1X50X3mm FLAT COPPER BAR.

E

10. SACRIFICIAL EATHMAT ANODES SHOWN THUS $\begin{pmatrix} S \\ EA \end{pmatrix}$ ARE TO BE MANUFACTURED AND CONNECTED TO THE MAIN EARTH MAT AS PER SHEET T12 FOR MILD TO VERY SEVERE CORROSIVE SOIL CONDITIONS.
 THE APPLICATION OF THESE ANODES WILL BE DETERMINED BY THE RESULTS OF SOIL TESTS CARRIED OUT BY ESKOM OR AN APPOINTED REPRESENTATIVE.

E

F

F



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REG No. 2002/015527/30

6

DRG SHEET REPLACED. FONT CHANGED TO FONT 80.

REV

REVISION DESCRIPTION

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28/06/2019

BY

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AUTH

DATE

EARTHING
STANDARDS


0.54/393

SHEET NUMBER

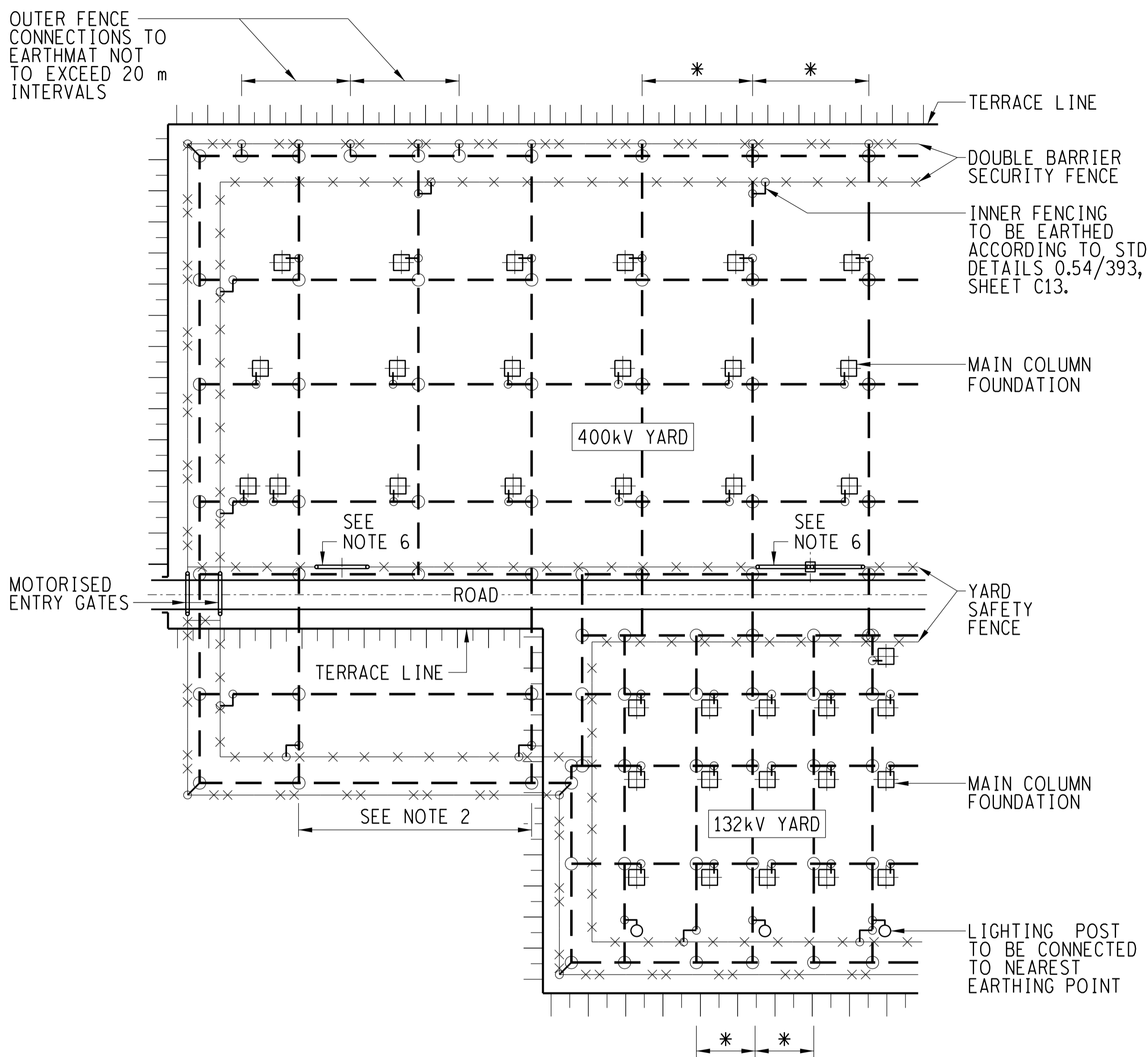
REVISION

C2

6

1		2		3		4			
EARTH MAT AND TAILS									
A	22. ISOLATOR AND EARTH SWITCH DRIVE SHAFTS ARE TO BE EARTHED THROUGH A FLEXIBLE COPPER STRAP CONNECTED BETWEEN A POINT JUST ABOVE THE MECHANISM BOX AND THE STEEL SUPPORT STRUCTURE. PANTOGRAPH ISOLATOR DRIVE SHAFTS (ROTATING NOT MORE THAN 90°) ARE TO BE EARTHED THROUGH A FLEXIBLE COPPER STRAP CONNECTED BETWEEN THE DRIVE SHAFT/INSULATOR FLANGE AND THE STEEL SUPPORT STRUCTURE. WHERE THE DRIVE SHAFT ROTATES MORE THAN 90° A METHOD OF EARTHING WILL BE SPECIFIED TO SUIT SUCH CASES INDIVIDUALLY.						A		
B	23. FLEXIBLE PROTECTIVE EARTH CONNECTIONS TO EQUIPMENT MUST BE EITHER OF BRAIDED COPPER OR OF FINELY STRANDED COPPER WIRE WITH GREEN/YELLOW INSULATION. THE RATED CONDUCTOR AREA SHALL NOT BE LESS THAN ONE HALF OF THE MAIN CONDUCTORS FEEDING THE EQUIPMENT WITH A MAXIMUM OF 70mm (75mm). THE LENGTH OF SUCH FLEXIBLE CONNECTION SHALL NOT EXCEED 1000mm.						B		
C	24. TWO EXTERNAL EARTHS ON LV MOTORS ARE NOT NECESSARY. ONE EARTH VIA A FOURTH CABLE CORE OR ONE VISIBLE EXTERNAL EARTH IS SUFFICIENT. FOR LARGE MOTORS (MV + LV) LOCAL EARTHING VIA FLEXIBLE EARTH CONNECTION IS REQUIRED.						C		
	25. EARTHING REQUIREMENTS FOR EQUIPMENT SUCH AS METALCLAD SF ₆ SWITCHGEAR INSTALLATION, PHASE ISOLATED BUSBARS AND GENERATORS WILL BE SHOWN ON DETAILED PROJECT DRAWINGS.								
D	26. TYPICAL EARTH STRAP DETAILS FOR POWER STATIONS ARE COVERED IN THE APPROPRIATE INFORMATION MANUALS.						D		
	27. <u>SURFACE LAYER COVERING</u> AS INDICATED IN THE EARTHING STANDARD, THE SURFACE RESISTIVITY PLAYS AN IMPORTANT PART IN ENSURING THE SAFETY OF PERSONNEL AS REQUIRED BY THE O.H.S. ACT. H.V. YARDS SHOULD HAVE A SURFACE LAYER COVERING OF AT LEAST 100mm THICK TO ACHIEVE SAFE "STEP AND TOUCH" POTENTIALS. THIS SURFACE LAYER COVERING SHOULD BE FORMED FROM CLEAN, HARD, SOUND CRUSHED STONE OF 26,5mm NOMINAL SIZE AS OUTLINED IN THE STANDARD FOR HV YARD STONES IN ESKOM SUBSTATION: 240-108982466.								
E							E		
F	 Eskom Holdings SOC Limited REG No. 2002/015527/30		4 DRG SHEET REPLACED. FONT CHANGED TO FONT 80.	JMV	KN	TM	30/07/2019		
			REV	REVISION DESCRIPTION		BY	CHKD	AUTH	DATE
			EARTHING STANDARDS		0.54/393				
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					C3A		4		
1		2		3		4		SIZE GROOTTE	A4L

EARTH MAT AND TAILS



TYPICAL EARTHMAT APPLICATION FOR NEW SUBSTATIONS

1. * AS A MINIMUM THE INTERVALS BETWEEN EARTHING RUNS TO COINCIDE WITH MAIN COLUMN FOUNDATIONS IN THE SUBSTATION YARDS. eg. 400kV = 24m; 132kV = 12m or 15m.
2. IF THE SECURITY FENCING IS OFF THE TERRACE THEN THE EARTHGRID BEYOND THE SUBSTATION SAFETY FENCE NEEDS ONLY TO BE AT ± 45 M INTERVALS.
3. WHERE THERE ARE TWO OR MORE YARDS IN CLOSE PROXIMITY, THE EARTH GRIDS ARE TO BE INTEGRATED.
4. FOR SECURITY AND SAFETY FENCING APPLICATIONS REFER TO S.L.D.G. 16-3; "SUBSTATION FENCING".
5. FOR EARTHING DETAILS REFER TO THIS STANDARD ie. 0.54/393.
6. ALL GATES AND REMOVABLE PANELS ARE TO BE BONDED WITH AN EARTH CONNECTION IN ACCORDANCE TO 0.54/4963.



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4 DRG SHEET REPLACED.

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BY CHKD AUTH DATE

EARTHING
STANDARDS


0.54/393

SHEET NUMBER REVISION

C3B

4

4 SIZE
GROOTTE A4L

1		2		3		4				
EARTH MAT AND TAILS										
A	11. ROOF EARTHING STRAP OF AT LEAST 25 X 3mm ANNEALED FLAT COPPER TO BE RUN ON OUTSIDE SURFACE OF BRICK BUILDING WALL TO THE ROOF AND JOINED TO METAL ROOF SHEETING WITH AT LEAST M8 BOLTS.						A			
	12. EARTH CONNECTIONS TO SHEET METAL CLAD BUILDING SIDEWALLS CAN BE DONE ON INSIDE AS DETAILED ON SHEET C12.									
B	13. WHERE CONNECTION IS MADE TO PAINTED STEELWORK THE PAINT SHALL BE REMOVED OVER A MINIMUM AREA TO ALLOW GOOD CONTACT BETWEEN SURFACES. SURFACES SHALL BE COATED WITH ANTI OXIDISING ELECTRICAL COMPOUND BEFORE BOLTING. AFTER BOLTING ANY SCRAPED AREA NOT COVERED BY THE COPPER CONNECTION SHALL BE MADE GOOD BY USING THE ORIGINAL TYPES AND COLOURS OF PAINTS.						B			
	14. WHERE CONNECTION IS MADE TO GALVANISED STEELWORK THE SURFACE SHALL BE COATED WITH ANTI OXIDISING ELECTRICAL COMPOUND PRIOR TO BOLTING.									
	15. FLAT COPPER STRAP IS TO BE SECURED TO DETAIL "A" ON SHEET C10, AT ALL CORNERS, INTERSECTIONS AND AT NOT MORE THAN 1000MM INTERVALS WHERE THE STRAP RUNS ACROSS VERTICAL OR HORIZONTAL FLAT SURFACES OF CONCRETE PLINTHS OR BRICK WALLS.									
C	16. FOR EARTH STRAP ARRANGEMENT IN CABLE RACKING SEE DETAIL "B" ON SHEET C10. FOR EARTH MAT PORTIONS RUN ALONG CABLE RACKING, SEPARATE INSTRUCTIONS WILL BE ISSUED.						C			
	17. WHERE FLAT COPPER EARTH STRAPS HAVE TO RUN ON TOP OF THE FINISHED FLOOR SURFACE ACROSS WALKWAYS THE STRAP IS TO BE SCREWED TO THE FLOOR AS SHOWN ON SHEET C10 DETAIL "A".									
	18. EARTHTAILS AT FOUNDATIONS WHERE NO EQUIPMENT STEELWORK IS FITTED ARE TO BE CLAMPED TOGETHER.									
D	19. CONNECTIONS OF 10mm DIA CU ROD ONTO MILD STEEL EARTHTAILS PROVIDED BY THE CIVIL CONTRACTOR FOR BONDING REINFORCING STEEL IN COLUMNS AND FLOORS ARE TO BE DONE BY AN EXOTHERMIC WELDING PROCESS (CADWELD, EXOWELD OR EQUIVALENT). REFER TO DETAIL SHEET C11.						D			
	20. ELECTRICAL APPARATUS MOUNTED ON ANY STRUCTURE SHALL BE EARTHED IN ACCORDANCE WITH THE APPARATUS SHEETS IN THIS STANDARD.									
E	21. A 50x3mm Cu EARTH BAR SHALL BE INSTALLED IN THE CABLE TRENCH OR ON THE CABLE TRAY ALL THE WAY AROUND THE INSIDE PERIMETER OF THE CONTROL BUILDING. THIS EARTH BAR SHALL BE BONDED TO THE MAIN SUBSTATION EARTH GRID AT EACH CABLE ENTRANCE INTO THE BUILDING.						E			
F	 Eskom Holdings SOC Limited REG No. 2002/015527/30	6	DRG SHEET REPLACED. FONT CHANGED TO FONT 80.			JMV	KN	TM	28/06/2019	F
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					C3		6			
1		2		3		4			SIZE GROOTTE A4L	

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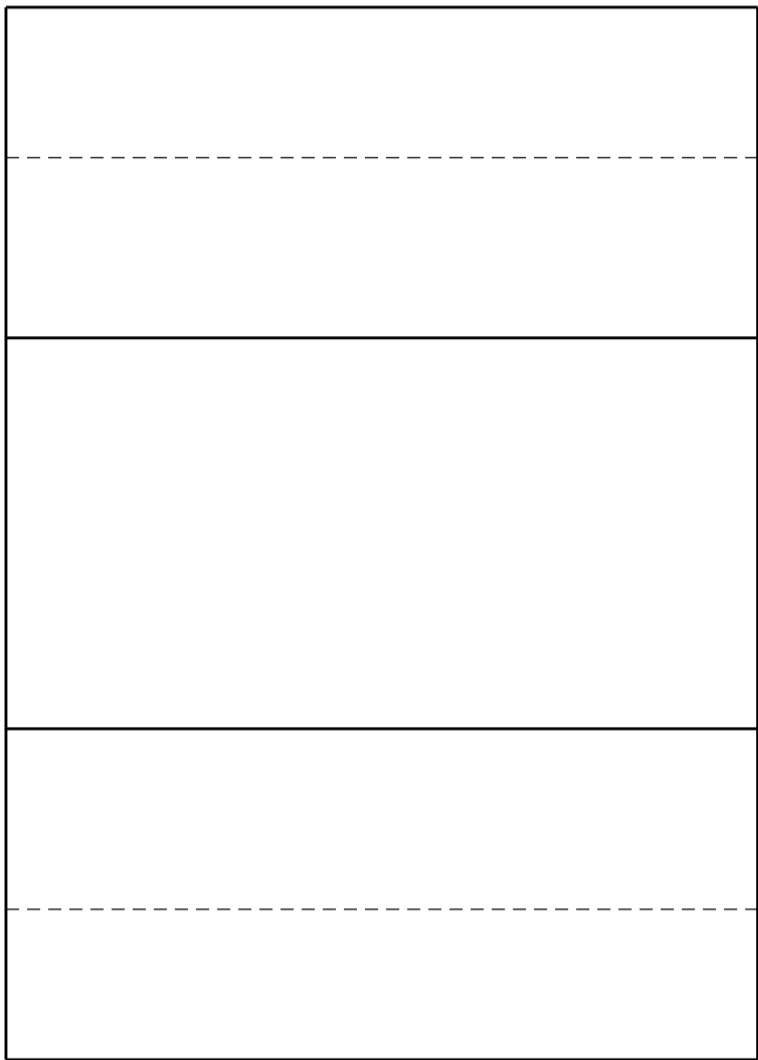
COPPER CRIMPET

A

(FOR CRIMPED JOINTS $\phi 10\text{mm}$ TO $\phi 10\text{mm}$ ANNEALED Cu-OFE (CW099A)
(REFERENCE: EUROPEAN STANDARD 'EN 13601' (2013 OR LATER) WITH
VOLUME RESISTIVITY EQUAL TO OR LOWER THAN $0,0172\Omega\text{mm}^2/\text{m}$

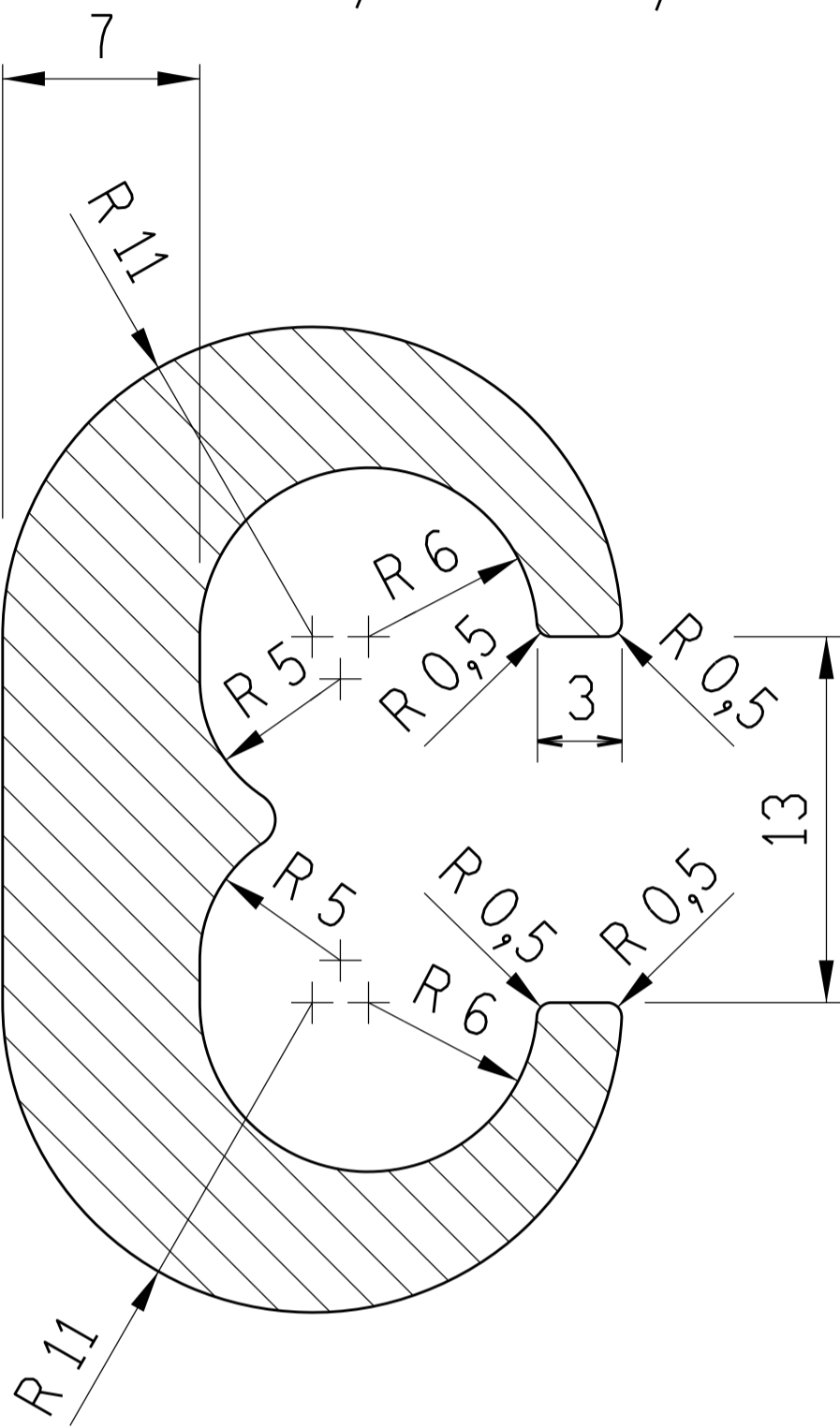
A

B



B

C



C

D

SCALE 2:1

D

E

MATERIAL: ELECTROLYTIC COPPER (ANNEALED)
MASS: 8 kg/100 UNITS.
NOTE: ALL DIMENSIONS $\pm 0,5\text{mm}$

E

F



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4

DRG SHEET REPLACED.

JMV

KN

TM

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REV

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EARTHING
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SHEET NUMBER

REVISION

C4

4

F

1

2

3

4

SIZE
GROOTTE A4L

1

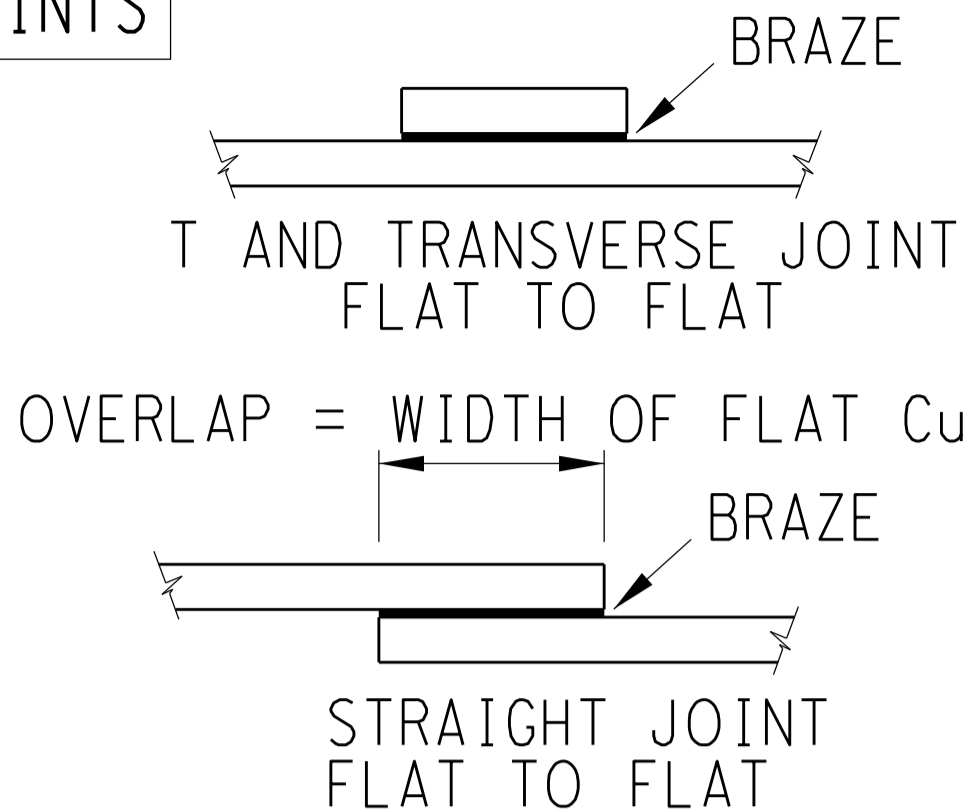
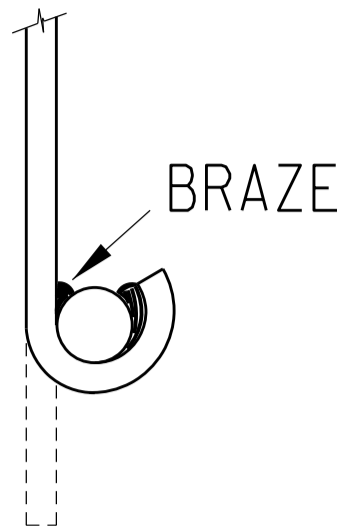
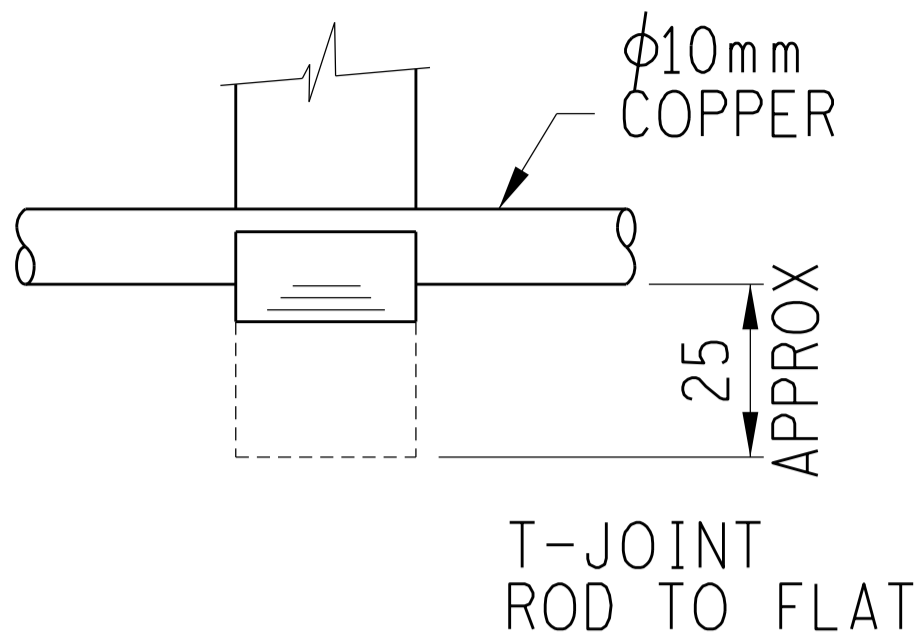
2

3

4

BRAZED COPPER JOINTS

A



A

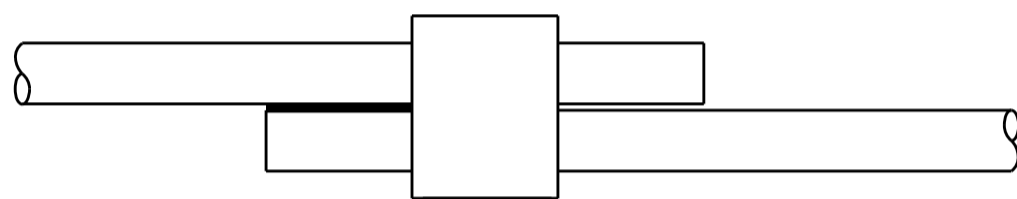
B

1. JOINTS TO BE OXY-ACETYLENE BRAZED, USING $\phi 3\text{mm}$ FILLER METAL EN 1044-CP 105 OR FILLER METAL EN 1044-B-CU92PAG-645/825 (REFERENCE: EUROPEAN STANDARD EN 1044, TABLE 4, ITEM CP 105). NO FLUX IS REQUIRED.
2. EXOTHERMIC WELDING PROCESSES (SEE NOTE 19 ON SHEET C3)

B

CRIMPED JOINTS

C

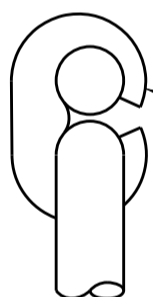


1 STRAIGHT JOINT ROD TO ROD

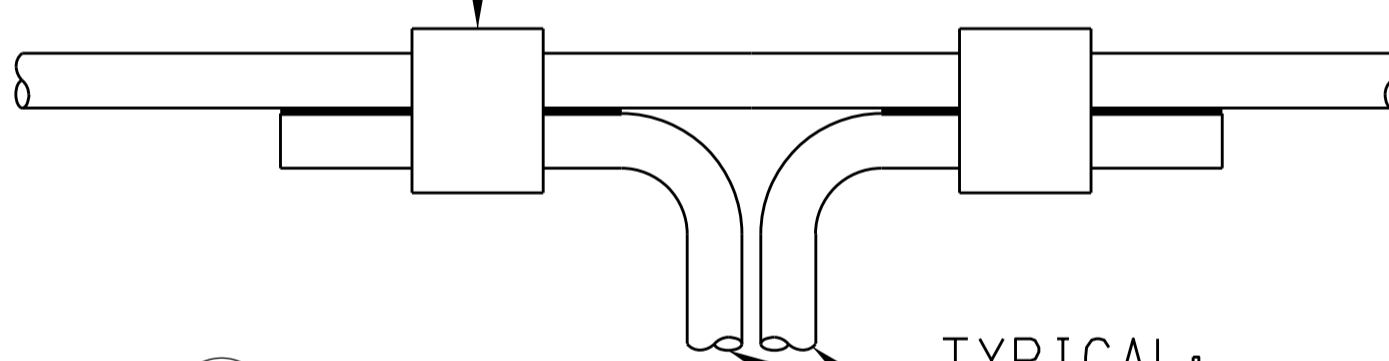
NOTE:
COPPER
CRIMPET
(SEE SHT C1,
NOTE 5)

TYPICAL:
MAIN EARTHMAT &
EARTHTAIL EXTENSIONS.

D



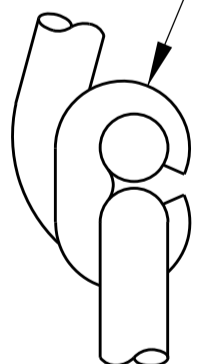
COPPER
CRIMPET
(SEE SHT C1,
NOTE 5)



2 T-JOINT
ROD TO ROD

TYPICAL:
ONE FOR MAIN EARTHMAT
PERIMETER JOINTS OR
FENCE EARTHTAIL.
TWO FOR COLUMN AND
EQUIPMENT SUPPORTS

E



3 TRANSVERSE JOINT
ROD TO ROD

TYPICAL: MAIN EARTHMAT

C

D

E

F



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5

DRG SHEET REPLACED. GENERAL REDAWN.

JMV

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TM

28/06/2019

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BY

CHKD

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EARTHING
STANDARDS

0.54/393

SHEET NUMBER

REVISION

C5

5

F

1

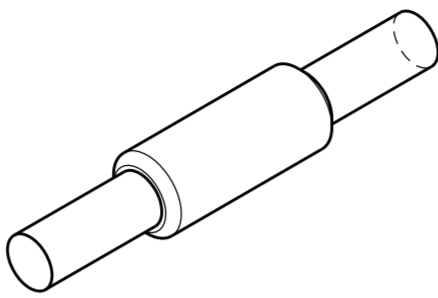
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3

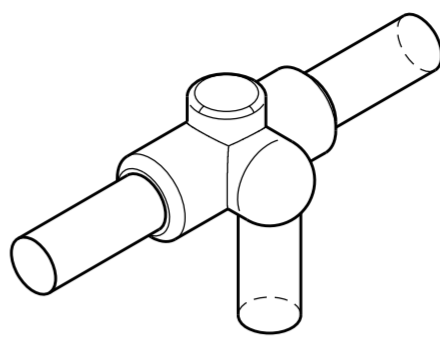
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SIZE
GROOTTE A4L

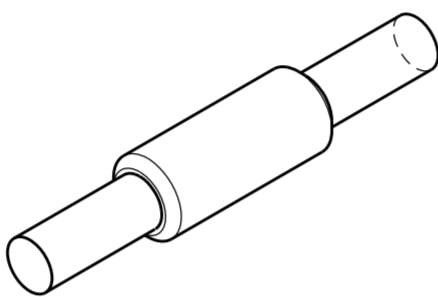
EXOTHERMIC JOINTS



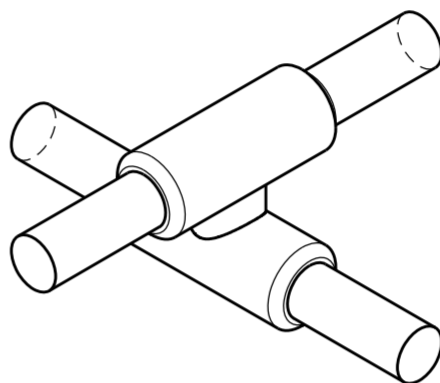
JOINT 1: STRAIGHT
8,5mm & 8,5mm



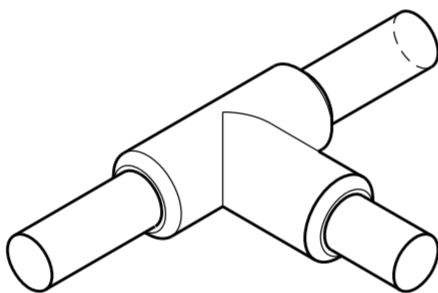
JOINT 5: TEE
RUN 8,5mm & TEE 14,2mm



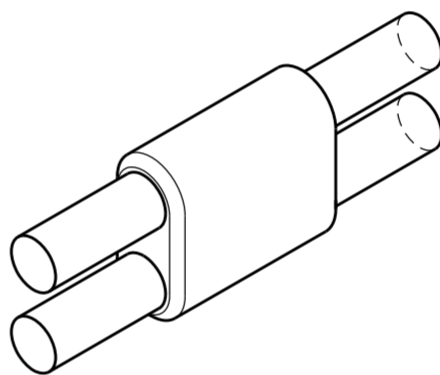
JOINT 2: STRAIGHT
8,5mm & 10,0mm



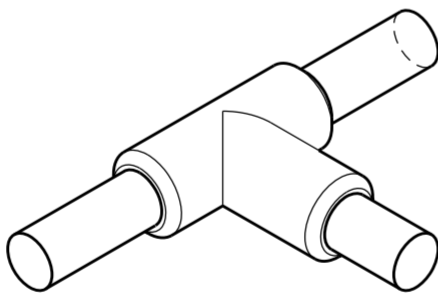
JOINT 6: CROSS (LAPPED)
8,5mm & 8,5mm



JOINT 3: TEE
RUN 8,5mm & TEE 8,5mm



JOINT 7: DOUBLE (MULTI)
2x 8,5mm



JOINT 4: TEE
RUN 10,0mm & TEE 8,5mm

(CONTINUED ON 0.54/393 SHT 5B)



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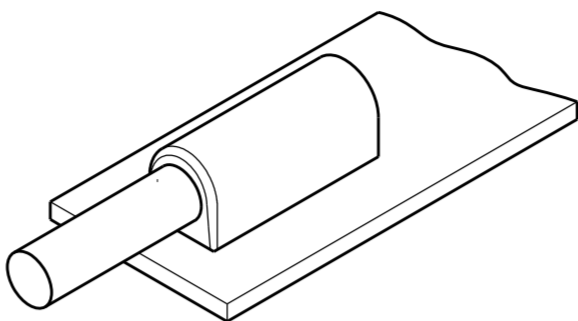
REVISION

C5A

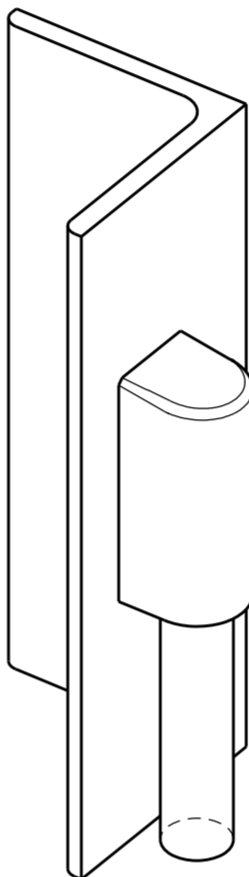
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EXOTHERMIC JOINTS

(CONTINUED FROM 0.54/393 SHT 5A)



JOINT 8: STRIP
8,5mm TO 50x3mm Cu STRIP
8,5mm TO 80x6mm GALVANISED STEEL STRIP



JOINT 9: STRUCTURE
8,5mm TO GALVANISED STEEL STRUCTURE

- NOTE:
- 1. ALL JOINTS SHALL BE EXOTHERMICALLY WELDED USING MOULDS AND WELD-METALS IN ACCORDANCE WITH ESKOM STANDARD 240-170000535.
 - 2. SEE D-DT-6367 FOR MOULD DETAILS.
 - 3. SEE D-DT-6368 FOR WELD-METAL DETAILS.
 - 4. CONDUCTOR DETAILS:
 - 8,5mm DIAMETER: Cu-CLADDED STEEL ROD
 - 10,0mm DIAMETER: Cu ROD
 - 14,2mm DIAMETER: Cu COATED STEEL ROD



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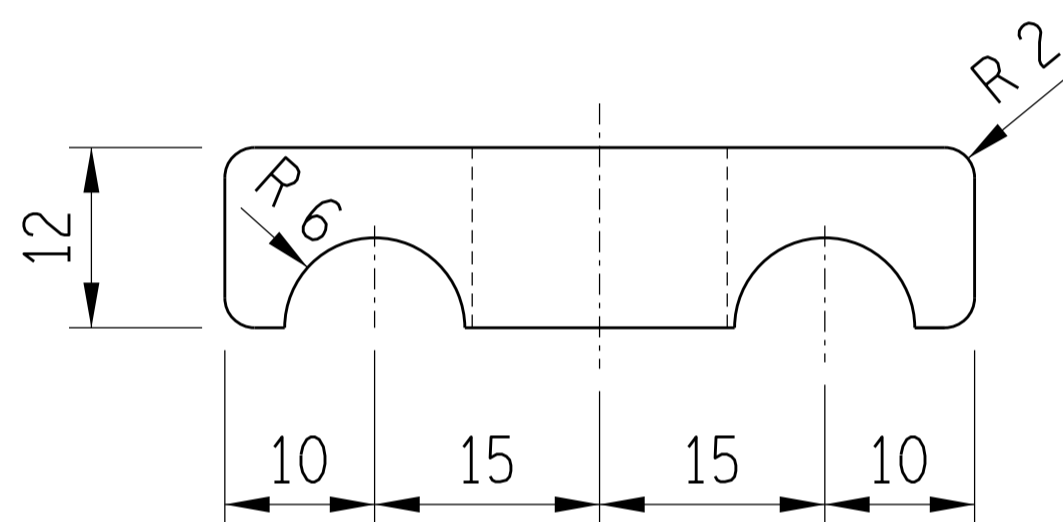
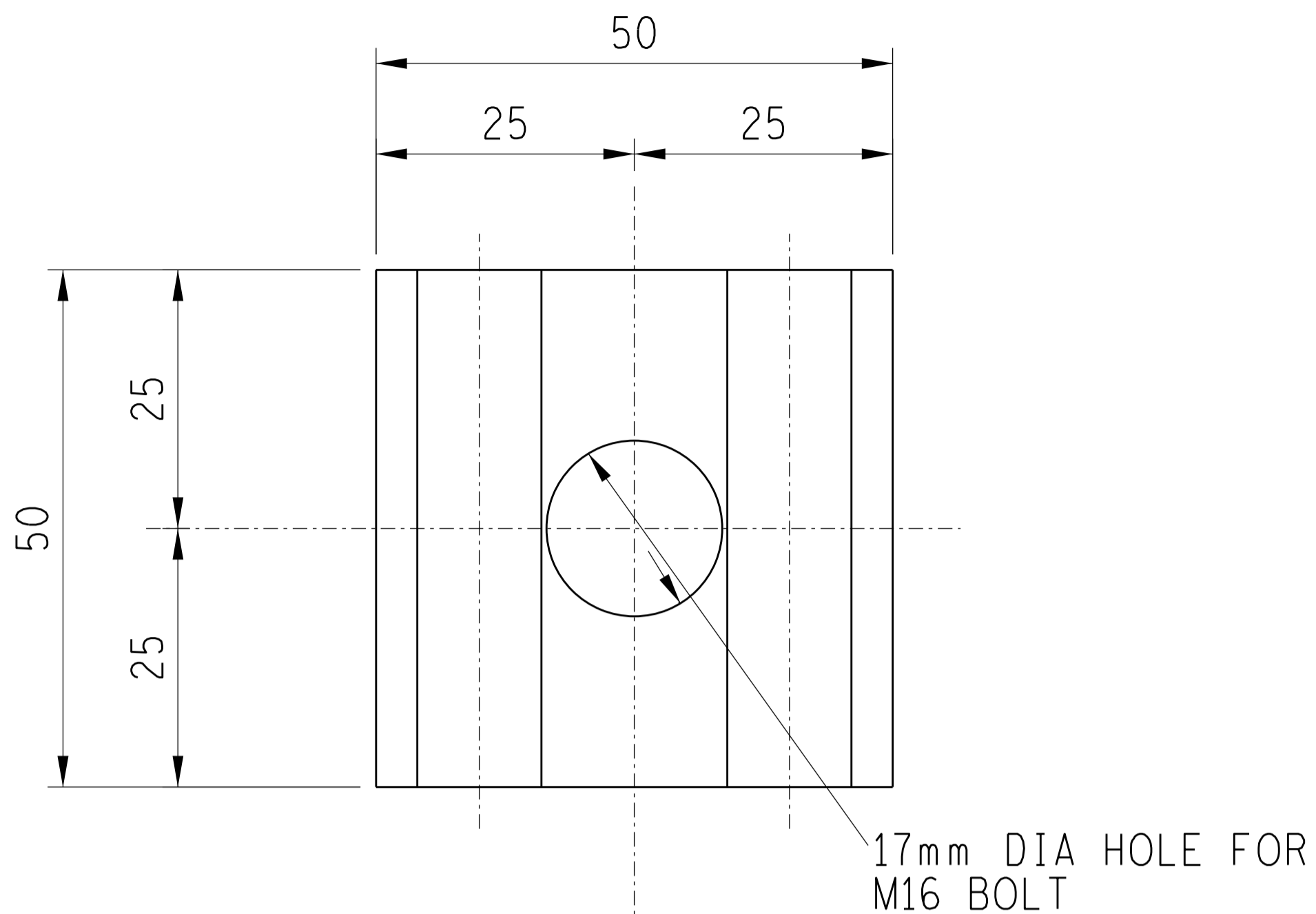
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REVISION

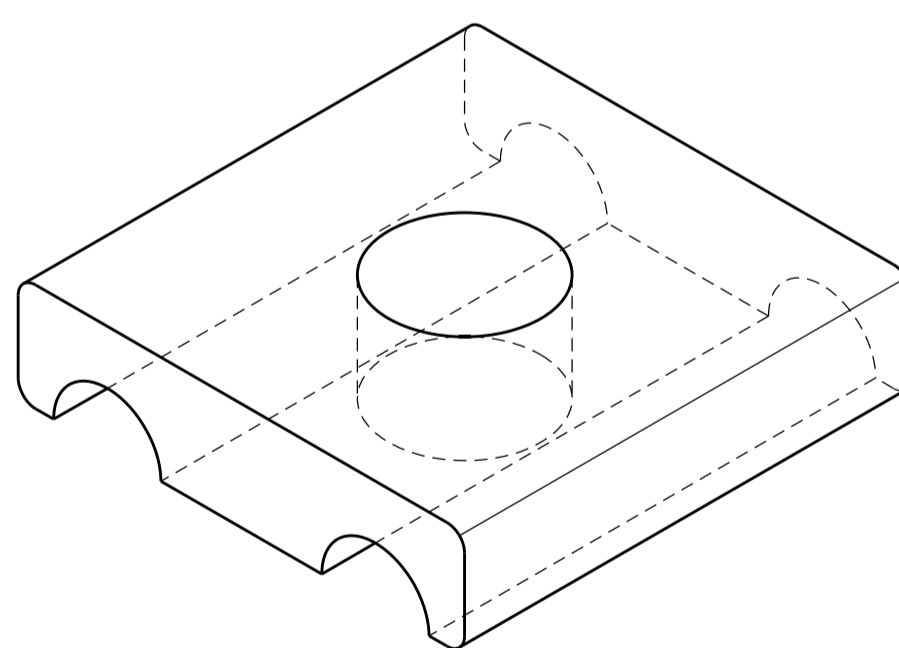
C5B

0

EARTHTAIL CLAMP



MATERIAL: ELECTROLYTIC COPPER
MASS: 16kg/100 UNITS
(FOR TYPICAL APPLICATIONS - SEE SHT C7)



END PRODUCT - ISOMETRIC VIEW
(NOT TO SCALE)



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3	DRG SHEET REPLACED. GENERAL REDAWN.	JMV	KN	TM	01/08/2019
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STANDARDS

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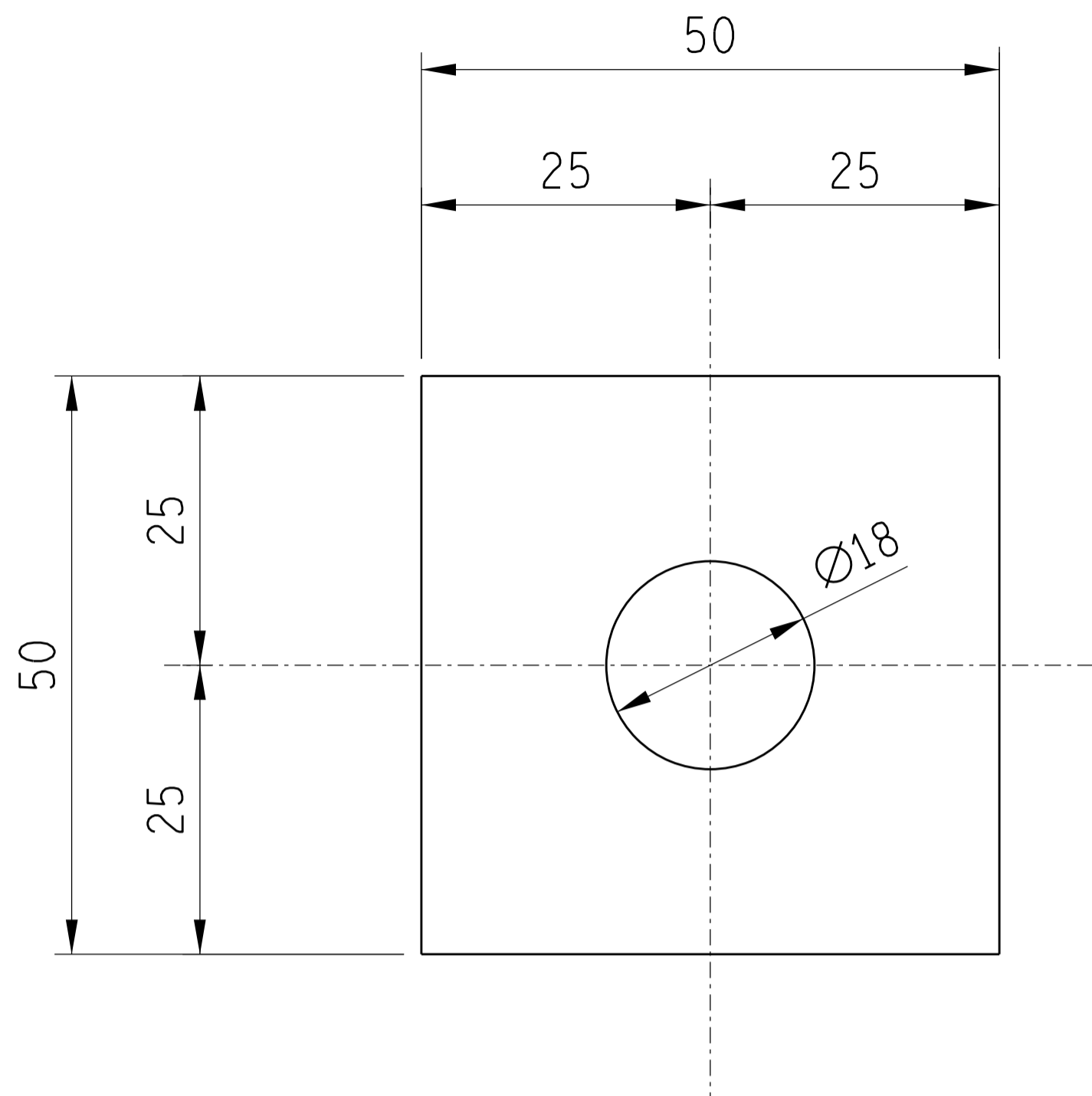
SHEET NUMBER	REVISION
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C6

3

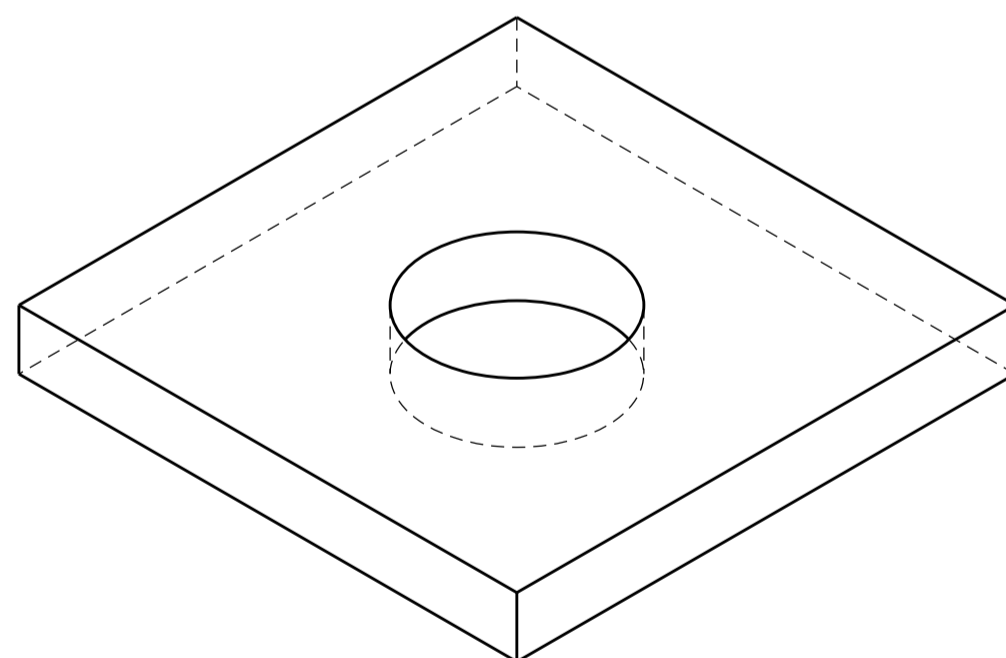
4 SIZE GROOTTE A4L

EARTHTAIL CLAMPING PLATE



MATERIAL: 6TH M.S. PLATE HOT DIP
GALVANISED TO SABS

APPLICATION: USED WITH EARTHTAIL CLAMP
SHEET C6 TO CLAMP TOGETHER SPARE
EARTHTAILS IN ORDER TO MAINTAIN
EARTHING CONTINUITY.



