

**TYPICAL EARTHING LAYOUT  
(FOR 2 TRANSFORMER SUBSTATION)**  
SCALE 1:50

NO	DESCRIPTION	DRN	DATE	CKD	APPD
9	AMENDED EARTHING RING. COMBINED MESH & ROD EARTH. UPDATED LOCAL EARTH TAIL TO INSULATED CABLE. ADDED & AMENDED LABELS.	P.BH.	JUL'23	B.C.	B.V.
8	AMENDED TRANSFORMER NEUTRAL CONNECTION REFERENCE. AMENDED IMAGERY.	P.BH.	APR'22	B.V.	B.C.
7	UPDATED EARTHING RINGS	A.N.	OCT'21	A.N.	B.V.
6	UPDATE NOTES, TWO CRIMPS REQUIRED PER CONNECTION OR CADWELD	C.W.M.	OCT'21	B.V.	A.N.
5	UPDATE EARTHING DESIGN. ADDED SHEET 2. REMOVED NOTE 4. ADDED NOTE 5. TITLEBLOCK & DRAWING NUMBER FORMATTED	K.T.	FEB'19	C.C.	C.C.
4	PIT EARTH ADDED	P.H.	APR'18	I.B.	B.C.
3	NOTE PIT EARTH ADDED	P.H.	OCT'17	I.B.	B.C.



DES	I. PURVES
DRN	G.R./A.D.
CKD	S. LEACH
APPD	F. ROBSON
SCALE	AS SHOWN
ISSUED	MARCH'98
ALL DIM.	IN mm

POWER STANDARD DRAWING	
<b>INDOOR SUBSTATION EARTHING LAYOUT SHEET 1 OF 2</b>	
A3	DRAWING NUMBER S02-02-07-46_1
DRAFTING STANDARD TO A.S.1100 CAD PRODUCT - DO NOT AMEND MANUALLY	



**NOTES:**

1. THE EARTH RODS ARE TO BE INSTALLED AND CONNECTED AS SHOWN IN THE TYPICAL EARTHING LAYOUT, WITH THE COMMON EARTHING TAIL BEING BROUGHT UP AGAINST THE SUBSTATION WALL IN THE VICINITY OF THE FUTURE NEUTRAL/EARTH BAR POSITION (REFER TO NOTE 6 FOR DETAILS), PRIOR TO POURING OF THE SUBSTATION FLOOR. ALTERNATIVELY, BARE COPPER CABLE MAY BE USED INSTEAD OF EARTH ELECTRODE UNLESS EXPLICITLY STATED OTHERWISE. AN EARTH ROD MAY BE CONNECTED BY TWO PROFILE '6' CONNECTORS TO END OF CABLE FOR EXTRA MASS TO ASSIST INSTALLATION.
2. UNLESS EXPLICITLY STATED OTHERWISE ALL EARTHING CABLES TO BE OF A MINIMUM 70sq mm COPPER CABLE.
3. CONNECTION FOR EARTH ROD AND EARTHING CABLE FOR EARTH RODS SHOULD BE AS DETAILED ON DRAWING No. S01-01-05-08 IN THE OVERHEAD LINE MANUAL.
4. A MINIMUM OF FOUR (4) EARTH RODS ARE TO BE INSTALLED IN A SINGLE TRANSFORMER SUBSTATION AND SIX (6) RODS IN A TWO OR THREE TRANSFORMER SUBSTATION. EARTH ELECTRODES MUST BE 14mm DIAMETER SS316 RODS INSTALLED INTO GROUND OR BARE 70 sq.mm COPPER CONDUCTOR INSTALLED AS FOLLOWS:
  - USE AUGER WITH MINIMUM 50mm DIAMETER TO DRILL BORE HOLES TO A DEPTH OF 3-5m; (DEEPER IS PREFERRED)
  - EARTH RODS TO BE SPACED WELL APART PREFERABLY NEAR THE CORNERS FOR GREATER SPACING BUT IN NO CASE CLOSER THAN 3m. FOR UPPER LEVEL SUBSTATION REFER TO S02-02-07-00 NOTE 6.
  - CONNECT EACH ROD WITH A 70sq.mm COPPER INSULATED CONDUCTOR BY A PROFILE '6' COMPRESSION CONNECTOR.
  - BACKFILL EACH HOLE WITH A WATERED MIXTURE OF EXISTING SOIL AND ONE BAG OF EARTHING COMPOUND WITH WATER. RATIO IS ONE (1) BAG EARTH COMPOUND TO 5L WATER.



NOTE:

  - (i) INSULATION TO BE REMOVED FROM THE CABLE WHICH IS IN THE BORE HOLE, TO INCREASE SURFACE CONDUCTIVITY TO GROUND.
  - (ii) ALL BARE CONNECTIONS, SUCH AS COMPRESSION CONNECTORS NEED NOT BE INSULATED, HOWEVER CARE MUST BE TAKEN TO ENSURE THAT NO BARE CONNECTION TOUCHES THE CONSUMERS' STEELWORK.
5. THE COMBINED EARTHING SYSTEM SHALL HAVE A RESISTANCE TO EARTH NOT GREATER THAN 1 OHM WITH ALL CONNECTIONS MADE INCLUDING CMEN.  
  
