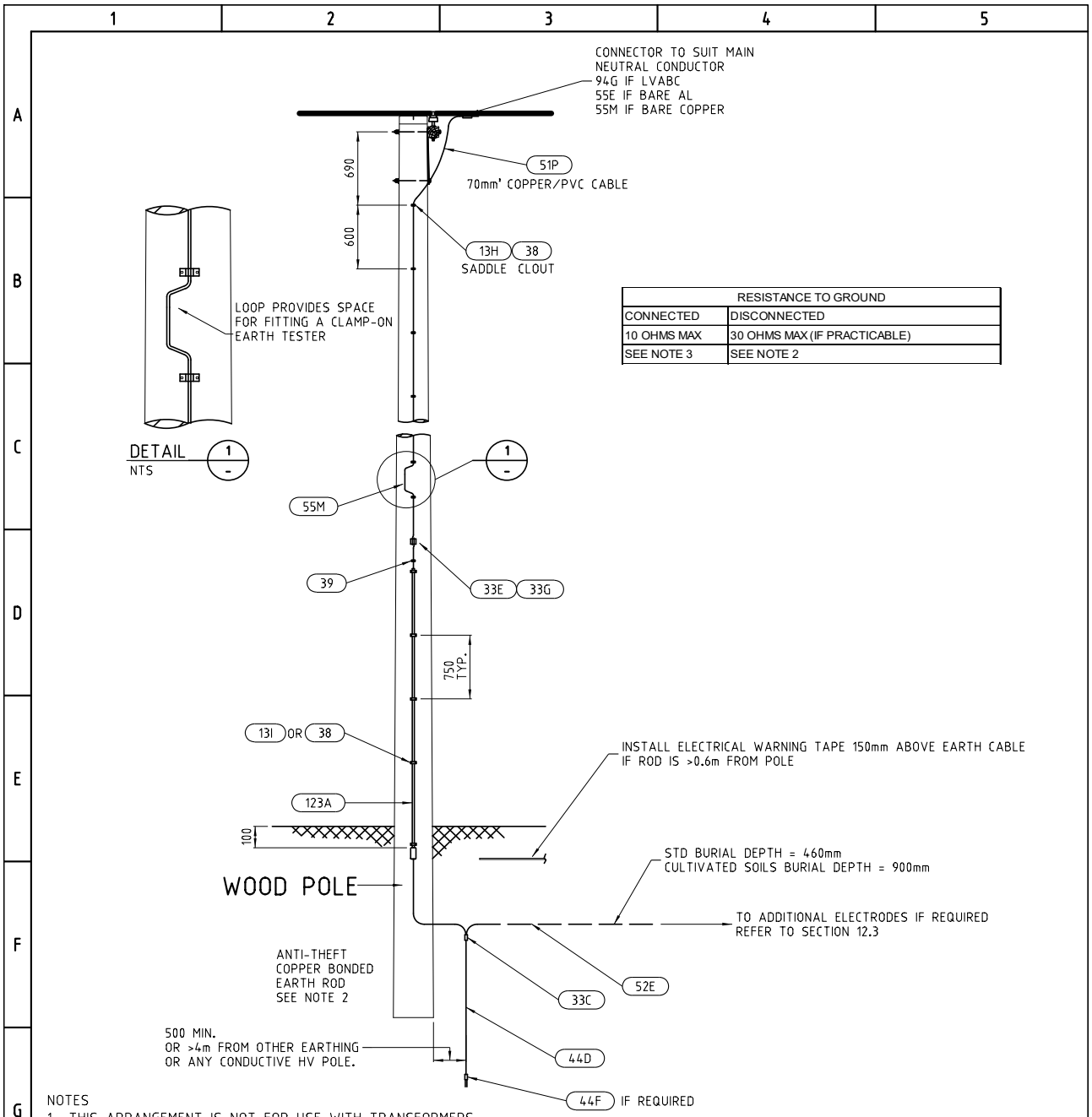
SECTION 12- EARTHING

VERSION 1.1

SECTION 12 – EARTHING

12.1 MEN – LV Neutral Earth Wood Pole



RESISTANCE TO GROUND	
CONNECTED	DISCONNECTED
10 OHMS MAX	30 OHMS MAX (IF PRACTICABLE)
SEE NOTE 3	SEE NOTE 2

NOTES
1. THIS ARRANGEMENT IS NOT FOR USE WITH TRANSFORMERS.
2. IT IS NOT ESSENTIAL TO ACHIEVE 30Ω AT EACH PLATE
   IF IN AN AREA WITH POOR SOIL EG; ROCK
   DRY SAND
   GRAVEL
3. WHERE THE LV DISTRIBUTION AREA IS ISOLATED FROM OTHER DISTRIBUTION CENTRES, HIGHER VALUES OF CONNECTION RESISTANCE ARE ALLOWED;
   30Ω MAX. - TRANSFORMERS UP TO 63kVA
   15Ω MAX. - TRANSFORMERS 100kVA AND ABOVE.
   THIS IS PERMISSBLE PROVIDED THAT LVABC IS USED FOR ALL LV MAINS BELOW BARE HV MAINS.
4. A TASNETWORKS ASSET / FIELD ENGINEER MUST BE CONSULTED WHERE APPROPRIATE EARTHING VALUES CANNOT BE REACHED.

APL Nos: EARTH/LV16mm/PLM

DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED

ALTERATIONS: ORIGINAL ISSUE

TasNetworks

DRAWN	C5 PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	17/JUN/19

TITLE: MEN - LV NEUTRAL EARTH WOOD POLE

SCALE: NTS

A4

D - OHC - M001 - SD - 001

REVISION: A

MEN LV Neutral Earth - Wood Pole – Materials list

Unit Assembly	Store Type	Item Ref	Stock Item	Stock Item Description	Quantity
EARTH/LV16MM/PLM	S	44D	155010	GROUND ROD,EARTH 13 X 1800MM ERICO611360	2 (or AR)
		44E	155145	COUPLING,GROUND ROD 13MM ERICO CC12F	1 (or AR)
		44F	155171	DRIVING HEAD,GROUND ROD HAND TYPE-DH12	1 (or AR)
		33C	155134	CONNECTOR,GROUND ROD 13-16 TO 50-70MM	1
		33E	155136	CONNECTOR,GROUND ROD 50-70 TO 50-70MM	1
		33G	155138	CONNECTOR,GROUND ROD 95-120 TO 95-120MM	1
		51P	94184	WIRE,BLDNG 70MM2 X 19/2.14 X 0.6/1KV BLK	8
		123A	155002	ROD,EARTH,ANTI-THEFT 70MM2	1
		13I	154541	SADDLE,FULL 16MM 2-HOLE GAL.STEEL	5
		38	72580	NAIL,CLOUT 2.8MM X 40MM GAL STEEL	24
		13H	154540	SADDLE,FULL 13MM 2-HOLE GAL.STEEL	7
		55M	144958	CLAMP,PG OH CONNECT 2.7-10.5 COPPER	1
		55E	144955	CLAMP,PG OH CONNECT 7.5-17.5/7.5-17.5 BM	AR
		94G	145659	CONNECTOR,IPC LV ABC K-443 FIG.1	AR

ALTERATIONS

ORIGINAL ISSUE

TasNetworks

DRAWN	C5 PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	A KETLEY
DATE APPROVED	06/MAR/19