END PRODUCT – ISOMETRIC VIEW
(NOT TO SCALE)



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STANDARDS

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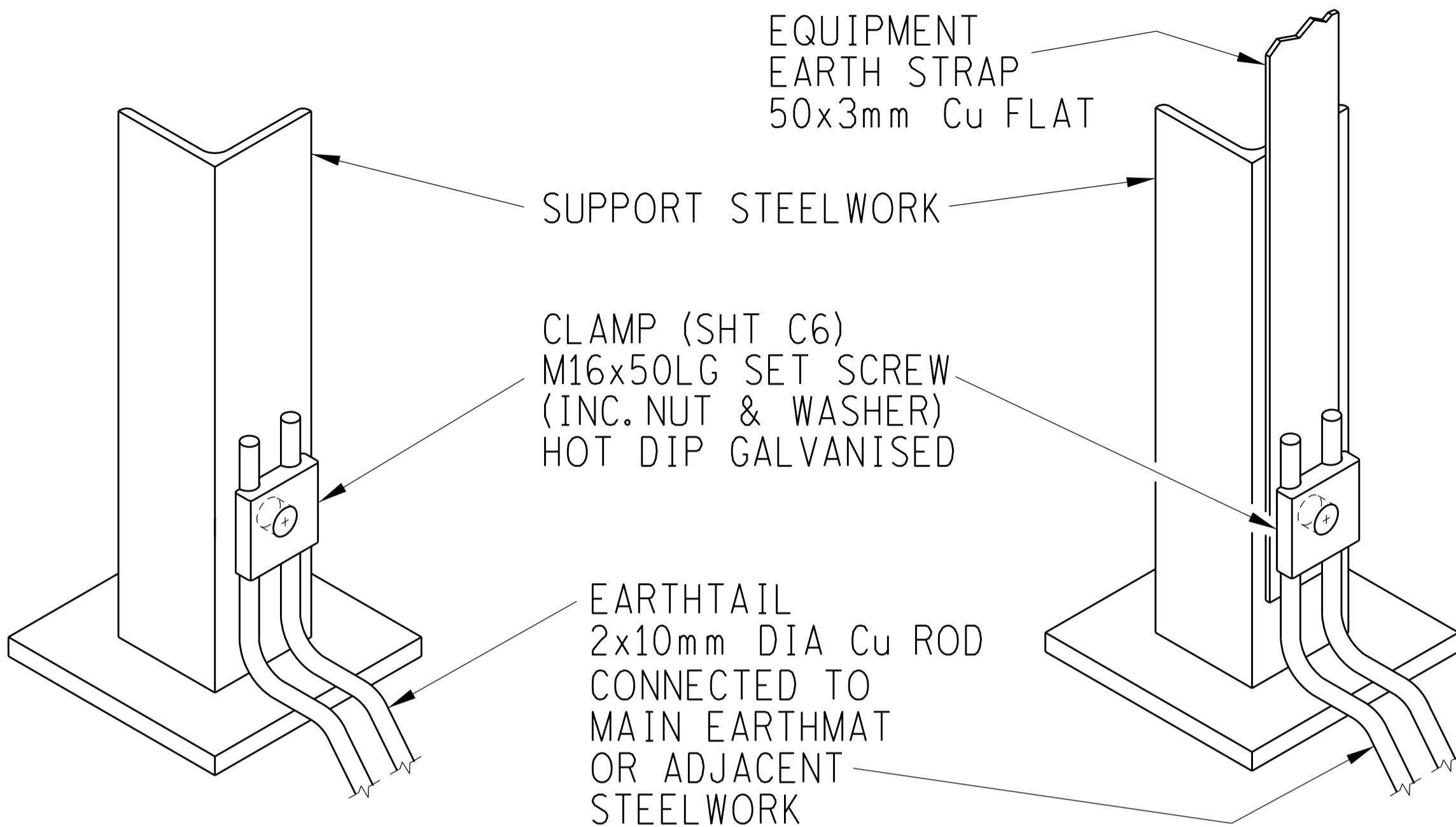
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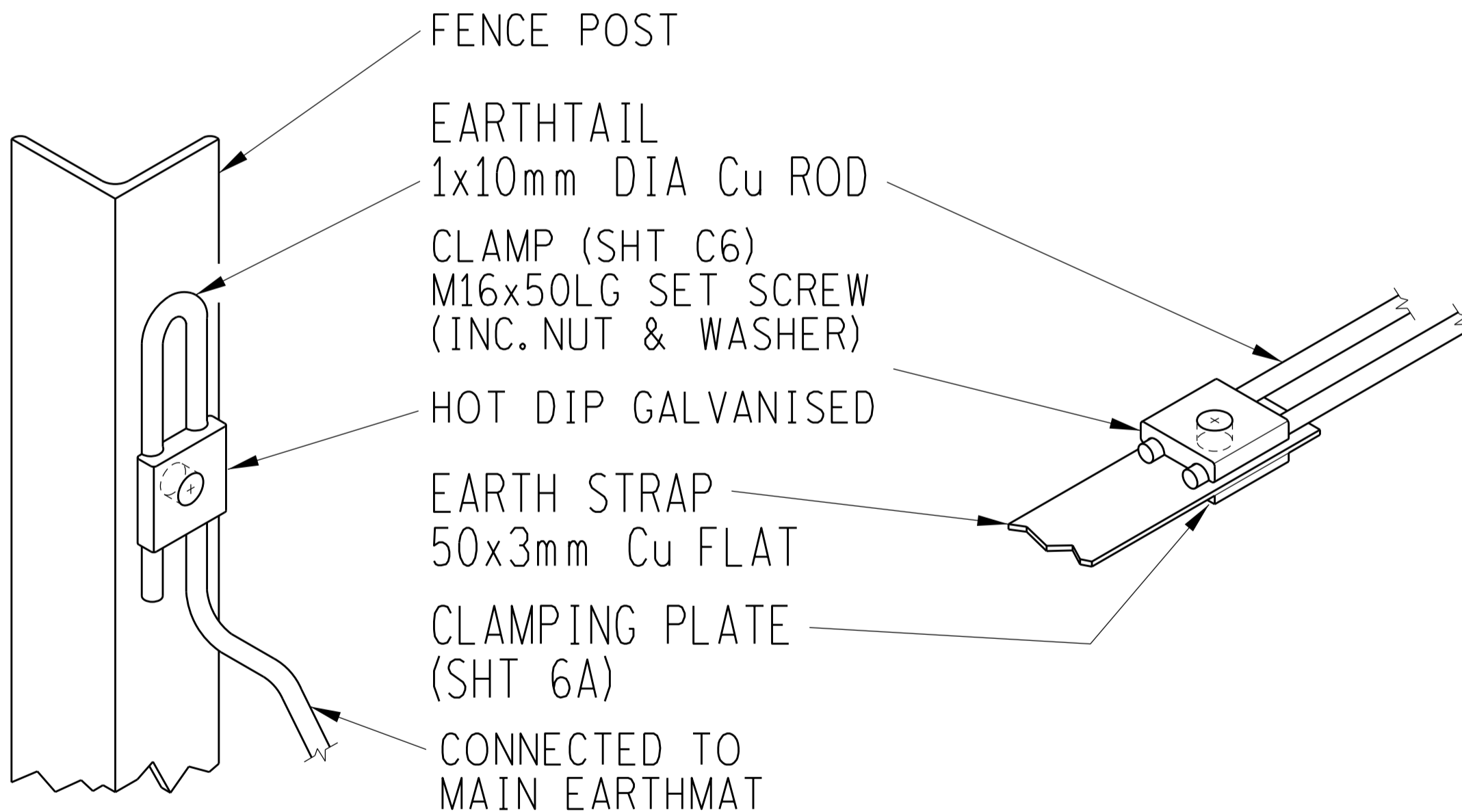
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4

EARTHTAIL CLAMP (TYPICAL APPLICATIONS)



SUPPORT STEELWORK EARTHING
(SEE ALSO SHEET C31)



STEEL POST FENCE EARTHING



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3

1

2

3

4

SIZE
GROOTTE A4L

1

2

3

4

A

B

C

D

E

F

A

B

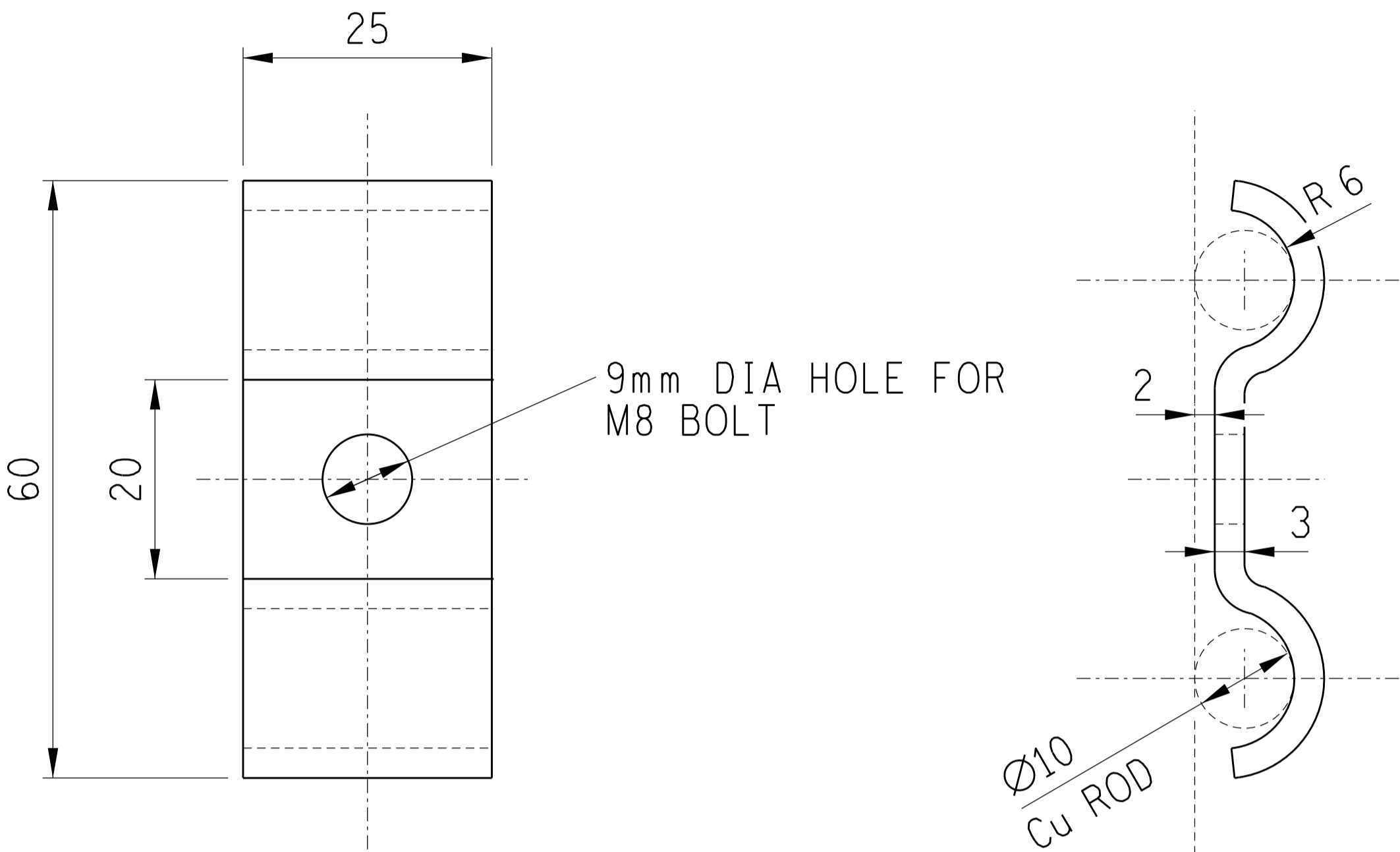
C

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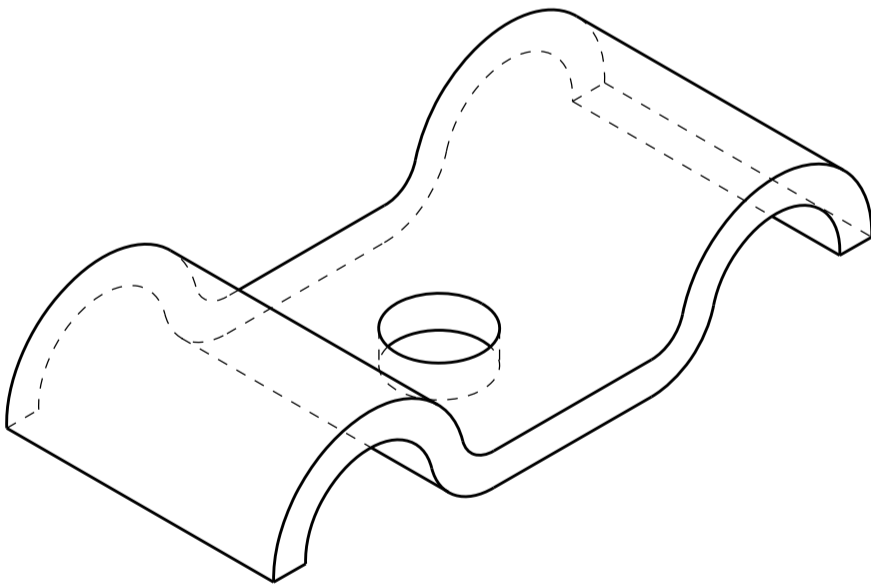
E

F

SADDLE FOR 2x10mm DIA, EARTHING Cu RODS



MATERIAL: HOT DIP GALVANISED STEEL
SCALE 1:1



END PRODUCT – ISOMETRIC VIEW
(NOT TO SCALE)



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C8

1

1

2

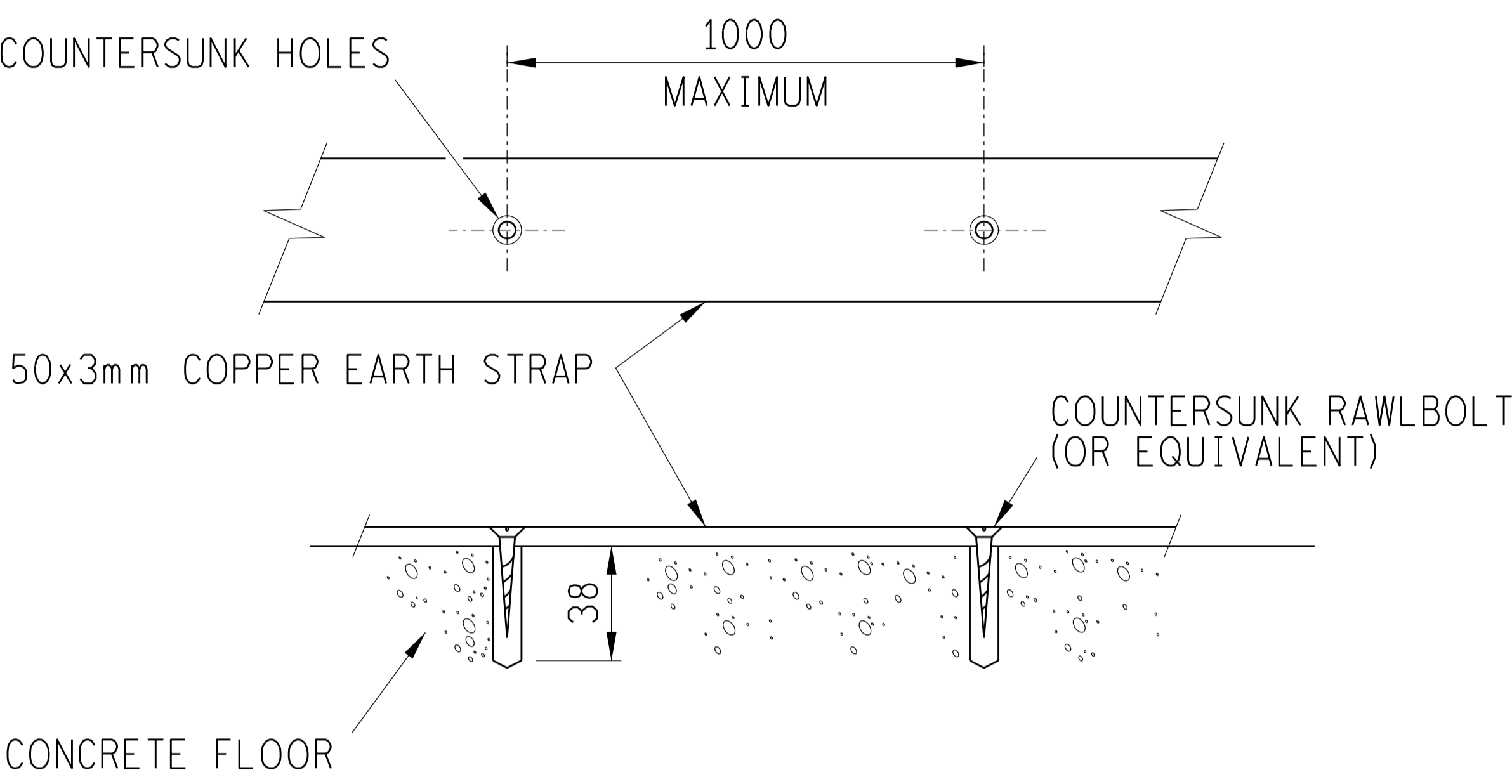
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4 SIZE GROOTTE A4L

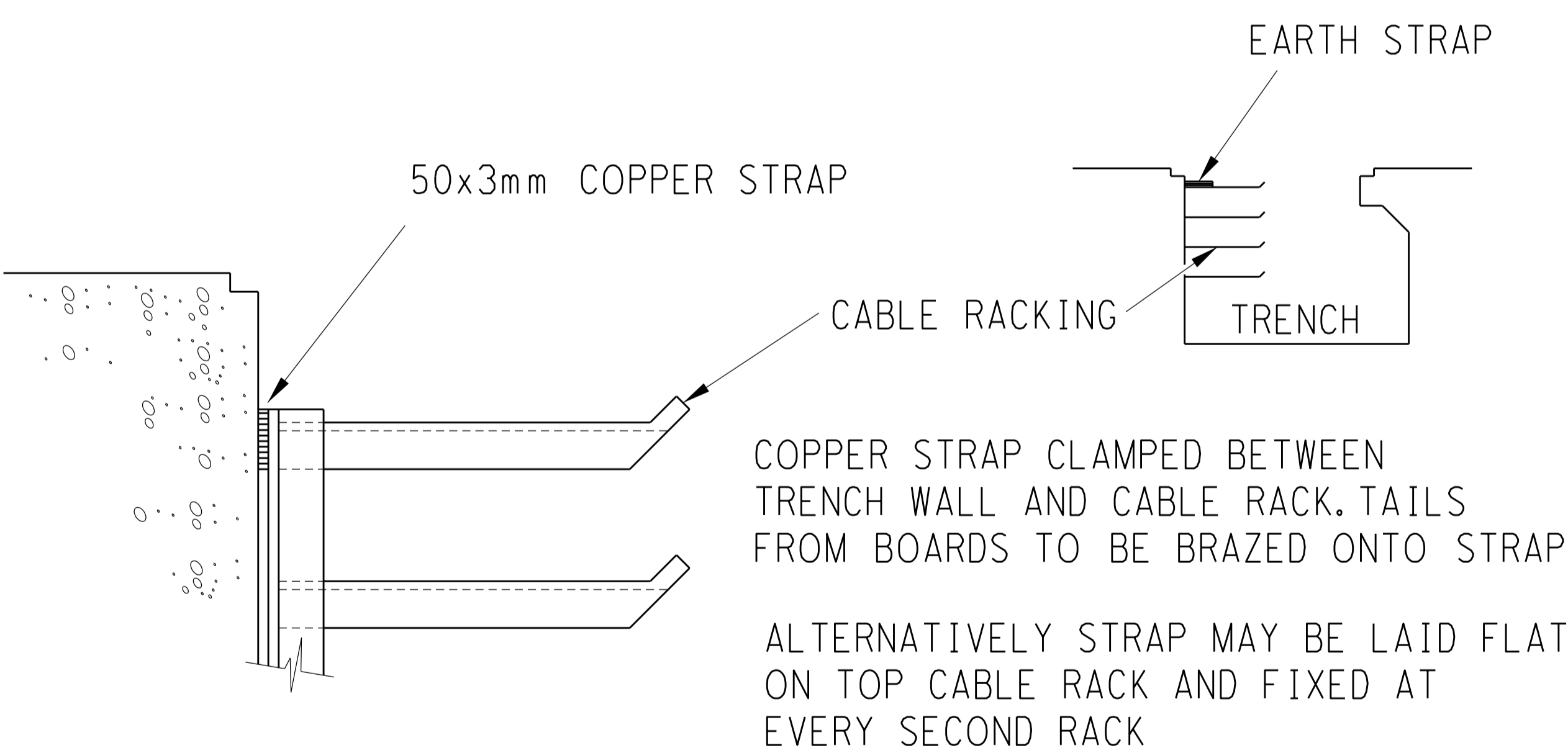
1	2	3	4	
A	<div> <div>BOLTED JOINTS</div> <div> <div> <div>13mm DIA HOLE FOR M12 BOLT</div> </div> <div> <div>17mm DIA HOLE FOR M16 BOLT</div> </div> </div> </div>			A
B	<div> <div>T-JOINT</div> <div>25x3mm FLAT BOLTED TO 25x3mm FLAT</div> </div> <div> <div>T-JOINT</div> <div>50x3mm FLAT BOLTED TO 40x3mm FLAT</div> <div>50x3mm FLAT BOLTED TO 40x3mm FLAT</div> </div>			B
C	<div> <div>13mm DIA HOLE FOR M12 BOLT</div> </div> <div> <div>17mm DIA HOLE FOR M16 BOLT</div> </div>			C
D	<div> </div> <div> </div>			D
E	<div> <div>STRAIGHT JOINT</div> <div>25x3mm FLAT BOLTED TO 25x3mm FLAT</div> </div> <div> <div>STRAIGHT JOINT</div> <div>50x3mm FLAT BOLTED TO 40x3mm FLAT</div> <div>50x3mm FLAT BOLTED TO 40x3mm FLAT</div> </div> <div> <div>1. CONNECTIONS TO CONSIST OF STEEL BOLTS, 2 FLAT WASHERS AND A NUT.</div> <div>2. CONNECTION SURFACES TO BE CLEANED AND COATED WITH ANTI OXIDISING ELECTRICAL COMPOUND BEFORE BOLTING.</div> <div>3. SEE SHEET C2 NOTE 8 FOR FURTHER NOTES.</div> </div>			E
F	<div> <div> <div> <div>Eskom</div> <div> <div>Eskom Holdings</div> <div>SOC Limited</div> <div>REG No. 2002/015527/30</div> </div> </div> </div> <div> <div>2</div> <div>DRG SHEET REPLACED. GENERAL REDAWN.</div> <div> <div> <div>REV</div> <div>REVISION DESCRIPTION</div> </div> <div> <div>EARTHING</div> <div>STANDARDS</div> </div> </div> </div> <div> <div> <div> <div> <div>0.54/393</div> <div> <div>SHEET NUMBER</div> <div>C9</div> </div> <div> <div>REVISION</div> <div>2</div> </div> </div> </div> </div> </div> </div>			F
1	2	3	4	SIZE GROOTTE A4L

EARTH STRAP FIXING - DETAIL 'A'

USED WHERE STRAP HAS TO RUN ON TOP OF FINISHED FLOOR IN WALKWAYS.
ONLY COUNTERSUNK SCREWS TO BE USED.



CONTROL ROOM TRENCH EARTH STRAP - DETAIL 'B'



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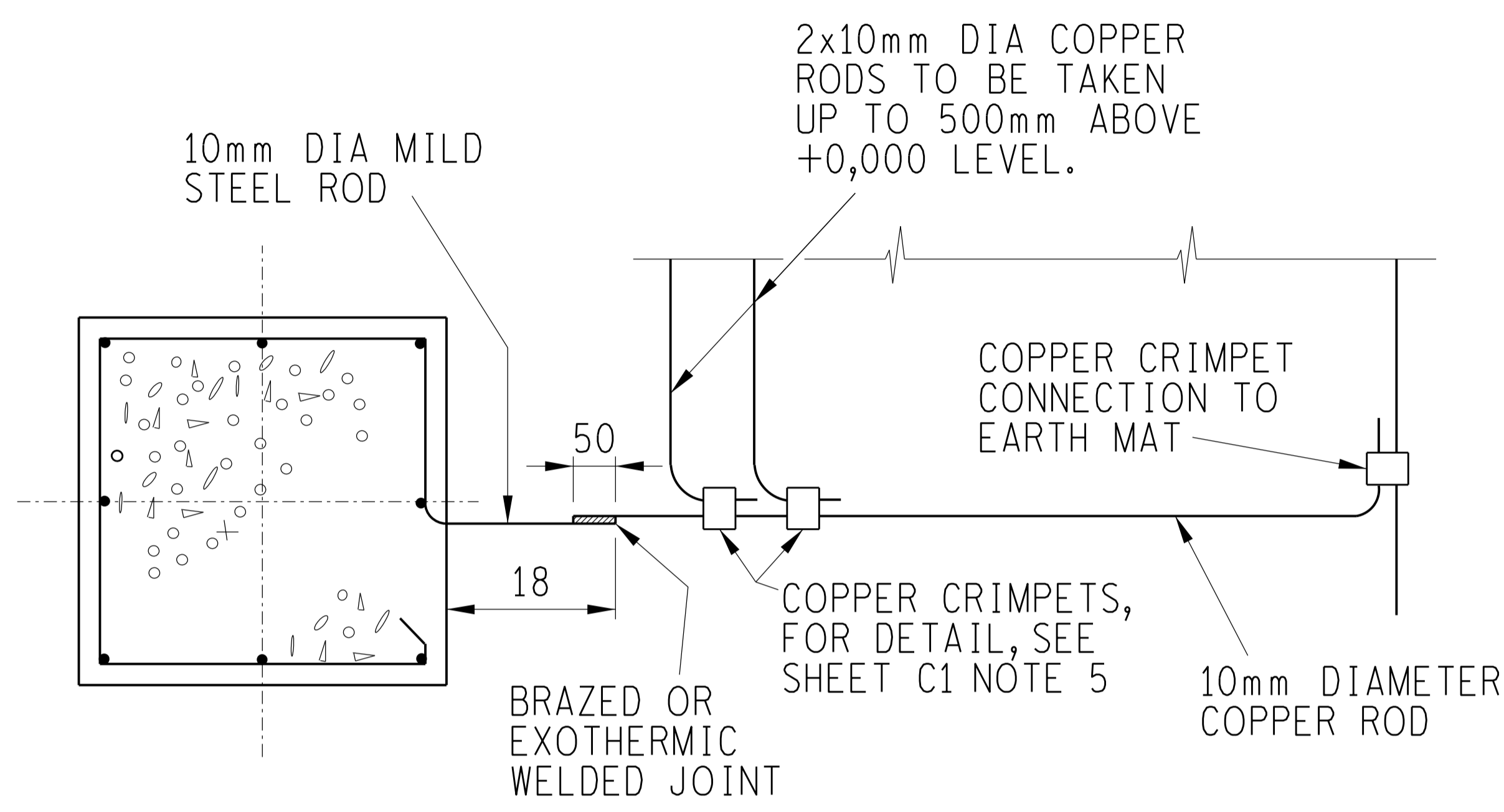
1

2

3

4

TYPICAL EARTH MAT CONNECTION TO COLUMN
AND TAIL FOR EQUIPMENT EARTHING.



NOTE:
ONE 10mm DIAMETER REINFORCING ROD TO BE CONNECTED TO MAJOR VERTICAL REINFORCING RODS BY MEANS OF BINDING WIRE AND TO SERVE AS EARTH CONNECTION.
THE FREE LENGTH OF THE MILD STEEL ROD TO BE 200mm OUTSIDE THE CONCRETE. THIS TAIL MUST BE WRAPPED WITH DENSOMASTIC TAPE, OVERLAPPING BY HALF IT'S WIDTH, TO AT LEAST 50mm ON EITHER SIDE OF ITS PENETRATION POINT INTO THE CONCRETE.
THE BRAZED JOINT, OR EXOTHERMIC WELD (SEE NOTE 19 ON SHT C3) MUST ALSO BE COVERED WITH DENSOMASTIC TAPE, TO AT LEAST 30mm BEYOND EITHER SIDE OF THE JOINT.



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		SHEET NUMBER		REVISION	
		C11		4	

1

2

3

4 SIZE GROOTTE A4L

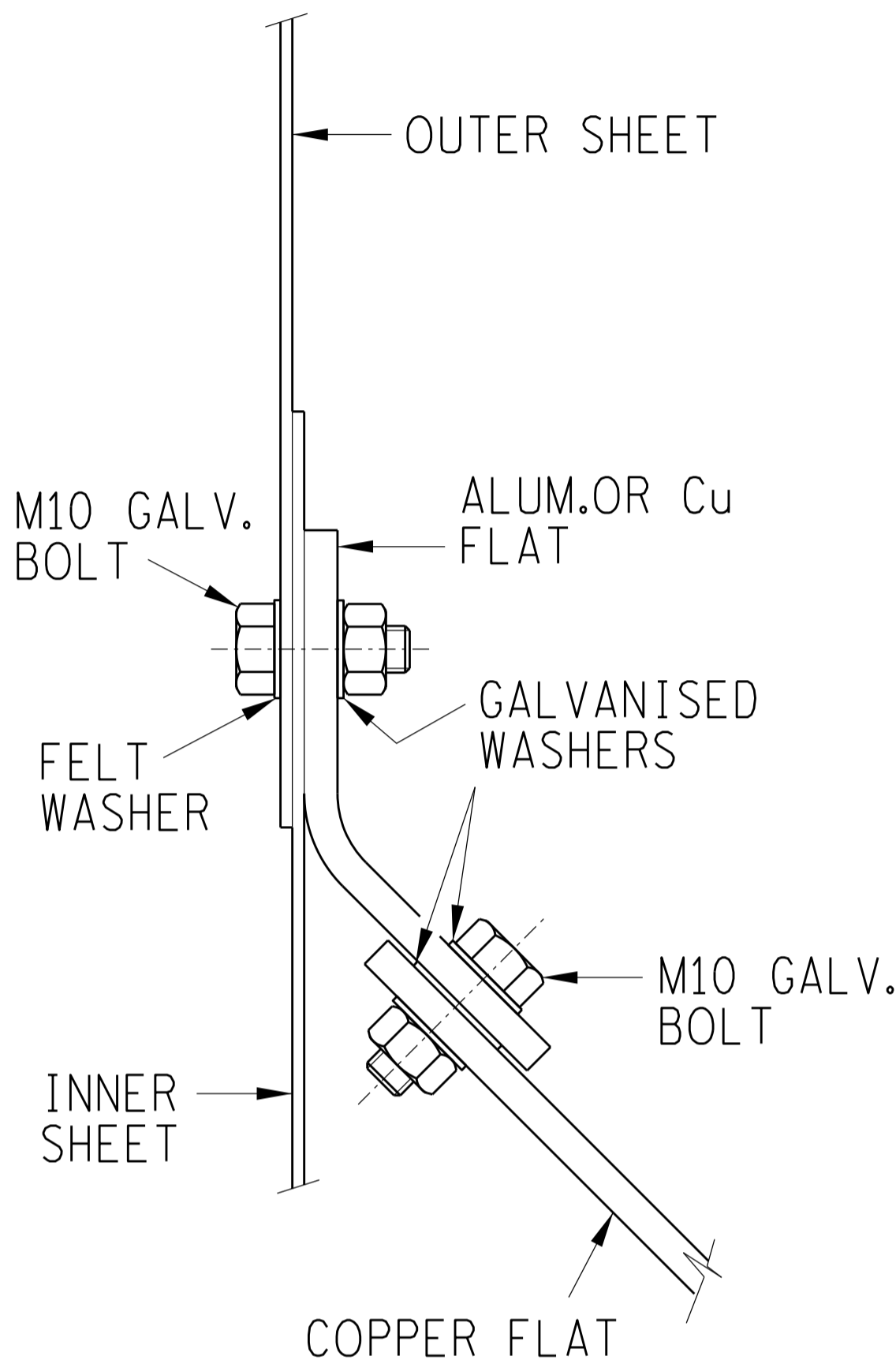
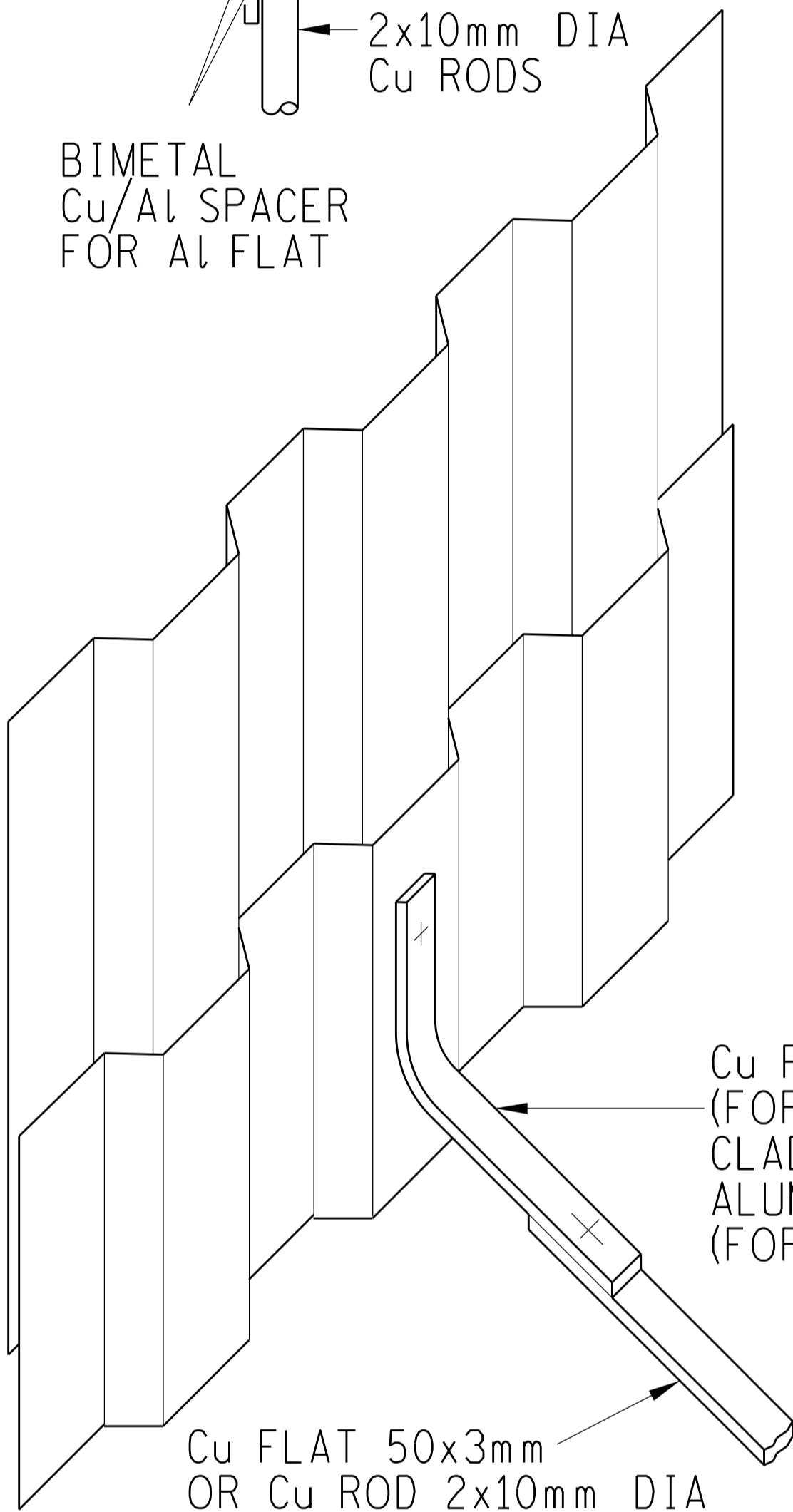
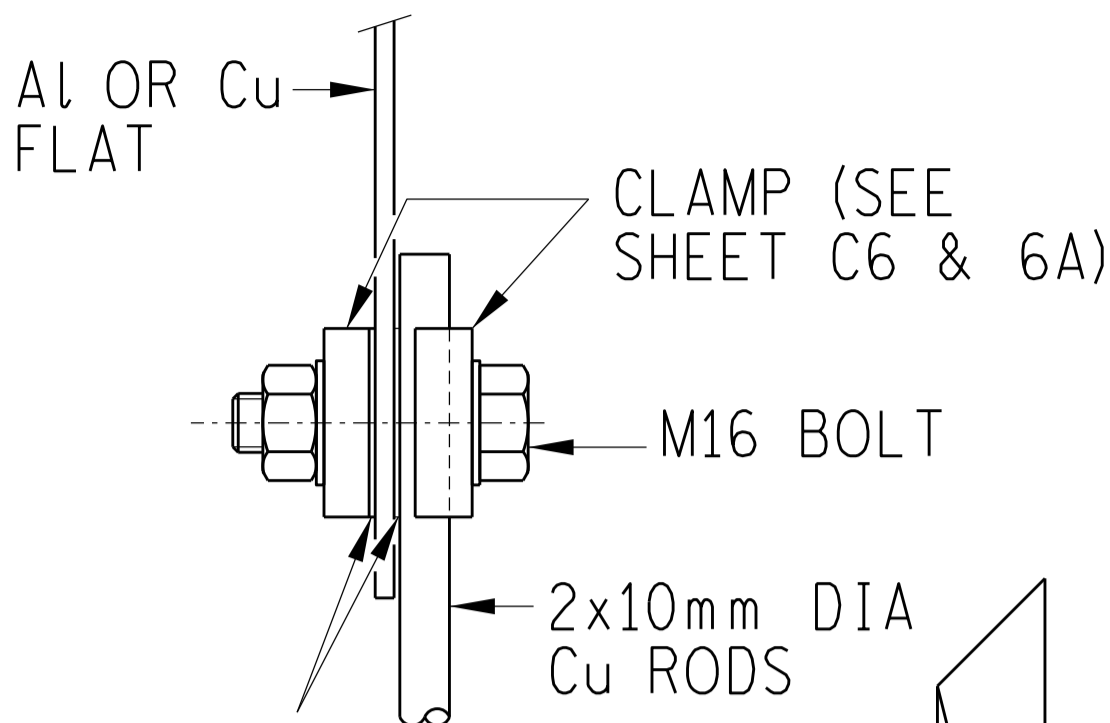
1

2

3

4

METHOD OF EARTHING ALUMINIUM
OR GALVANISED STEEL CLADDING



EARTH CONNECTIONS TO BE MADE NEAR TOP OF
LOWEST SHEET OF CLADDING AT 10000mm INTERVALS.
THE ALUMINIUM TO ALUMINIUM JOINT SHALL BE MADE
WITH USE OF JOINTING COMPOUND AS USED
IN HIGH VOLTAGE YARD JOINTS.