THE EARTH ELECTRODE SYSTEM MUST HAVE A RESISTANCE NO GREATER THAN THIRTY (30) OHMS WHILST ISOLATED FROM THE REMAINING EARTH SYSTEM INCLUDING CMEN. CONNECTIONS.
6. A COMMON NEUTRAL/EARTH BAR IS TO BE INSTALLED WITHIN THE SUBSTATION. THE BUSBAR SHALL BE 80X6.3mm H.D.H.C. TINNED COPPER, MOUNTED ON LV INSULATORS APPROXIMATELY 300mm ABOVE THE SUBSTATION FLOOR AND SHOULD EXTEND FOR THE FULL DISTANCE BETWEEN THE LOW VOLTAGE CIRCUIT BREAKER POSITIONS, AND IN NO CASE BE LESS THAN 2m IN LENGTH. THE BUSBAR MUST BE MOUNTED ON BOBBIN STYLE STANDOFF INSULATORS. NUMBER OF HOLES TO SUIT INSTALLATION AND 8 SPARE.
7. THE TRANSFORMER NEUTRAL SIZE SHALL BE THE SAME SIZE AS THE ACTIVE CONDUCTORS.

8. THE FOLLOWING IS A GUIDE FOR THE DISCONNECTION OF COMPONENTS WHEN WORKING ON AN EARTHING INSTALLATION.

L.V. TRANSFORMER NEUTRAL TRANSFORMER EARTH LV SURGE DIVERTER EARTH	} PERMITTED ONLY WHEN THE ASSOCIATED TRANSFORMER IS TAKEN OUT OF SERVICE
CABLE TRAY EARTH	NO RESTRICTION, EXCEPT TO KEEP TIME OF DISCONNECTION TO MINIMUM
LV NETWORK DISTRIBUTOR NEUTRAL LV NETWORK DISTRIBUTOR SHEATH	} PERMITTED ONLY WHEN THE LV NETWORK DISTRIBUTOR IS TAKEN OUT OF SERVICE.
CONSUMERS' NEUTRAL	PERMITTED ONLY WHEN CUSTOMERS SERVICE IS TAKEN OUT OF SERVICE.
C.M.E.N.	PERMITTED WHEN EARTH ELECTRODE SYSTEM IS IN SERVICE
EARTH ELECTRODES	PERMITTED WHEN C.M.E.N. SYSTEM IS IN SERVICE
H.V. SWITCHGEAR EARTH OR IT EARTH BAR	PERMITTED ONLY WHEN ALL HV FEEDERS TAKEN OUT OF SERVICE
H.V. CABLE SHEATHS	PERMITTED ONLY WHEN THE ASSOCIATED HV FEEDER IS TAKEN OUT OF SERVICE
REINFORCING MESH	NO RESTRICTION EXCEPT TO KEEP TIME OF DISCONNECTION TO A MINIMUM

9. SUBSTATION METALWORK MUST ONLY BE CONNECTED TO SUBSTATION EARTH BAR WHEN SUBSTATION METALWORK IS ELECTRICALLY SEPARATE FROM ALL OTHER BUILDING METALWORK AND EARTHED METALWORK CONNECTIONS.
10. A SEPARATE EARTH BAR SHALL BE WITHIN THE HV PIT. THE BUSBAR SHALL BE A MINIMUM OF 50x3 H.D.H.C TINNED COPPER MOUNTED ON BOBBIN INSULATORS AT MAXIMUM INTERVALS APPROX 300mm FROM THE TOP OF THE HV PIT. THE EARTH BAR SHALL BE MOUNTED AT EITHER END OF THE HV PIT AND AVOID AREAS UNDER THE SWITCH. THIS BUSBAR SHALL BE CONNECTED TO THE COMBINED EARTH/NEUTRAL BAR BY 2x70 sq.mm COPPER YELLOW/GREEN INSULATED CABLE AND HAS A MINIMUM OF 2 SPARE HOLES.
11. ALL CABLES ATTACHING TO THE EARTH/NEUTRAL BAR SHALL BE LABELED WITH CRITCHLEY K TYPE LABELED AS LISTED IN S02-01-08-25.
12. ALL METAL GRATES (CABLE TRENCH COVERS) MUST BE INDIVIDUALLY BONDED TO THE EARTH GRID WITH 70 sq.mm FLEXIBLE Y/Gr INSULATED COPPER CABLE WITH ENOUGH SLACK TO REMOVE THE GRATES FROM THE CABLE TRENCH WITHOUT REMOVING THE EARTH BOND. NON-CONDUCTIVE GRATES DO NOT REQUIRE EARTHING.
13. EACH INDIVIDUAL PIECE OF REINFORCING MESH MUST BE INTERCONNECTED TO EARTHING RING. REINFORCING MESH WITHIN SUBSTATION MUST BE INTERCONNECTED ELECTRICALLY WITH ADJACENT BUILDING REINFORCEMENT.

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