TITLE: LV NEUTRAL EARTH WOOD POLE

SCALE: NTS

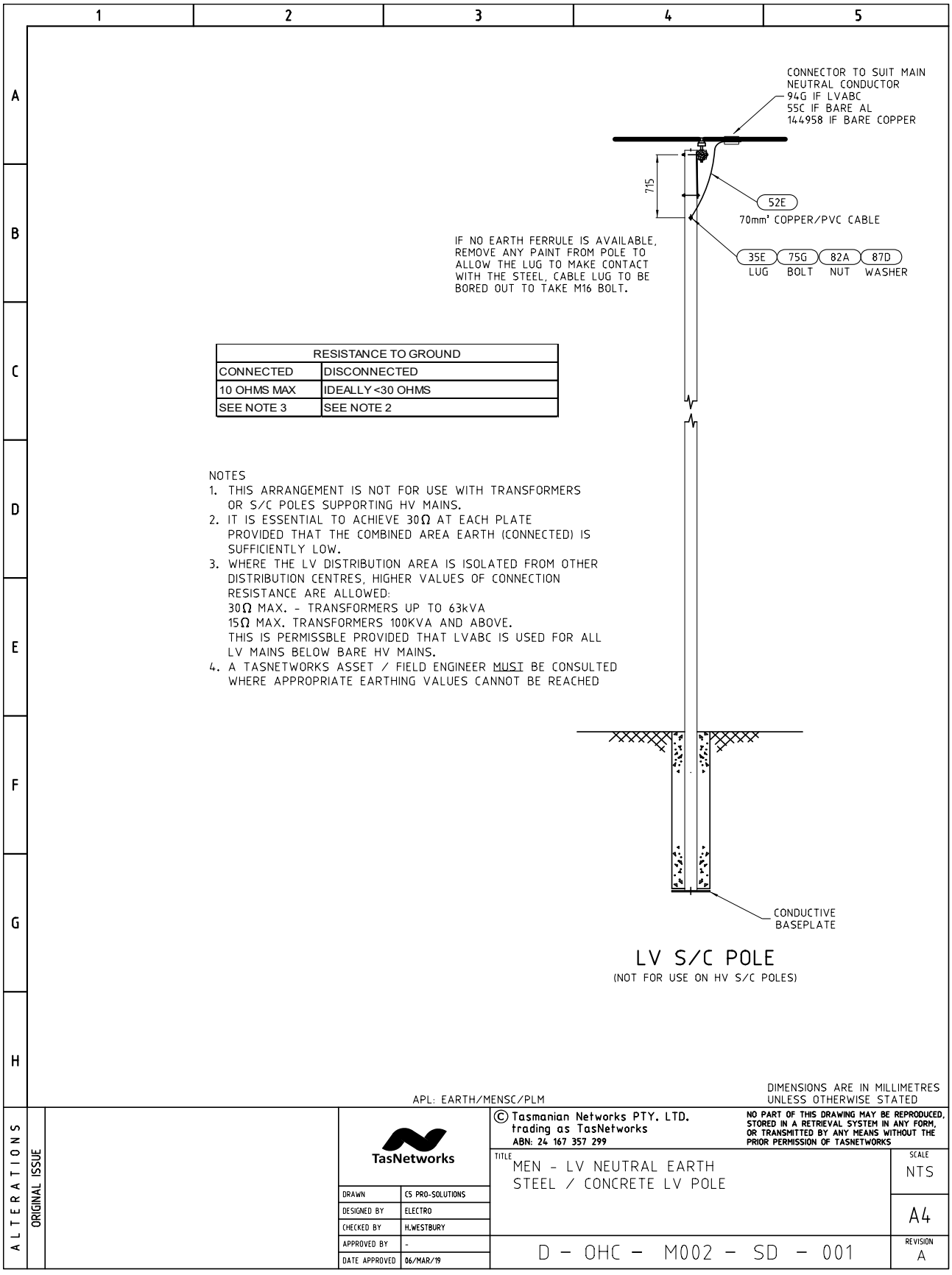
A4

D – OHC – M001 – SD – 002

REVISION: A

12.2 MEN – LV Neutral Earth – Steel / Concrete Pole

MEN LV Neutral Steel / Concrete Pole



MEN LV Neutral Steel / Concrete Pole - Materials list

Unit Assembly	Store Type	Item Ref	Stock Item	Stock Item Description	Quantity
EARTH/MENSC/PLM	S	35E	141363	Lug tinned copper 70mm² cable M12 hole	1
		52E	102311	Wire Cu 70mm² 19/2.14 Bare	1
		55E	144955	Connector PG Clamp to Mains neutral (Al-Cu)	1
			144958	Connector PG Clamp to Mains neutral (Cu-Cu)	AR
		94G	145659	Connector IPC to 50-150mm² LVABC mains neutral	AR
		75G	32282	Bolt Hex head M16x220 galv steel	1
		82A	40441	Nut M16 galv steel	1
		87D	65616	Washer M16 galv steel	1