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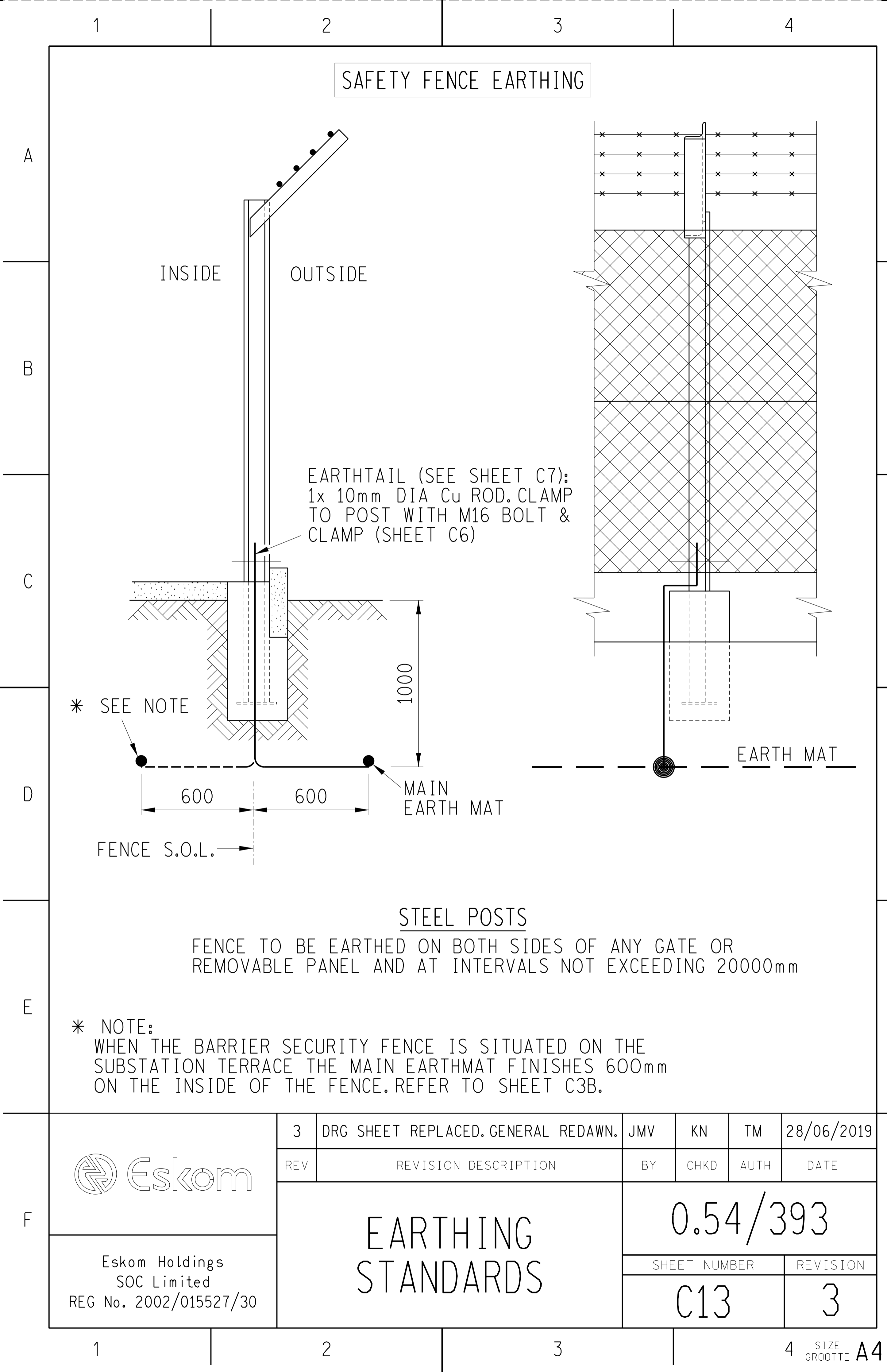
1

2

3

4

SIZE
GROOTTE A4L



SAFETY FENCE EARTHING

INSIDE OUTSIDE

EARTHTAIL (SEE SHEET C7):
1x 10mm DIA Cu ROD. CLAMP
TO POST WITH M16 BOLT &
CLAMP (SHEET C6)

* SEE NOTE

1000

600

600

MAIN
EARTH MAT

FENCE S.O.L.

EARTH MAT

STEEL POSTS

FENCE TO BE EARTHED ON BOTH SIDES OF ANY GATE OR
REMOVABLE PANEL AND AT INTERVALS NOT EXCEEDING 20000mm

* NOTE:
WHEN THE BARRIER SECURITY FENCE IS SITUATED ON THE
SUBSTATION TERRACE THE MAIN EARTHMAT FINISHES 600mm
ON THE INSIDE OF THE FENCE. REFER TO SHEET C3B.



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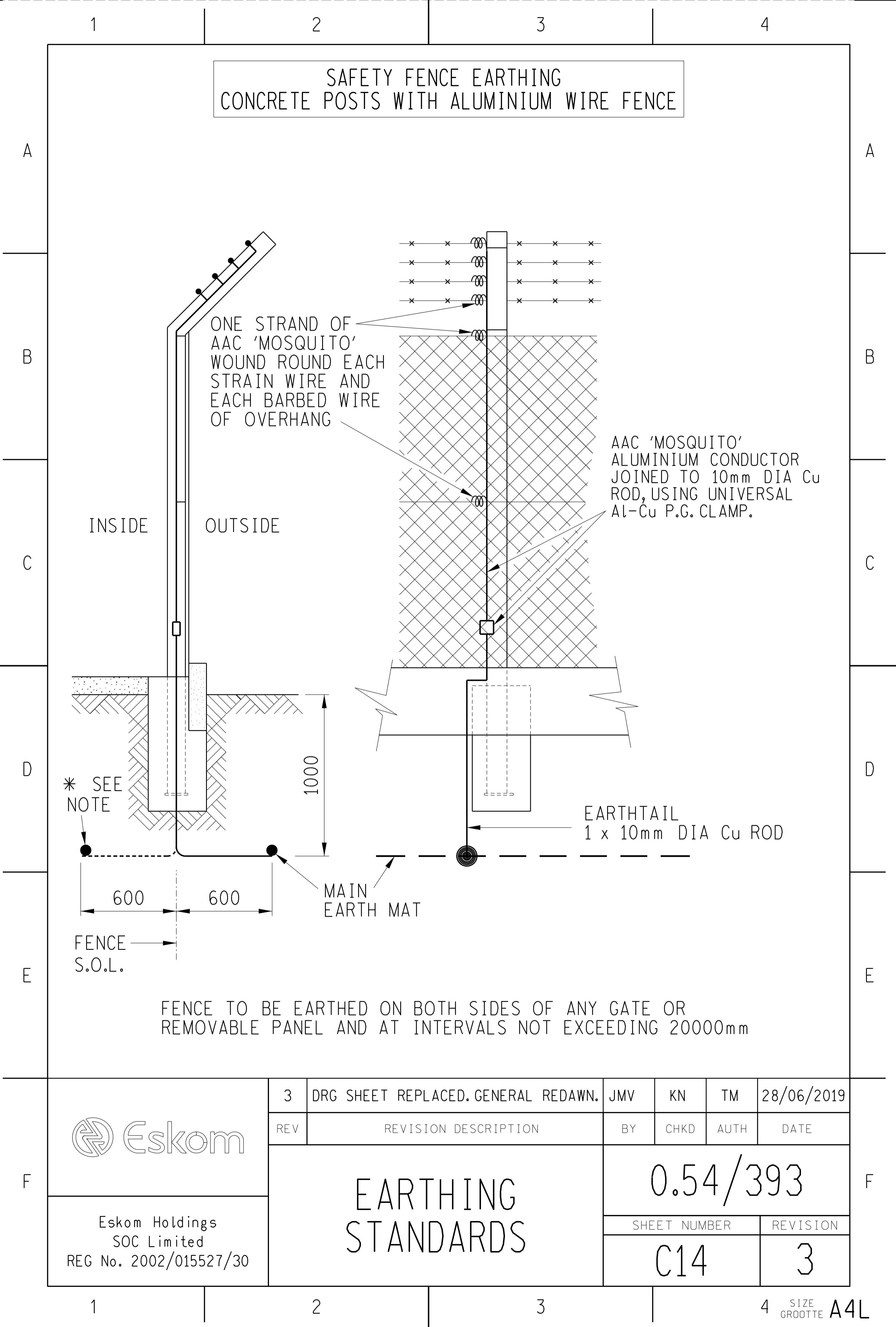
1

2

3

4

SIZE
GROOTTE A4L



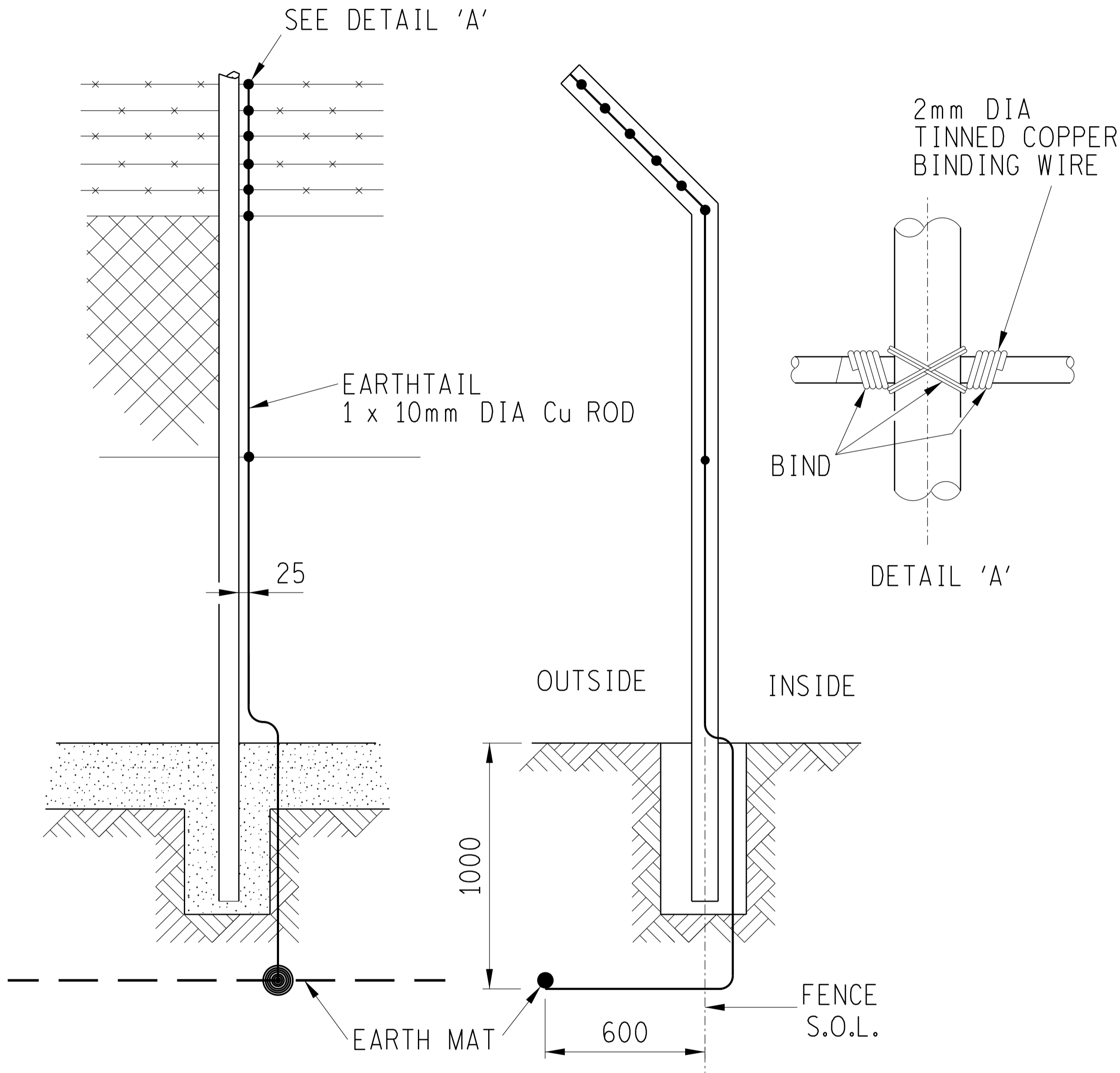
1

2

3

4

FENCE EARTHING WOODPOLE WITH GALVANISED WIRE FENCE



FENCE TO BE EARTHED ON BOTH SIDES OF ANY GATE OR REMOVABLE PANEL AND AT INTERVALS NOT EXCEEDING 20000mm



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C15

1

1

2

3

4 SIZE GROOTTE A4L

1

2

3

4

TANKS, BASES, ETC. & NEUTRALS OF ALL
EQUIPMENT MOUNTED ON NON-METALLIC SUPPORTS

A

A

B

B

C

C

D

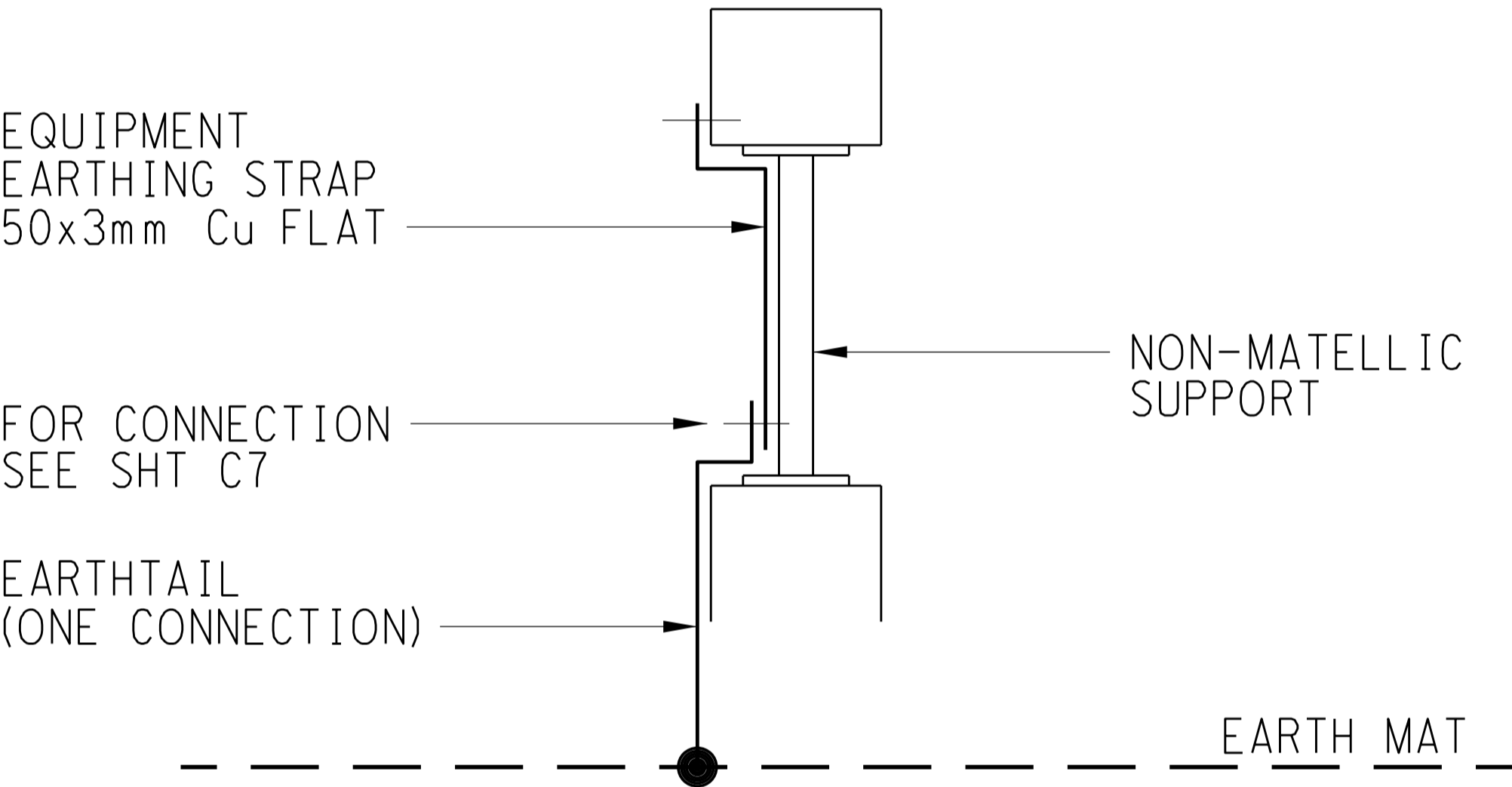
D

E

E

EXAMPLES

PLUG BOXES,
JUNCTION BOXES,
ETC.



EQUIPMENT
EARTHING STRAP
50x3mm Cu FLAT

FOR CONNECTION
SEE SHT C7

EARTHTAIL
(ONE CONNECTION)

NON-MATELLIC
SUPPORT

EARTH MAT



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C16

2

1

2

3

4

SIZE
GROOTTE A4L

1

2

3

4

PAINTED TANKS, BASES ETC. OF EQUIPMENT
MOUNTED ON EARTHED STEELWORK

A

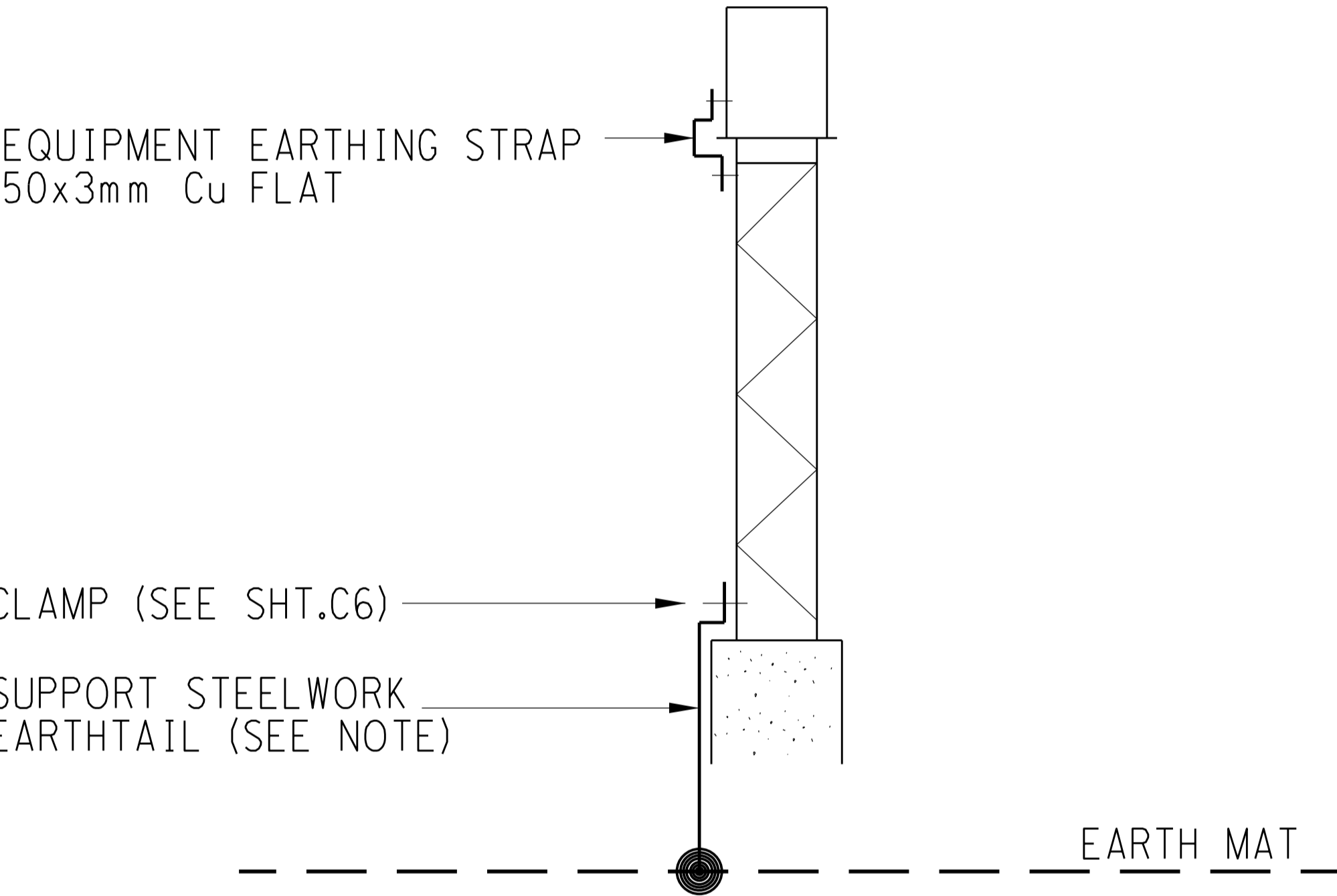
A

B

B

EXAMPLES

CURRENT TRANSFORMERS,
AUXILIARY TRANSFORMERS,
CIRCUIT BREAKERS, ETC.



C

C

D

D

E

E

NOTE:
SUPPORT STEEL EARTHING.
NUMBER OF EARTHING CONNECTIONS
TO EARTH MAT AS PER APPLICABLE SUBSTATION BAY EARTHING SHEETS.

F

F



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C17

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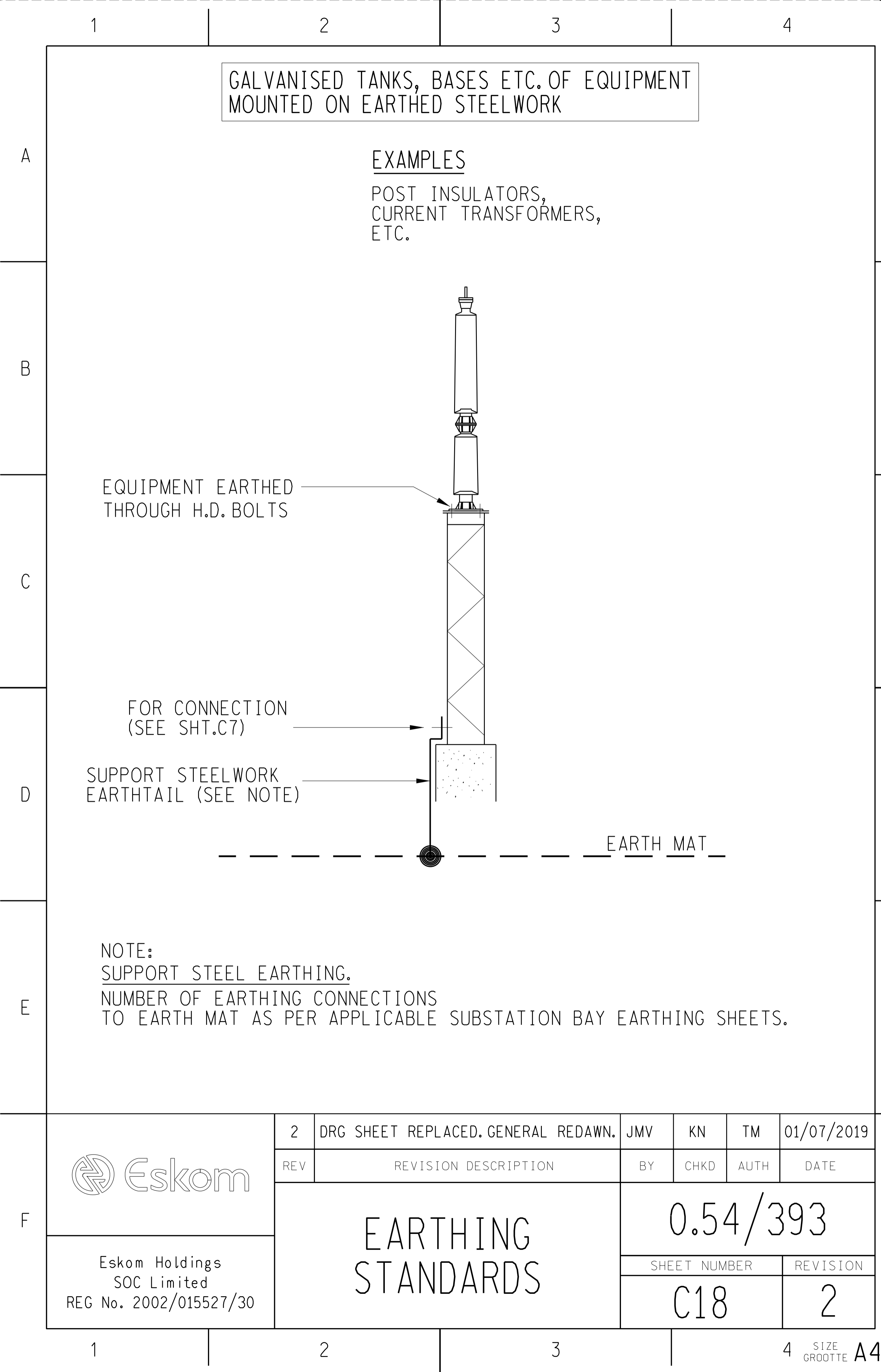
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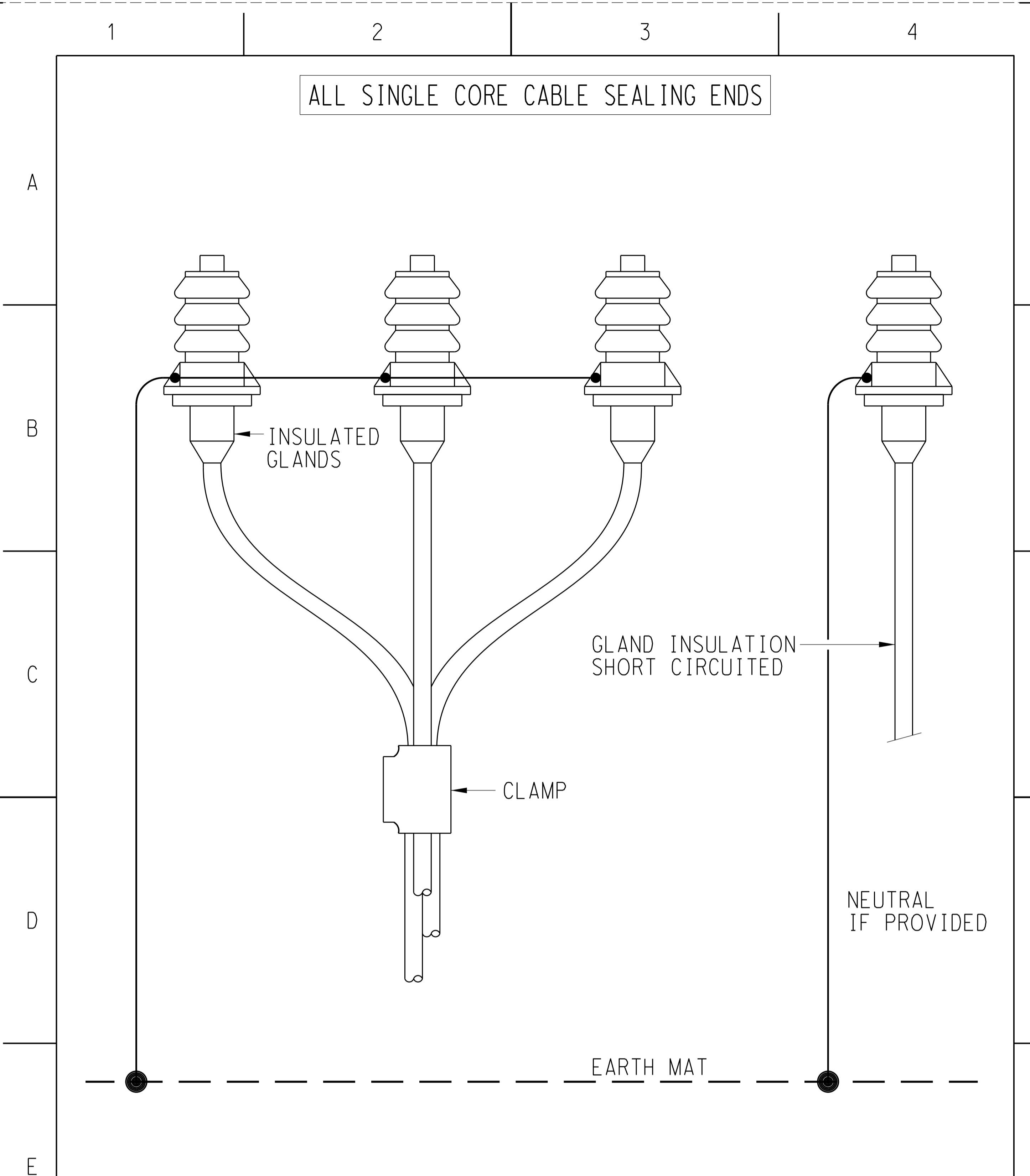
2

3

4

SIZE
GROOTTE A4L





ALL SINGLE CORE CABLE SEALING ENDS

INSULATED
GLANDS

GLAND INSULATION
SHORT CIRCUITED

CLAMP

NEUTRAL
IF PROVIDED

EARTH MAT

TRANSFORMER LV SINGLE CORE BARE CABLE TERMINATIONS



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0.54/393

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SIZE
GROOTTE A4L

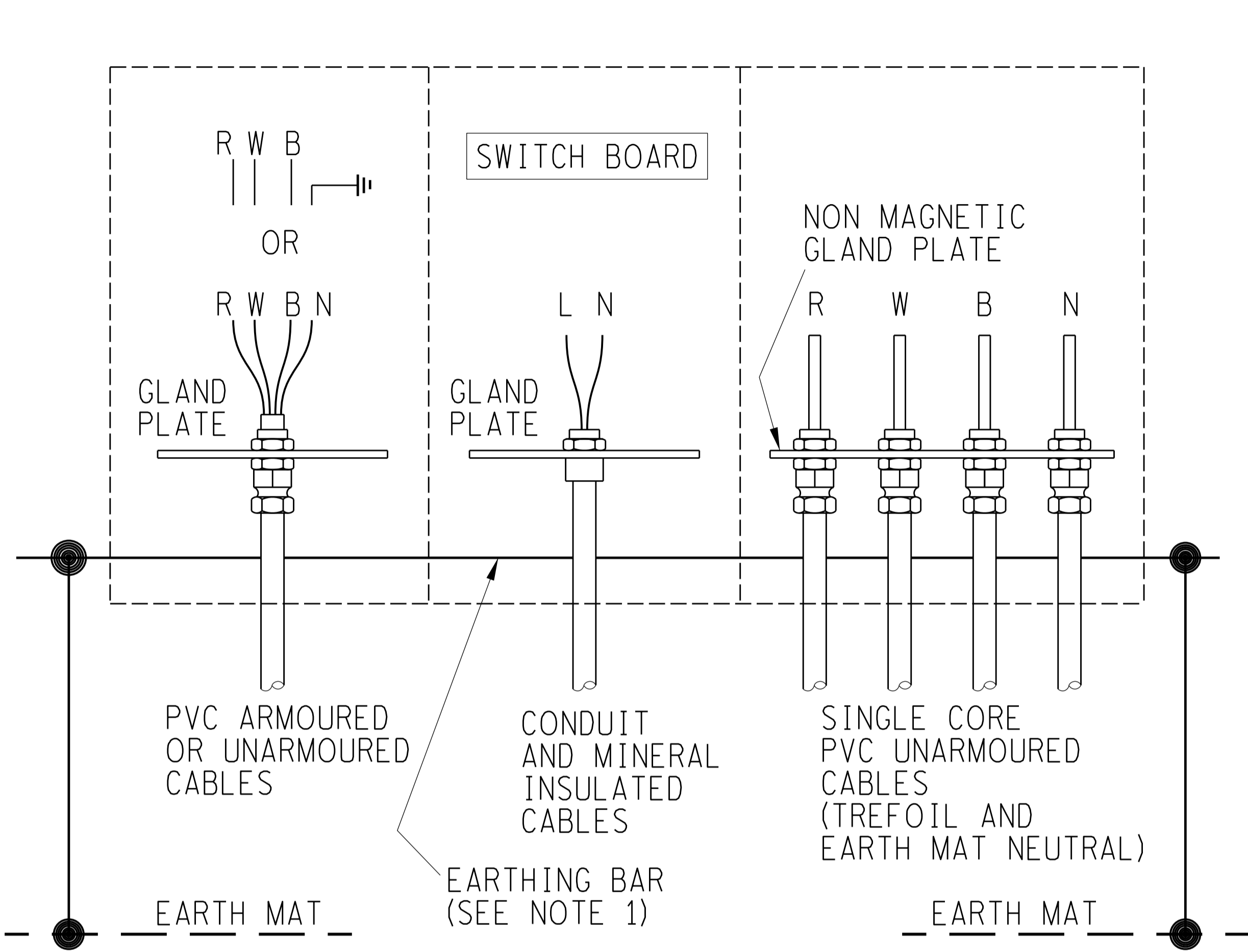
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SWITCHBOARDS (WITH THERMOPLASTIC INSULATED CABLES)



NOTE:

1. EARTHING BAR.

NUMBER OF EQUIPMENT EARTHING STRAPS AS PER CABLING AND EARTHING SPECIFICATION FOR STATION.

2. ARMOURING OF SINGLE CORE CABLES AND SCREENS OF POWER AND CONTROL CABLES TO BE EARTHED ON ONE END ONLY.



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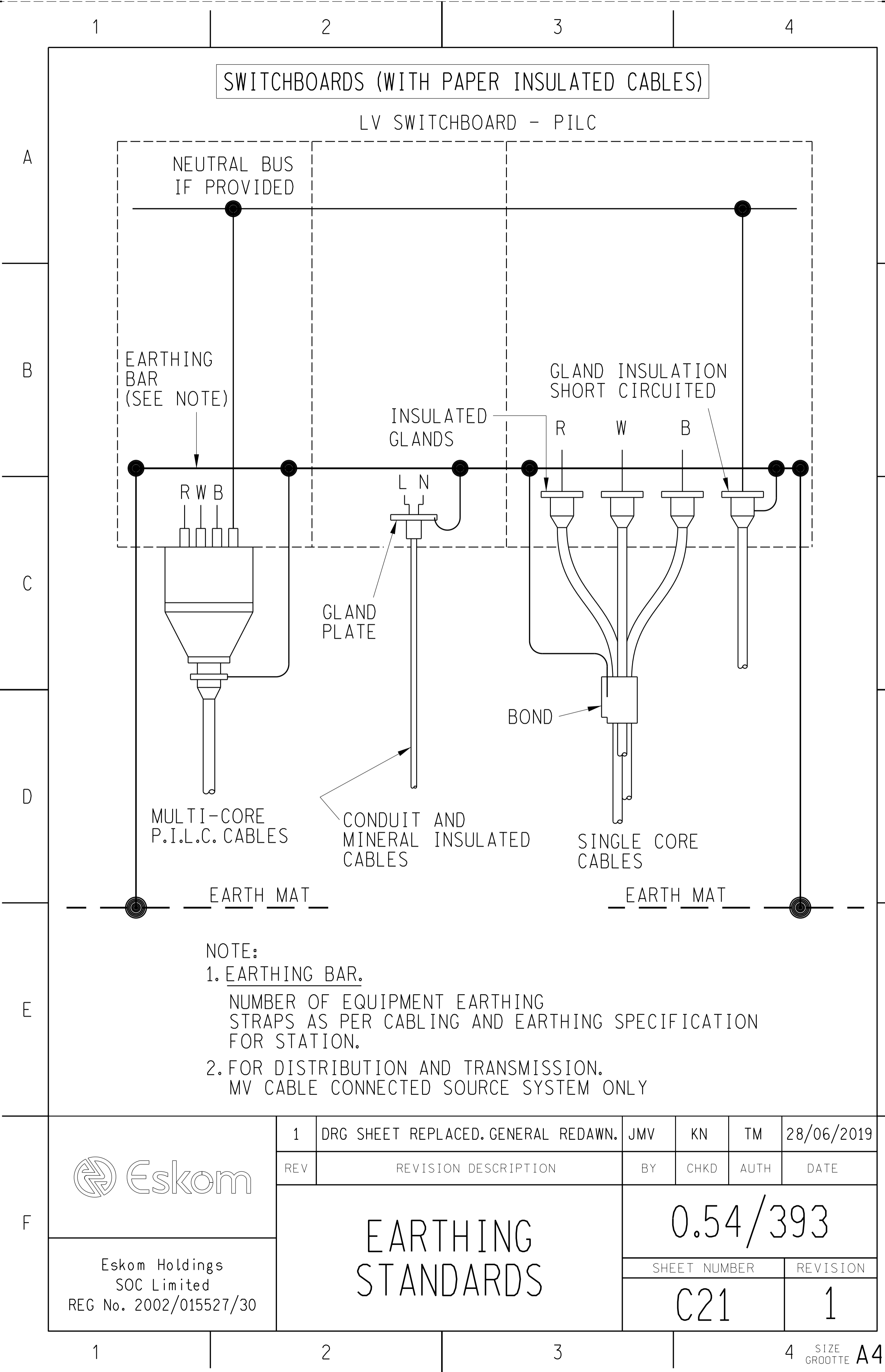
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SIZE
GROOTTE A4L



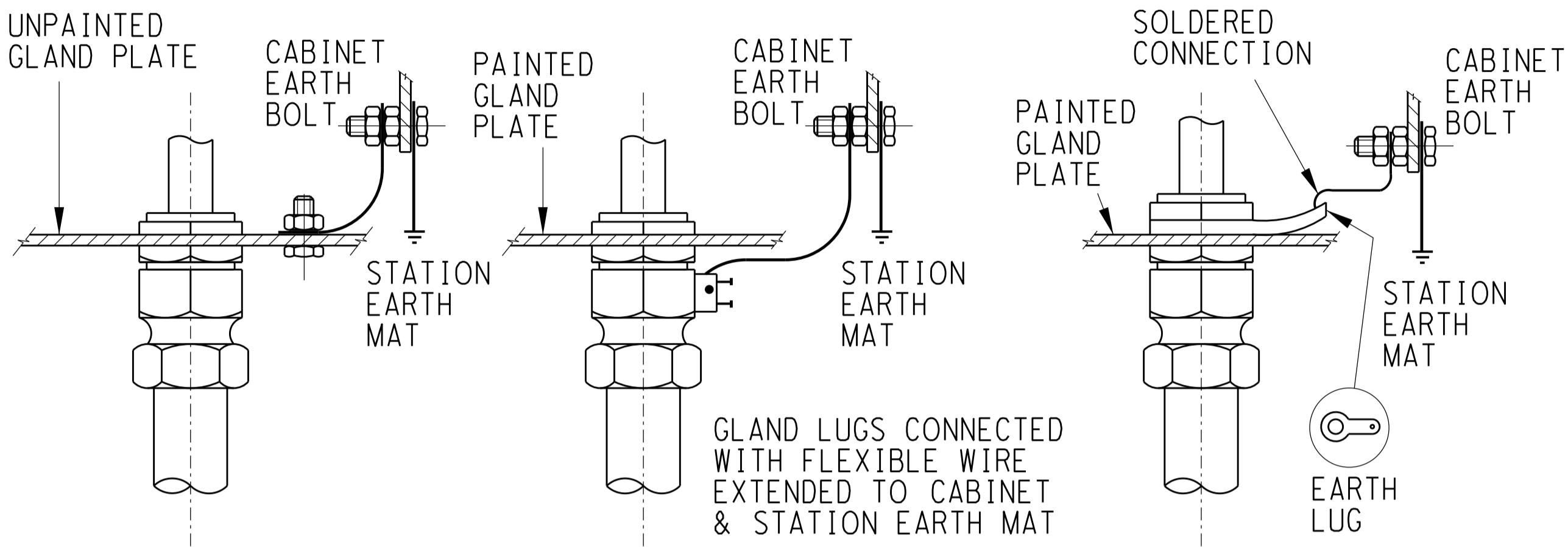
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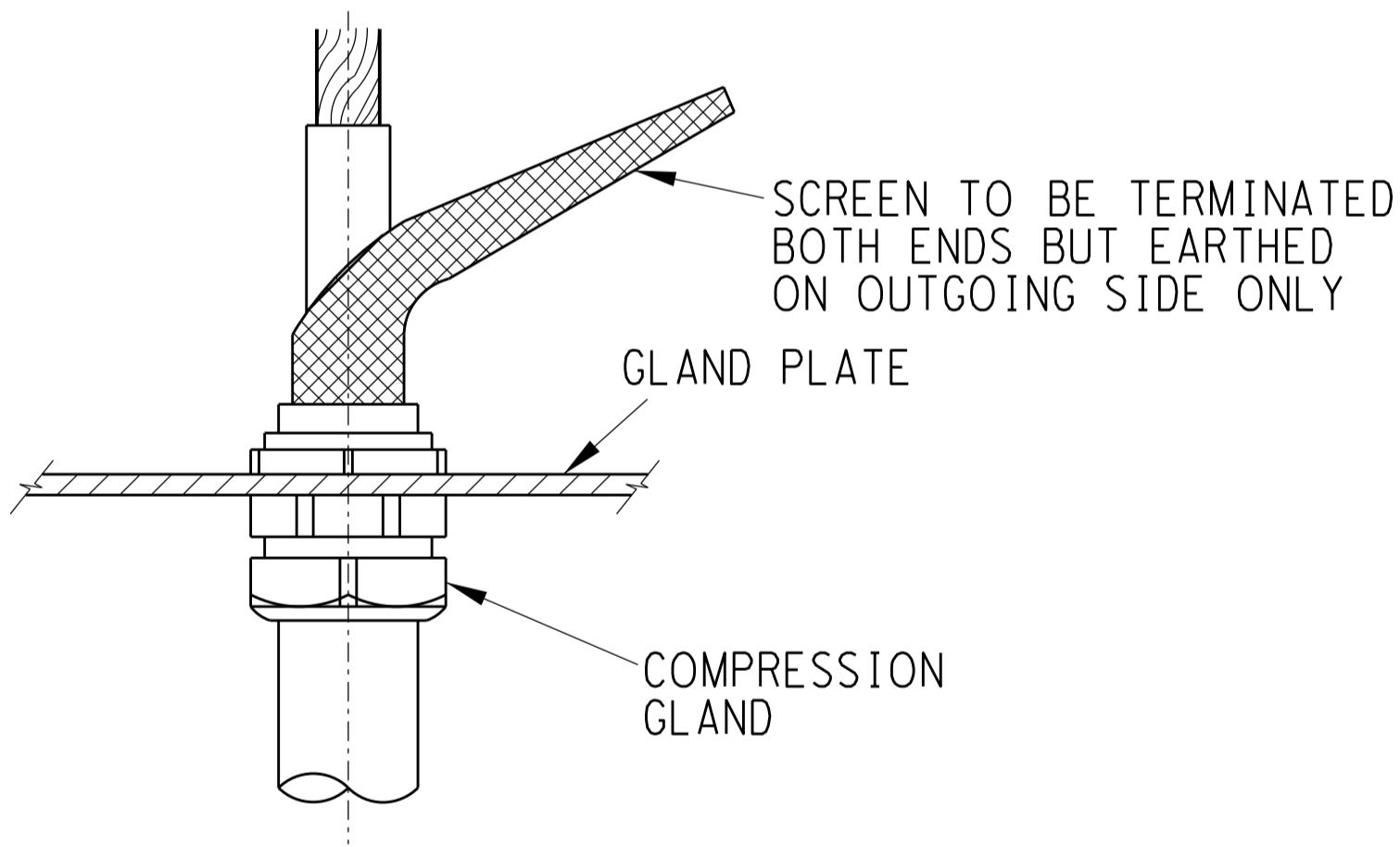
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ARMOURED MULTICORE CONTROL, TELEPHONE
AND POWER CABLES



G.P.O. UNARMOURED TYPE 'Z' CABLE



NOTE:
ALUMINIUM GLANDS
MUST BE USED ON
ALUMINIUM ARMOURED
CABLES (DOUBLE
LOCK TYPE)



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		2		DRG SHEET REPLACED. GENERAL REDAWN.		JMV	KN	TM	28/06/2019		
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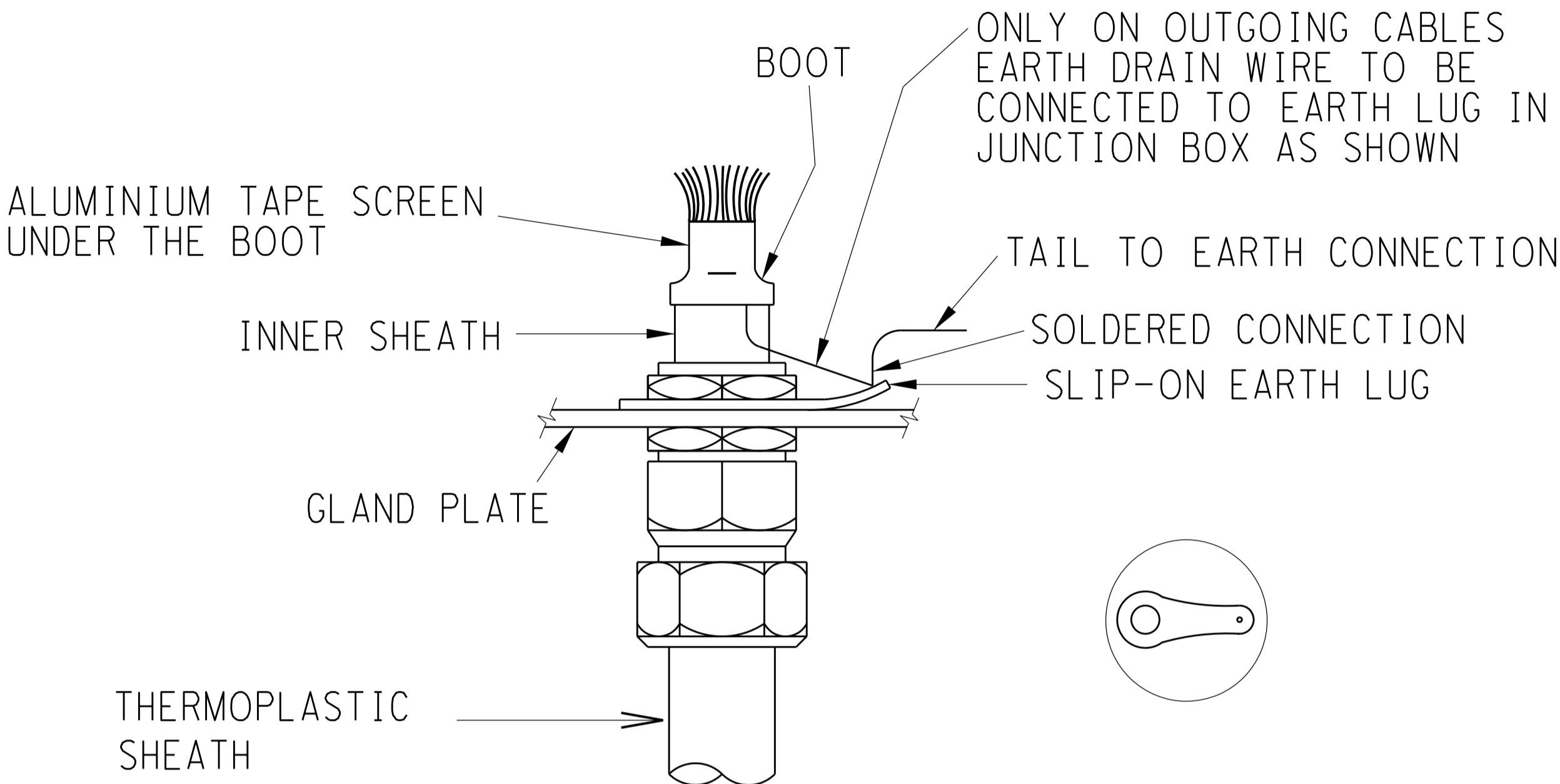
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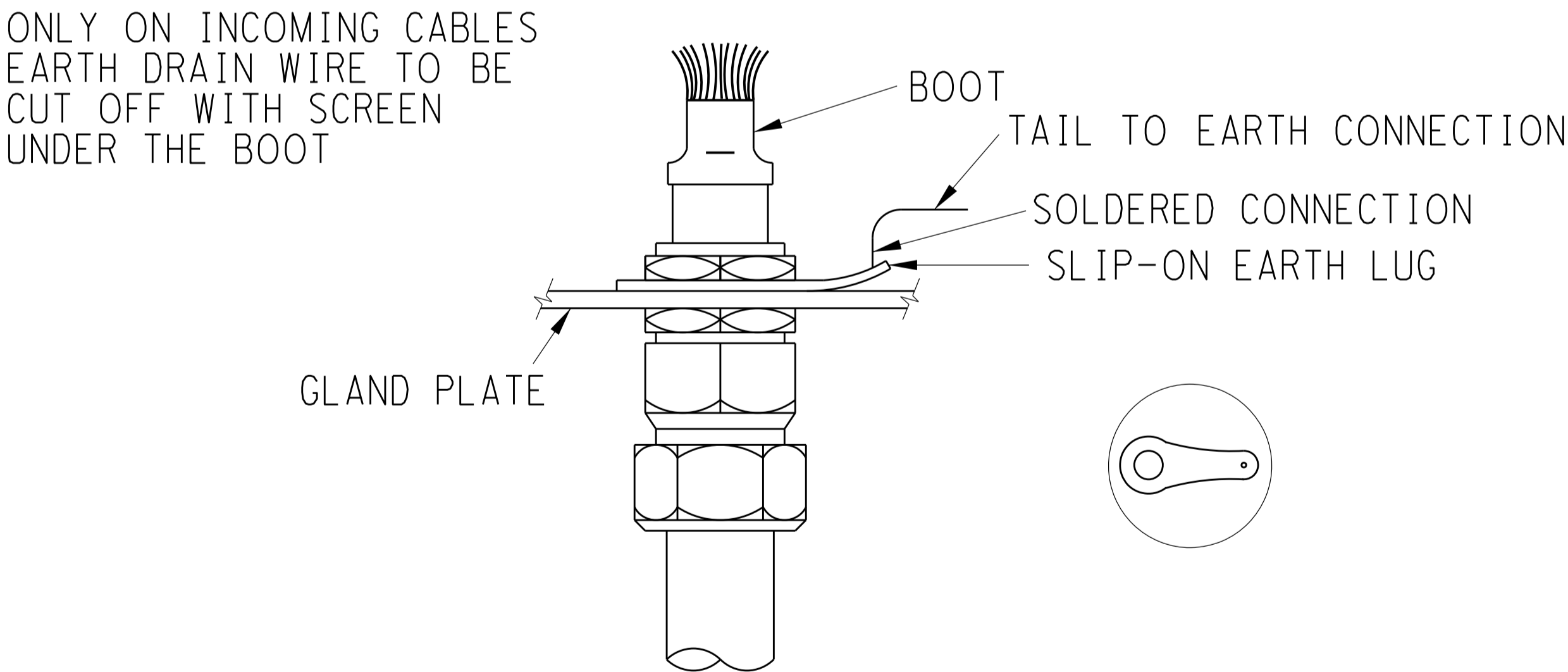
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ARMOURED TELEPHONE AND SCREENED
CONTROL CABLES AT JUNCTION BOX

OUTGOING CABLES



INCOMING CABLES



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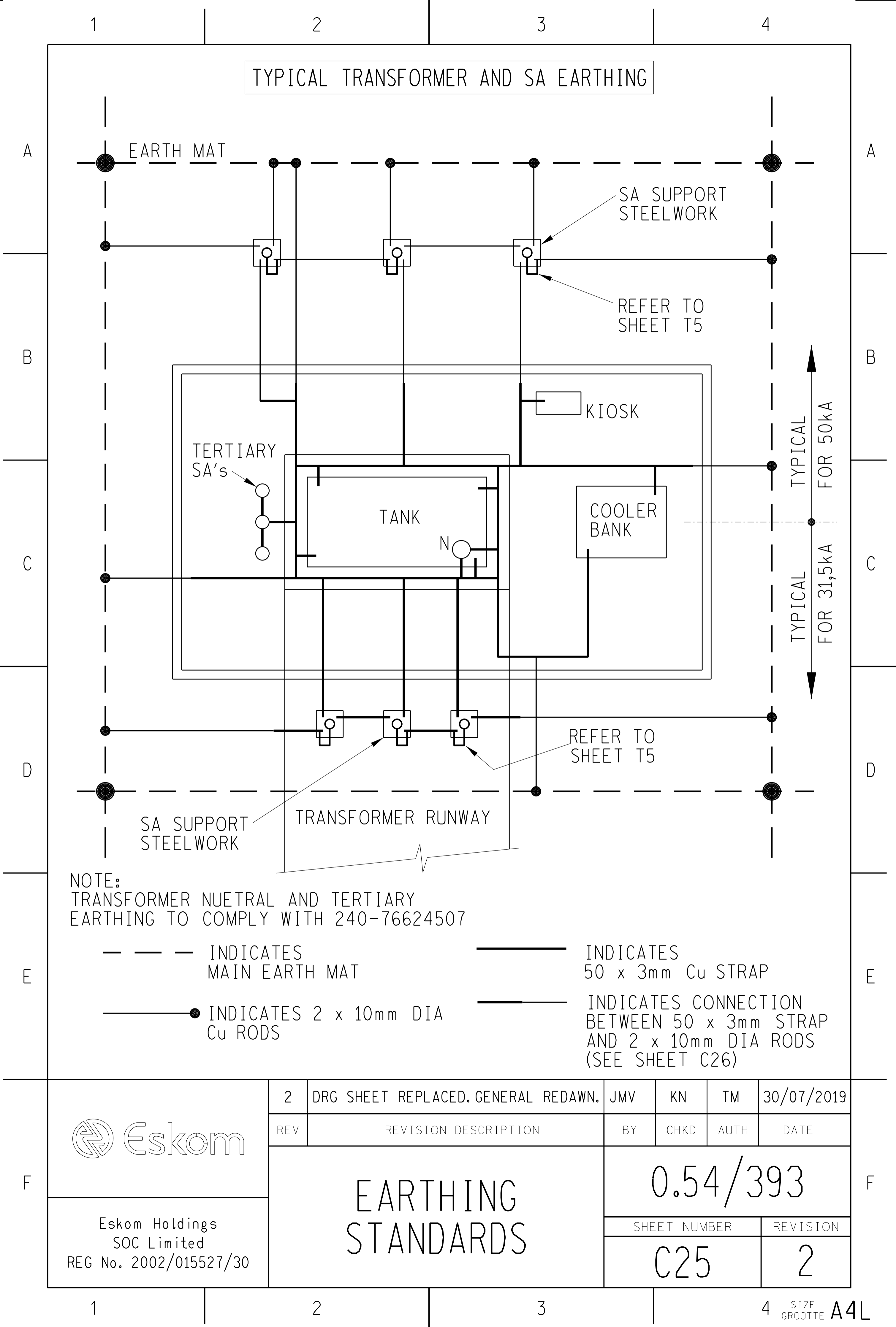
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SIZE
GROOTTE A4L



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A

A

B

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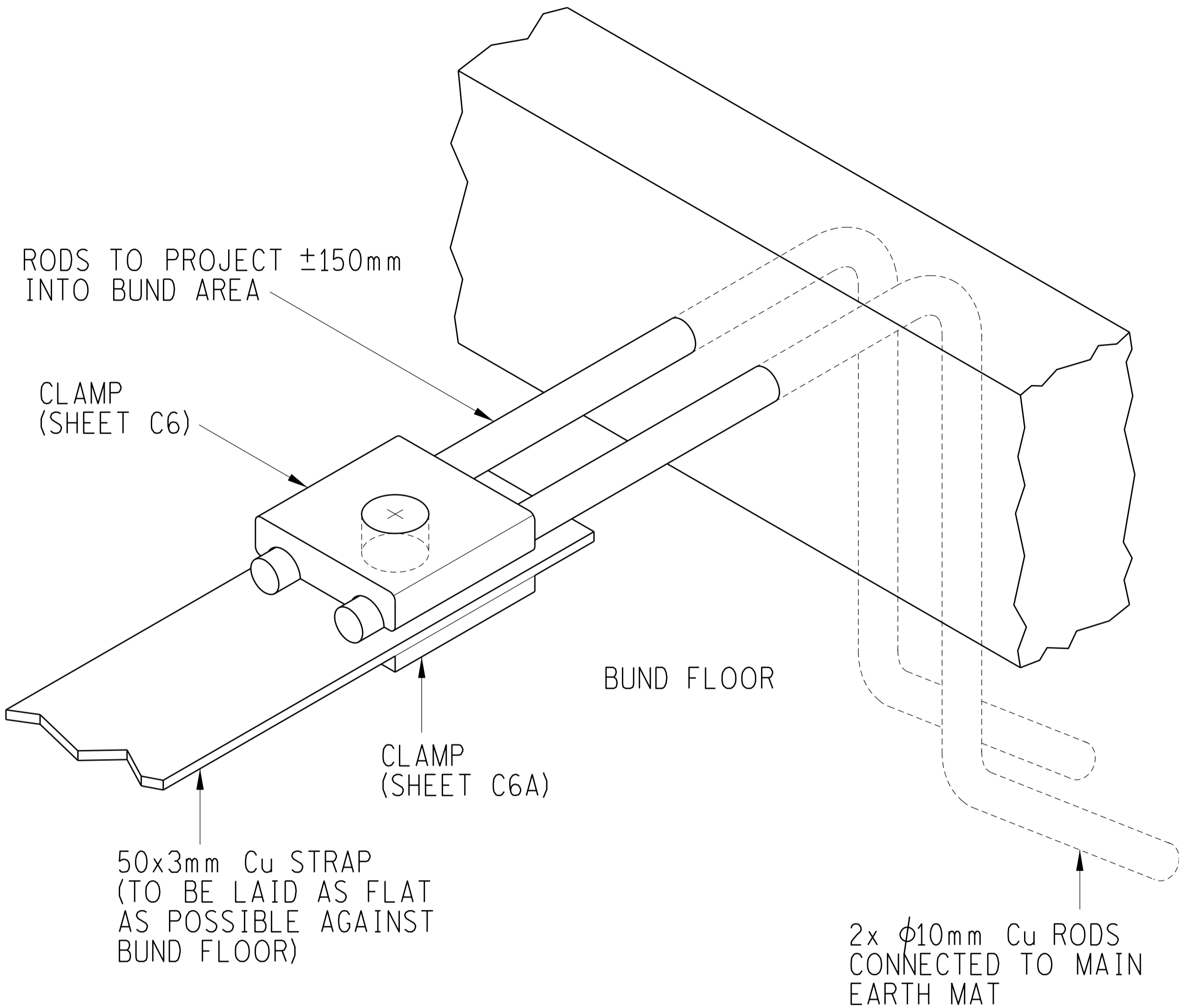
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BOLTED CONNECTION BETWEEN
50x3mm Cu STRAP AND 2 x ϕ 10 Cu RODS



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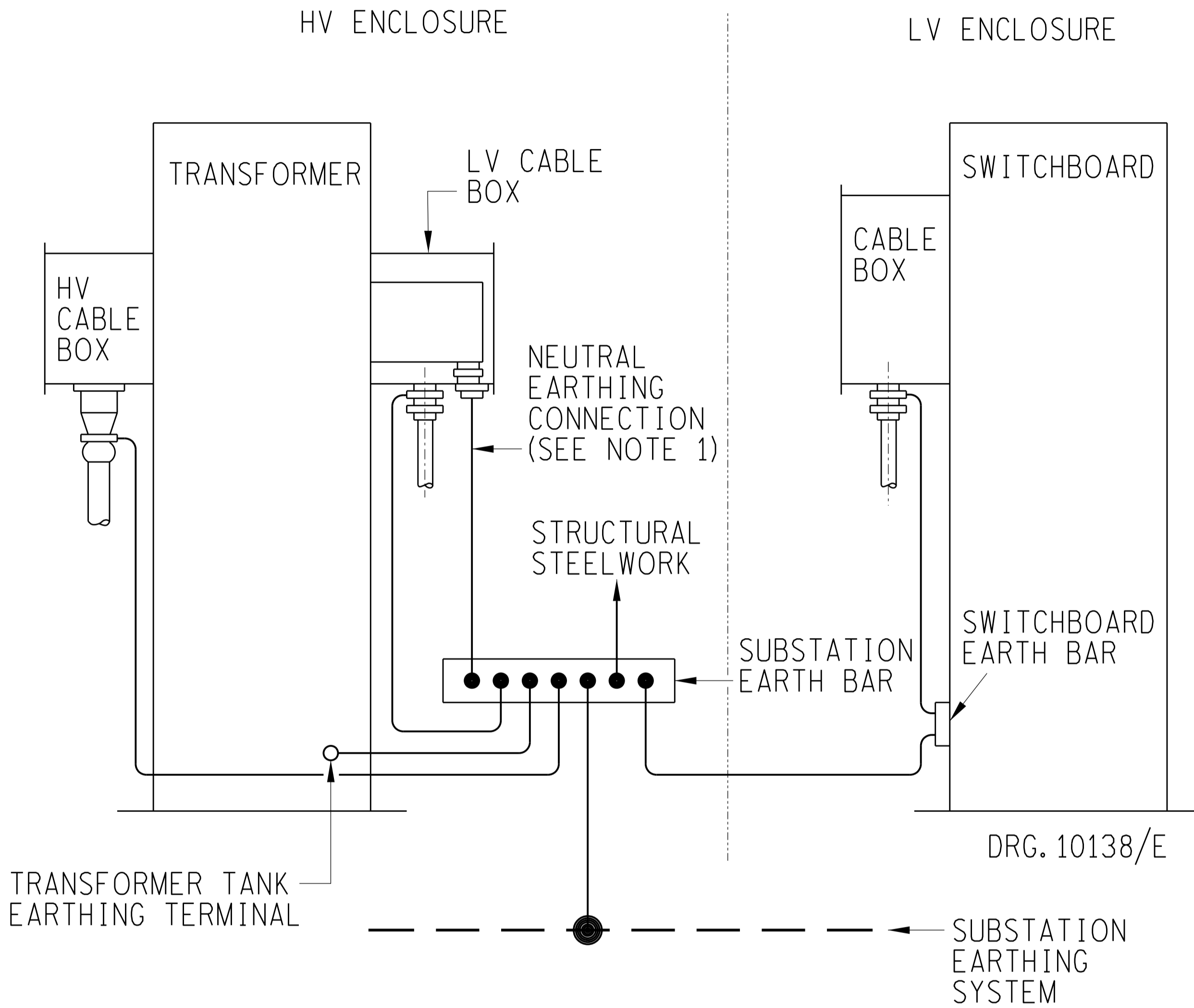
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SIZE
GROOTTE A4L

TYPICAL LAYOUT OF SUBSTATION
SHOWING REQUIRED EARTHING CONNECTIONS
(SABS 0198: PART III - 1988)

LV SWITCHBOARD SUPPLY CONNECTION



NOTES:

1. GENERAL: MAKE EARTH CONNECTIONS TO STRUCTURES AND EQUIPMENT AT POINTS SPECIFICALLY PROVIDED FOR THIS PURPOSE. DO NOT MAKE EARTH CONNECTIONS TO BOLTS OR CLAMPS DESIGNED FOR MECHANICAL SUPPORT BECAUSE THESE MAY BE REMOVED TEMPORARILY OR PERMANENTLY (E.G. DURING MAINTENANCE WORK OR ALTERATIONS TO THE STRUCTURE).
2. NORMAL ESKOM PRACTICE IS TO EARTH THE NEUTRAL AT THE INCOMER IN THE SWITCHBOARD.
3. APPLICABLE ONLY FOR MV CABLE CONNECTED SOURCE SYSTEMS.



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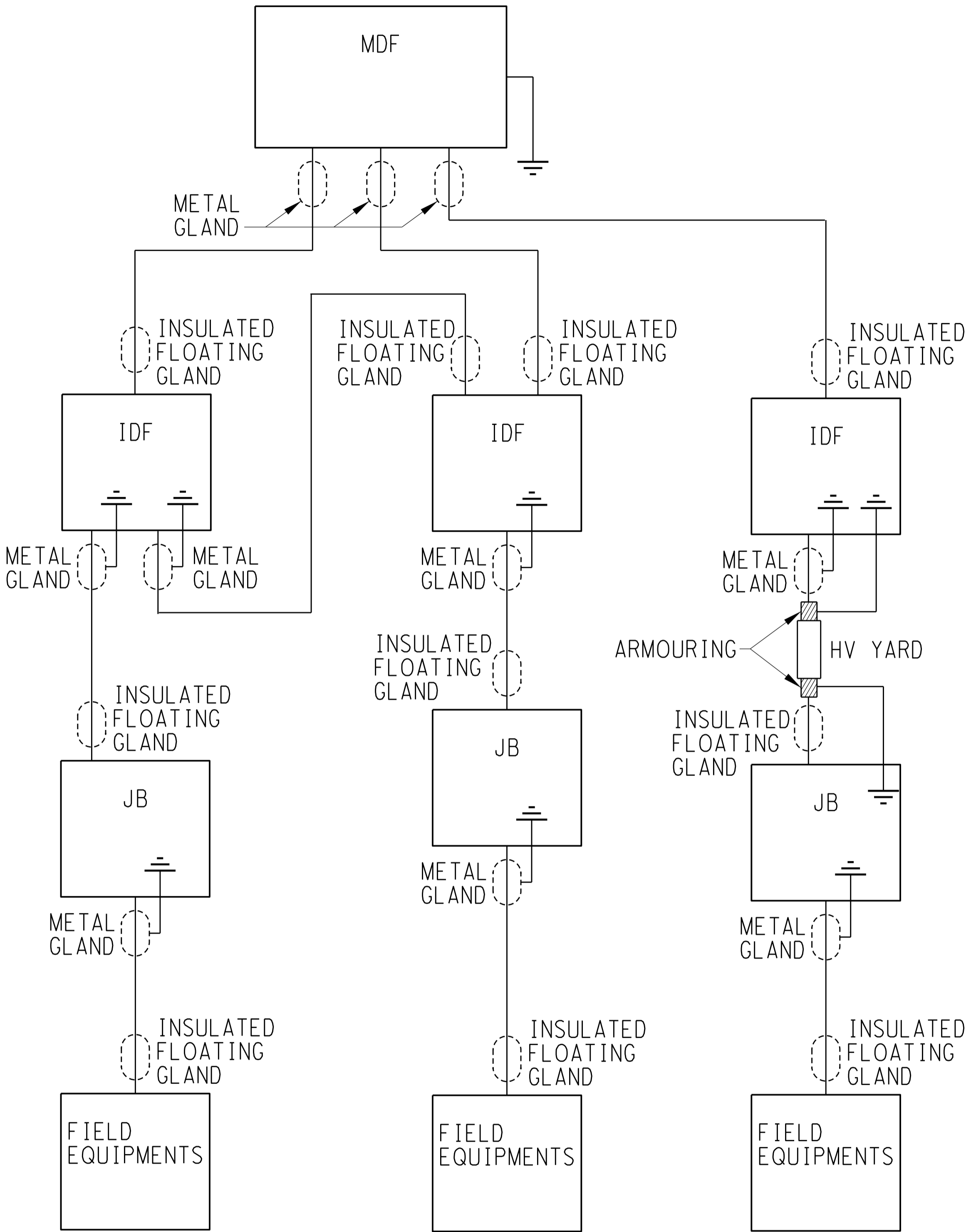
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EARTHING OF TELEPHONE OR
PROCESS CONTROL CABLES



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SIZE
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EARTHING OF PROCESS
CONTROL COMPUTERS

ELECTRONIC ROOM

COMPUTER ROOM

- THE FOLLOWING ELECTRONIC CIRCUITS ARE
CONNECTED TO THE ELECTRONIC EARTH NETWORK:
- REGULATION CABINETS
 - FRAMES OF ANY TELEVISION SETS
 - SLIDE-IN RACKS OF EQUIPMENT FOR DETECTION
OF EARTH FAULT
 - MEASUREMENT DISPATCHER
 - MISCELLANEOUS ELECTRONIC MEASURING
INSTRUMENTS
 - CENTRALISED DATA PROCESSING (KIT)
 - PROCESS COMPUTER

NOTE:
EEE = ELECTRONIC EQUIPMENT EARTH
STE = STATION EARTH MAT



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			SHEET NUMBER		REVISION
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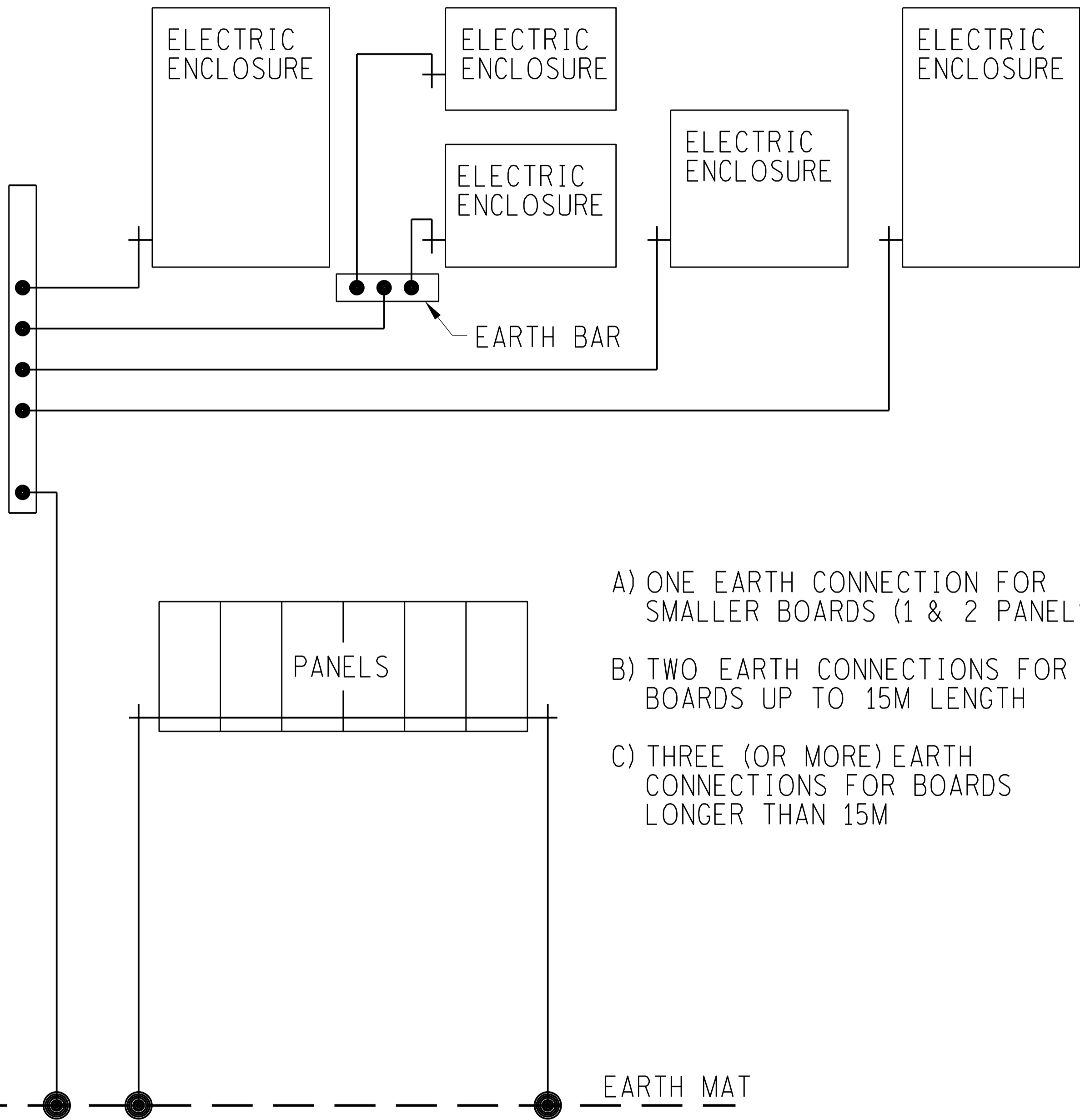
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EARTHING OF ELECTRIC ENCLOSURES

EARTHING OF ELECTRIC ENCLOSURES



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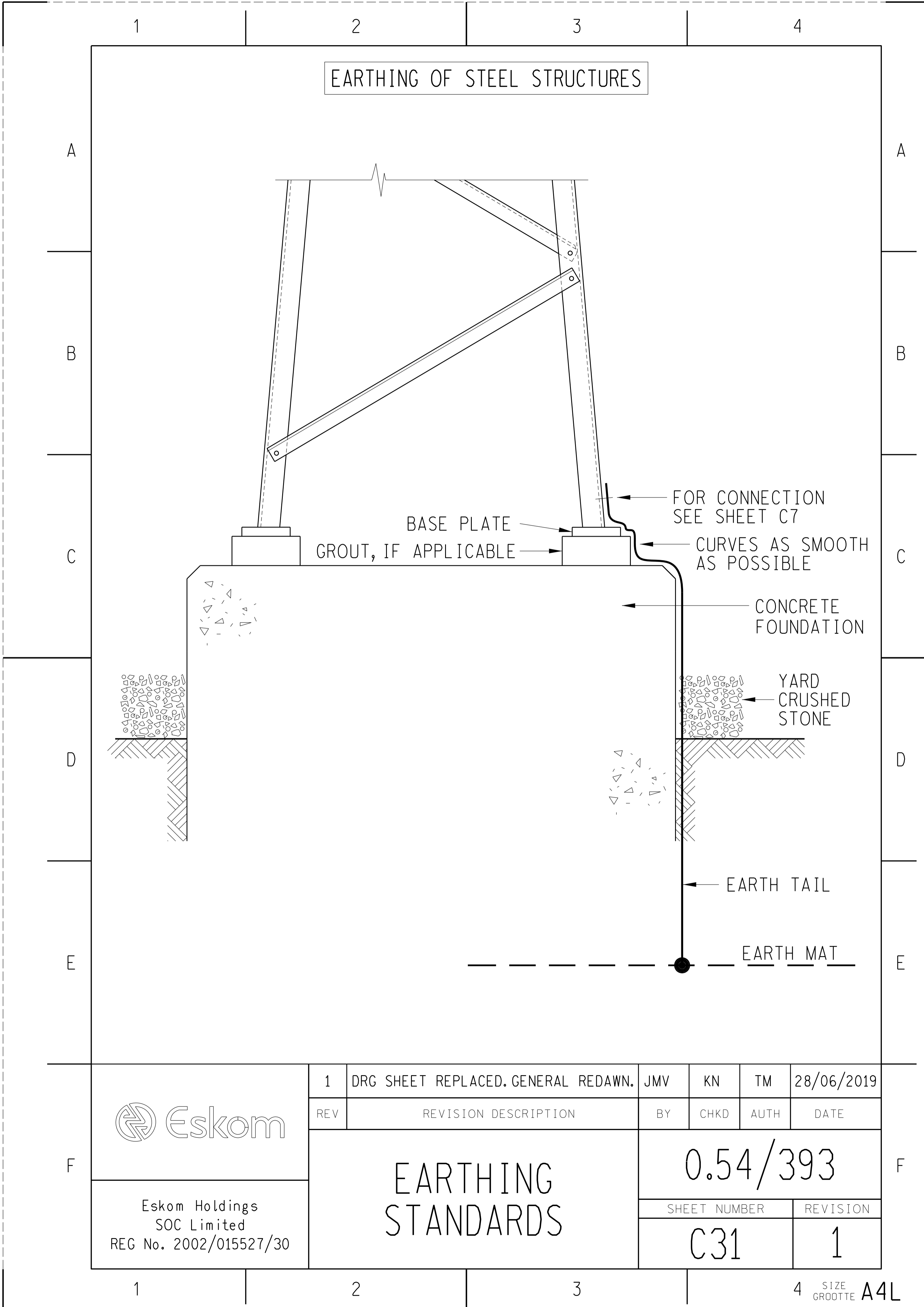
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SIZE
GROOTTE A4L



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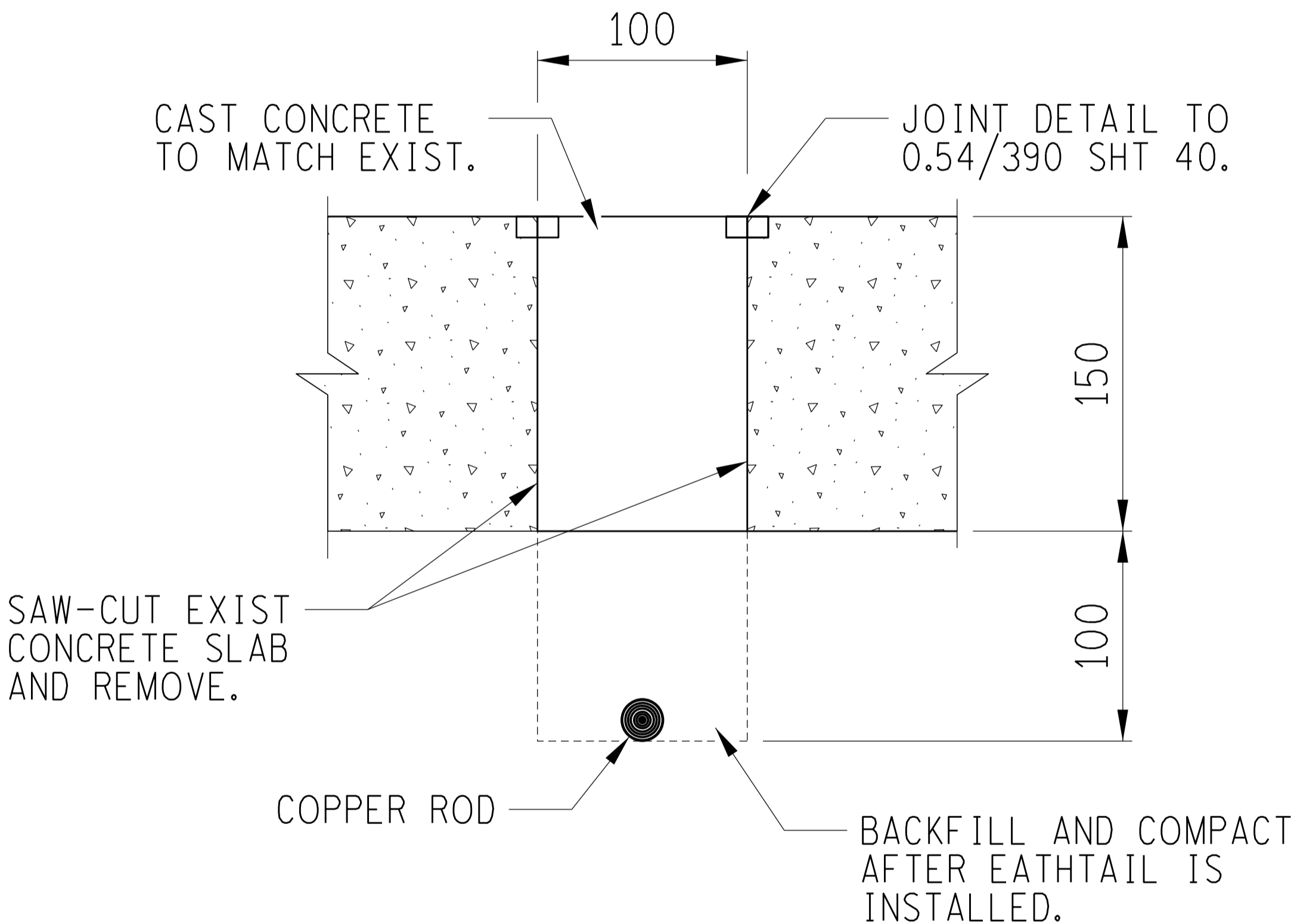
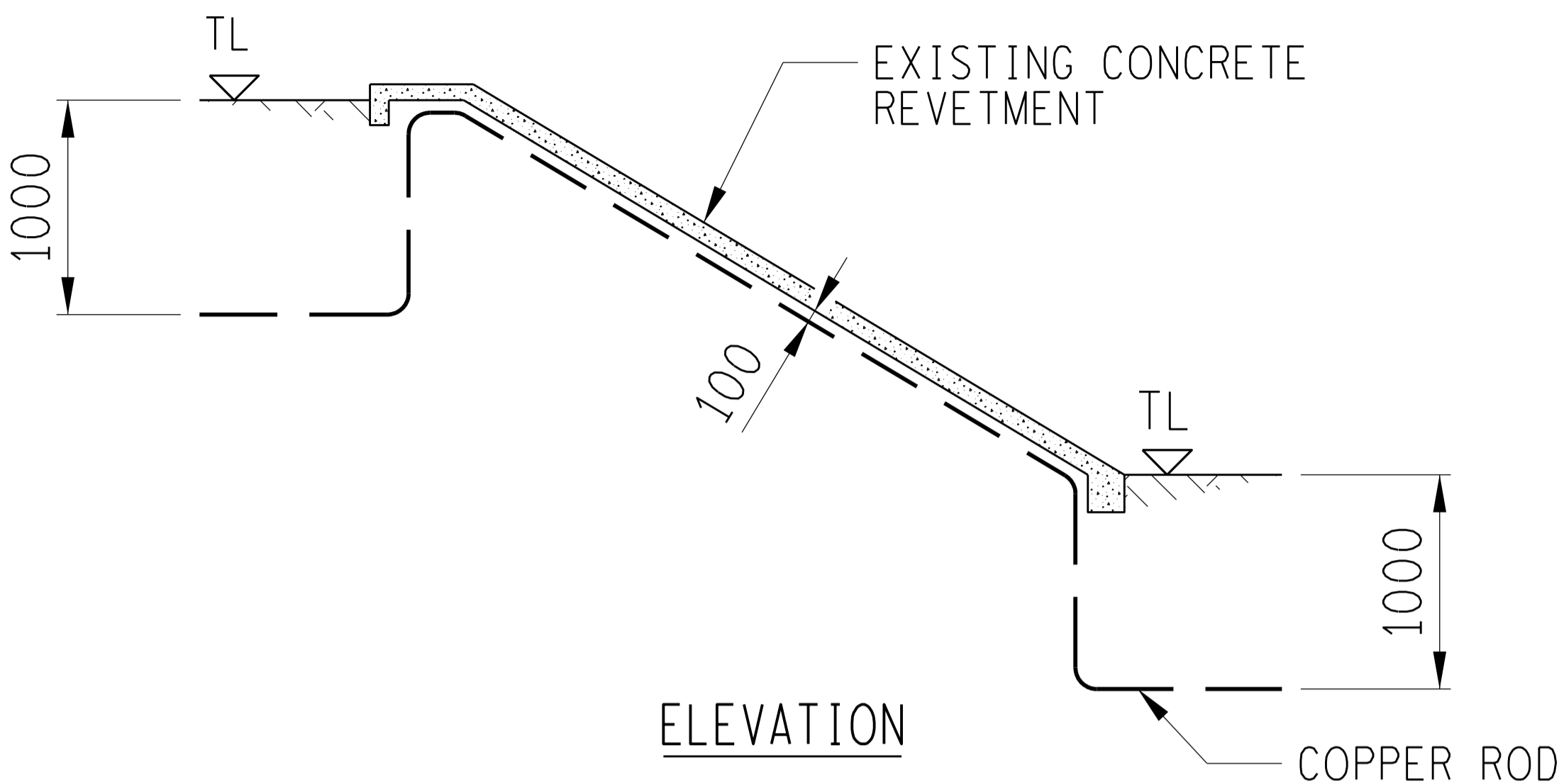
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EARTHMAT RUNNING UNDER EXISTING REVETMENT