ALTERATIONS

ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	06/MAR/19

TITLE: LV NEUTRAL EARTH MATERIALS LIST

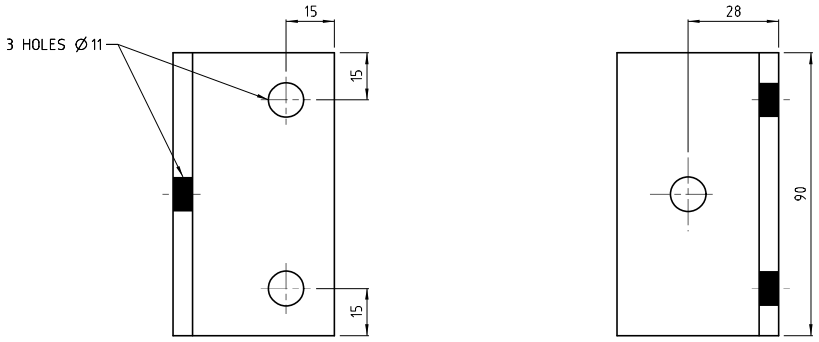
SCALE: NTS

A4

D - OHC - M002 - SD - 002

REVISION: A

Earthing Bracket



ITEM 40
MARK 72 - EARTHING BRACKET
S.I. 32.33.72
MATERIAL: 50 x 50 x 6 ANGLE TO AS/NZS 3679.1-300

NOTE
1. HOT DIP GALVANIZE TO AS 4680

DIMENSIONS ARE IN MILLIMETRES
UNLESS OTHERWISE STATED

ALTERATIONS
ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	06/MAR/19

TITLE
EARTHING COMPONENTS
EARTHING BRACKET

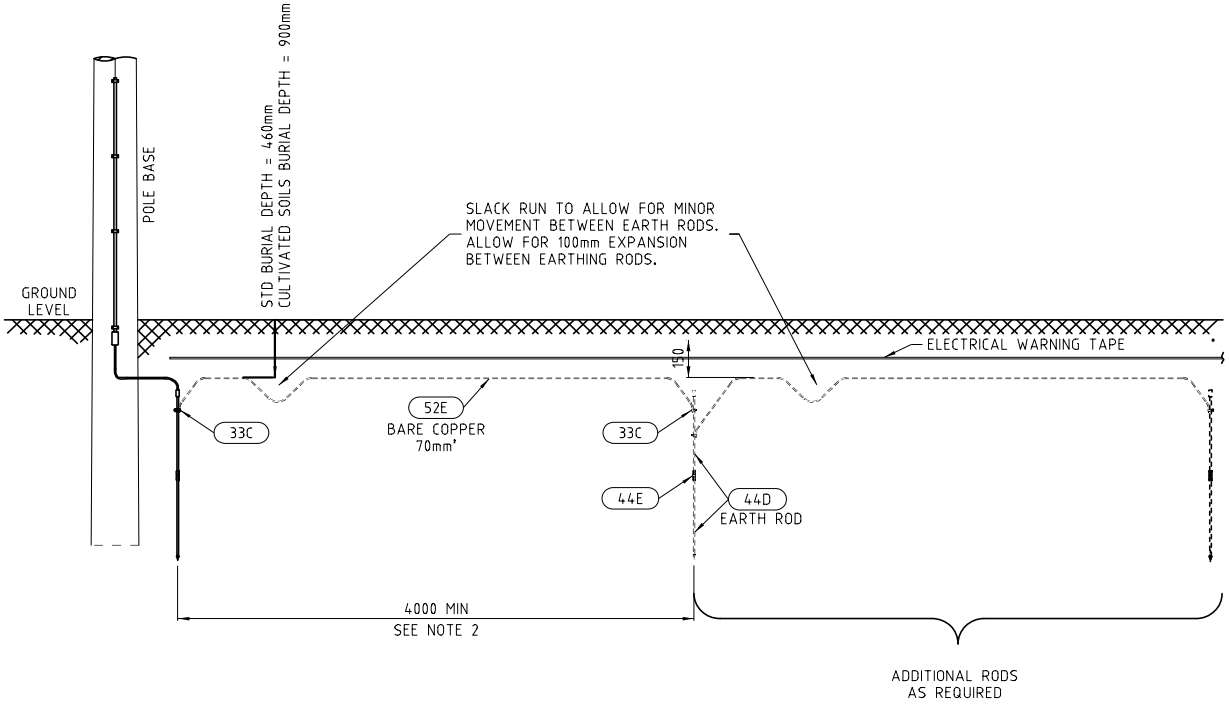
SCALE 1:2

A4

D - OHC - M003 - SD - 001

REVISION A

12.3 Additional Earthing – Driven Rods



NOTES:

1. ADDITIONAL EARTH RODS MAY BE DRIVEN OUT UNDER THE LINE TO SUPPLEMENT THE RODS DRIVEN NEAR THE POLE IN ORDER TO ACHIEVE THE REQUIRED RESISTANCE TO EARTH.
2. IDEAL SPACING BETWEEN RODS IS TWICE THE ROD LENGTH SO THAT EACH ROD IS DRIVEN INTO ITS OWN HEMISPHERE OF EARTH CLOSER SPACINGS ARE POSSIBLE BUT EFFECTIVENESS IS REDUCED.
3. IN AREAS WITH A LAYER OF HIGH RESISTIVITY SOIL ON TOP OF LOW RESISTIVITY SOIL BELOW, IT IS PREFERABLE TO DRIVE RODS DEEPER RATHER THAN GO OUT WIDER. UP TO 4 RODS MAY BE JOINED TOGETHER. HOWEVER, WHERE THE TOP SOIL HAS LOWER RESISTIVITY THAN LOWER LEVELS IT IS PREFERABLE TO GO OUT WIDER RATHER THAN DEEPER.
4. HIGH RESISTAVITY SOIL TYPES INCLUDE: DRY SAND AND GRAVEL
   ROCK
   SALT DEPLETED AREAS LIKE MOUNTAIN TOPS
   LOW RESISTAVITY SOIL TYPES INCLUDE: SILT
   CLAY
   MOIST AREAS
5. IF REACHING THE TARGET RESISTANCE IS PROVING DIFFICULT / EXPENSIVE, REFER THE MATTER BACK TO THE DESIGNER
6. IN ROCKY AREAS, DEEP DRILLED HOLES MAY BE REQUIRED. THE ROD IS LOWERED INTO THE HOLE AND BACKFILLED WITH A SLURRY OF BENTONITE AND GYPSUM.

APL Nos: EARTH/EXT/PLM

DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED

ALTERATIONS: ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	06/MAR/19

TITLE: ADDITIONAL EARTHING DRIVEN RODS AND LOCATION FOR UNDER THE LINE SUPPLIMENTAL ROUTING

SCALE: NTS

A4

D - OHC - M004 - SD - 001

REVISION: A

Additional Earthing Driven Rods – Materials list

Unit Assembly	Store Type	Item Ref	Stock Item	Stock Item Description	Quantity
EARTH/EXT/PLM	S	44D	155010	Earth Electrode 1800 x 13mm Dia. Steel/Cu Extendable	2 (or AR)
		44E	155145	Earth Rod Coupling 13mm (cw locking pin)	1 (or AR)
		44F	155171	Driving Head	1 (or AR)
		33C	155134	Earth Crimp - Rod 13-16mm to Conductor 50-70mm² (YGHP29C26)	1
		52E	102311	Wire Cu 70mm² 19/2.14 Bare	10 (or AR)
				Electrical Warning Marker Tape	4m (or AR)

ALTERATIONS

ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	06/MAR/19

TITLE: EARTHING DRIVEN RODS MATERIALS LIST

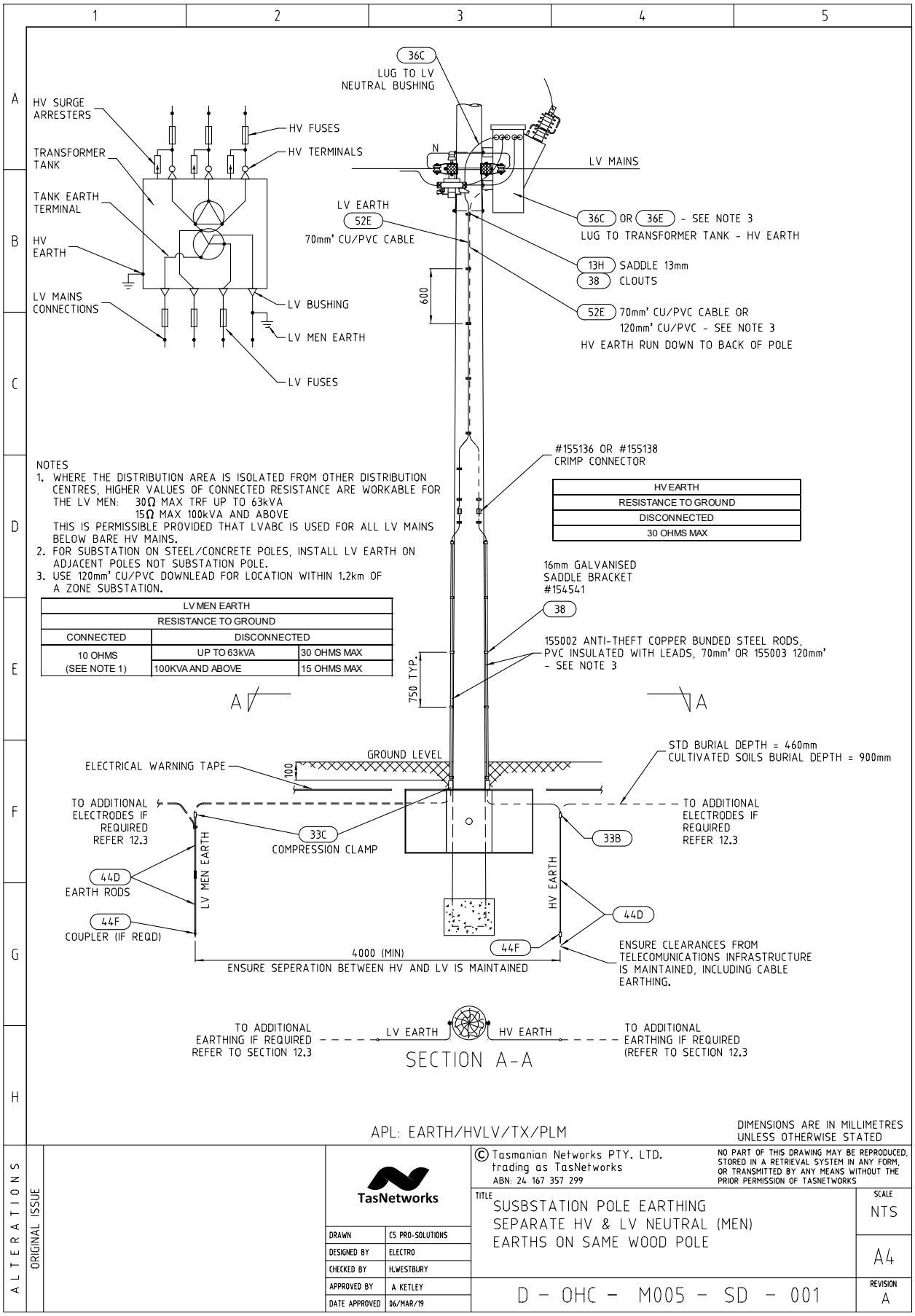
SCALE: NTS

A4

D – OHC – M004 – SD – 002

REVISION: A

12.4 Substation Wood Pole Earthing



Substation Wood Pole Earthing - Separate LV & HV Neutral Earths on same Pole – Materials List