SECTION THROUGH SAW-CUT REVETMENT



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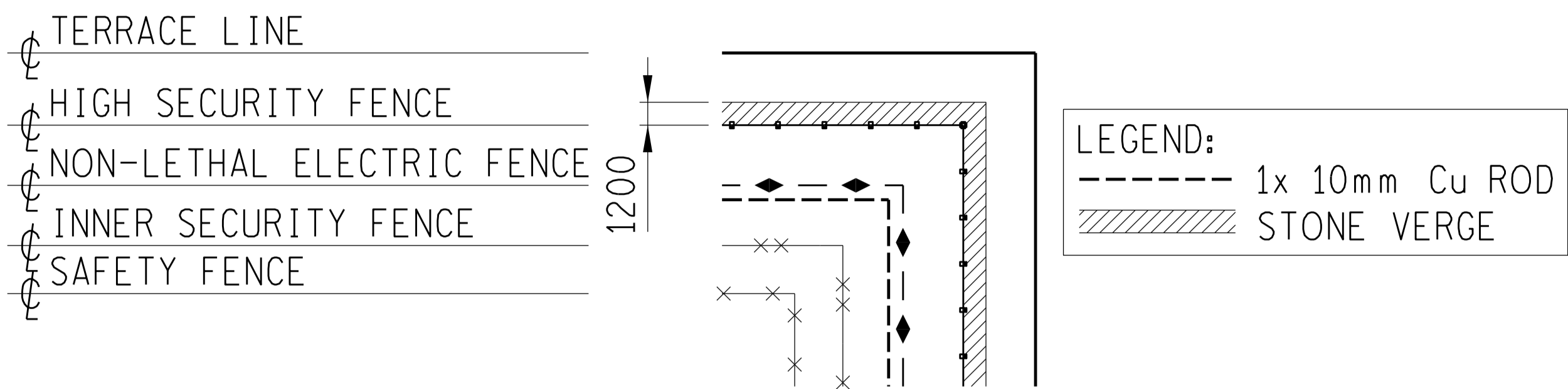
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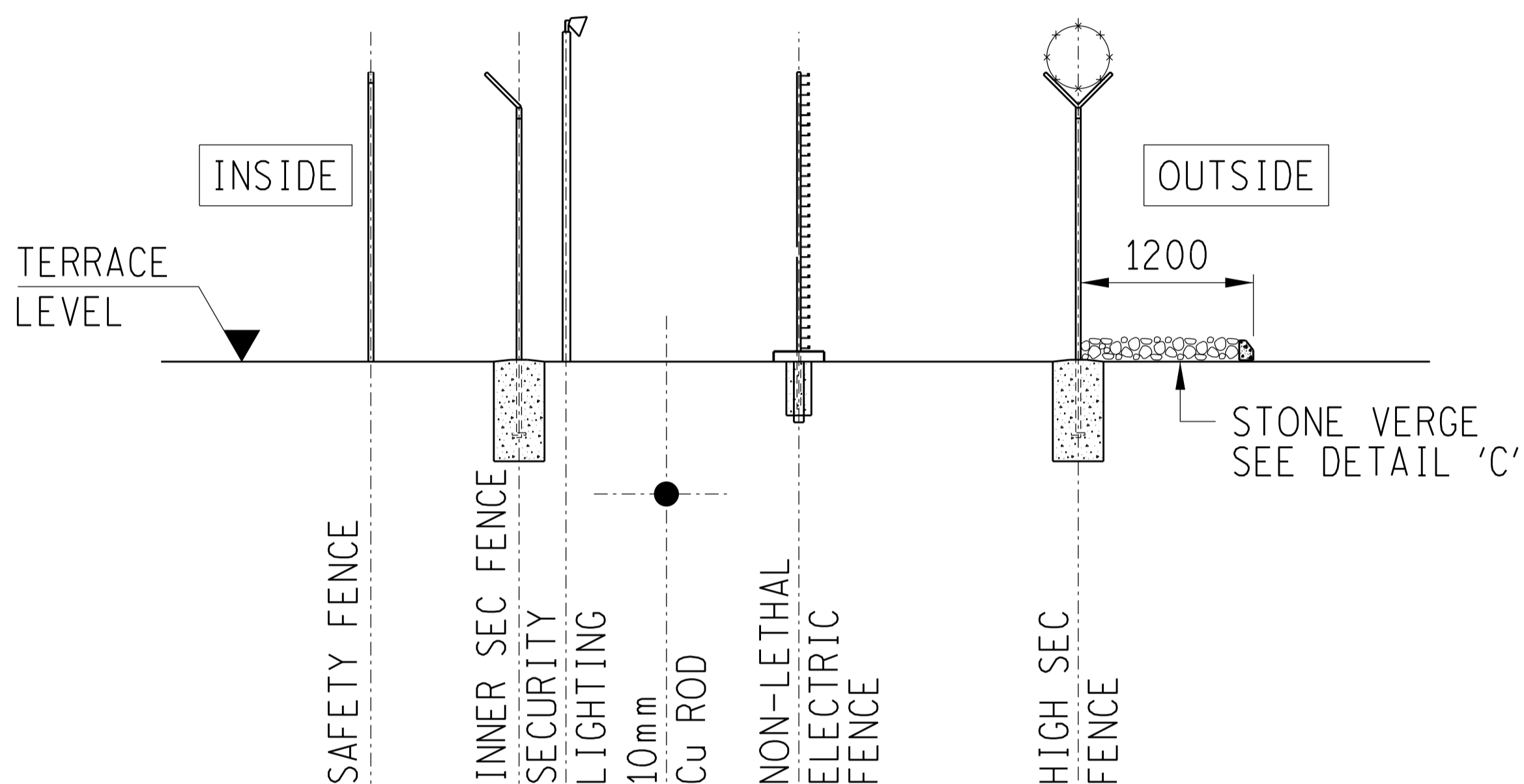
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SIZE GROOTTE A4L

TYPICAL LAYOUT FOR EARTHING OF BARRIER
FENCES WITH STONE VERGE (NTS)

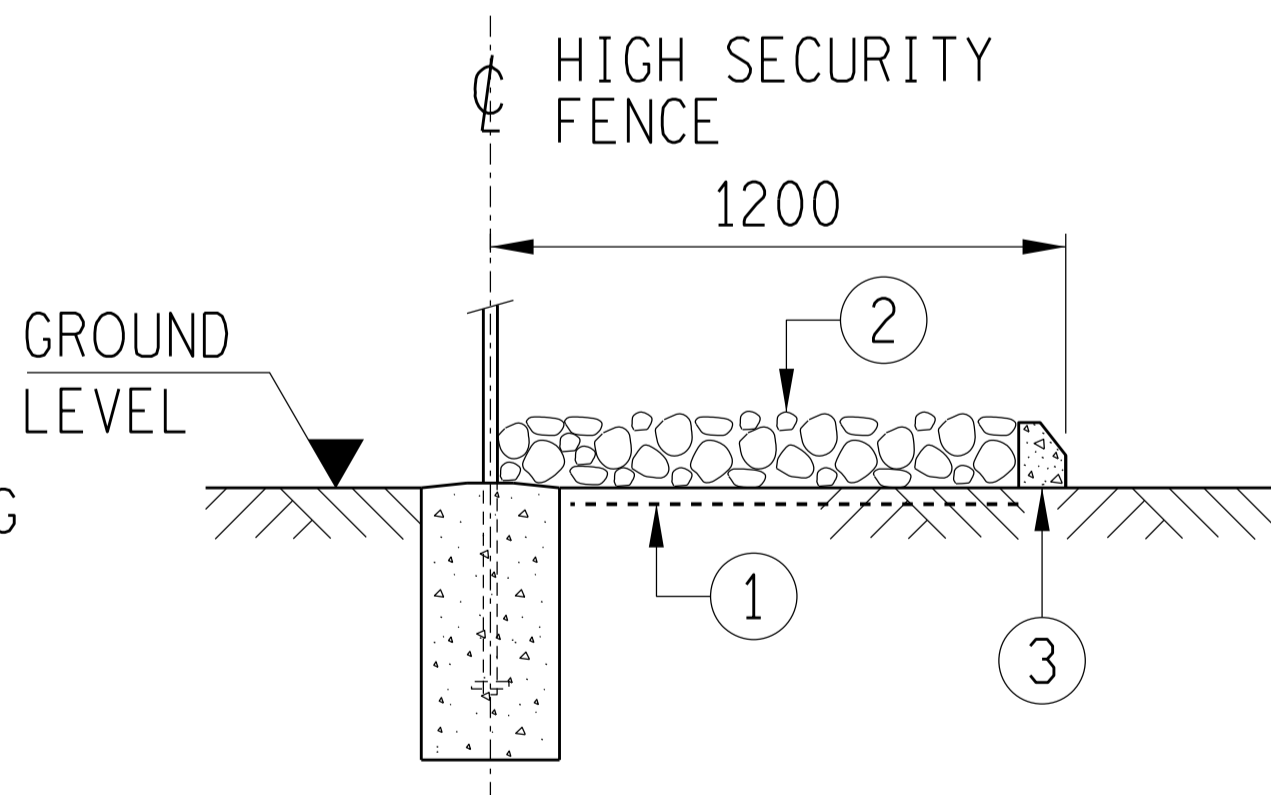


DETAIL A - PARALLELED FENCING (TYPICAL TOP VIEW)



DETAIL B - TYPICAL CROSS SECTION OF FENCES

- 1 PLACE WEEDKILLER BEFORE PVC SHEETING (250 MICRON) IS PLACED UNDER STONES.
- 2 STONE PITCHING AVERAGE DIAMETER - 150mm
- 3 STANDARD PRECAST CONCRETE KERB FIG 7 FROM SABS 927-1969 (WITH INSITU CONCRETE HAUNCHING AT JOINTS ON BOTH SIDES)



DETAIL C - TYPICAL CROSS SECTION ON STONE VERGE



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REPOSITIONED FROM INCORRECT SHEET
C32 DATED 12/10/2018.

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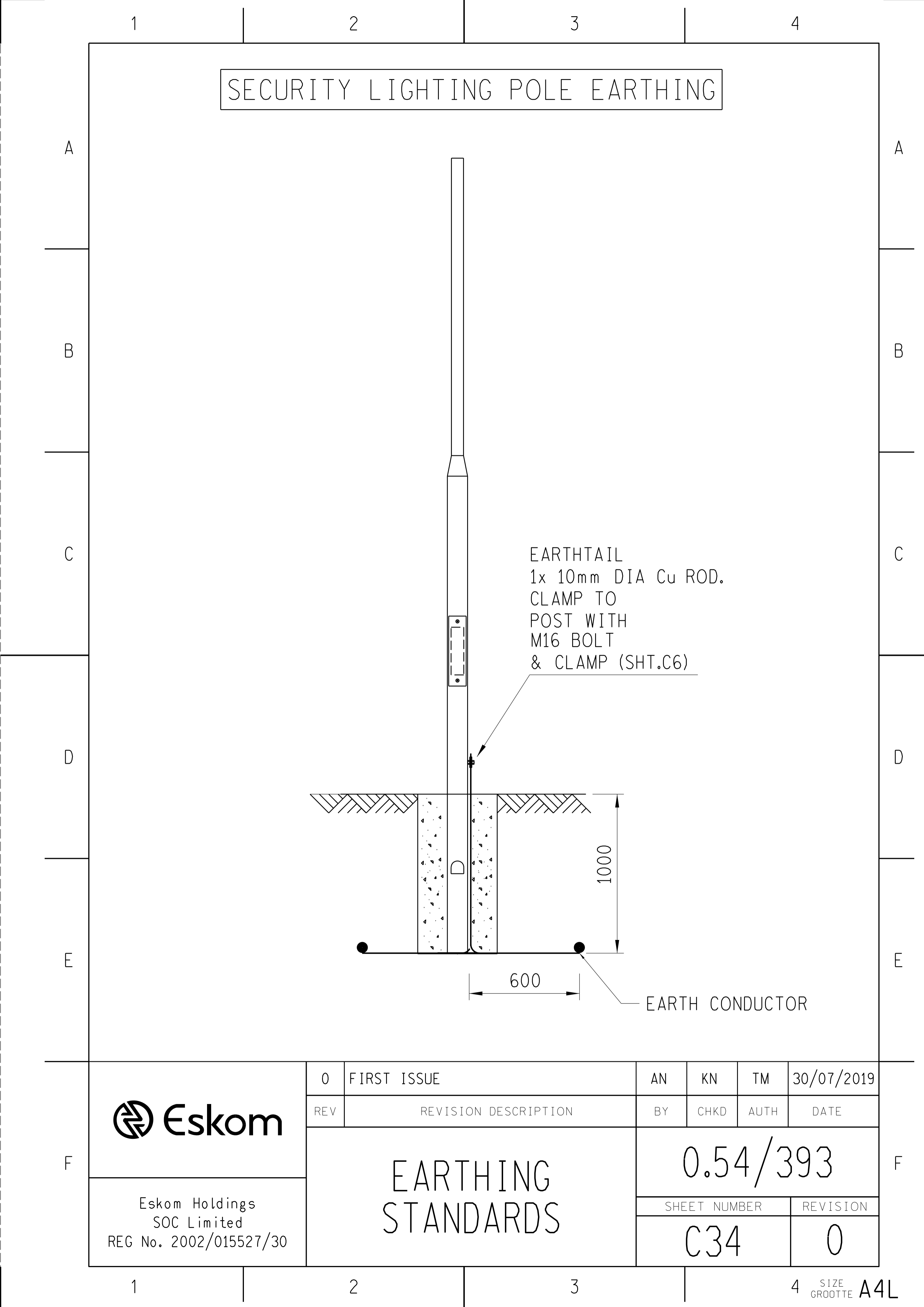
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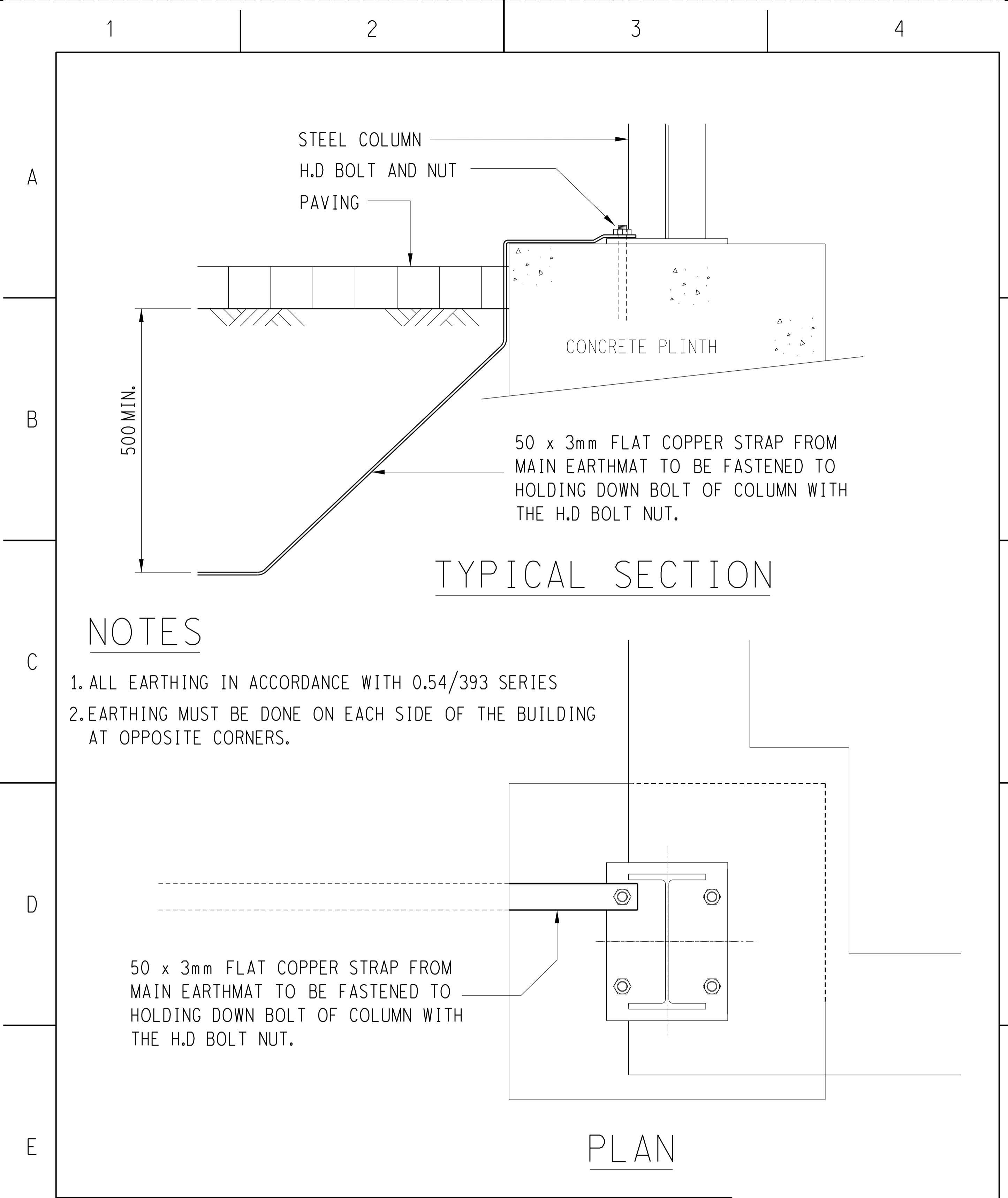
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	1	2	3	4	
A	<div><div><div>CONCRETE ROOF TILES</div><div>ALUMINIUM GUTTER</div><div>M16 BOLT</div><div>MAKE A 60 x 60 OPENING IN FASCIA TO FIT A 50 x 50 EARTHTAIL CLAMP SEE DRG. 0.54/393 SHT.C6</div><div>φ10mm COPPER ROD FIXED TO CLAMP SEE DRG. 0.54/393 SHT.C7</div><div>φ20mm GALVANISED PIPE FIXED TO WALL WITH GALV. SADDLES</div><div>φ10mm COPPER ROD FROM MAIN EARTHMAT TO BE TIED TO EACH INDIVIDUAL GUTTER.</div></div></div>				A
B					B
C					C
D	<div><div>TYPICAL SECTION</div><div>NOTES</div><div>ALL EARTHING IN ACCORDANCE WITH 0.54/393 SERIES. THE EARTHTAIL CLAMP MUST BE FIXED TIGHTLY AGAINST THE GUTTER THE 50 x 50mm AREA OF THE CLAMP AT THE GUTTER MUST BE SANDED TO EXPOSED METAL.</div><div>AFTER THE CLAMP IS FITTED THE AREA AROUND IT MUST BE SEALED WITH SIKA SIKAFLEX F1 TO PREVENT THE INCRESS OF WATER.</div><div>IF GUTTERS IS NOT CONTINIOUS AND IS DEVIDED, EACH MUST BE EARTHED SEPERATELY AND FIXED TO THE MAIN EARTHMAT</div><div>EARTHING TO TILED ROOF BUILDINGS</div></div> <div><div><div><div><div><div></div><div>Eskom</div></div><div>Eskom Holdings SOC Limited REG No. 2002/015527/30</div></div><div><div>0</div><div>FIRST ISSUE</div></div><div><div>REV</div><div>REVISION DESCRIPTION</div></div><div><div>EARTHING STANDARDS</div></div></div><div><div><div>DN</div><div>KN</div><div>TM</div><div>30/07/2019</div></div><div><div>BY</div><div>CHKD</div><div>AUTH</div><div>DATE</div></div><div><div>0.54/393</div></div><div><div>SHEET NUMBER</div><div>REVISION</div></div><div><div>C35</div><div>0</div></div></div></div></div>				D
E					E
F					F
	1	2	3	4	SIZE GROOTTE A4L

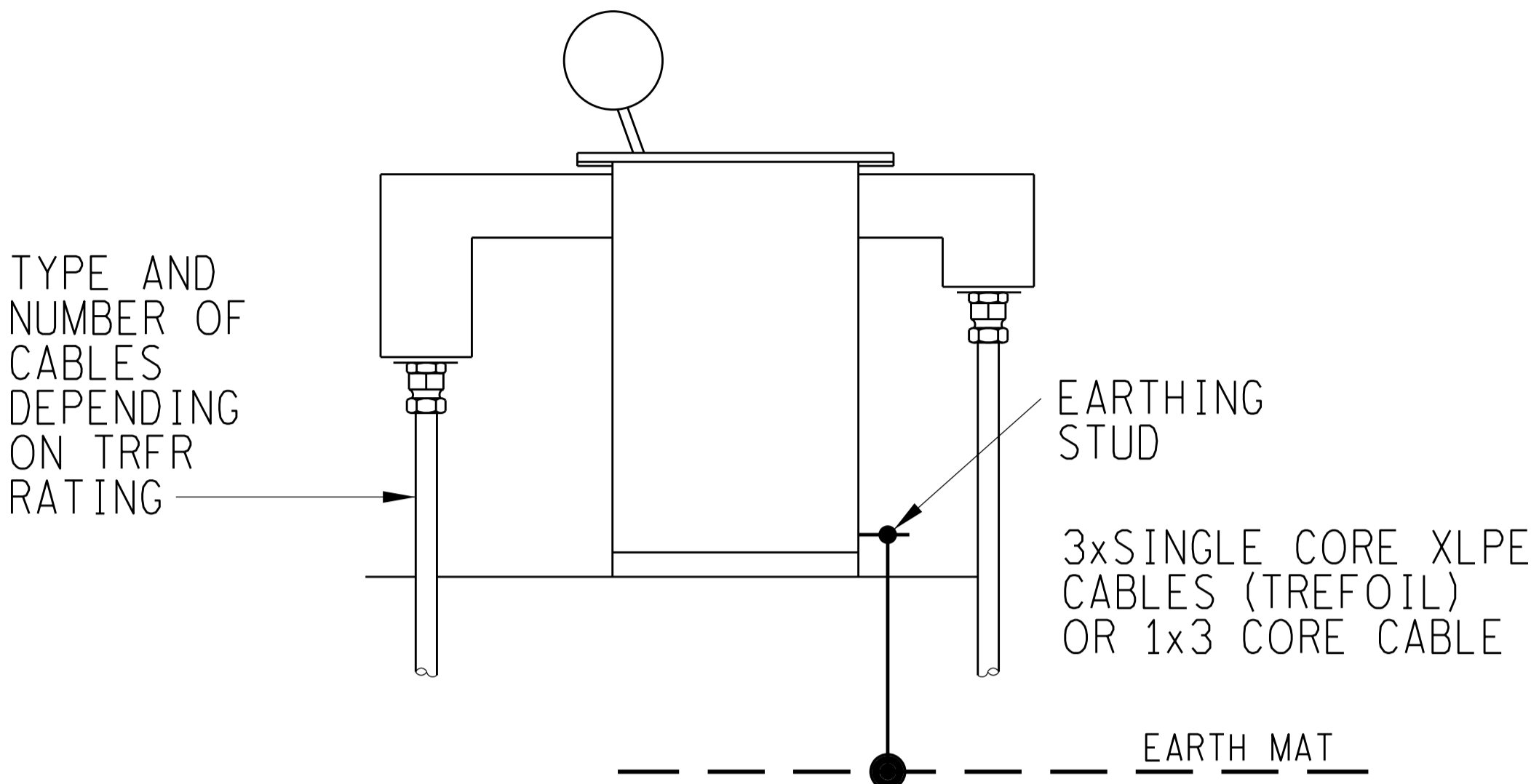


EARTHING TO CLADDED STORE BUILDING COLUMN

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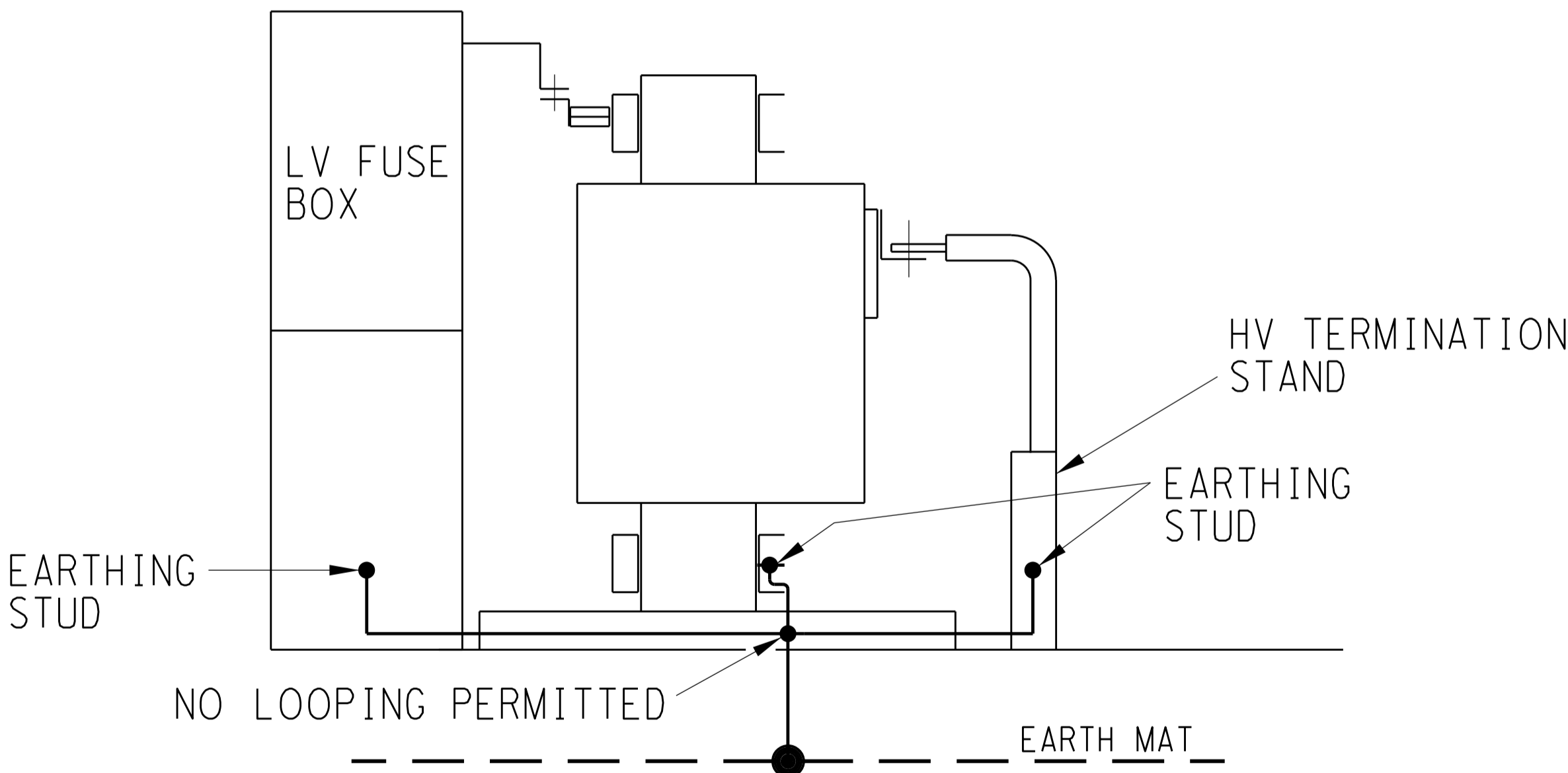
OIL TYPE AUXILIARY TRANSFORMERS
IN POWER STATION

EARTHING OF AUXILIARY TRANSFORMER



- NOTES:
- 1. GLAND PLATES FOR HV AND LV TERMINATION BOXES TO BE NON MAGNETIC IF CONNECTIONS ARE TO BE SINGLE CORE CABLES.
 - 2. MV + LV SINGLE CORE CABLES TO BE SINGLE END POINT BONDED AND EARTHED AT SWITCH BOARDS ONLY.
 - 3. FOR EARTHING OF LARGER TRANSFORMERS REFER TO SPECIFIC EARTH MAT LAYOUT DRAWINGS.

DRY TYPE AUXILIARY TRANSFORMERS
IN POWER STATION



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MOTORS FED BY XLPE OR THERMOPLASTIC INSULATED CABLES

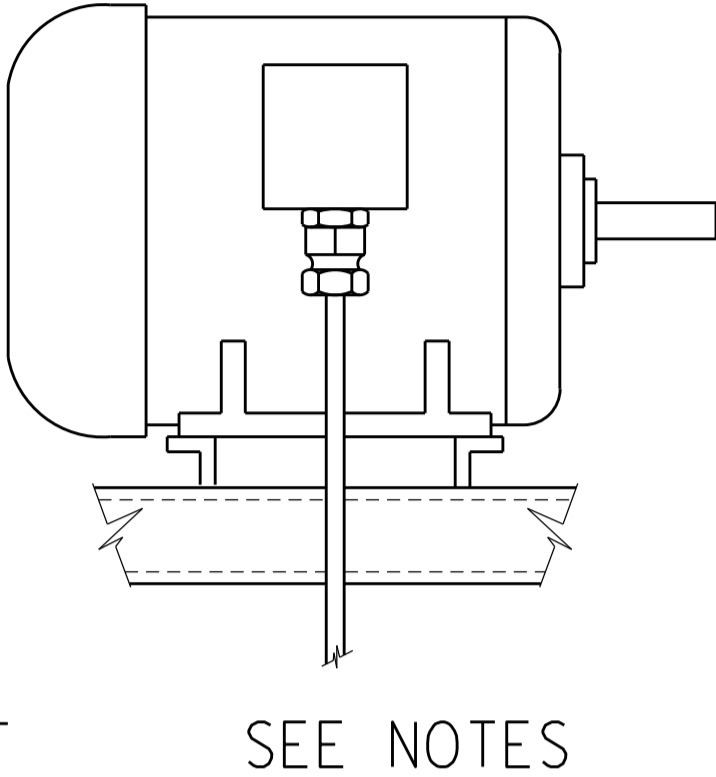
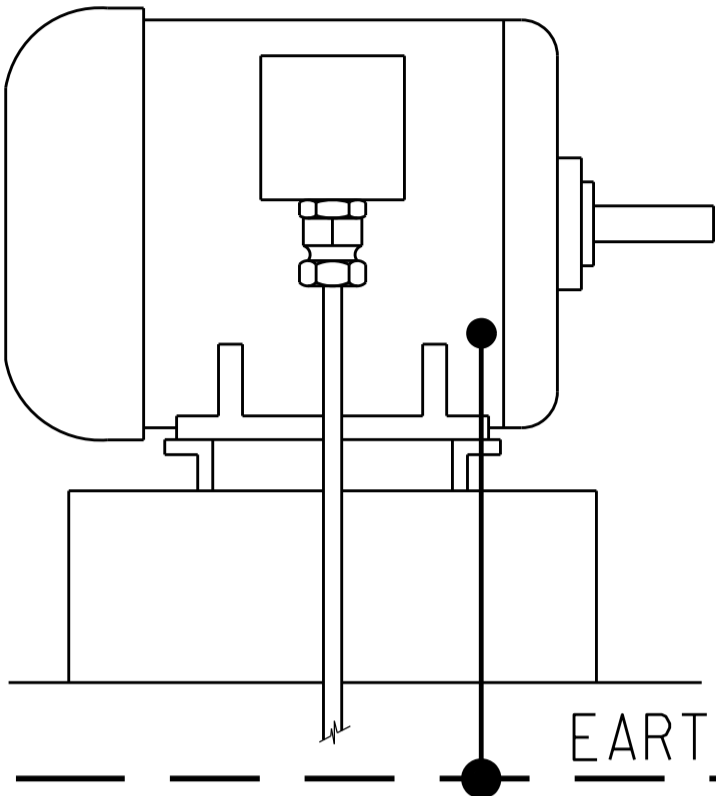
MOTOR CONNECTIONS - XLPE/PVC PN EARTH AND UNEARTHED

MOTORS MOUNTED ON
UNEARTHED MATERIAL

MOTORS MOUNTED ON
EARTHED MATERIAL

UP TO 1000V

UP TO 1000V

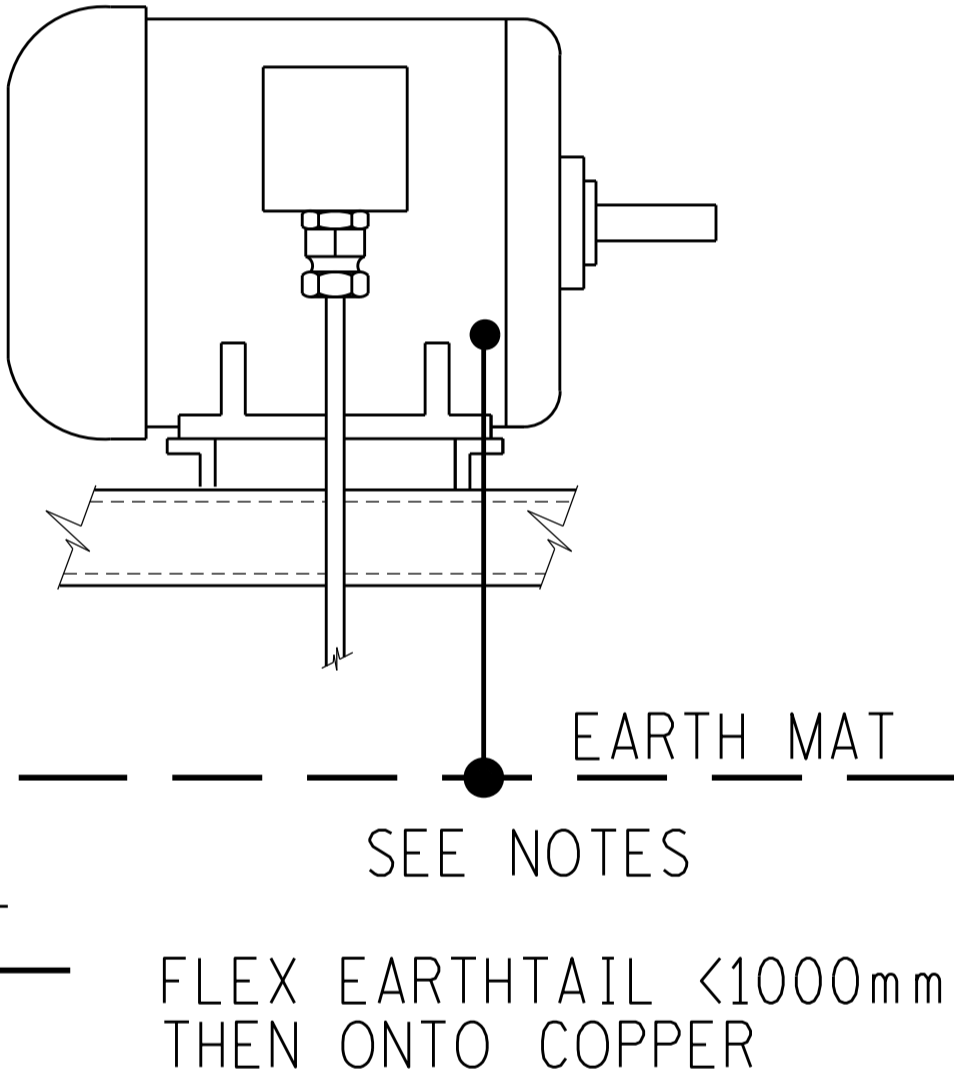
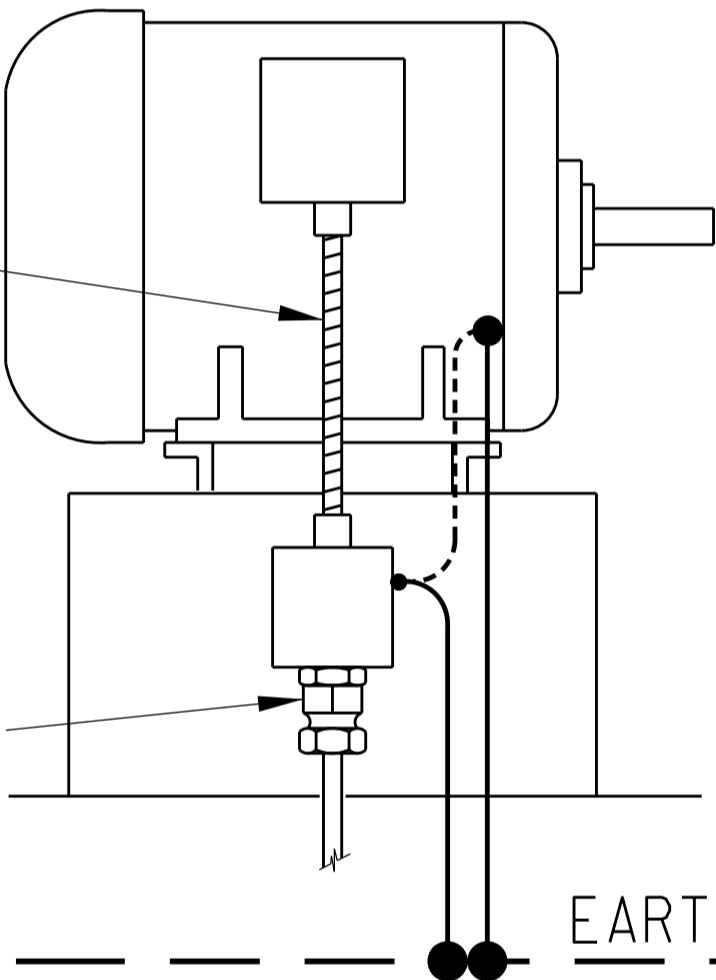


UP TO 1000V

ABOVE 1000V

FLEXIBLE
CONDUIT OR
CABLE OF
SMALLER RATED
AREA

JUNCTION/
REDUCTION
BOX



- NOTES:
1. MOTORS MOUNTED ON EARTHED STEELWORK AND CONNECTED WITH UNARMoured CABLES SHALL BE EARTHED TO EARTHMAT. WHERE A DEDICATED CORE IS PROVIDED FOR EARTHING PURPOSES, THIS CORE IS TO BE CONNECTED TO AN INTERNAL EARTHING POINT.
 2. FOR EARTHING OF LARGE MOTORS REFER TO SPECIFIC EARTHMAT LAYOUT DRAWINGS.
 3. FOR MOTORS FED BY CABLES UP TO 16mm² A FOURTH CABLE CAN BE USED AS EARTH CONTINUITY CONDUCTOR. FOR MOTORS FED BY CABLES >25mm² A SEPARATE LOCAL EARTH CONNECTION IS REQUIRED.



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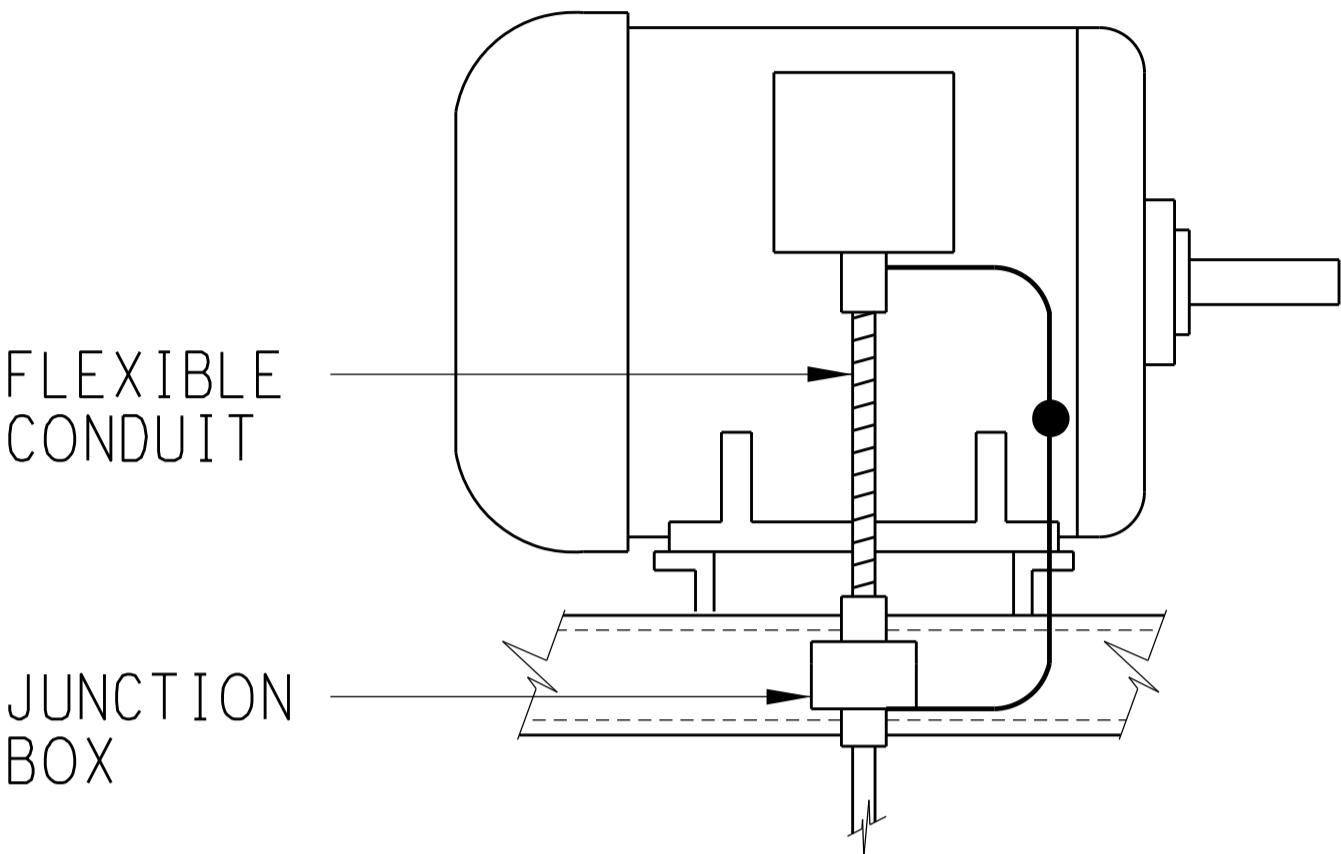
MOTORS FED BY MICC, CONDUIT OR PILCSWA CABLES
MOUNTED ON EARTHED MATERIAL

MOTOR CONNECTIONS – PILC ON EARTHED STRUCTURES

A

A

UP TO 1000V



B

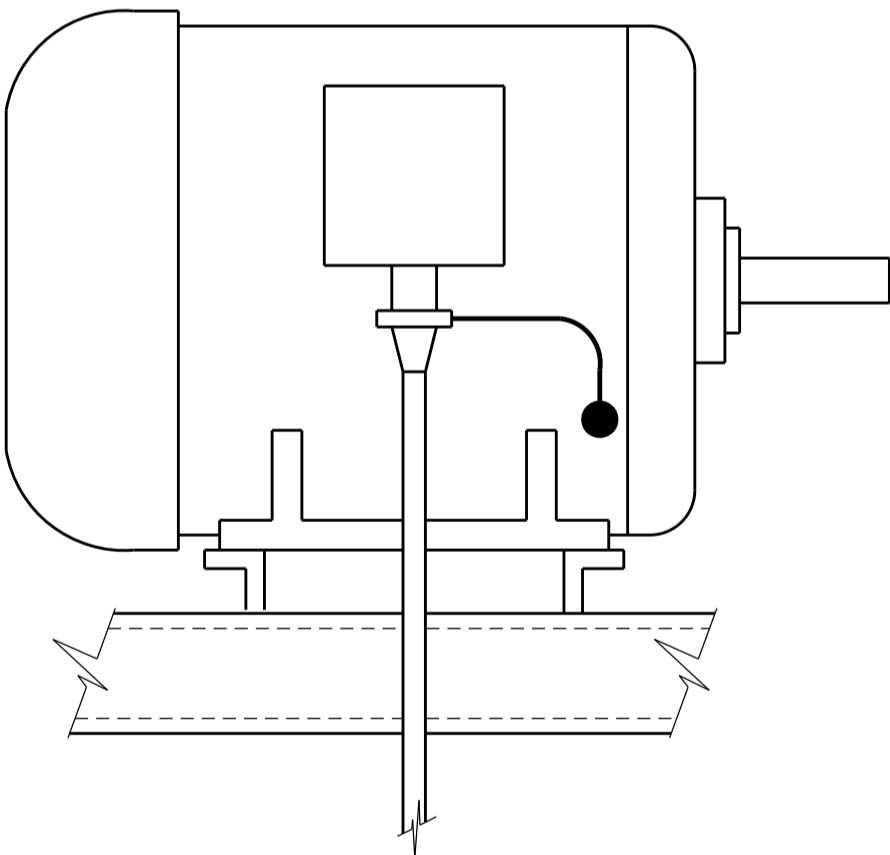
B

C

C

MINERAL INSULATED CABLES
OR CABLES IN CONDUIT

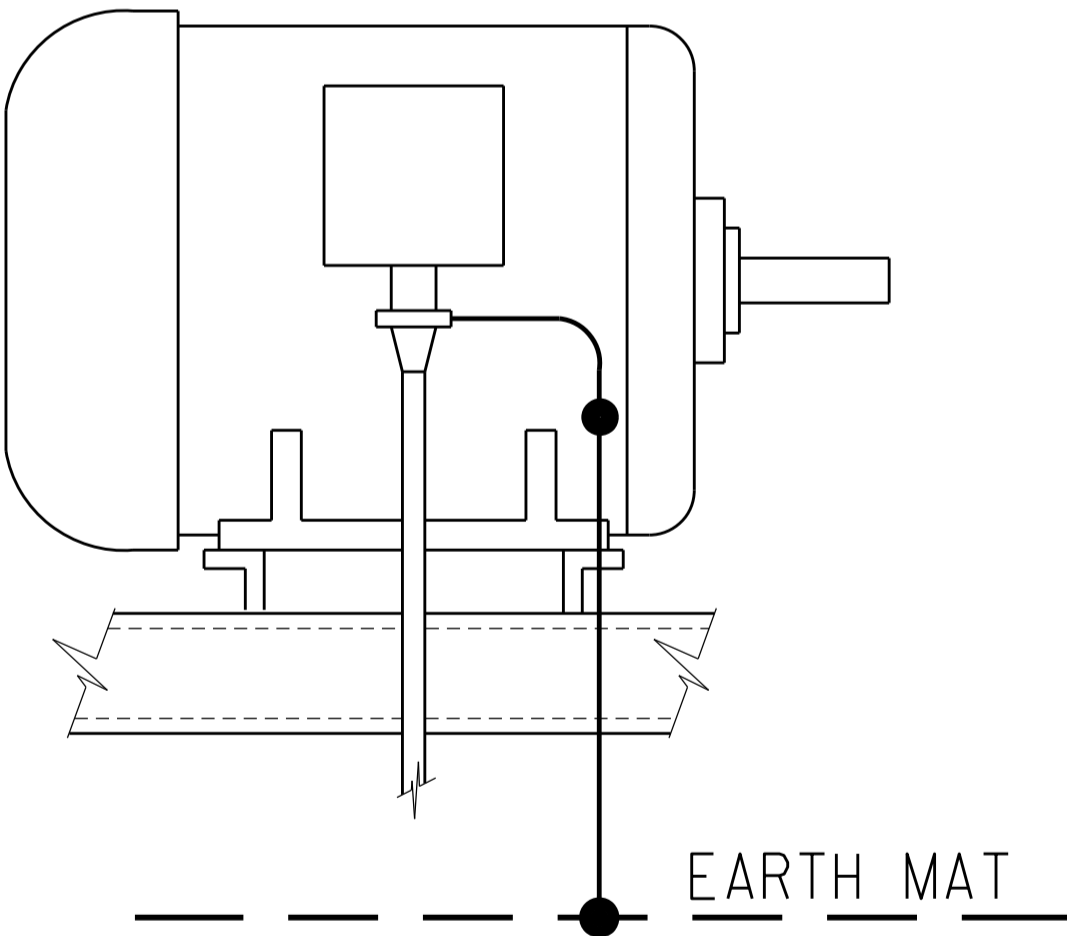
UP TO 1000V



D

D

UP TO 1000V



E

E

P.I.L.C.S.W.A. CABLES

P.I.L.C.S.W.A. CABLES

F

F



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MOTORS FED BY MCC, CONDUIT OR PILCSWA CABLES
MOUNTED ON UNEARTHED MATERIAL