Unit Assembly	Store Type	Item Ref	Stock Item	Stock Item Description	Quantity
EARTH/HVLV/TX/PLM	S	38	72580	NAIL,CLOUT 2.8MM X 40MM GAL STEEL	52
HV + LV		123A	155002	ROD,EARTH,ANTI-THEFT 70MM2	2
		124A	348630	TAPE,CAUTION-BURIED ELECT CABLE 500M	4m (or AR)
50mm2		13H	154540	SADDLE,FULL 13MM 2-HOLE GAL.STEEL	16
		13I	154541	SADDLE,FULL 16MM 2-HOLE GAL.STEEL	10
		33C	155134	CONNECTOR,GROUND ROD 13-16 TO 50-70MM	2 (or AR)
		36C	141304	LUG,BOLTED TERMINAL M12 X 50-70MM2 CU	2
		44D	155010	GROUND ROD,EARTH 13 X 1800MM ERICO611360	4 (or AR)
		44E	155145	COUPLING,GROUND ROD 13MM ERICO CC12F	2 (or AR)
		44F	155171	DRIVING HEAD,GROUND ROD HAND TYPE-DH12	1 (or AR)
		51P	94184	WIRE,BLDNG 70MM2 X 19/2.14 X 0.6/1KV BLK	24
EARTH/LVMENA/PLM	S	38	72580	NAIL,CLOUT 2.8MM X 40MM GAL STEEL	26
LV earth only		123A	155002	ROD,EARTH,ANTI-THEFT 70MM2	1 (or AR)
		124A	348630	TAPE,CAUTION-BURIED ELECT CABLE 500M	4m (or AR)
50mm2		13H	154540	SADDLE,FULL 13MM 2-HOLE GAL.STEEL	8
		13I	154541	SADDLE,FULL 16MM 2-HOLE GAL.STEEL	5
		33C	155134	CONNECTOR,GROUND ROD 13-16 TO 50-70MM	1
		36C	141304	LUG,BOLTED TERMINAL M12 X 50-70MM2 CU	1
		44D	155010	GROUND ROD,EARTH 13 X 1800MM ERICO611360	2 (or AR)
		44E	155145	COUPLING,GROUND ROD 13MM ERICO CC12F	1 (or R)
		44F	155171	DRIVING HEAD,GROUND ROD HAND TYPE-DH12	1 (or AR)
		51P	94184	WIRE,BLDNG 70MM2 X 19/2.14 X 0.6/1KV BLK	20
EARTH/HV/OP/TX/PLM	S	38	72580	NAIL,CLOUT 2.8MM X 40MM GAL STEEL	26
HV earth only		123A	155002	ROD,EARTH,ANTI-THEFT 70MM2	1 (or AR)
		13H	154540	SADDLE,FULL 13MM 2-HOLE GAL.STEEL	8
50mm2		13I	154541	SADDLE,FULL 16MM 2-HOLE GAL.STEEL	5
		33C	155134	CONNECTOR,GROUND ROD 13-16 TO 50-70MM	1 (or AR)
		36C	141304	LUG,BOLTED TERMINAL M12 X 50-70MM2 CU	1
		44D	155010	GROUND ROD,EARTH 13 X 1800MM ERICO611360	2 (or AR)
		44E	155145	COUPLING,GROUND ROD 13MM ERICO CC12F	1 (or AR)
		44F	155171	DRIVING HEAD,GROUND ROD HAND TYPE-DH12	1 (or AR)
		51P	94184	WIRE,BLDNG 70MM2 X 19/2.14 X 0.6/1KV BLK	10
EARTH/HV/OP/ZONE/PLM	S	38	72580	NAIL,CLOUT 2.8MM X 40MM GAL STEEL	26
120mm2		123B	155003	ROD,EARTH,ANTI-THEFT 120MM2	1
		13H	154540	SADDLE,FULL 13MM 2-HOLE GAL.STEEL	8
See Note 3 sect 12.4-1		13I	154541	SADDLE,FULL 16MM 2-HOLE GAL.STEEL	5
Use near zone subs		33D	155135	CONNECTOR,GROUND ROD 13-16 TO 95-120MM	1
		36E	141306	LUG,BOLTED TERMINAL M16 X 150-185MM2 CU	AR
		44D	155010	GROUND ROD,EARTH 13 X 1800MM ERICO611360	2 (or AR)
		44E	155145	COUPLING,GROUND ROD 13MM ERICO CC12F	1 (or AR)
		44F	155171	DRIVING HEAD,GROUND ROD HAND TYPE-DH12	1 (or AR)
		51Q	94190	WIRE,BLDNG 120MM2 X 37/2.03 X 0.6/1 BLK	10

ALTERATIONS

ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	A KETLEY
DATE APPROVED	06/MAR/19

TITLE: LV MEANS LV AND HV ON SAME POLE MATERIALS LIST

SCALE: NTS

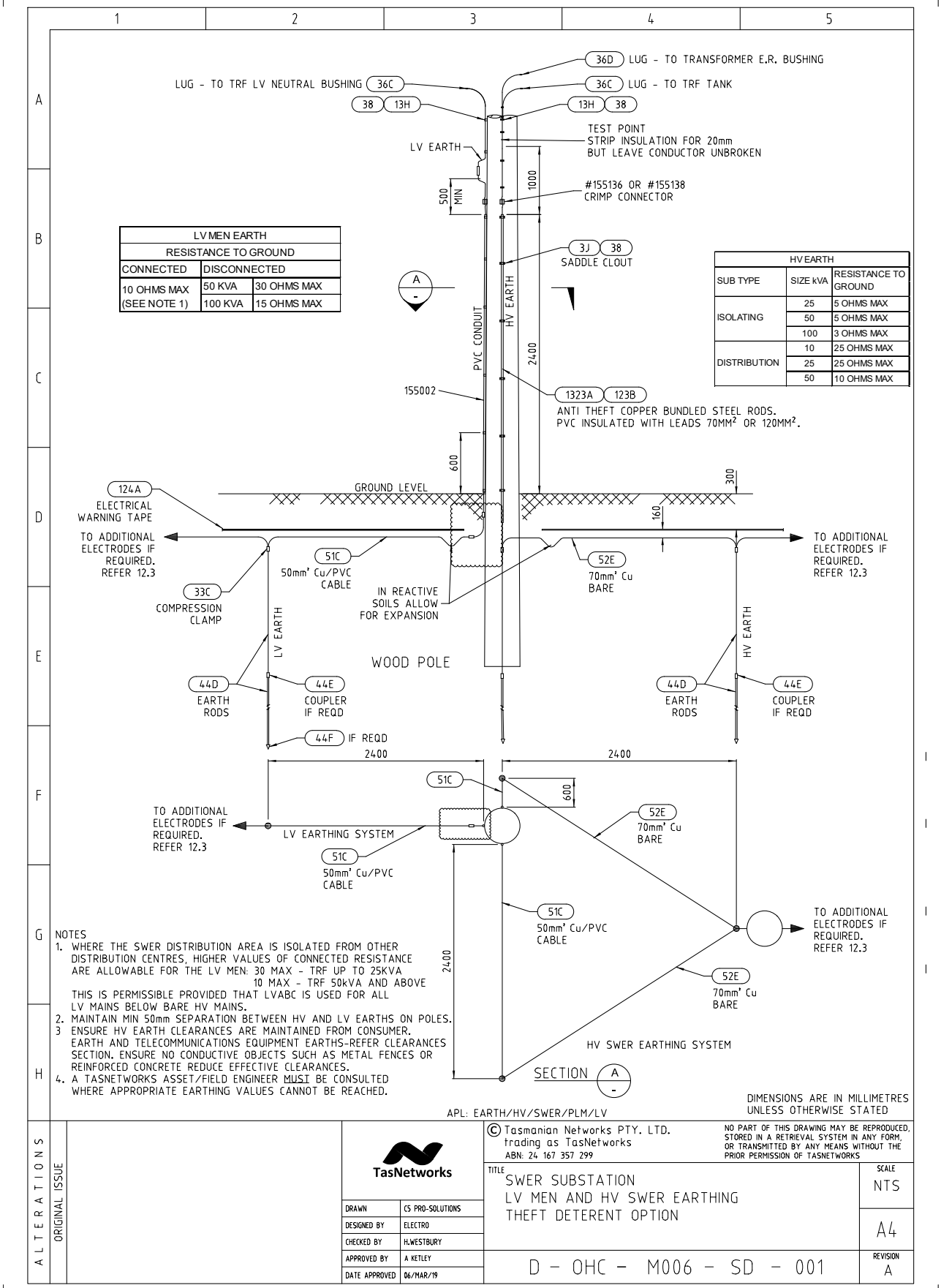
A4

D - OHC - M005 - SD - 002

REVISION: A

12.5 SWER Substation Earthing Details

Transformer Pole – LV & HV SWER Earthing



Transformer pole – LV & HV SWER Earthing – Materials list

Unit Assembly	Store Type	Item Ref	Stock Item	Stock Item Description	Quantity
EARTH/HV/SWER/PLM	S	44D	155010	GROUND ROD,EARTH 13 X 1800MM ERICO611360	6 (or AR)
		44E	155145	COUPLING,GROUND ROD 13MM ERICO CC12F	3 (or AR)
		44F	155171	DRIVING HEAD,GROUND ROD HAND TYPE-DH12	
		33C	155134	CONNECTOR,GROUND ROD 13-16 TO 50-70MM	3
		51P	94184	WIRE,BLDNG 70MM2 X 19/2.14 X 0.6/1KV BLK	20
		42B	244207	PIPE,MEDIUM GALANISED 25MM X 6.5M STEEL	1
		38	72580	NAIL,CLOUT 2.8MM X 40MM GAL STEEL	52
		13J	154542	SADDLE,FULL 20MM 2-HOLE GAL.STEEL	10
		13H	154540	SADDLE,FULL 13MM 2-HOLE GAL.STEEL	20
		124A	348630	TAPE,CAUTION-BURIED ELECT CABLE 500M	4m (or AR)
		36C	141304	LUG,BOLTED TERMINAL M12 X 50-70MM2 CU	2
EARTH/LVMEN/PLM	S	38	72580	NAIL,CLOUT 2.8MM X 40MM GAL STEEL	30
		13H	154540	SADDLE,FULL 13MM 2-HOLE GAL.STEEL	10
		13J	154542	SADDLE,FULL 20MM 2-HOLE GAL.STEEL	5
		37	152723	CONDUIT,RIGID PVC 20MM X 4M LD GREY	1
		33C	155134	CONNECTOR,GROUND ROD 13-16 TO 50-70MM	1
		36C	141304	LUG,BOLTED TERMINAL M12 X 50-70MM2 CU	1
		44D	155010	GROUND ROD,EARTH 13 X 1800MM ERICO611360	2
		44E	155145	COUPLING,GROUND ROD 13MM ERICO CC12F	1
		51P	94184	WIRE,BLDNG 70MM2 X 19/2.14 X 0.6/1KV BLK	16
		124A	348630	TAPE,CAUTION-BURIED ELECT CABLE 500M	4m (or AR)
		33E	155136	CONNECTOR,GROUND ROD 50-70 TO 50-70MM	1
		123A	155002	ROD,EARTH,ANTI-THEFT 70MM2	1

ALTERATIONS: ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	A KETLEY
DATE APPROVED	07/MAR/19

TITLE: SWER SUBSTATION
LV MEN AND HV SWER EARTHING
THEFT DETERENT OPTION
MATERIALS LIST

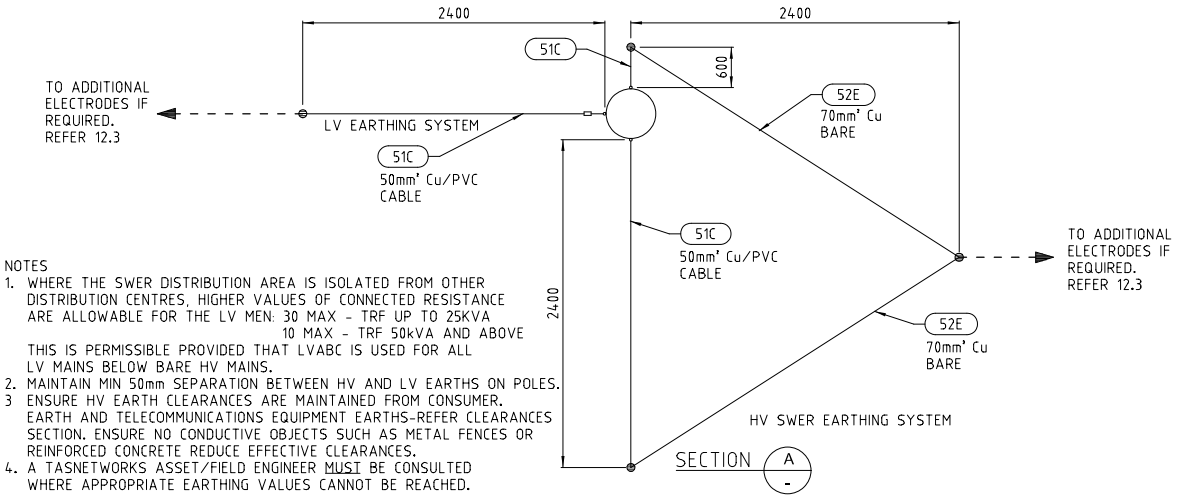
SCALE: NTS

A4

D – OHC – M006 – SD – 003

REVISION: A

SWER Substation Earthing Schematic



NOTES
1. WHERE THE SWER DISTRIBUTION AREA IS ISOLATED FROM OTHER DISTRIBUTION CENTRES, HIGHER VALUES OF CONNECTED RESISTANCE ARE ALLOWABLE FOR THE LV MEN: 30 MAX - TRF UP TO 25KVA
   10 MAX - TRF 50kVA AND ABOVE
   THIS IS PERMISSIBLE PROVIDED THAT LVABC IS USED FOR ALL LV MAINS BELOW BARE HV MAINS.
2. MAINTAIN MIN 50mm SEPARATION BETWEEN HV AND LV EARTHS ON POLES.
3 ENSURE HV EARTH CLEARANCES ARE MAINTAINED FROM CONSUMER. EARTH AND TELECOMMUNICATIONS EQUIPMENT EARTHS-REFER CLEARANCES SECTION. ENSURE NO CONDUCTIVE OBJECTS SUCH AS METAL FENCES OR REINFORCED CONCRETE REDUCE EFFECTIVE CLEARANCES.
4. A TASNETWORKS ASSET/FIELD ENGINEER MUST BE CONSULTED WHERE APPROPRIATE EARTHING VALUES CANNOT BE REACHED.