MOTOR CONNECTION - PILC ON UNEARTHED STRUCTURES

A

A

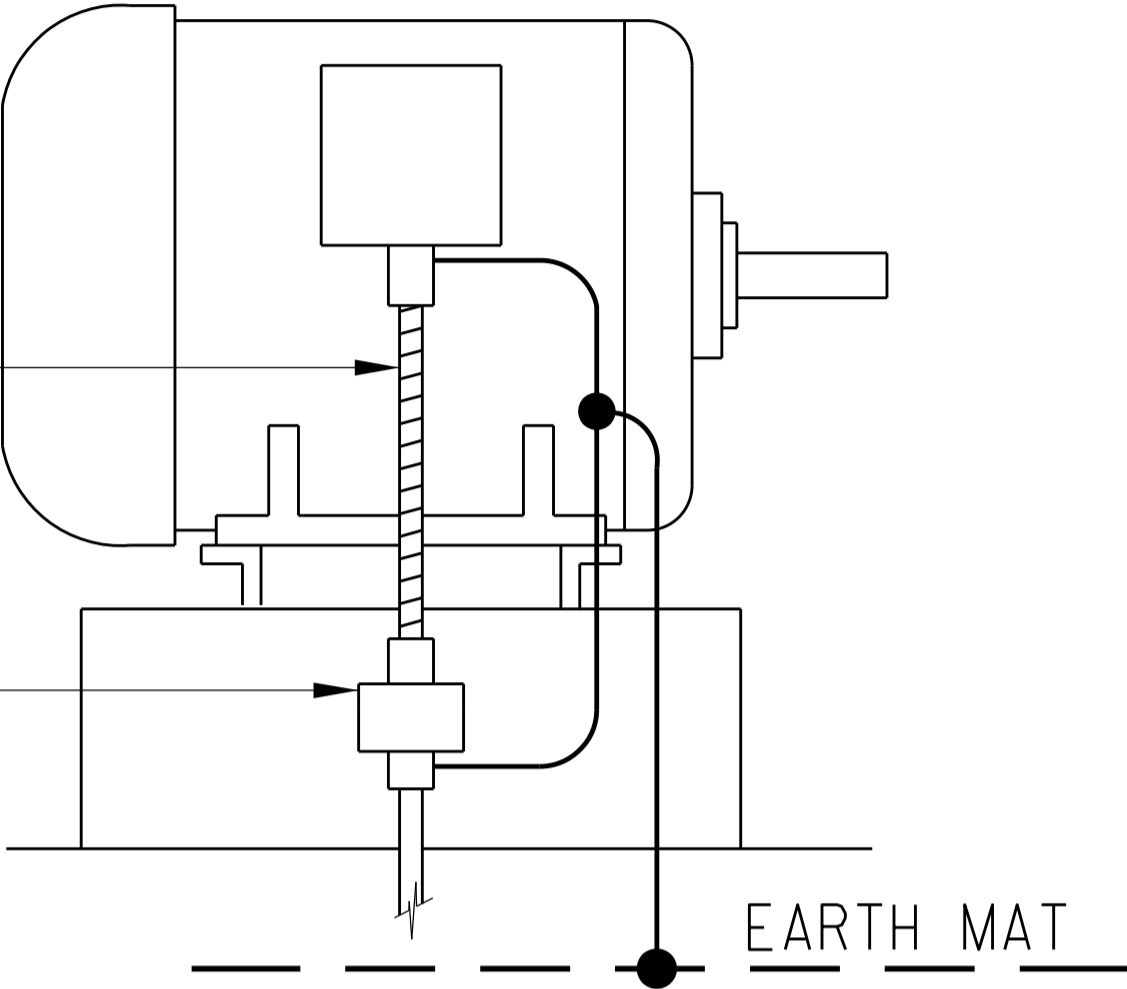
UP TO 1000V

B

B

FLEXIBLE
CONDUIT

JUNCTION
BOX



C

C

MINERAL INSULATED CABLES
OR CABLES IN CONDUIT

D

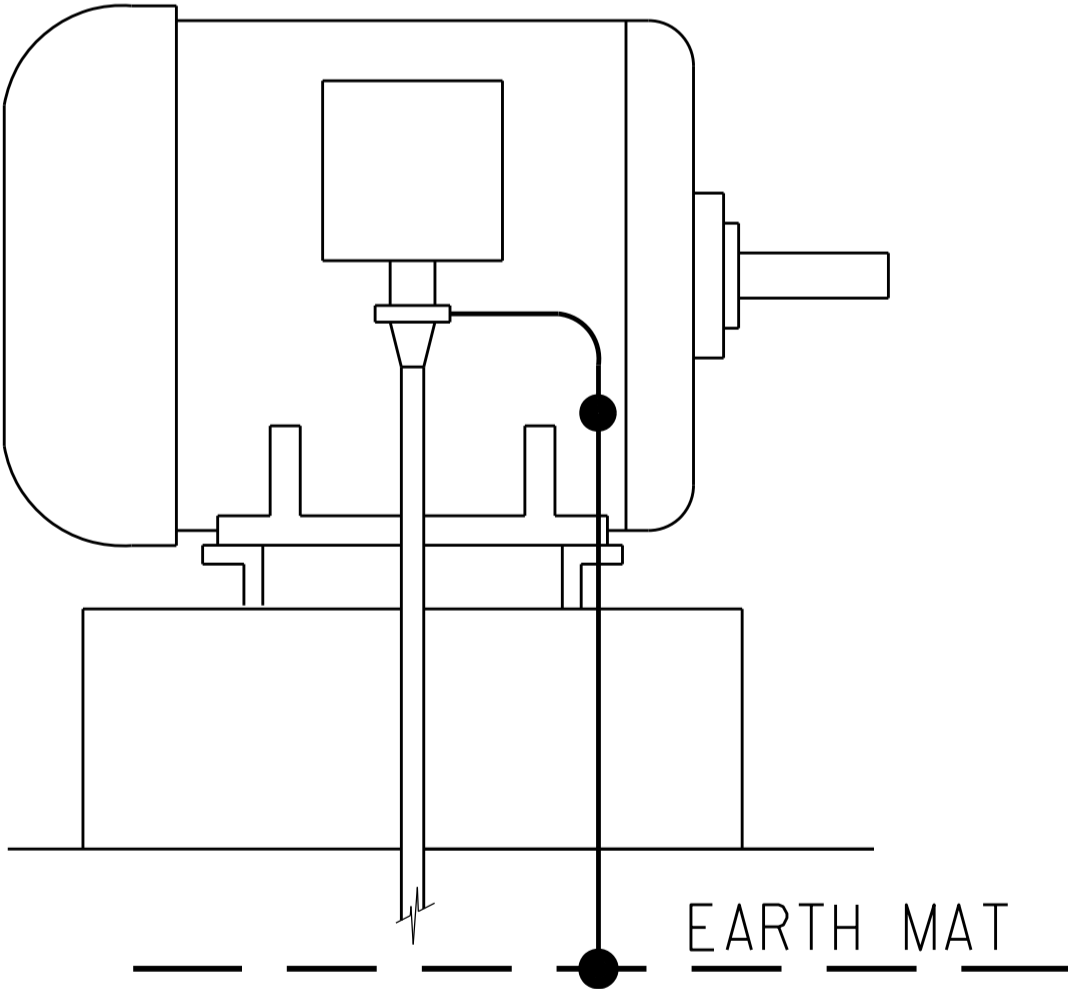
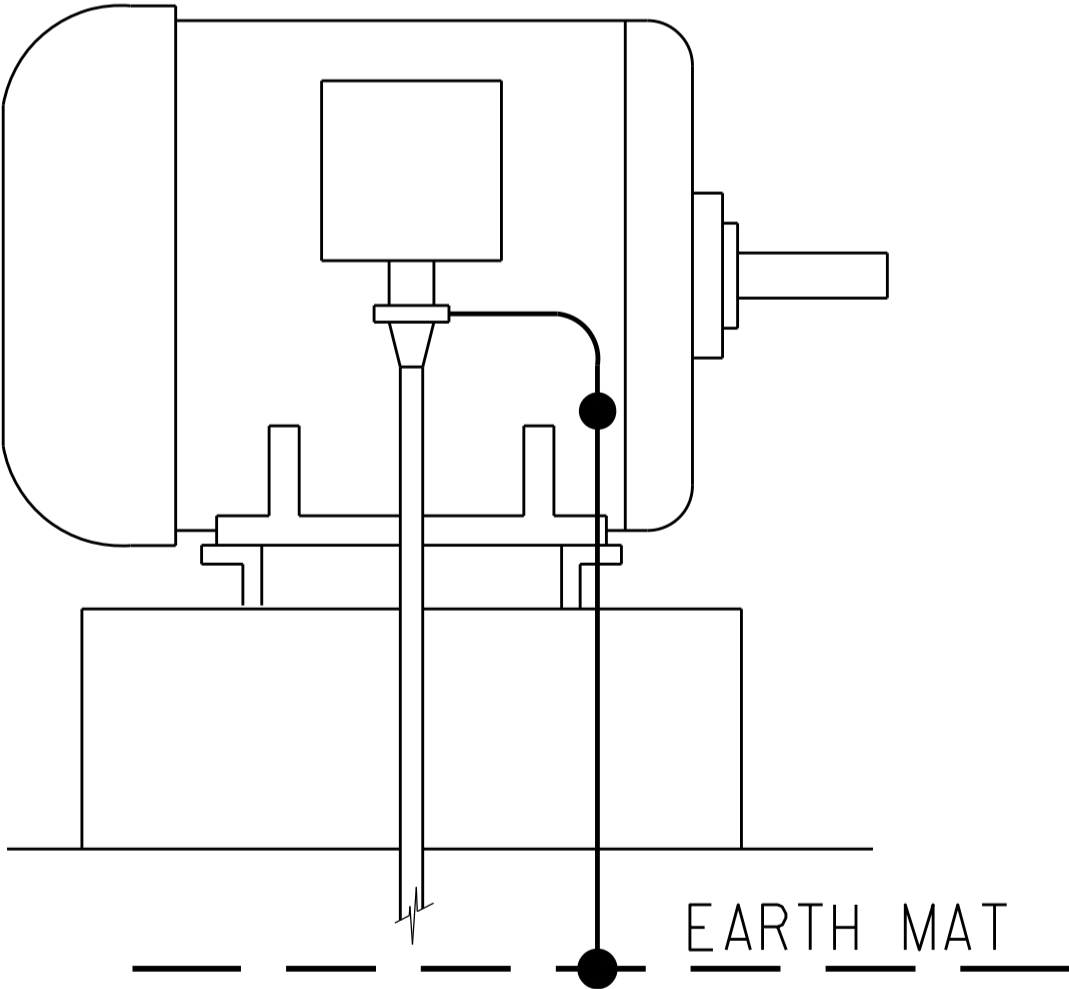
D

UP TO 1000V

UP TO 1000V

E

E



P.I.L.C.S.W.A. CABLES

P.I.L.C. CABLES

F

F



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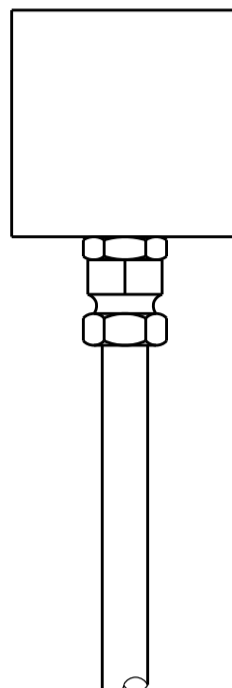
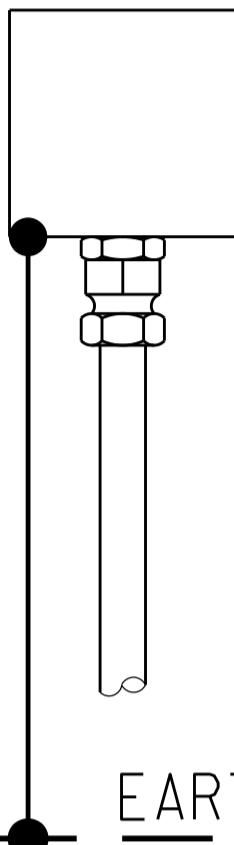
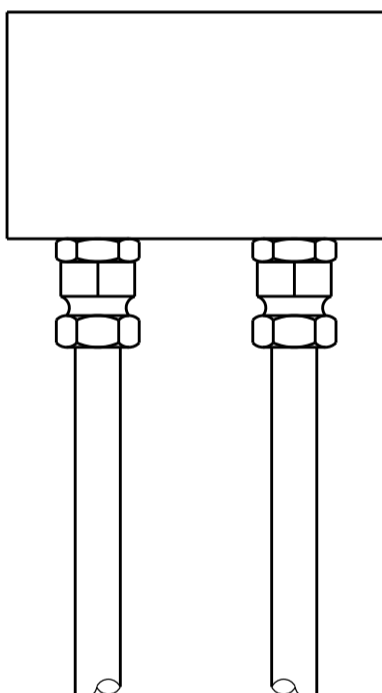
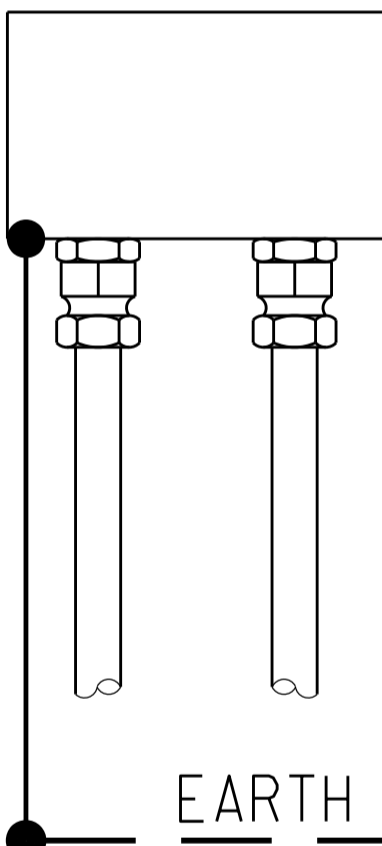



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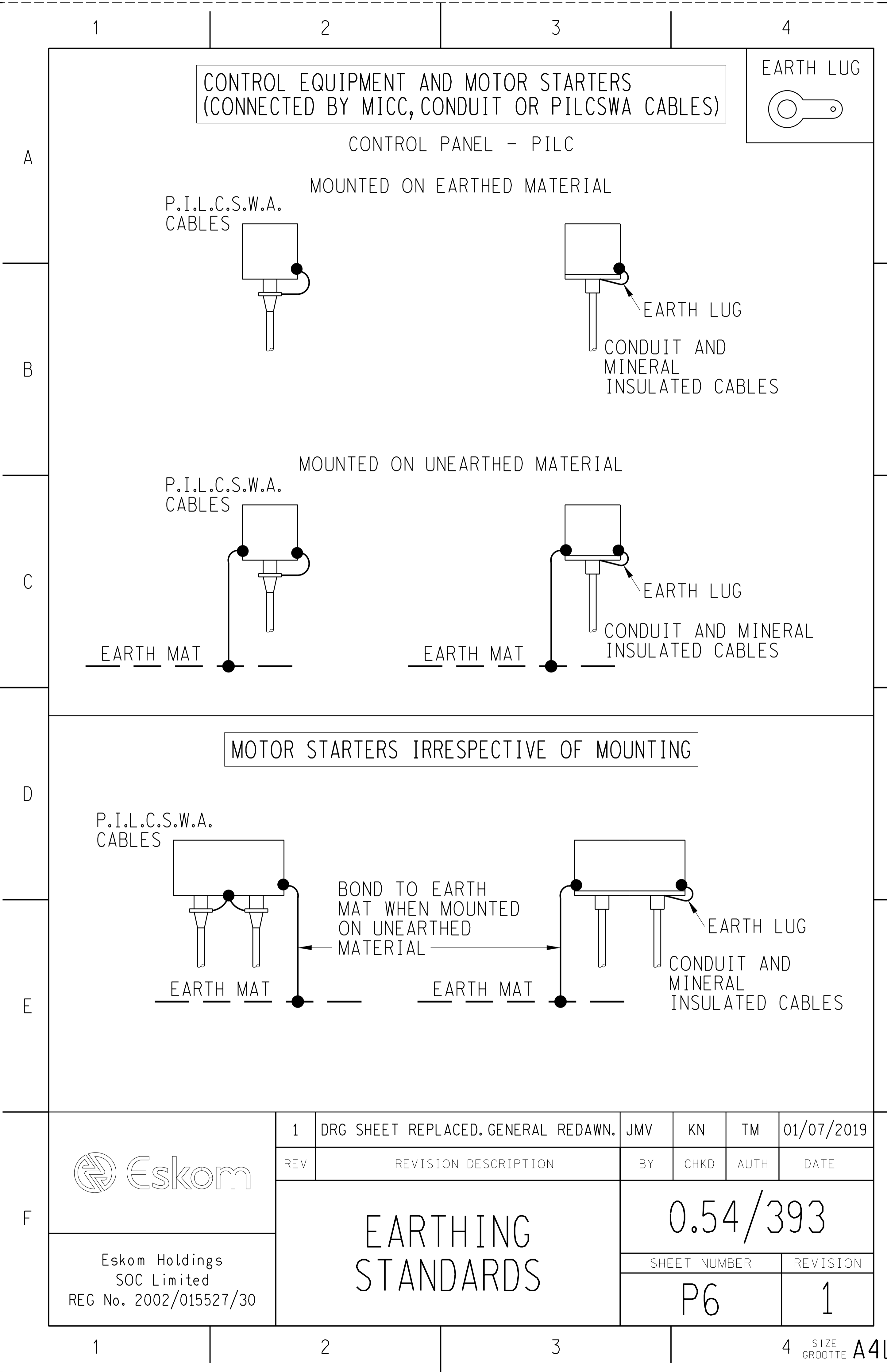
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SIZE
GROOTTE A4L

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A		<div>CONTROL EQUIPMENT & MOTOR STARTERS (CONNECTED BY ARMOURED OR UNARMOURED PVC INSULATED CABLES)</div> <div>CONTROL PANEL – PVC</div>						A																												
B		<div>CONTROL EQUIPMENT MOUNTED ON EARTHED MATERIAL</div>  <div>SEE NOTE</div>		<div>CONTROL EQUIPMENT MOUNTED ON UNEARTHED MATERIAL</div>  <div>EARTH MAT</div>				B																												
C		<div>MOTOR STARTERS MOUNTED ON EARTHED MATERIAL</div>  <div>SEE NOTE</div>		<div>MOTOR STARTERS MOUNTED ON UNEARTHED MATERIAL</div>  <div>EARTH MAT</div>				C																												
D								D																												
E		<div>NOTE:</div> <div>STEEL ENCLOSURES MOUNTED ON EARTHED MATERIAL AND CONNECTED WITH UNARMOURED CABLES SHALL BE EARTHED TO EARTH MAT.</div> <div>WHERE A DEDICATED CORE IS PROVIDED FOR EARTHING PURPOSES, THIS CORE IS TO BE CONNECTED TO AN INTERNAL EARTHING POINT.</div>						E																												
F		<table><tr><td rowspan="3"></td><td>2</td><td>DRG SHEET REPLACED. GENERAL REDAWN.</td><td>JMV</td><td>KN</td><td>TM</td><td>01/07/2019</td></tr><tr><td>REV</td><td>REVISION DESCRIPTION</td><td>BY</td><td>CHKD</td><td>AUTH</td><td>DATE</td></tr><tr><td colspan="2" rowspan="3">EARTHING STANDARDS</td><td colspan="4">0.54/393</td></tr><tr><td colspan="2">SHEET NUMBER</td><td colspan="2">REVISION</td></tr><tr><td colspan="2">P5</td><td colspan="2">2</td></tr></table>							2	DRG SHEET REPLACED. GENERAL REDAWN.	JMV	KN	TM	01/07/2019	REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	EARTHING STANDARDS		0.54/393				SHEET NUMBER		REVISION		P5		2		F	
	2	DRG SHEET REPLACED. GENERAL REDAWN.	JMV	KN	TM	01/07/2019																														
	REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE																														
	EARTHING STANDARDS		0.54/393																																	
SHEET NUMBER			REVISION																																	
P5			2																																	
1		2		3		4		SIZE GROOTTE A4L																												



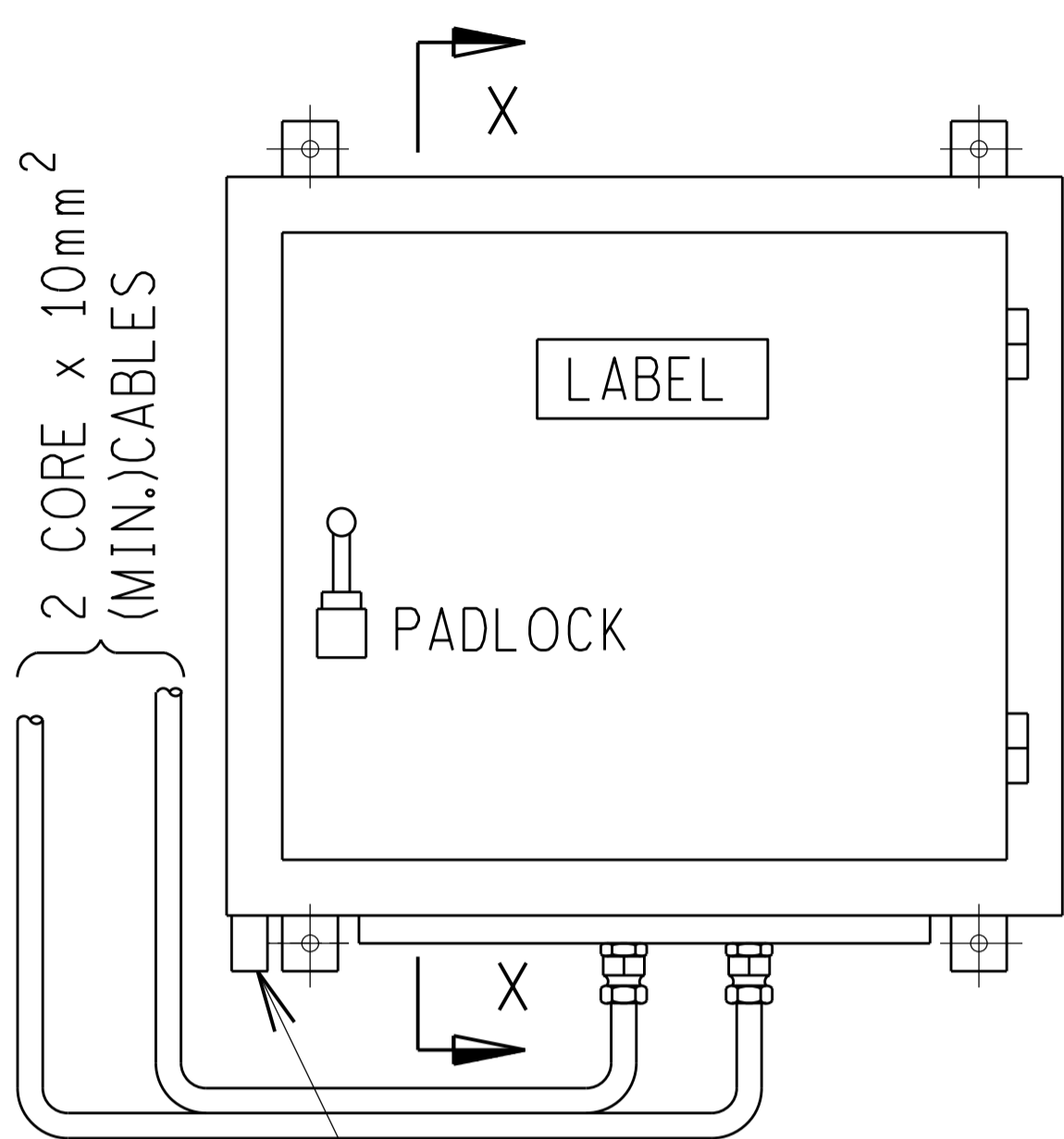
1

2

3

4

POWER STATION AUXILIARY BAY
SIGNAL EARTH TERMINATION BOX



DRAIN PIPE

FRONT VIEW

CONNECTION TO MAIN EARTH MAT

50mm DIA PLASTIC PIPE THROUGH
CONCRETE OF SUB BASEMENT.
(TO BE SEALED OFF WITH
WATERTIGHT SEALANT)

INSULATOR

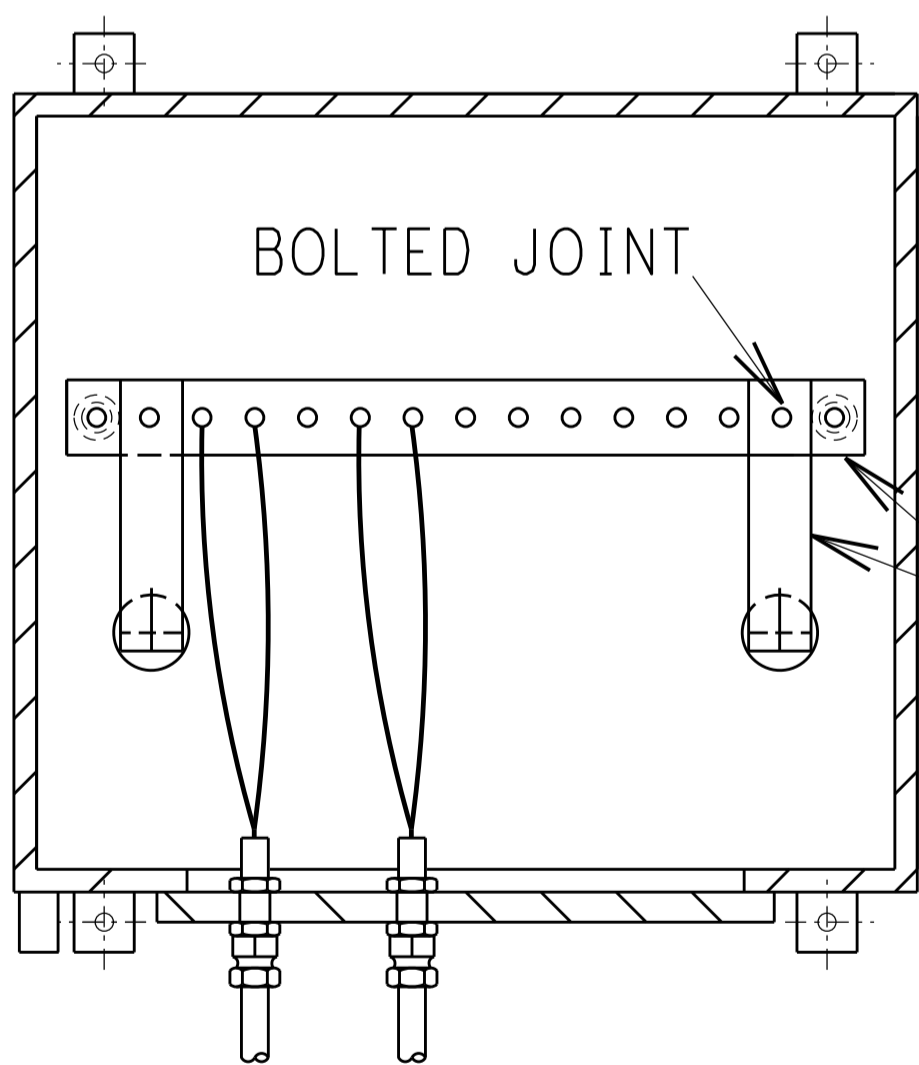
50x3mm FLAT
COPPER

REMOVABLE
GLAND PLATE

1200

SUB BASEMENT FLOOR

SECTIONAL SIDE VIEW X-X



BOLTED JOINT

50x3mm FLAT COPPER

SECTIONAL FRONT VIEW Y-Y



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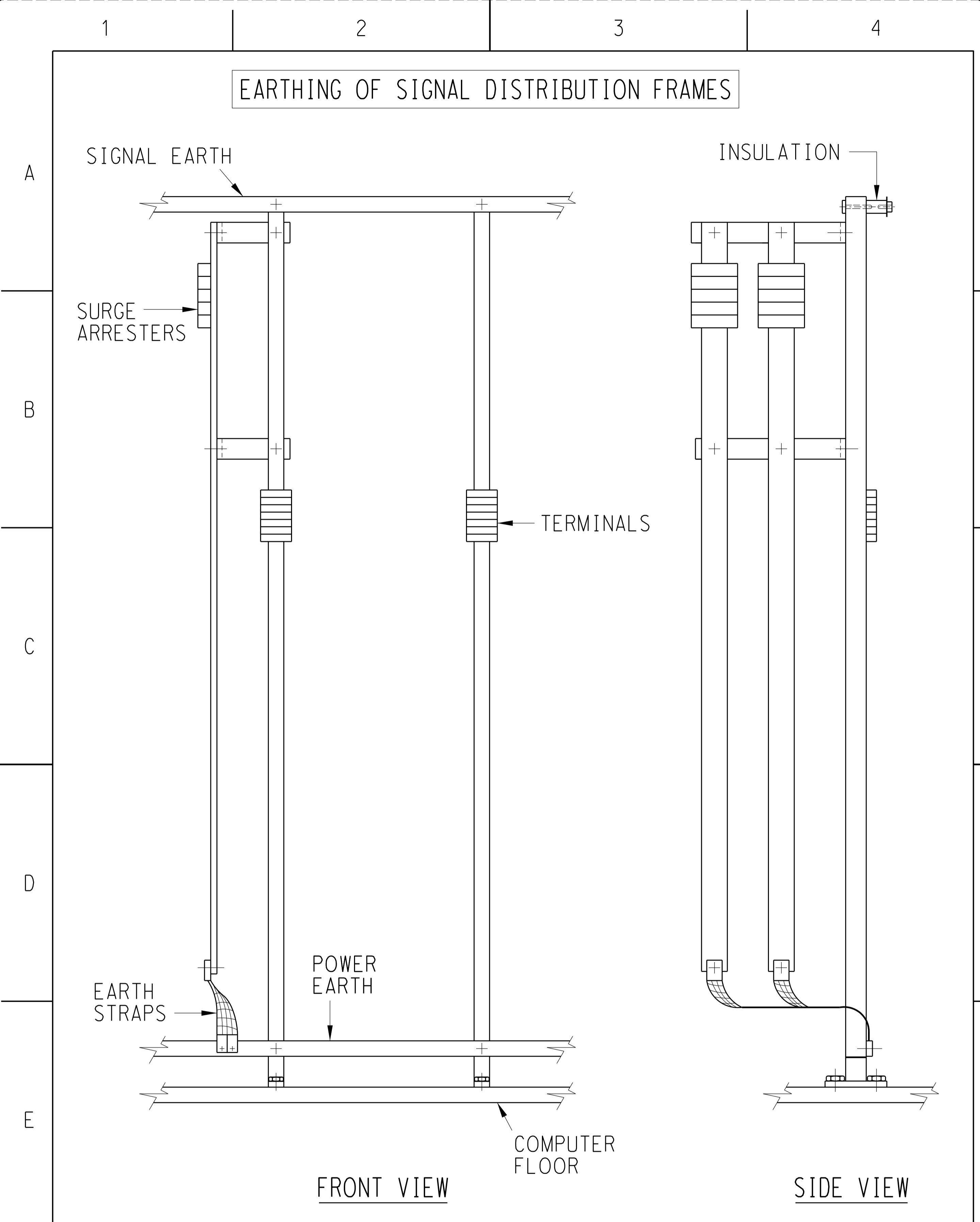
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4

SIZE
GROOTTE A4L



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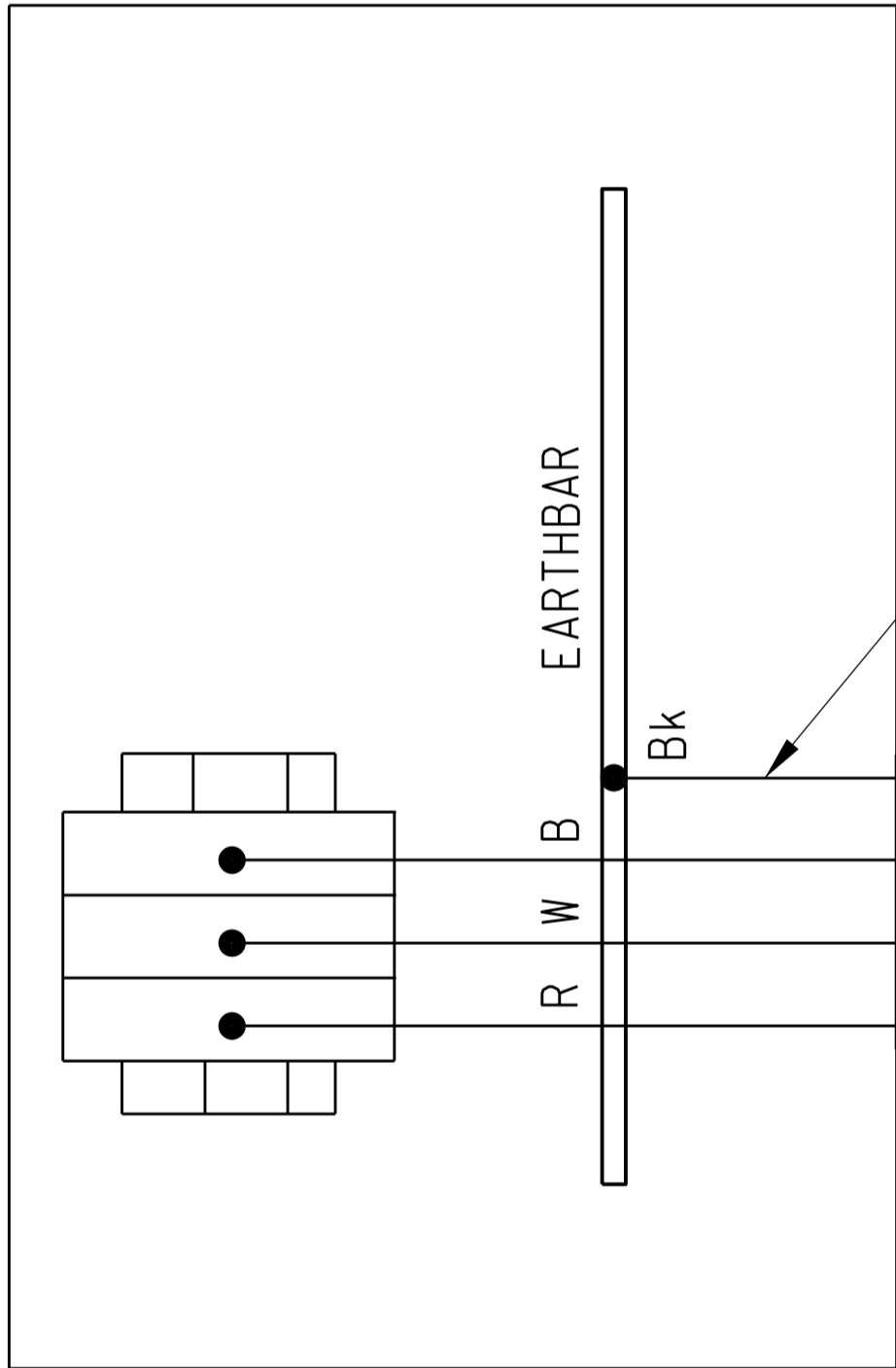
REVISION

P8

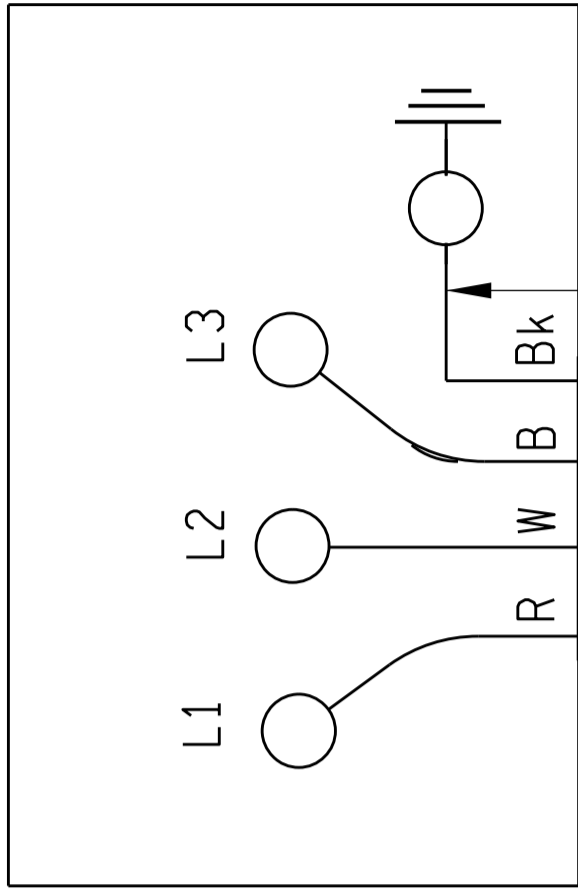
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EARTHING OF SMALLER 3 PHASE CONSUMERS WITHOUT
NEUTRAL WITH 4 CORE UNARMoured CABLE

MOTOR CONTROL CENTRE



e.g. MOTORS, THRUSTORS, ACTUATORS.



4 CORE UP TO 16mm² UNARMoured
CABLE (BVV4HCV) BLACK CONDUCTOR
TO BE FITTED WITH GREEN/YELLOW
SLEEVE AT TERMINATIONS



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1



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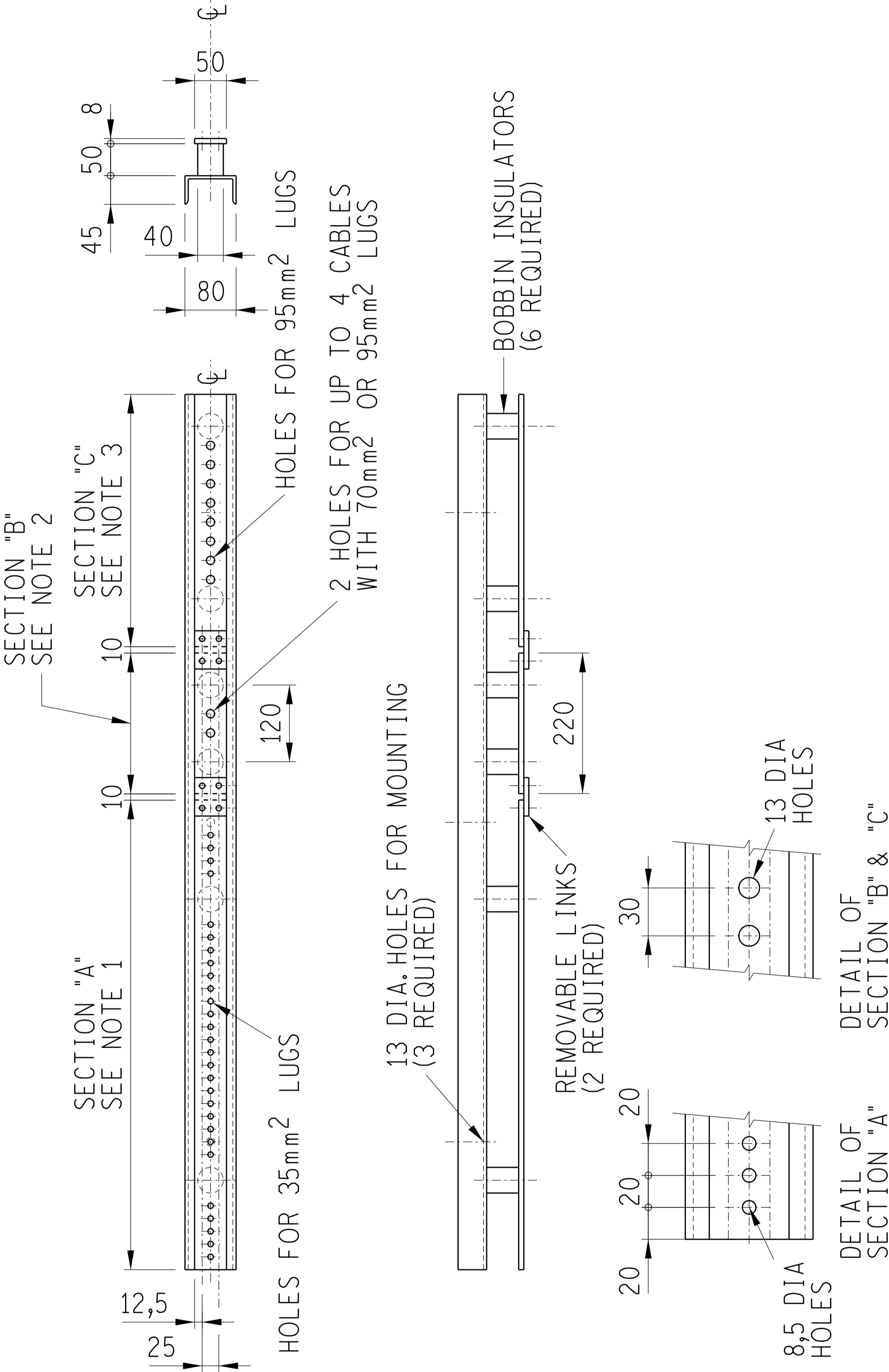
SHEET NUMBER

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P10

1

INSULATED MAIN SCREEN EARTH BAR TYPICAL ARRANGEMENT



NOTE:
SECTION "A" - FOR EARTHING OF ELECTRONIC SYSTEMS LENGTH TO SUIT
SECTION "B" - FOR CONNECTION TO EARTH MAT
SECTION "C" - FOR EARTHING OF EQUIPMENT CUBICLES LENGTH TO SUIT

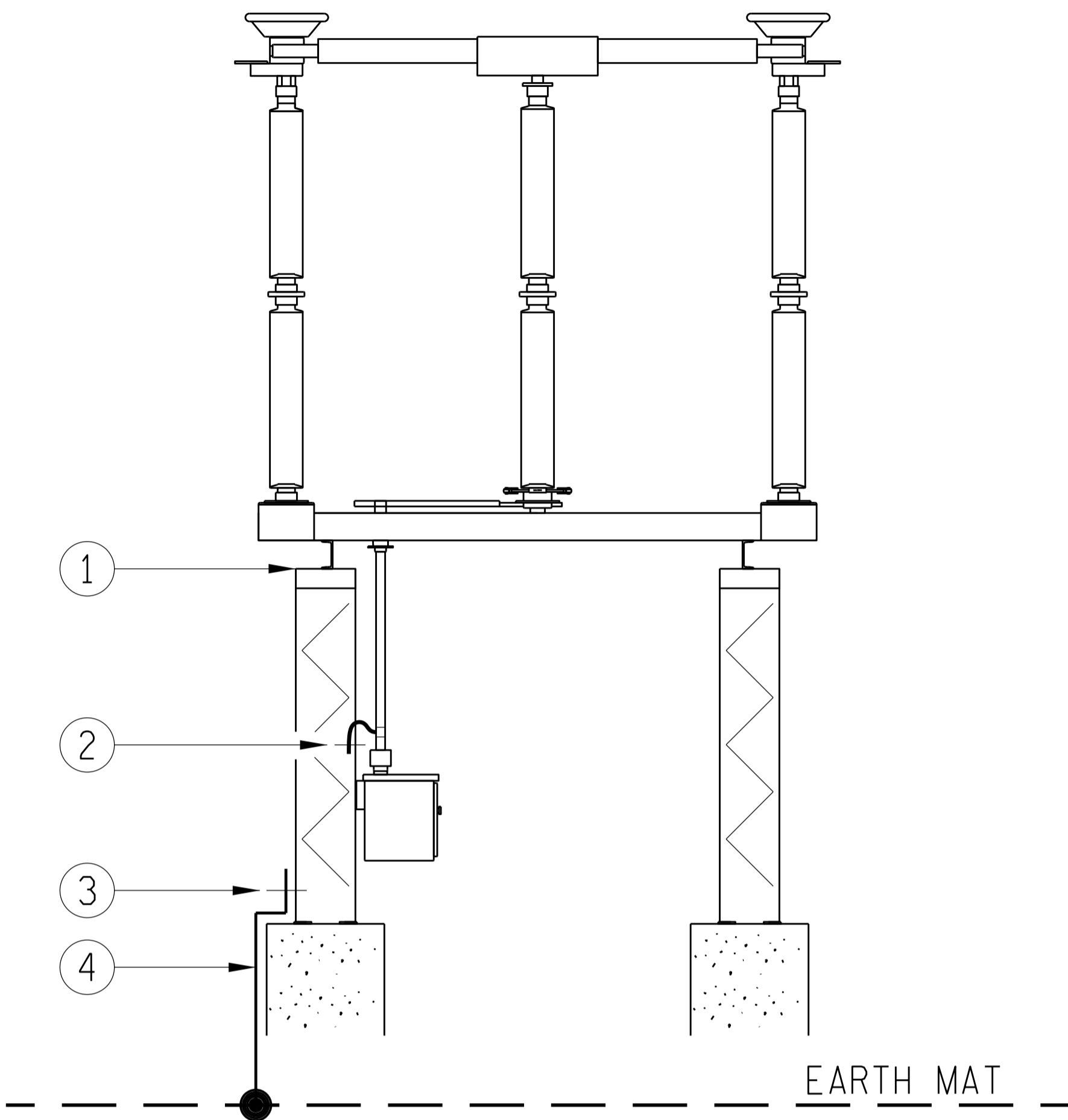
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4

ISOLATOR WITHOUT EARTHING BLADES



- ① EQUIPMENT EARTHED THROUGH H.D. BOLTS.
- ② FOR DRIVE SHAFT EARTH REFER TO SHT C3A NOTE 22.
- ③ FOR CONNECTION, REFER TO SHT C7.
- ④ SUPPORT STEELWORK EARTHTAIL (SEE NOTE).