APL Nos:
EARTH/HV/SWER/PLM/LV

DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED

ALTERATIONS	
ORIGINAL ISSUE	

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	A KETLEY
DATE APPROVED	01/JUL/19

TITLE
SWER SUBSTATION
LV MEN AND HV SWER EARTHING
THEFT DETERENT OPTION
UNDERGROUND EARTHING VIEW

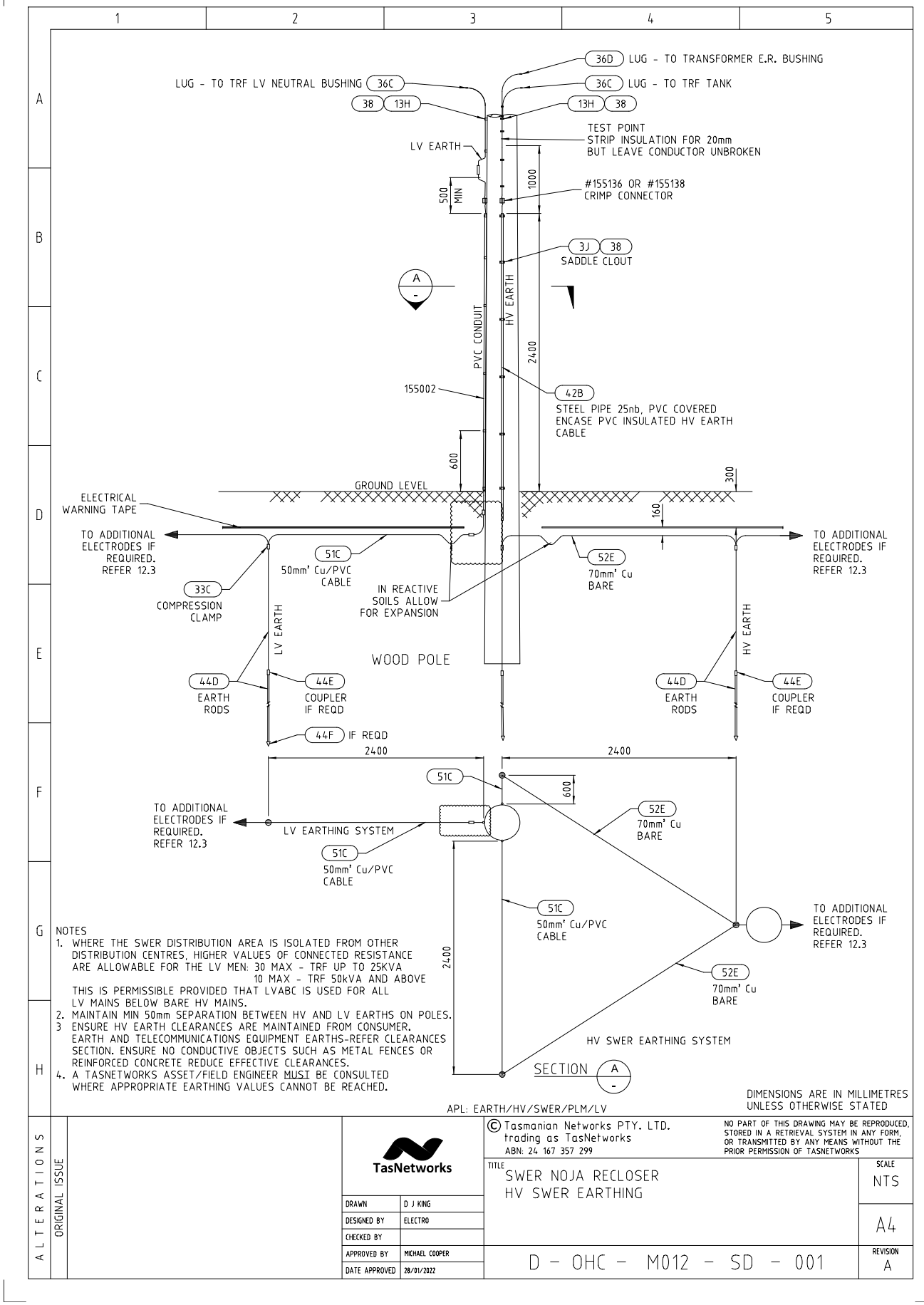
SCALE NTS

A4

D - OHC - M006 - SD - 002

REVISION A

Transformer Pole – LV & HV SWER NOJA Recloser Earthing



Transformer pole – LV & HV SWER NOJA Recloser Earthing – Materials list

Unit Assembly	Store Type	Item Ref	Stock Item	Stock Item Description	Quantity
EARTH/HV/SWER	S	44D	155010	GROUND ROD,EARTH 13 X 1800MM ERICO611360	6 (or AR)
		44E	155145	COUPLING,GROUND ROD 13MM ERICO CC12F	3 (or AR)
		44F	155171	DRIVING HEAD,GROUND ROD HAND TYPE-DH12	
		33C	155134	CONNECTOR,GROUND ROD 13-16 TO 50-70MM	3
		51P	94184	WIRE,BLDNG 70MM2 X 19/2.14 X 0.6/1KV BLK	20
		42B	244207	PIPE,MEDIUM GALANISED 25MM X 6.5M STEEL	1
		38	72580	NAIL,CLOUT 2.8MM X 40MM GAL STEEL	52
		13J	154542	SADDLE,FULL 20MM 2-HOLE GAL.STEEL	10
		13H	154540	SADDLE,FULL 13MM 2-HOLE GAL.STEEL	20
		124A	348630	TAPE,CAUTION-BURIED ELECT CABLE 500M	4m (or AR)
		36C	141304	LUG,BOLTED TERMINAL M12 X 50-70MM2 CU	2

ALTERATIONS

ORIGINAL ISSUE

TasNetworks

DRAWN	D J KING
DESIGNED BY	ELECTRO
CHECKED BY	
APPROVED BY	M COOPER
DATE APPROVED	28/01/2022

TITLE: SWER NOJA RECLOSER HV SWER EARTHING

MATERIALS LIST

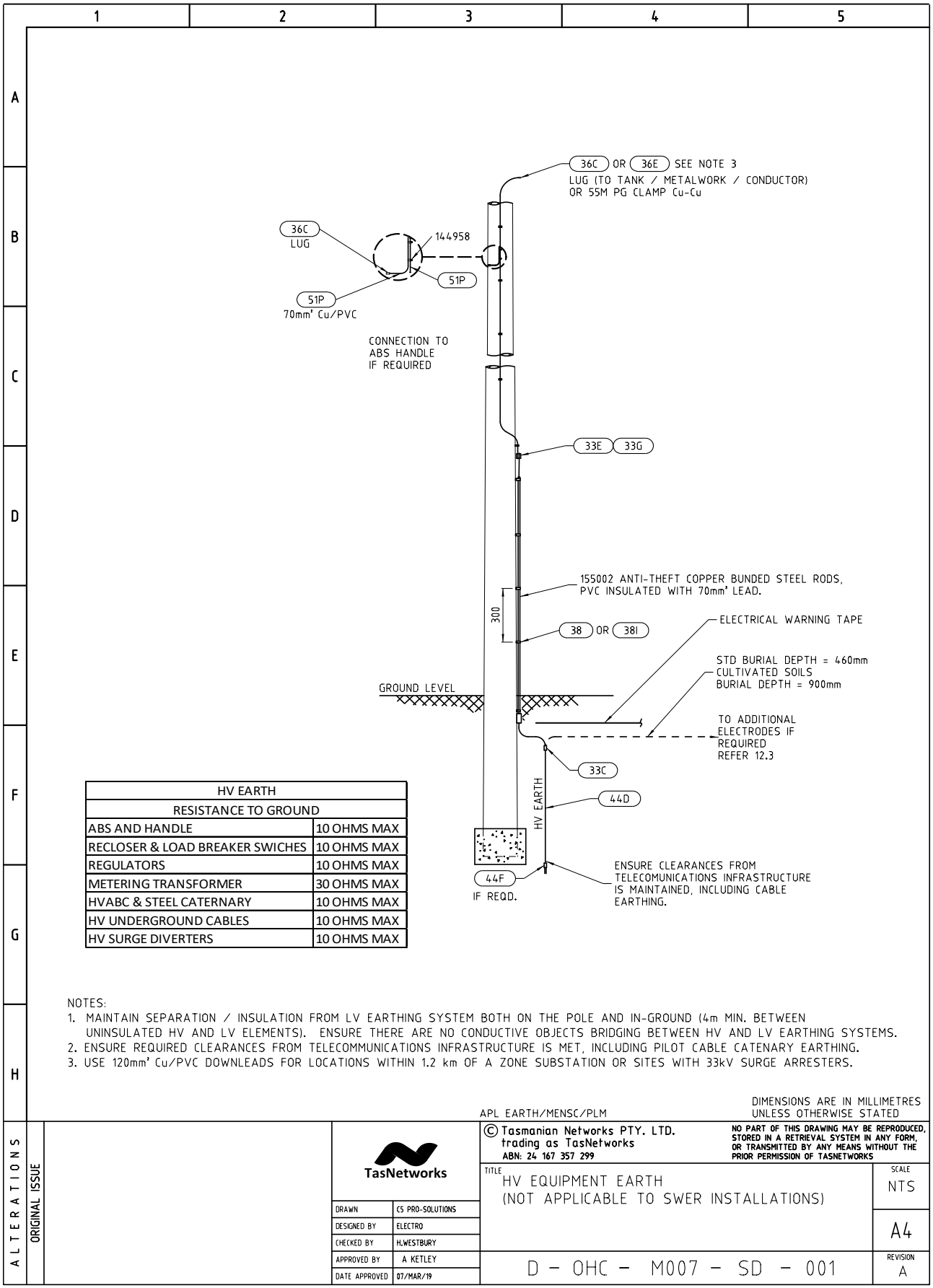
SCALE: NTS

A4

D – OHC – M012 – SD – 002

REVISION: A

12.6 HV Equipment Earth (Not SWER)



HV EARTH	
RESISTANCE TO GROUND	
ABS AND HANDLE	10 OHMS MAX
RECLOSER & LOAD BREAKER SWICHES	10 OHMS MAX
REGULATORS	10 OHMS MAX
METERING TRANSFORMER	30 OHMS MAX
HVABC & STEEL CATERNARY	10 OHMS MAX
HV UNDERGROUND CABLES	10 OHMS MAX
HV SURGE DIVERTERS	10 OHMS MAX

NOTES:
1. MAINTAIN SEPARATION / INSULATION FROM LV EARTHING SYSTEM BOTH ON THE POLE AND IN-GROUND (4m MIN. BETWEEN UNINSULATED HV AND LV ELEMENTS). ENSURE THERE ARE NO CONDUCTIVE OBJECTS BRIDGING BETWEEN HV AND LV EARTHING SYSTEMS.
2. ENSURE REQUIRED CLEARANCES FROM TELECOMMUNICATIONS INFRASTRUCTURE IS MET, INCLUDING PILOT CABLE CATENARY EARTHING.
3. USE 120mm² Cu/PVC DOWNLEADS FOR LOCATIONS WITHIN 1.2 km OF A ZONE SUBSTATION OR SITES WITH 33kV SURGE ARRESTERS.

APL EARTH/MENSC/PLM

DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED

ALTERATIONS: ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	A KETLEY
DATE APPROVED	07/MAR/19

TITLE: HV EQUIPMENT EARTH (NOT APPLICABLE TO SWER INSTALLATIONS)

SCALE: NTS

A4

D - OHC - M007 - SD - 001

REVISION: A

HV Equipment Earth (NOT SWER) – Materials list

Unit Assembly	Store Type	Item Ref	Stock Item	Stock Item Description	Quantity
EARTH/HV/70/PLM	S	44D	155010	Earth Electrode 1800 x 13mm Dia. Steel/Cu Extendable	2 (or AR)
70mm²		44E	155145	Earth Rod Coupling 13mm (cw locking pin)	1 (or AR)
		44F	155171	Driving Rod	1 (or AR)
		33C	155134	Earth Crimp - Rod 13-16mm to Conductor 50-70mm² (YGHP29C26)	1
		51P	94184	Wire Cu 70mm² 1C Black UV resistant	10
			155002	Anti-theft copper-bonded steel rod, PVC ins 70mm² with leads, 3m	1
			154541	Saddle 16mm galv steel	5
		38	72580	Clout 40mm galv steel	26
		13H	154540	Saddle 13mm galv steel	8
			144958	Connector PG Clamp Cu-Cu	1 (or AR)
		36C	141304	Q LUG bolted 50 70mm² tinned copper	1 (or AR)
EARTH/HV/OP/ZONE/PLM	S	44D	155010	Earth Electrode 1800 x 13mm Dia. Steel/Cu Extendable	2 (or AR)
120mm²		44E	155145	Earth Rod Coupling 13mm (cw locking pin)	1 (or AR)
See Note 3 sect 12.6-1		33D	155135	Earth Crimp - Rod 13-16mm to Conductor 95-120mm² (YGHP29C26)	1
Use near zone subs				Wire Cu 120mm² 1C	10
			155003	Anti-theft copper-bonded steel rod, PVC ins 120mm² with leads, 3m	1
			154541	Saddle 16mm galv steel	5
		38	72580	Clout 40mm galv steel	26
		13H	154540	Saddle 13mm galv steel	8
			144958	Connector PG Clamp Cu-Cu	1 (or AR)
		36E	141306	LUG bolted 120 150mm² tinned copper	1 (or AR)