NOTE:
SUPPORT STEEL EARTHING.
NUMBER OF EARTHING CONNECTIONS
TO EARTH MAT AS PER APPLICABLE SUBSTATION BAY EARTHING SHEETS.



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3

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SIZE
GROOTTE A4L

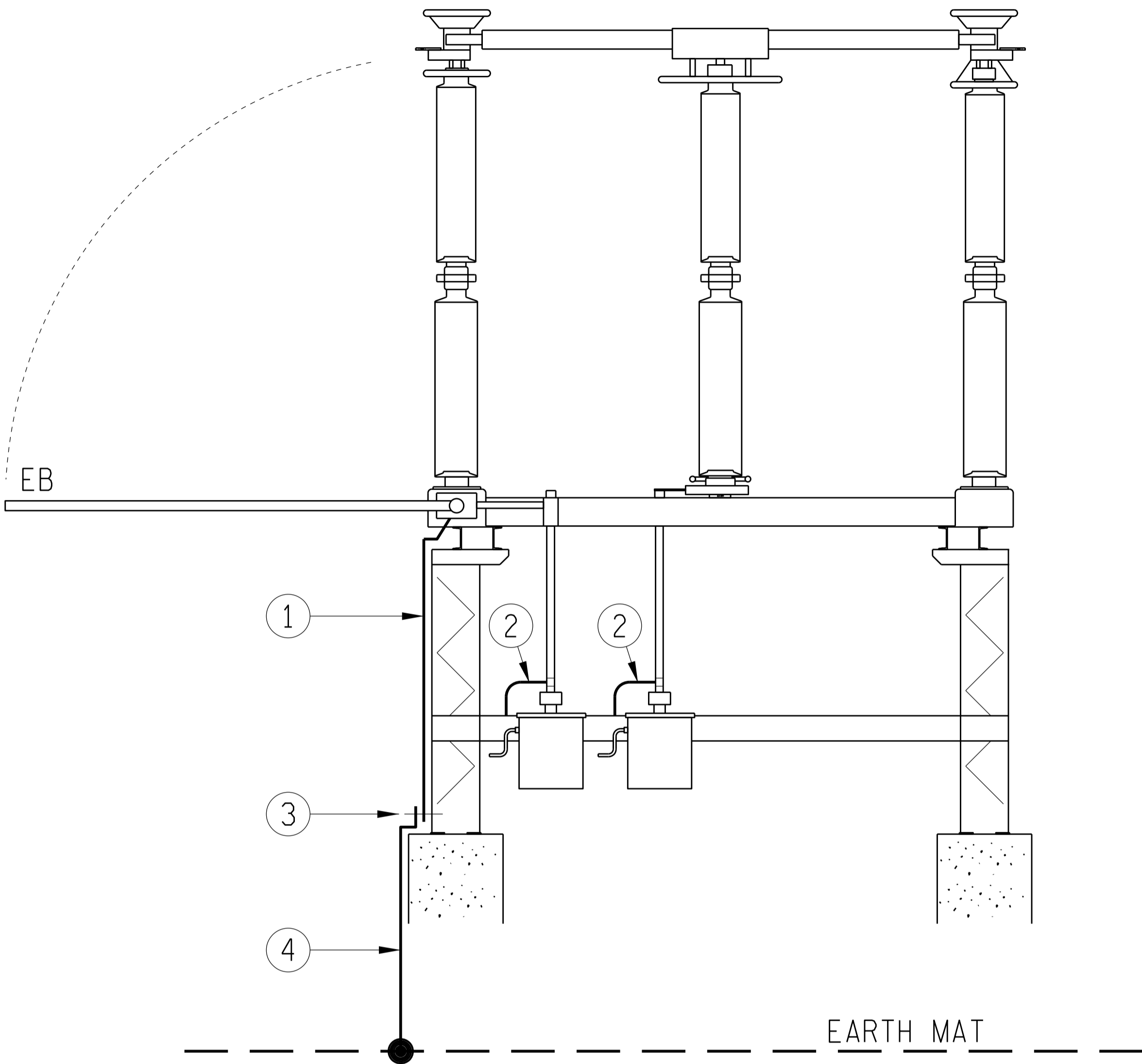
1

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4

ISOLATOR WITH ONE EARTHING BLADE



- ① EQUIPMENT EARTHING STRAP 50x3mm Cu FLAT.
- ② FOR DRIVE SHAFT EARTHS, REFER TO SHT C3A NOTE 22.
- ③ FOR CONNECTION, REFER TO SHT C7.
- ④ SUPPORT STEELWORK EARTHTAIL (SEE NOTE).

NOTE:
SUPPORT STEEL EARTHING.
NUMBER OF EARTHING CONNECTIONS
TO EARTH MAT AS PER APPLICABLE SUBSTATION BAY EARTHING SHEETS.



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3

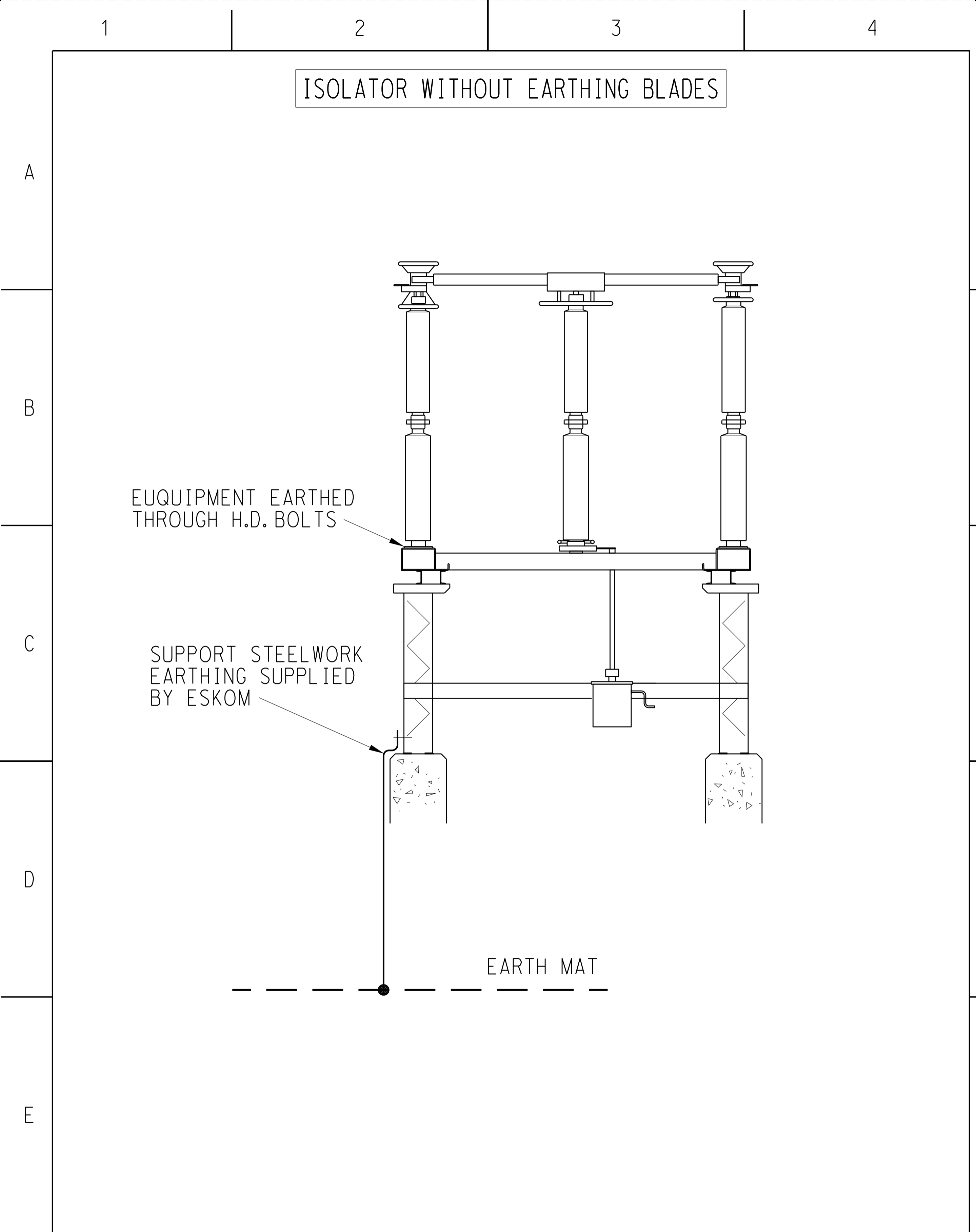
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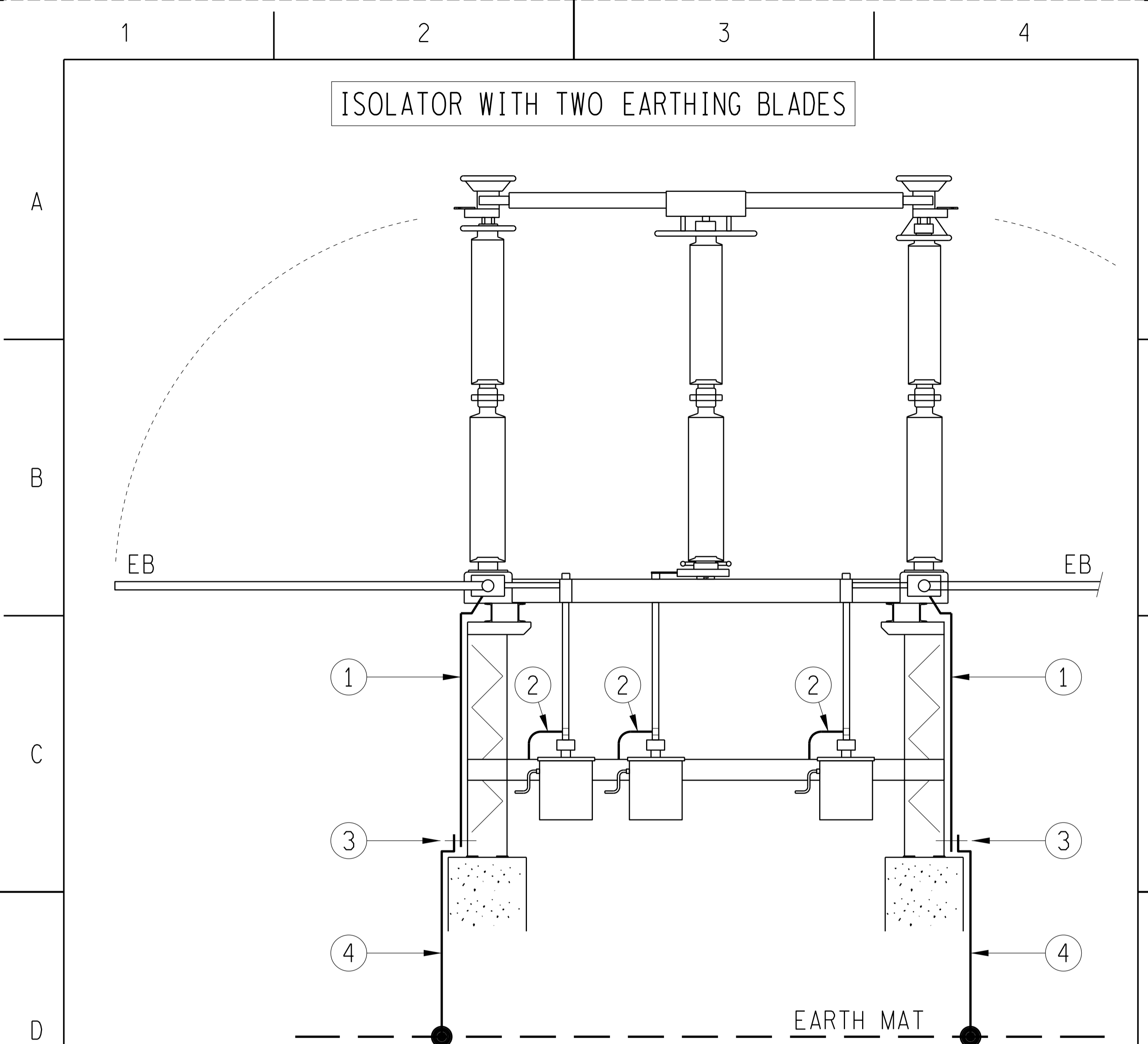
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4

SIZE GROOTTE A4L



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	REV	REVISION DESCRIPTION		BY	CHKD	AUTH	DATE
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SHEET NUMBER				REVISION			
T2A				1			
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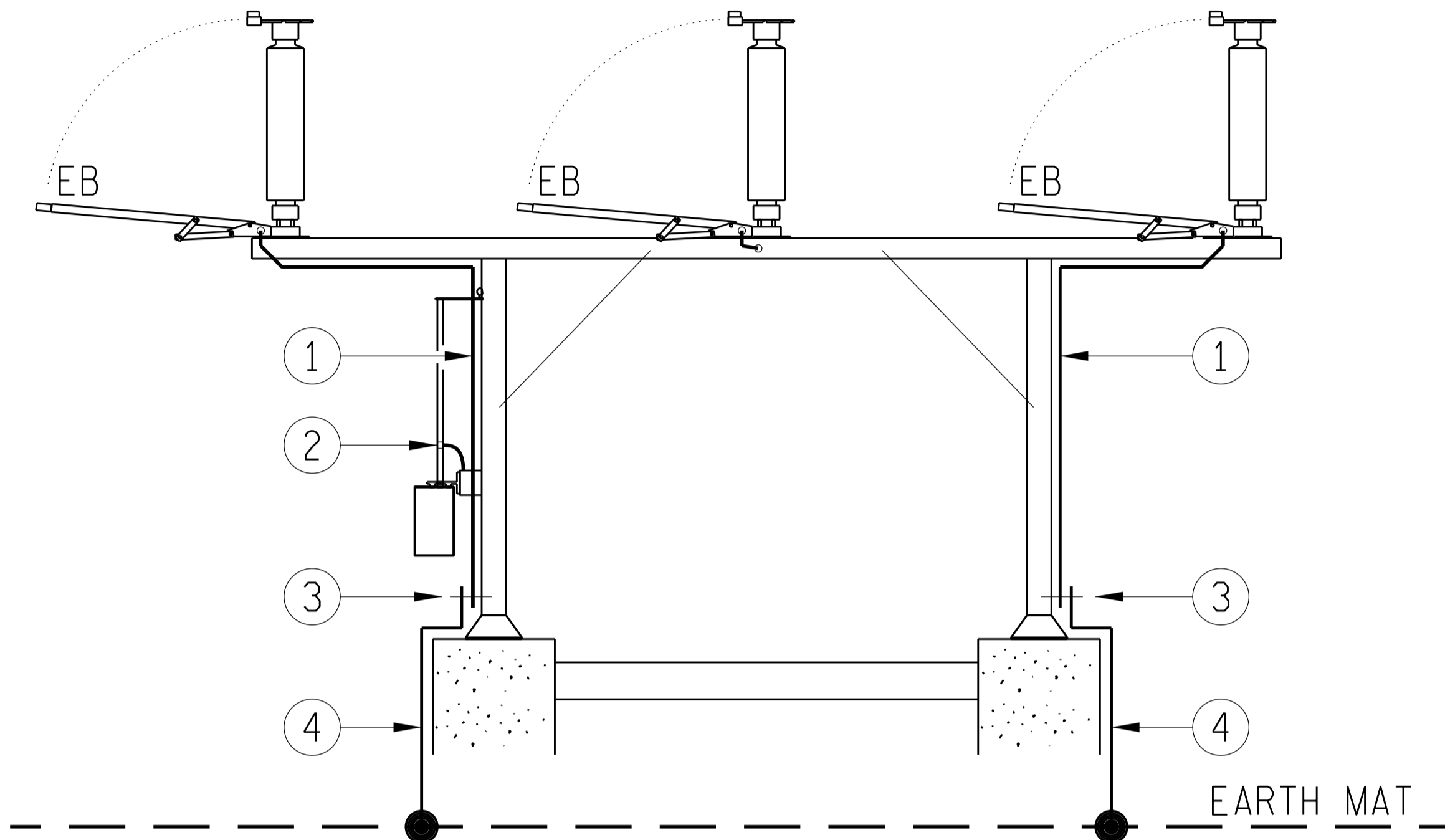


- 1 EQUIPMENT EARTHING STRAP 50x3mm Cu FLAT.
- 2 FOR DRIVE SHAFT EARTHS, REFER TO SHT C3A NOTE 22.
- 3 FOR CONNECTION, REFER TO SHT C7.
- 4 SUPPORT STEELWORK EARTHTAIL (SEE NOTE).

NOTE:
SUPPORT STEEL EARTHING.
NUMBER OF EARTHING CONNECTIONS
TO EARTH MAT AS PER APPLICABLE SUBSTATION BAY EARTHING SHEETS.

F		3	DRG SHEET REPLACED. GENERAL REDAWN.	JMV	KN	TM	01/07/2019
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					SHEET NUMBER		REVISION
					T3		3

EARTHING SWITCH



- ① EQUIPMENT EARTHING STRAP 50x3mm Cu FLAT.
- ② FOR DRIVE SHAFT EARTHS, REFER TO SHT C3 NOTE 22.
- ③ FOR CONNECTION CLAMP, REFER TO C7.
- ④ SUPPORT STEELWORK EARTHTAIL (SEE NOTE).

NOTE:
SUPPORT STEEL EARTHING.
NUMBER OF EARTHING CONNECTIONS
TO EARTH MAT AS PER APPLICABLE SUBSTATION BAY EARTHING SHEETS.



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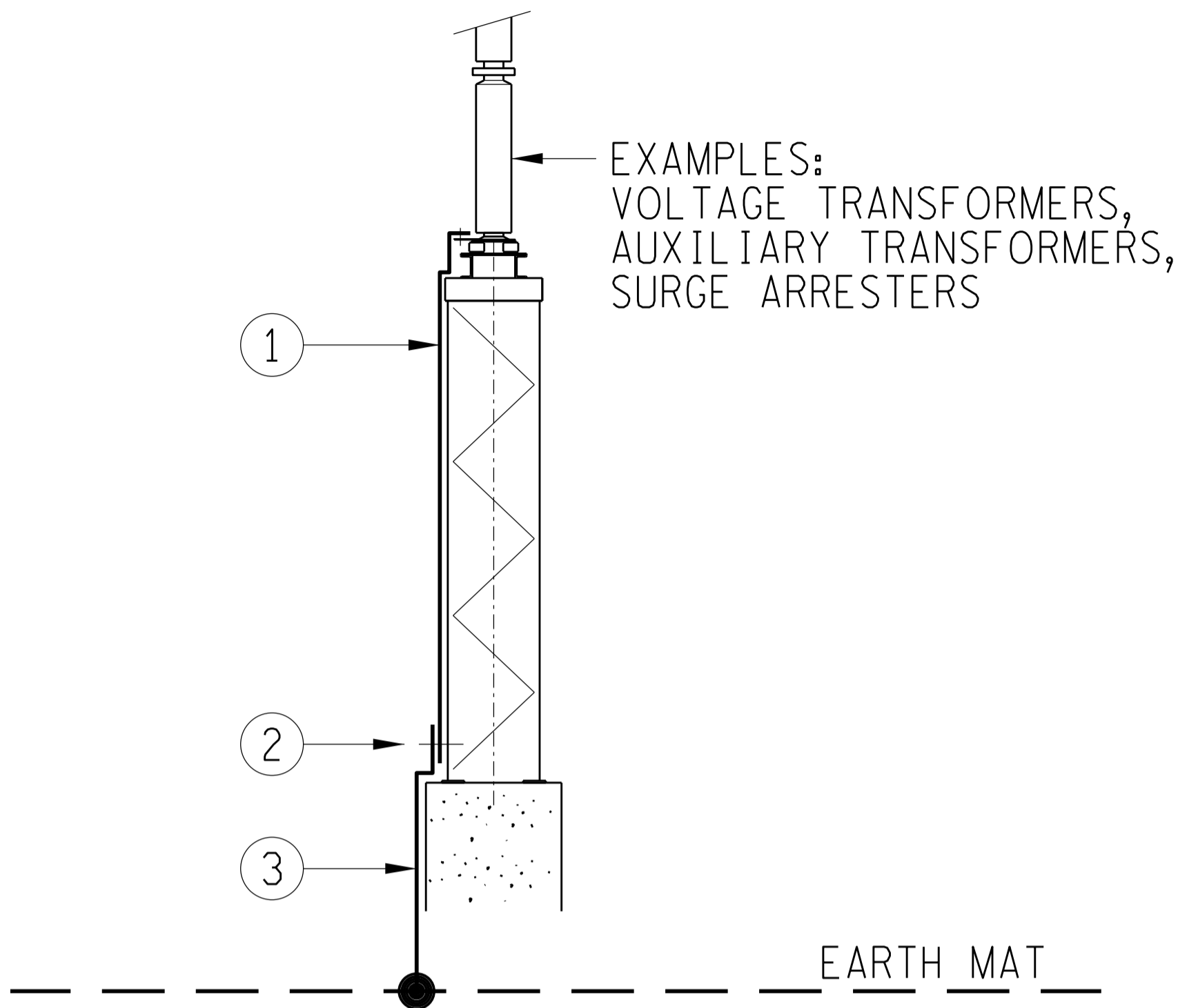
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EARTHING
STANDARDS

0.54/393

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T4	3

NEUTRALS OF EQUIPMENT
MOUNTED ON EARTHED STEELWORK



- ① EARTHING OR NEUTRAL TERMINAL EARTHING STRAP 50x3mm Cu FLAT.
- ② FOR CONNECTION CLAMP, REFER TO SHT C7.
- ③ SUPPORT STEELWORK EARTHTAIL (SEE NOTE).

NOTE:
SUPPORT STEEL EARTHING.

- 1. NUMBER OF EARTHING CONNECTIONS TO EARTH MAT AS PER APPLICABLE SUBSTATION EARTHING LAYOUT.
- 2. SURGE ARRESTERS EARTH STRAP TO BE RUN AS STRAIGHT AS POSSIBLE.
- 3. FOR SURGE ARRESTERS FITTED WITH DISCHARGE COUNTERS SEE SHEETS T8 & T9.
- 4. SEE SHEET 14, 14A, 14B FOR EARTHING OF SURGE ARRESTERS WITH PROVISION FOR CONDITION MONITORING DEVICE.



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3

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T5

3

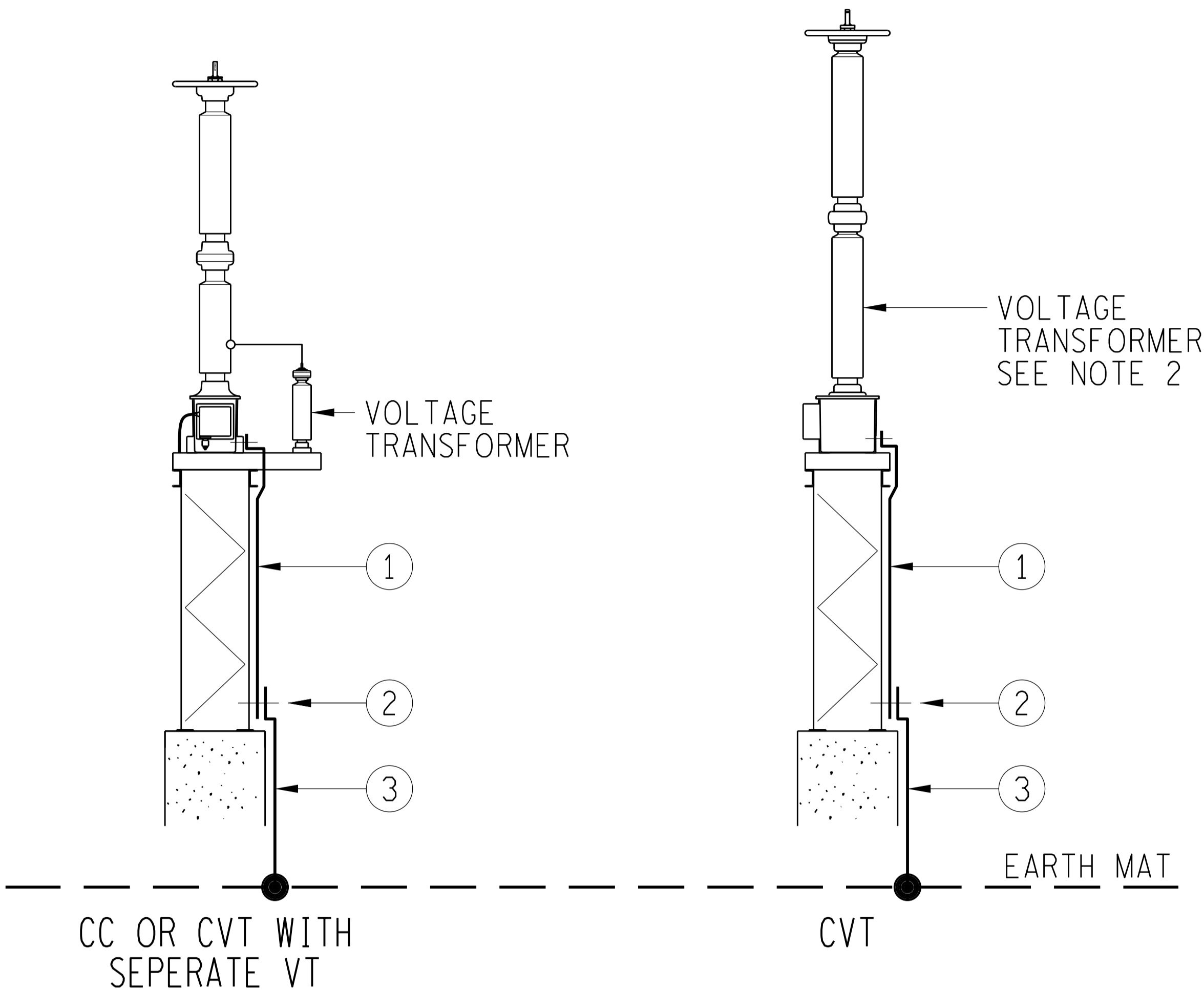
1

2

3

4

CVT (GALVANISED & PAINTED TANKS)
MOUNTED ON EARTHED STEELWORK
WITHOUT CARRIER COUPLING EQUIPMENT (LME)



- ① EQUIPMENT EARTHING STRAP 50x3mm Cu FLAT.
- ② FOR CONNECTION CLAMP, REFER TO SHT C7.
- ③ SUPPORT STEELWORK EARTHTAIL (SEE NOTE).

NOTE:
SUPPORT STEEL EARTHING.
1. NUMBER OF EARTHING CONNECTIONS
TO EARTH MAT AS PER APPLICABLE SUBSTATION BAY EARTHING LAYOUT.
2. LOW VOLTAGE (LME) TERMINAL TO BE EARTHED IN
VOLTAGE TRANSFORMER CONNECTION BOX.



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2

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EARTHING
STANDARDS

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REVISION

T6

2

1

2

3

4

SIZE
GROOTTE A4L

1

2

3

4

A

B

C

D

E

F

A

B

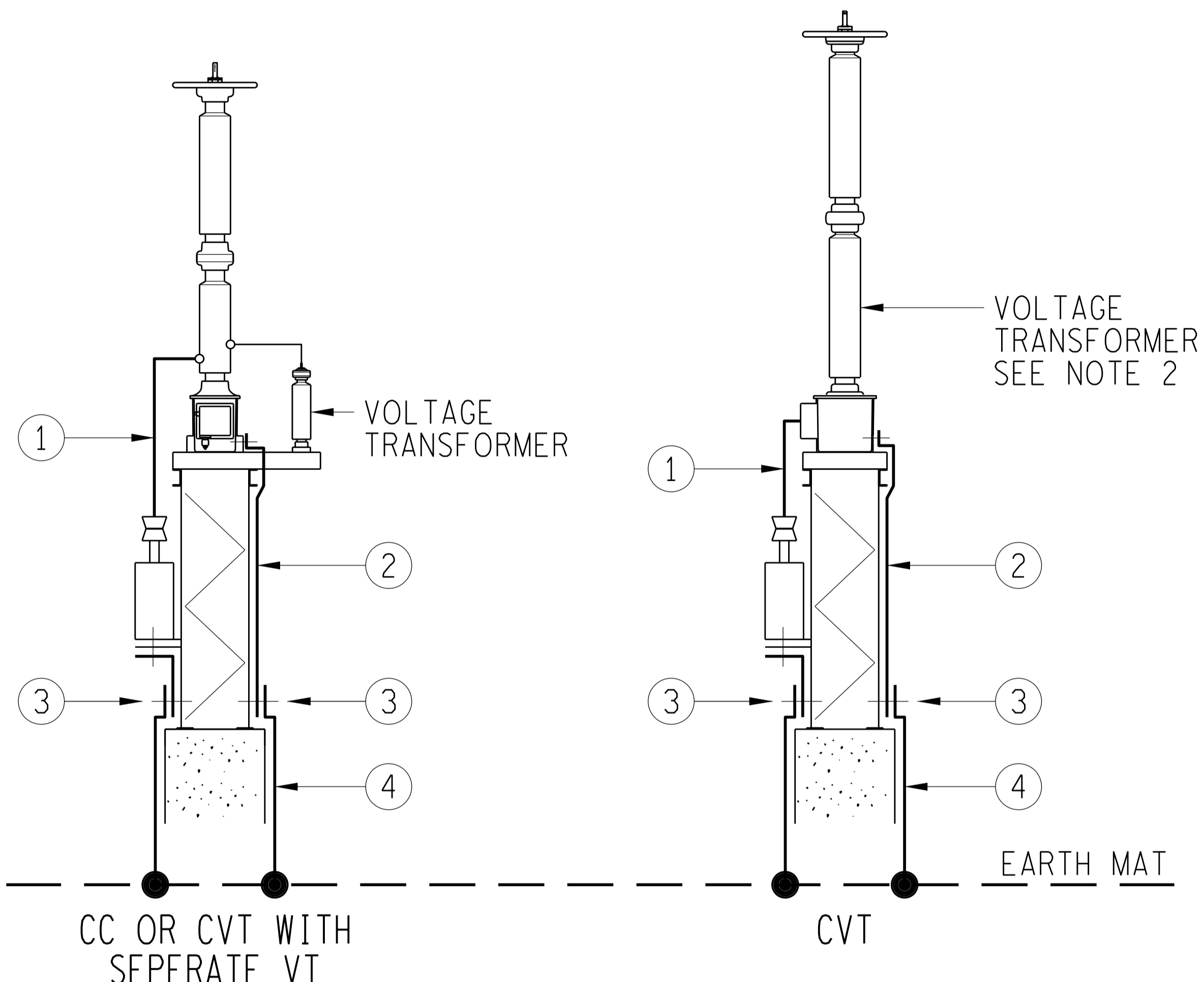
C

D

E

F

CVT (GALVANISED & PAINTED TANKS)
MOUNTED ON EARTHED STEELWORK
WITH CARRIER COUPLING EQUIPMENT (LME)



- ① $\phi 10\text{mm}$ Cu ROD.
- ② EQUIPMENT EARTHING STRAP 50x3mm Cu FLAT.
- ③ FOR CONNECTION CLAMP, REFER TO SHT C7.
- ④ SUPPORT STEELWORK EARTHTAIL (SEE NOTE).

NOTE:
SUPPORT STEEL EARTHING.
NUMBER OF EARTHING CONNECTIONS TO EARTH MAT
AS PER APPLICABLE SUBSTATION BAY EARTHING LAYOUT.



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EARTHING STANDARDS			0.54/393		
			SHEET NUMBER		REVISION
			T7		2

1

2

3

4 SIZE GROOTTE A4L

1

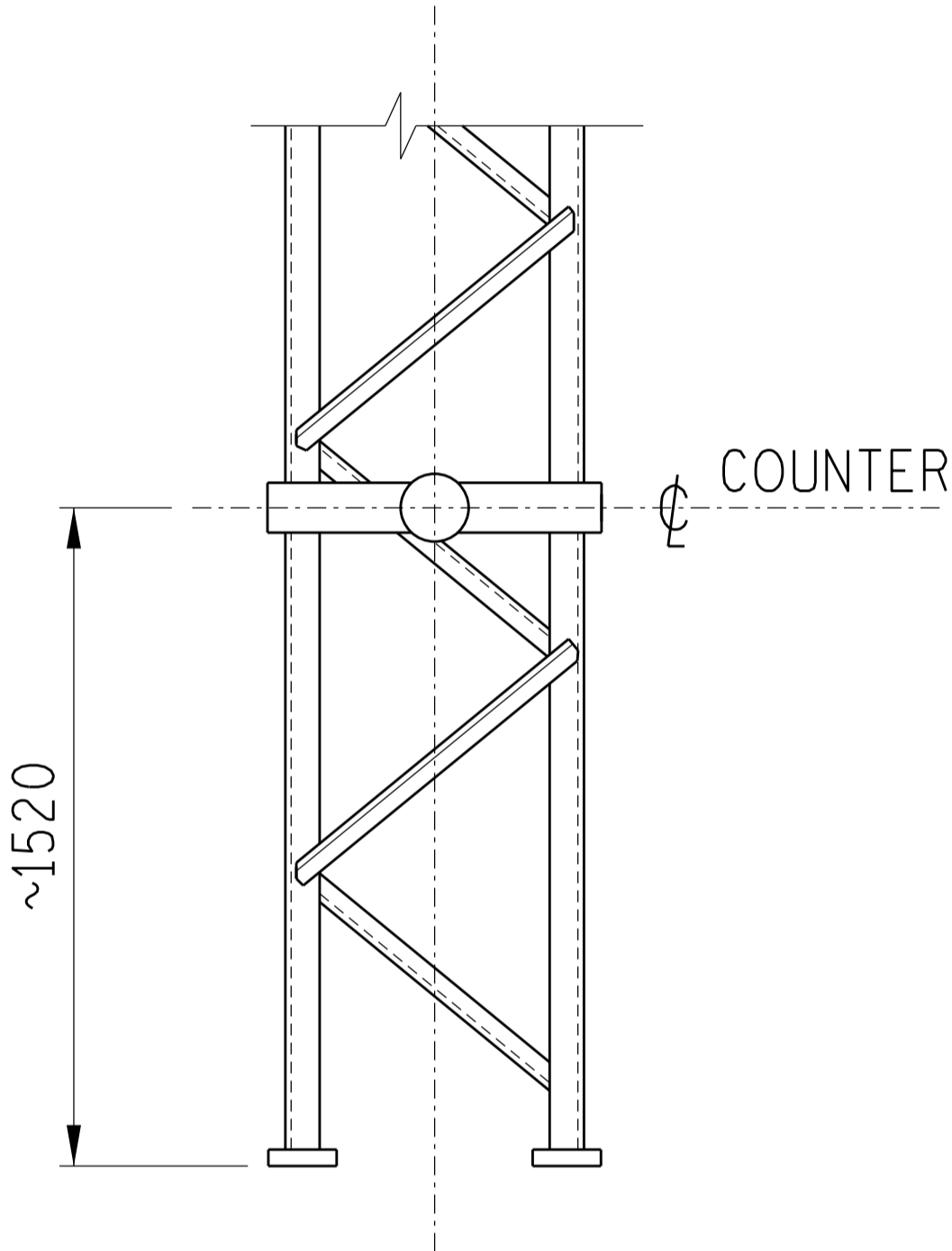
2

3

4

EARTHING OF SURGE ARRESTERS
FITTED WITH DISCHARGE COUNTERS
(CONTINUED ON SHT T9)

FOR DISCHARGE COUNTER & PI
BRACKET DETAILS SEE
DRG No 0.54/6603



2500 – 7000 HIGH
MEDIUM SUPPORT



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2

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STANDARDS

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SHEET NUMBER

REVISION

T8

2

1

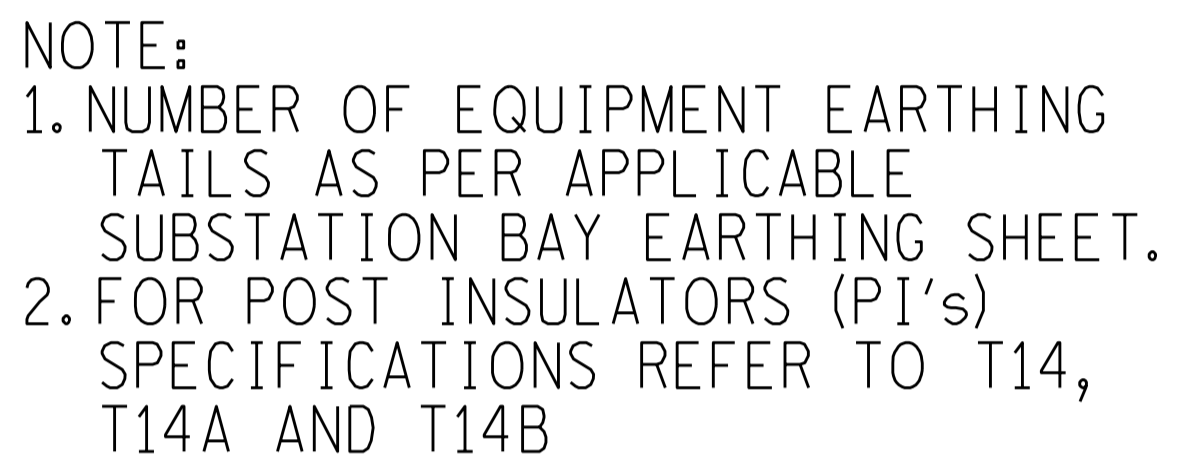
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3

4

SIZE
GROOTTE A4L

(CONTINUED ON SHT T8)



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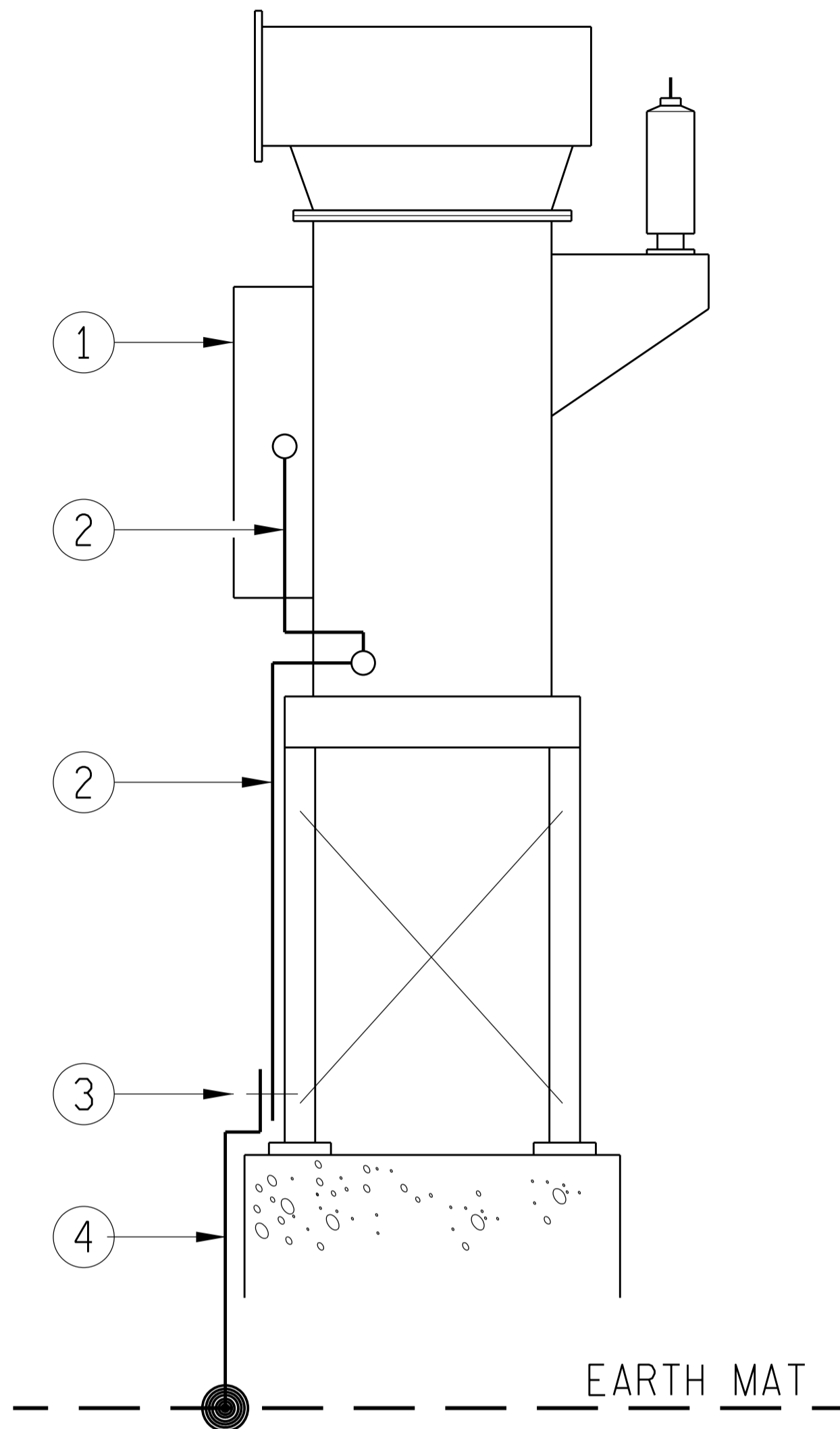
SHEET NUMBER

REVISION

T9

3

HV YARD AUXILIARY TRANSFORMER



- ① LV TERMINAL BOX.
- ② NEUTRAL TERMINAL EARTHING STRAP 50x3 Cu FLAT.
- ③ FOR CONNECTION CLAMP, REFER TO SHT C7.
- ④ SUPPORT STEELWORK EARTHTAIL (SEE NOTE).

NOTE:
SUPPORT STEEL EARTHING.
NUMBER OF EARTHING CONNECTIONS TO EARTH MAT
AS PER APPLICABLE SUBSTATION BAY EARTHING LAYOUT.



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EARTHING STANDARDS

0.54 / 393

SHEET NUMBER

T11

REVISION

1

TYPE OF CABLE ARMOURING	GLAND TYPE	MAKE
ALUMINIUM	ALUMINIUM GLAND	FALKADE
STEEL WIRE	CHROME PLATED GLAND	CMP RE PRATLEY
UNARMoured	COMPRESSION CLAND	CMP

NOTE:
CABLE ARMOURING EARTHED AT BOTH ENDS DRAIN WIRE EARTHED AT ONE END ONLY. EITHER
1. AT IDF
OR
2. AT PROTECTION PNL
OR
3. AT NEAREST POIT TO MAIN
IDF DRAIN WIRE AT OTHER END
OF CABLE TO BE CUT BACK AND
INSULATED.

2. AT PROTECTION PNL

OR
3. AT NEAREST POIT TO MAIN
IDF DRAIN WIRE AT OTHER END
OF CABLE TO BE CUT BACK AND
INSULATED.

Diagram illustrating the cross-section of a cable conductor, showing the central core and the surrounding insulation layers.

Diagram illustrating the cross-section of a cable with an inner cable sheath. The diagram shows a central core surrounded by an inner cable sheath, which is further enclosed by an outer jacket. The label "INNER CABLE SHEATH" points to the inner layer.

— EARTH CONNECTING STRAP TO GLAND

Diagram illustrating a zinc plate connected to a galvanic cell. The zinc plate is labeled "ZINC PLATE". The galvanic cell is labeled "GALVANIC CELL". The zinc plate is connected to the negative terminal of the galvanic cell.

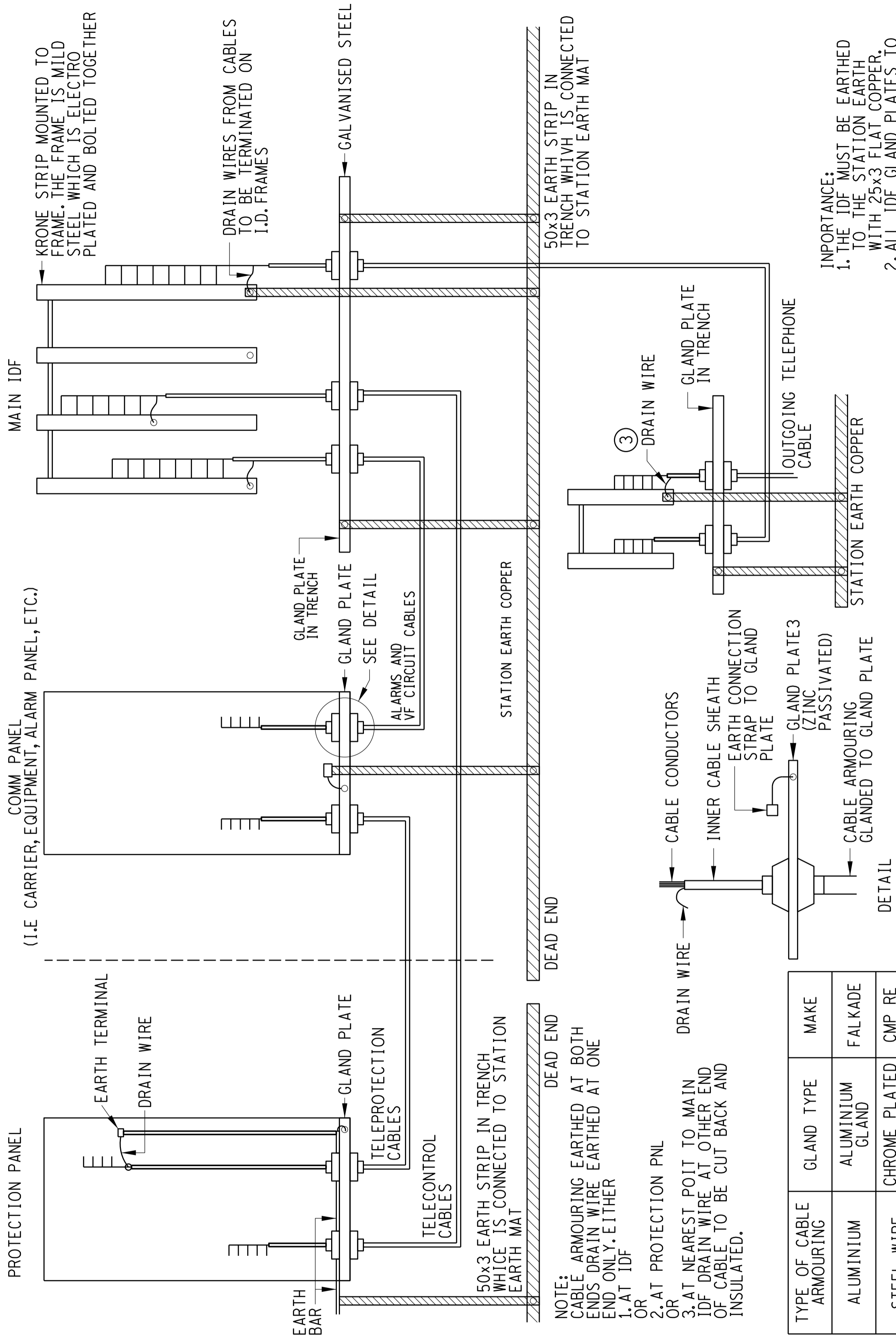
ALKADE

→ CABLE ARMOURING
GLANDED TO GLAND PLATE

DETAIL

IMPORTANCE:

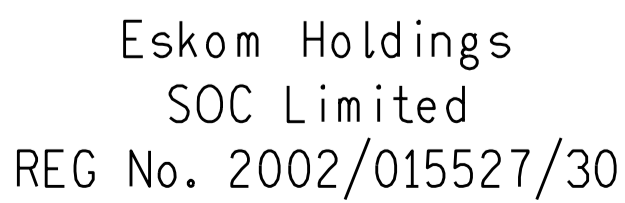
1. THE IDF MUST BE EARTHED TO THE STATION EARTH WITH 25x3 FLAT COPPER.
2. ALL IDF GLAND PLATES TO BE EARTHED WITH 25x3 FLAT COPPER TO STATION EARTH.



A STRIP OF APPROX. 80mm WIDE AROUND THE CENTRE PORTION OF THE RAIL, WHICH INCLUDES THE WELD AREA, IS TO BE BITUMISED WHILE STILL HOT FROM THE WELD PROCESS.

NOTE:

1. * THE NUMBER OF THE ANODES IS TO BE DETERMINED BASED ON THE CORROSIVENESS OF THE SOIL AND SURROUNDING CONDITIONS.
2. THE POSITIONS OF THE ANODES ARE TO BE INDICATED THUS $\textcircled{\text{S}_{\text{EA}}}$ ON THE FOUNDATION, TRENCH & EARTHMAT DRAWING OF THE SUBSTATION.



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5

1

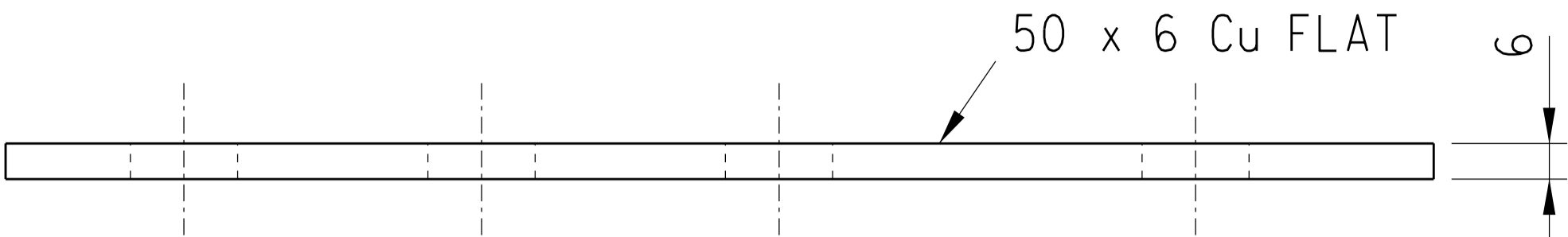
2

3

4

CAPACITOR BANK EARTH STUD ADAPTOR PLATE

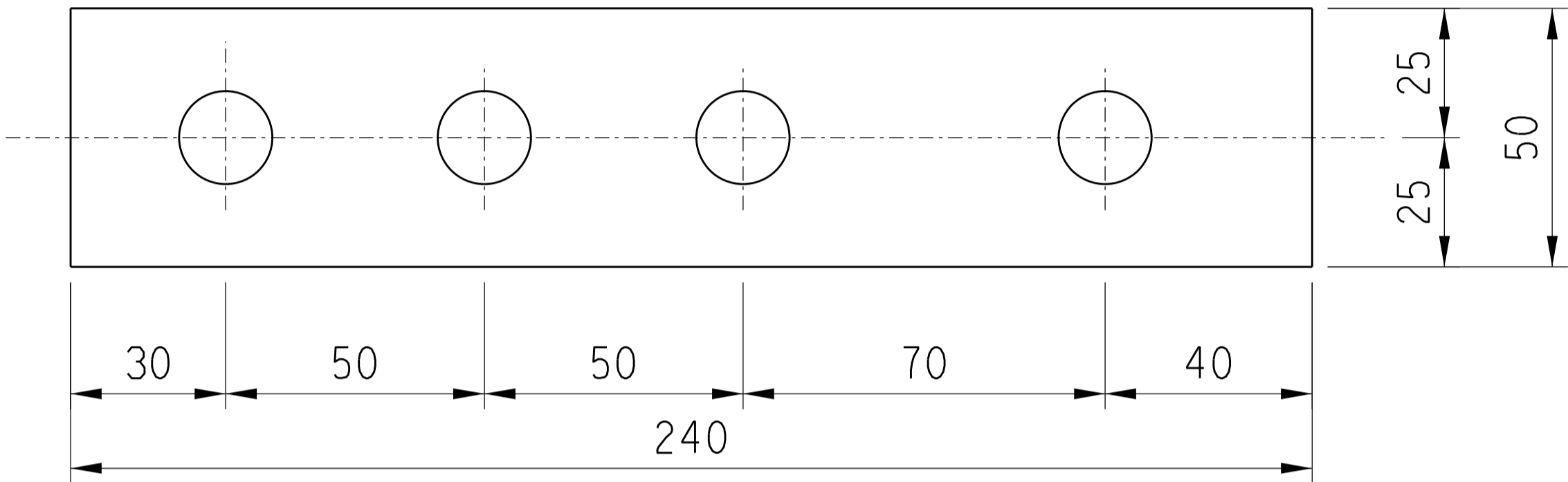
A



A

ELEVATION

B



B

C

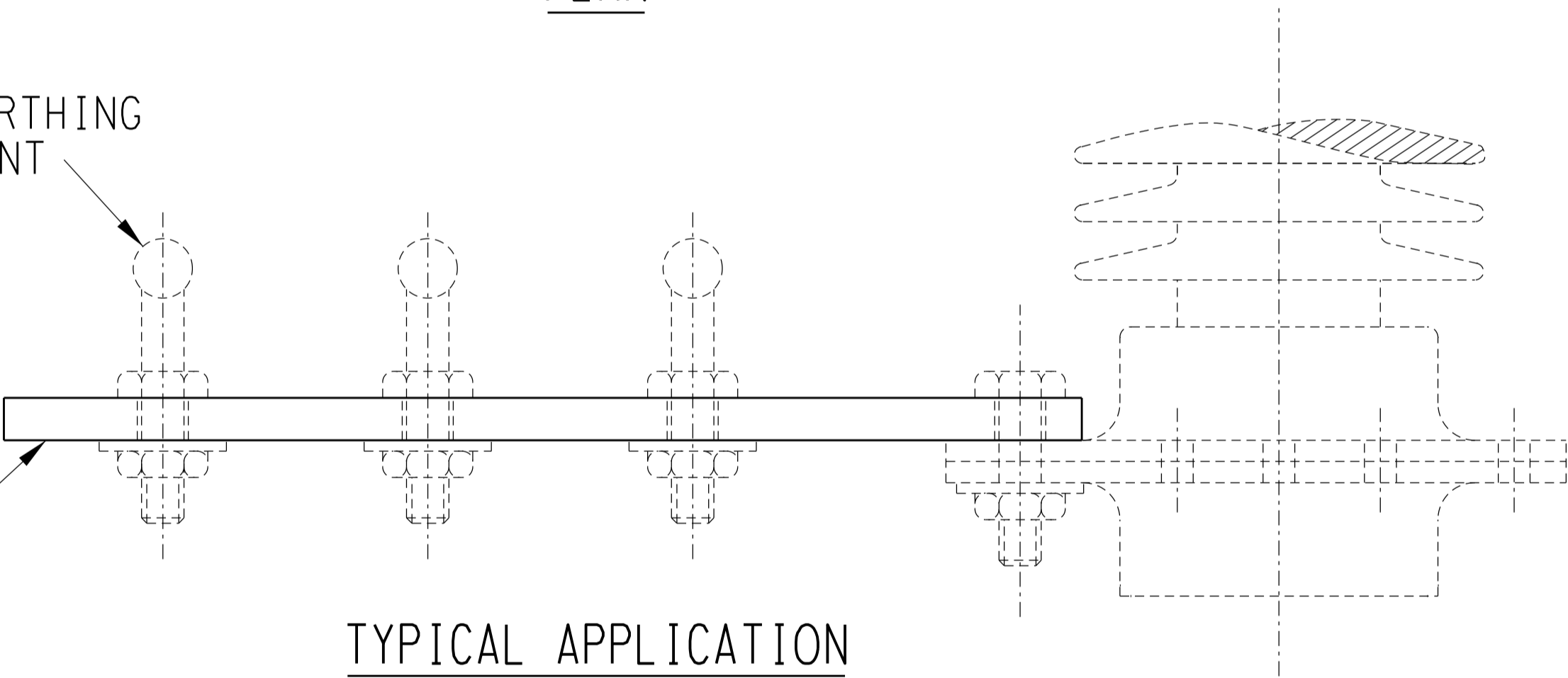
C

PLAN

D

FIXED EARTHING
BALL JOINT

ADAPTOR
PLATE



D

E

E

NOTE:
1. ALL HOLES TO BE $\phi 18$.

F

F



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1

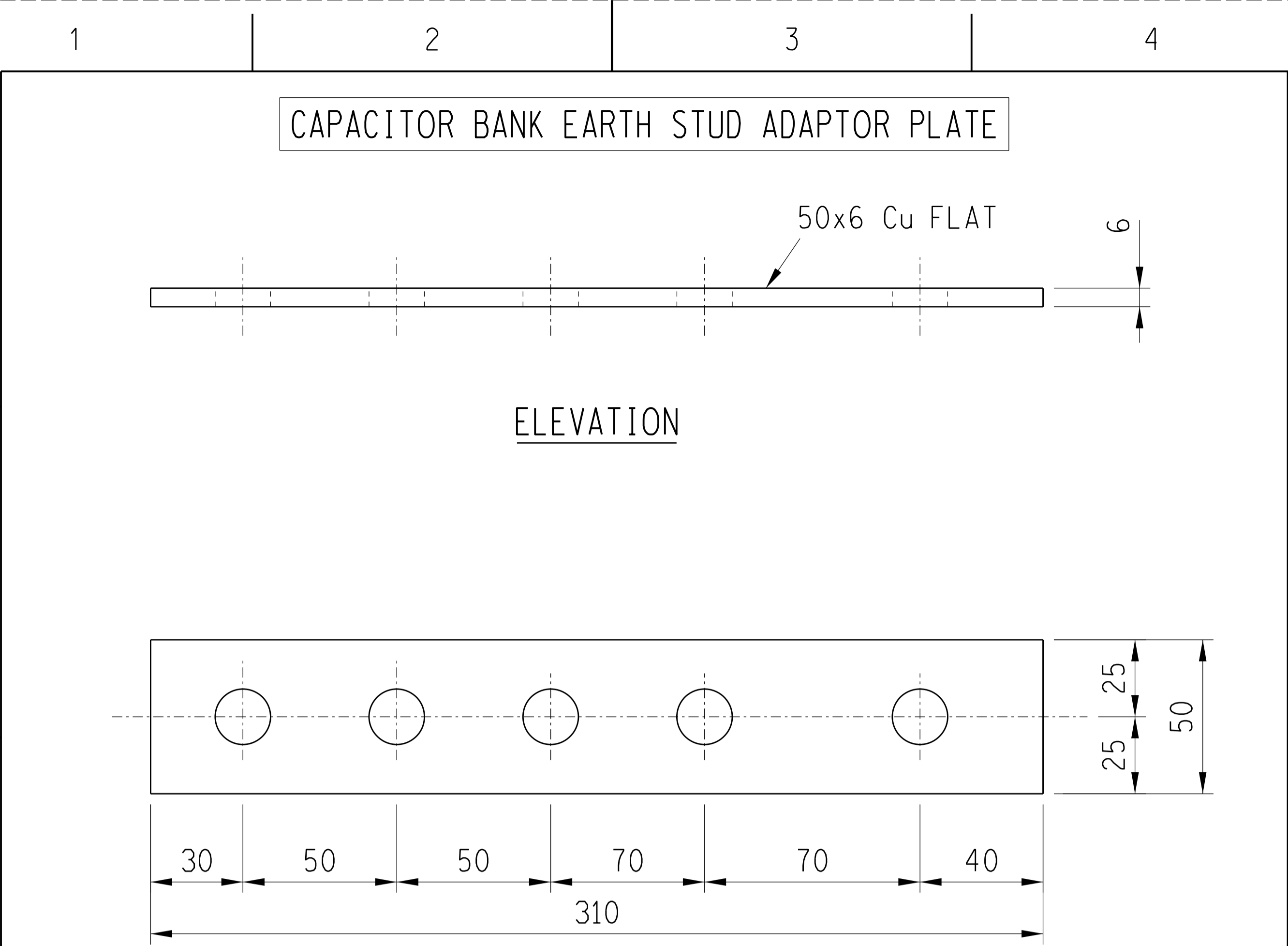
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4

SIZE
GROOTTE A4L



1

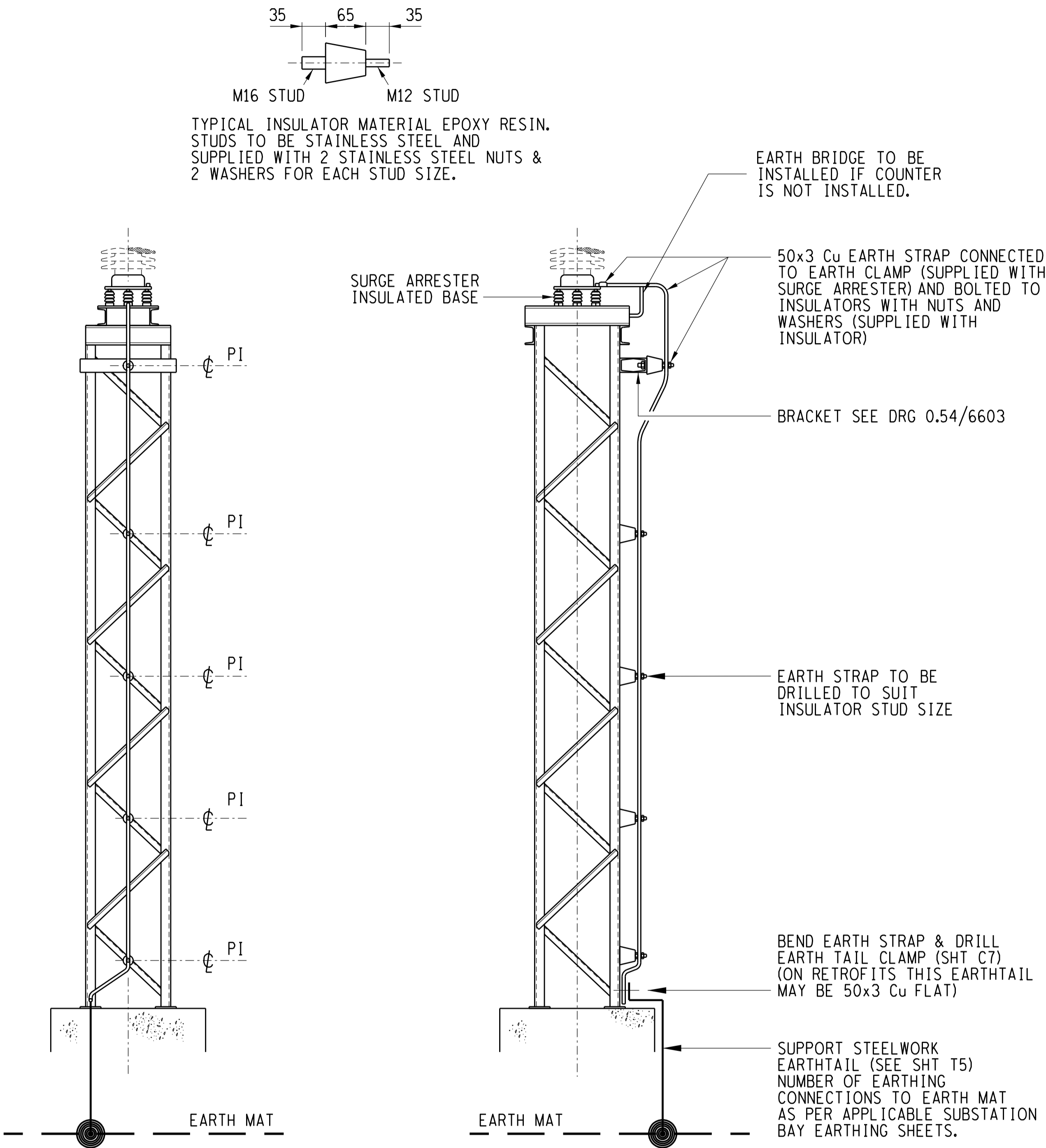
2

3

4

EARTHING OF SURGE ARRESTER MOUNTED ON INSULATED BASE
WITH PROVISION FOR CONDITION MONITORING DEVICE

(SEE ALSO SHT T14A & T14B)



TYPICAL ARRANGEMENT

INSULATOR QUANTITY VARIES WITH SUPPORT HEIGHT
5000 HIGH SHOWN SEE SHT T14A & T14B.



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1

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SIZE GROOtte A4L

1

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EARTHING OF SURGE ARRESTER MOUNTED ON INSULATED BASE
WITH PROVISION FOR CONDITION MONITORING DEVICE

(SEE ALSO SHT T14 & 14B)

A

A

B

B

C

C

D

D

E

E

F

F

FOR PI BRACKET DETAILS
SEE DRG 0.54/6603

0.54/302
2500 HIGH
MEDIUM SUPPORT
(3 INSULATORS)

0.54/303
3000 HIGH
MEDIUM SUPPORT
(3 INSULATORS)

0.54/304
3500 HIGH
MEDIUM SUPPORT
(4 INSULATORS)

0.54/305
4000 HIGH
MEDIUM SUPPORT
(4 INSULATORS)

0.54/4707
4500 HIGH
MEDIUM SUPPORT
(5 INSULATORS)



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1

1

2

3

4

SIZE
GROOTTE A4L

1

2

3

4

EARTHING OF SURGE ARRESTER MOUNTED ON INSULATED BASE
WITH PROVISION FOR CONDITION MONITORING DEVICE

(SEE ALSO SHT T14 & 14A)

A

A

B

B

C

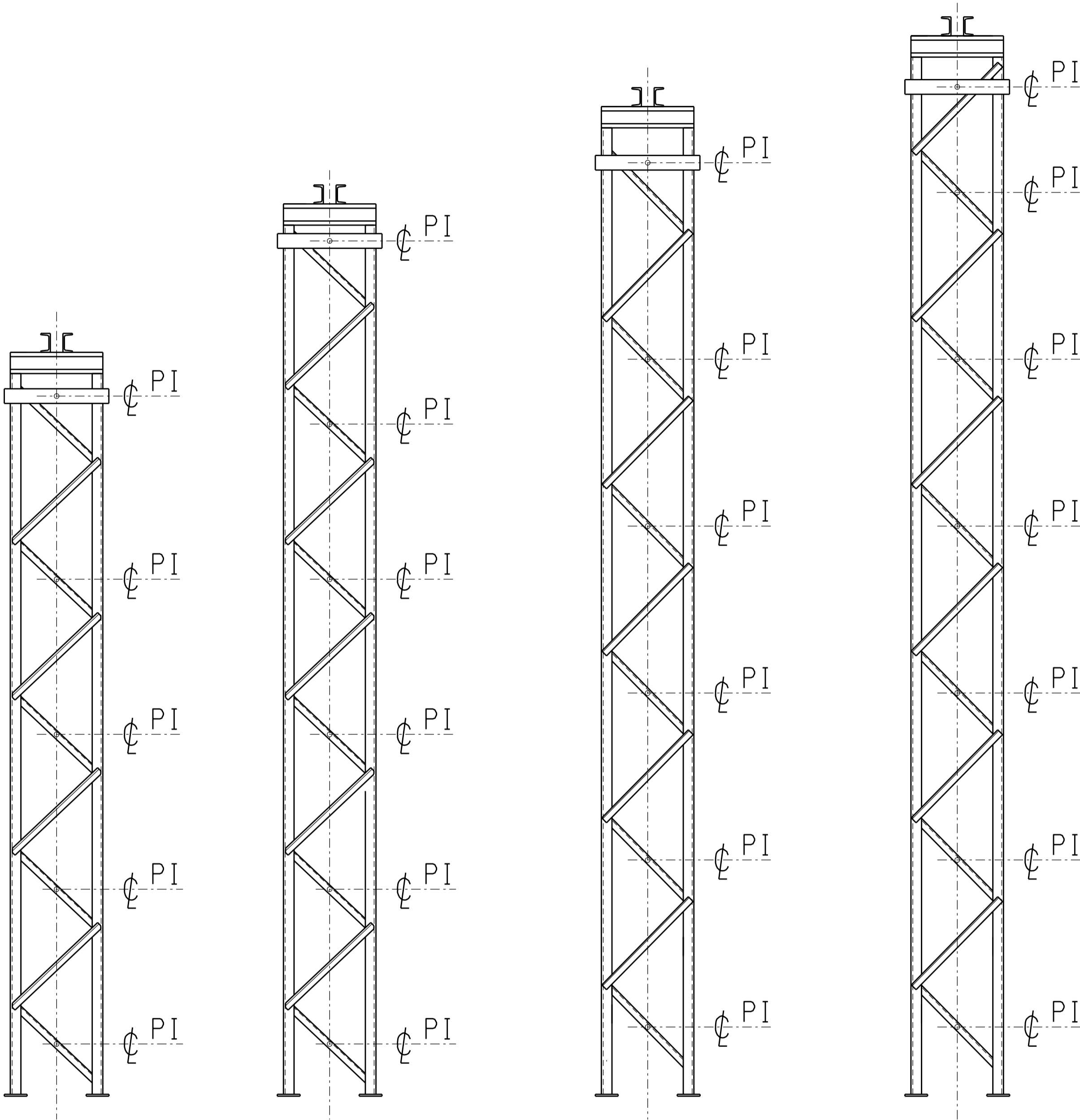
C

D

D

E

E



0.54/1596
5000 HIGH
MED. SUPPORT

0.54/4160
6000 HIGH SUPPORT
(SA MTD ON FIRE
BARRIER SUPPORT)

0.54/4586
6500 HIGH SUPPORT

0.54/4318
7000 HIGH SUPPORT

(5 INSULATORS)

(6 INSULATORS)

(6 INSULATORS)

(7 INSULATORS)

F

F



Eskom Holdings
SOC Limited
REG No. 2002/015527/30

1

DRG SHEET REPLACED. GENERAL REDAWN.

JMV

KN

TM

09/07/2019

REV

REVISION DESCRIPTION

BY

CHKD

AUTH

DATE

EARTHING
STANDARDS

0.54/393

SHEET NUMBER

REVISION

T14B

1

1

2

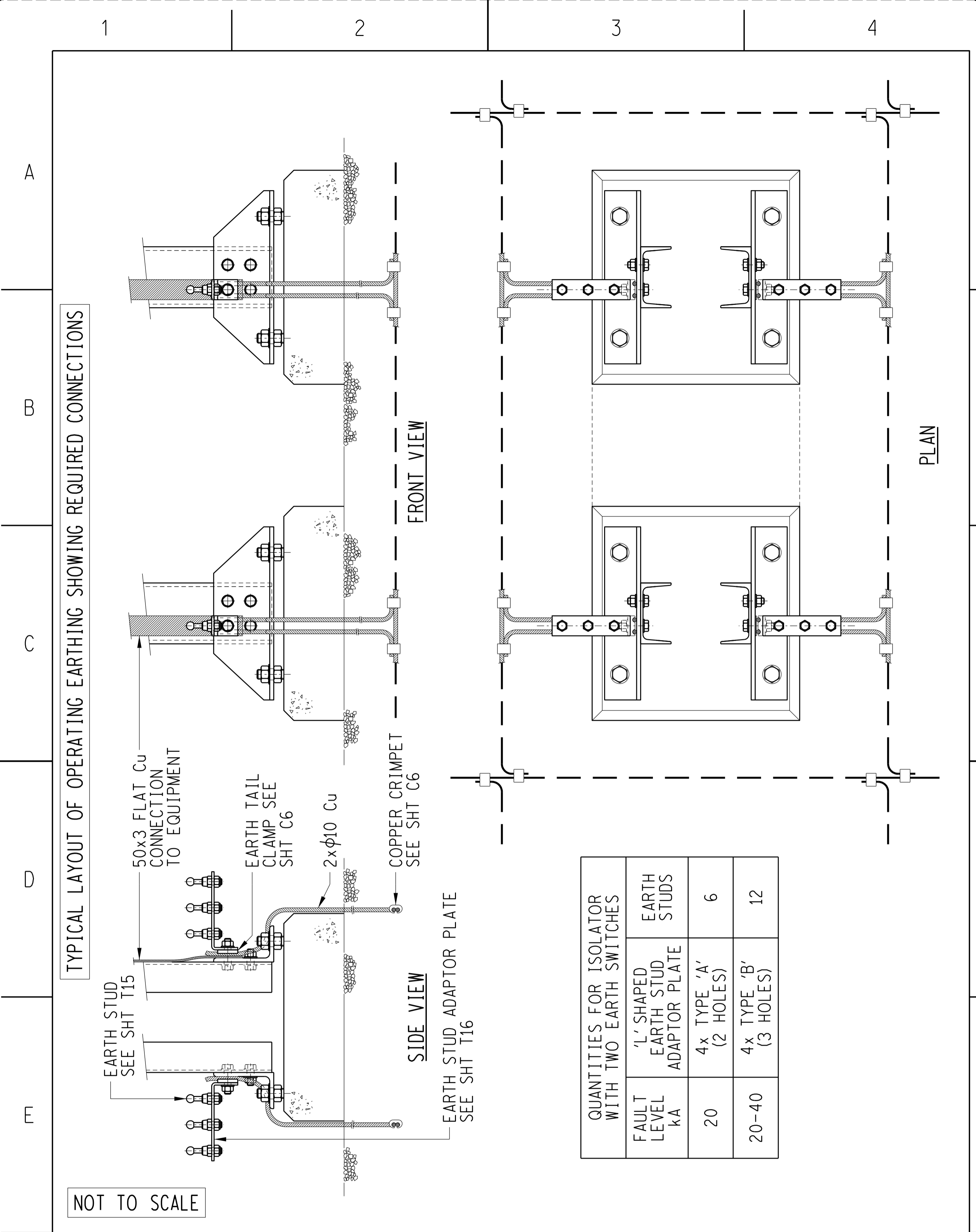
3

4

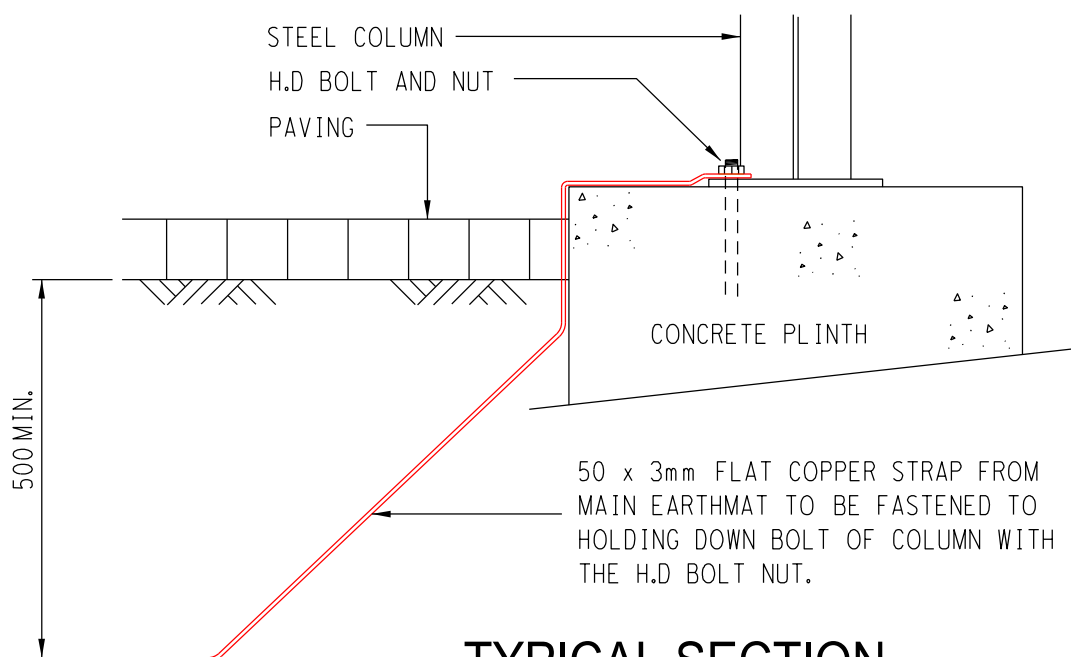
SIZE
GROOTTE A4L

1		2		3		4			
A	<div>EARTH STUD</div> <div></div> <div>NOT TO SCALE</div> <div>NOTE : DRAWING NOT FOR MANUFACTURING PURPOSE.</div>							A	
B								B	
C								C	
D	<div>SHORT DESCRIPTION: JOINT, BALL PORTABLE EARTH 20kA T/C</div> <div>TECHNICAL DESCRIPTION: BALL JOINT (SINGLE) FOR USE ON PORTABLE EARTH ASSEMBLY. FAULT LEVEL : 0-20kA; BALL DIAMETER: 20mm. ITEM A - MATERIAL: TINNED COPPER. ITEM B - THREADED ROD: M16 - MATERIAL: STAINLESS STEEL. M16 HEX. NUT - MATERIAL: STAINLESS STEEL. ITEM B TO BE TIGHTENED BY SCREWING INTO ITEM A. SUPPLIED WITH HEX. NUT, WASHER AND SPRING WASHER.</div>							D	
E								E	
F	<div></div> <div>Eskom Holdings SOC Limited REG No. 2002/015527/30</div>	<div>1FIRST ISSUE</div> <div>REVREVISION DESCRIPTION</div>	<div>JMV</div> <div>BY</div>	<div>KN</div> <div>CHKD</div>	<div>TM</div> <div>AUTH</div>	<div>01/07/2019</div> <div>DATE</div>	<div>0.54/393</div> <div>SHEET NUMBER</div> <div>T15</div>	<div>REVISION</div> <div>1</div>	F
1		2		3		4		SIZE GROOTTE	A4L

	1	2	3	4	
A	<div>ADAPTOR PLATE FOR EARTH STUD</div> <div>TYPE 'A'</div> <div> FLAT LENGTH: 198mm MATERIAL: COPPER 3 HOLES: 17 DIA </div>				A
B					B
C	<div>TYPE 'B'</div> <div> FLAT LENGTH: 263mm MATERIAL: COPPER 4 HOLES: 17 DIA </div>				C
D					D
E	<div>NOTE:</div> <div>1.) MATERIAL TO BE 50x6 COPPER.</div> <div>2.) ALL SHARP EDGES TO BE BLUNT OFF.</div>				E
F	<div> Eskom Holdings SOC Limited REG No. 2002/015527/30 </div>	<div>1</div> <div>FIRST ISSUE</div> <div>REV</div> <div>REVISION DESCRIPTION</div> <div>EARTHING STANDARDS</div>	<div>JMV</div> <div>KN</div> <div>TM</div> <div>01/07/2019</div> <div>BY</div> <div>CHKD</div> <div>AUTH</div> <div>DATE</div>	<div>0.54/393</div> <div>SHEET NUMBER</div> <div>T16</div> <div>REVISION</div> <div>1</div>	F
	1	2	3	4	SIZE GROOTTE A4L



<div></div> <div>Eskom Holdings SOC Limited REG No. 2002/015527/30</div>	0	FIRST ISSUE	JMV	IH	TM	20/10/2015
	REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE
	EARTHING STANDARDS		0.54/393			
			SHEET NUMBER		REVISION	
			T17		0	

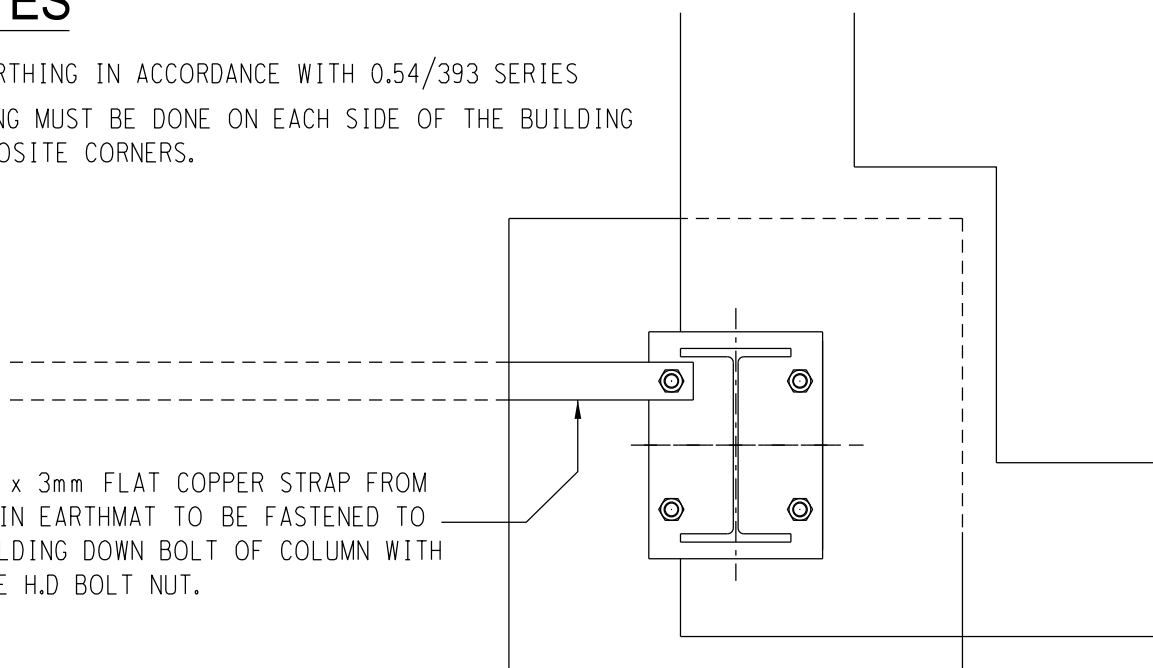


TYPICAL SECTION

NOTES

1. ALL EARTHING IN ACCORDANCE WITH 0.54/393 SERIES
2. EARTHING MUST BE DONE ON EACH SIDE OF THE BUILDING AT OPPOSITE CORNERS.

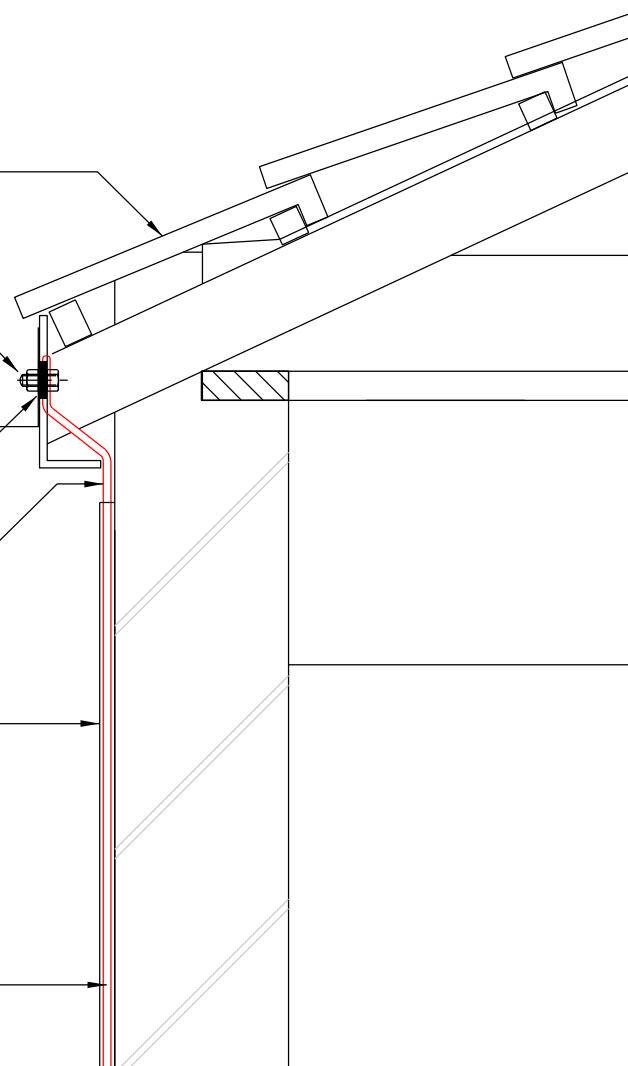
50 x 3mm FLAT COPPER STRAP FROM MAIN EARTHMAT TO BE FASTENED TO HOLDING DOWN BOLT OF COLUMN WITH THE H.D BOLT NUT.



PLAN

EARTHING TO CLADDED STORE BUILDING COLUMN

	DRAWN GETEKEN	DBN	JAN 2020	CHKD NAGES	 23/7/20	AUTH MAS	 23-7-20	REV	0	DATE DATUM	
	H V YARD CIVIL WORK STANDARD DETAILS								0.54/393		
									SHEET T18		



NOTES

IF GUTTERS IS NOT CONTINUOUS AND IS DIVIDED, EACH MUST BE EARTHED SEPARATELY AND FIXED TO THE MAIN EARTH MAT

A4L