ALTERATIONS

ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	07/MAR/19

TITLE: HV EQUIPMENT EARTH (NOT APPLICABLE TO SWER INSTALLATIONS) MATERIALS LIST

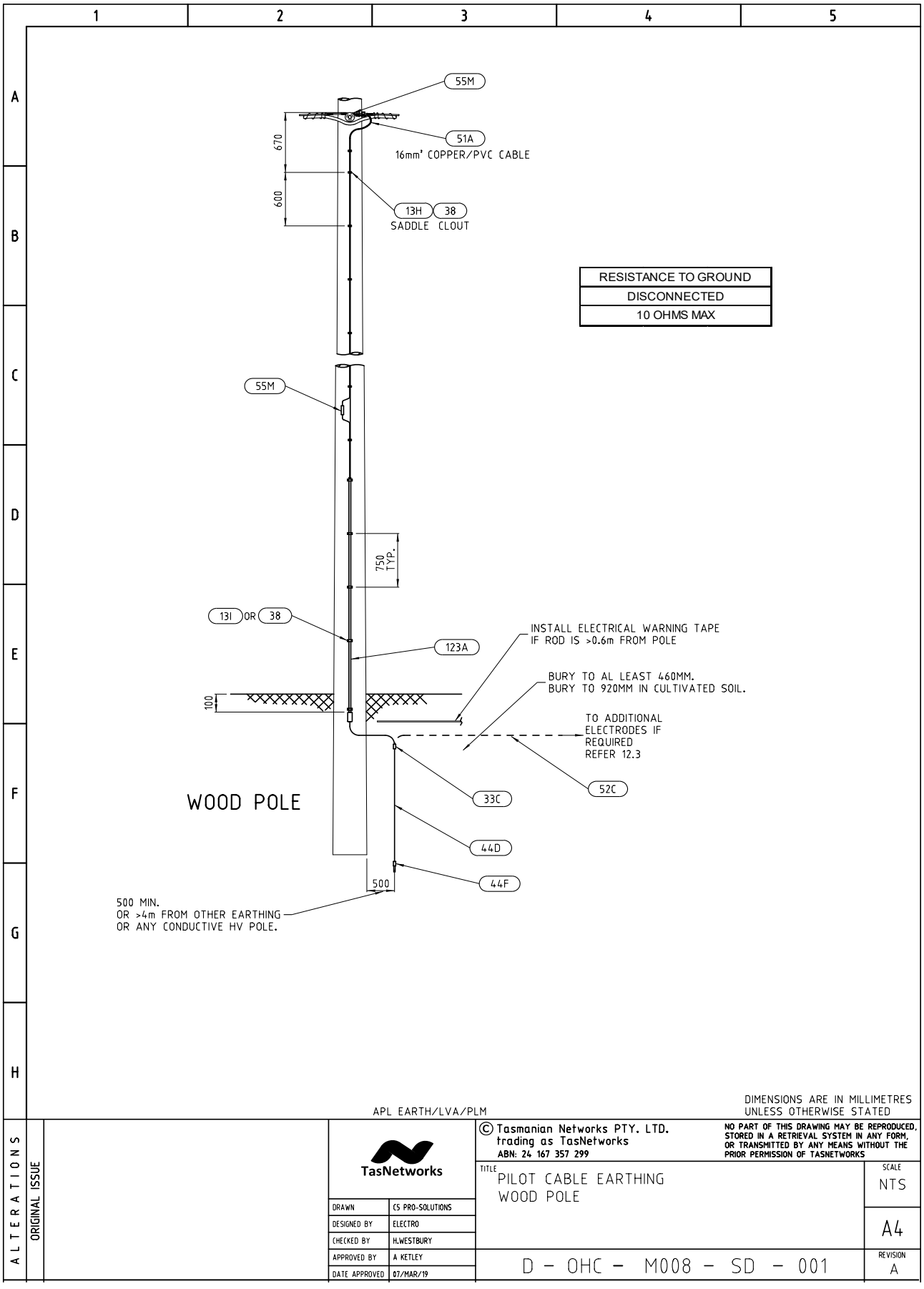
SCALE: NTS

A4

D – OHC – M007 – SD – 002

REVISION: A

12.7 Pilot Cable Earthing Wood Pole



HV Pilot Cable Earthing Wood Pole – Materials list

Unit Assembly	Store Type	Item Ref	Stock Item	Stock Item Description	Quantity
EARTH/LVA/PLM	S	44D	155010	Earth Electrode 1800 x 13mm Dia. Steel/Cu Extendable	2 (or AR)
LV earth only		44E	155145	Earth Rod Coupling 13mm (cw locking pin)	1 (or R)
		44F	155171	Driving Rod	1 (or AR)
50mm²		33C	155134	Earth Crimp - Rod 13-16mm to Conductor 50-70mm² (YGHP29C26	1
		51A	103208	Wire Cu 16mm² 1C Black UV resistant	20
			155002	Anti-theft copper-bonded steel rod, PVC ins 70mm² leads, 3m	1 (or AR)
			154541	Saddle 16mm galv steel	5
		38	72580	Clout 40mm galv steel	26
		13H	154540	Saddle 13mm galv steel	8
			144958	Connector PG Clamp Cu-Cu	2
				Electrical Warning Marker Tape	4m (or AR)
		36C	141304	Q LUG bolted 50 70mm² tinned copper	1

ALTERATIONS

ORIGINAL ISSUE

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DATE APPROVED	07/MAR/19

TITLE: PILOT CABLE EARTHING MATERIALS LIST

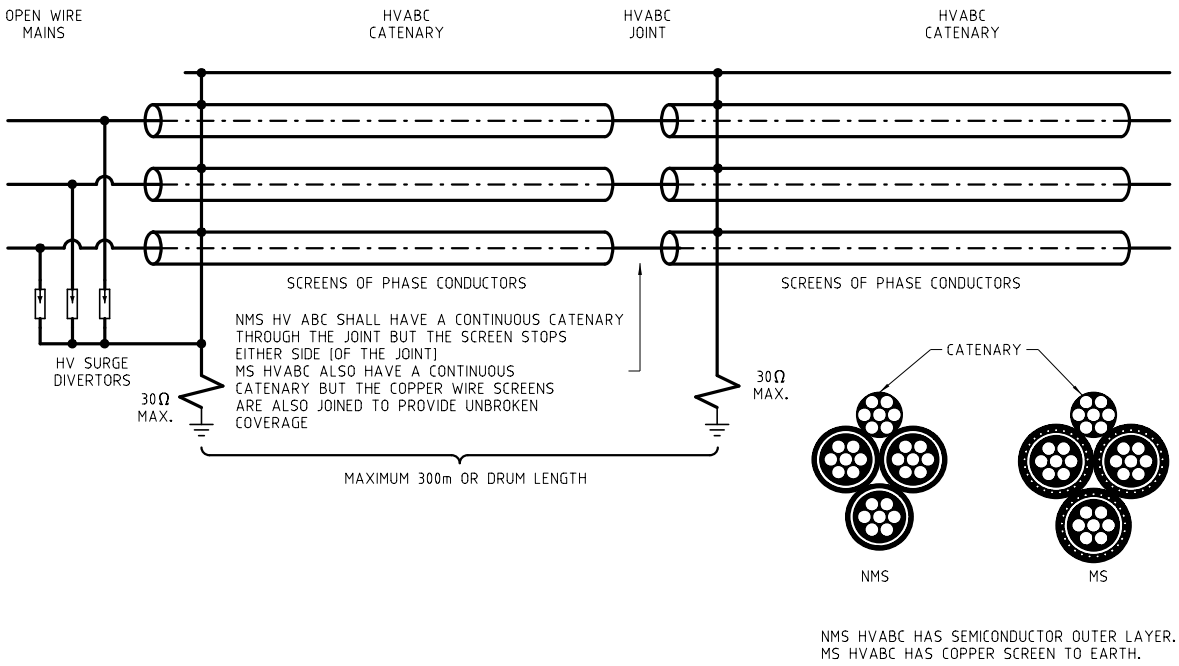
SCALE: NTS

A4

D – OHC – M008 – SD – 002

REVISION: A

12.8 HVABC Earthing Schematic



DIMENSIONS ARE IN MILLIMETRES
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ALTERATIONS: ORIGINAL ISSUE

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DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	07/MAR/19

TITLE: HVABC EARTHING SCHEMATIC
EARTHING SCHEMATIC

SCALE: NTS

A4

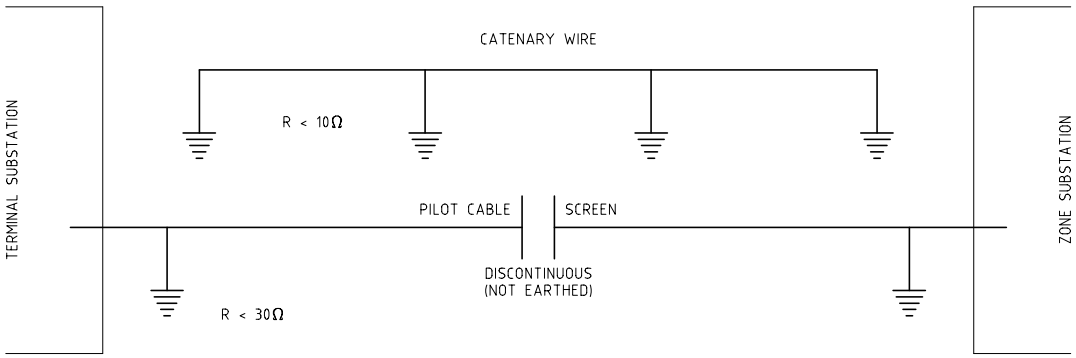
D - OHC - M008 - SD - 003

REVISION: A

12.9 Pilot Cable Earthing Schematic & Notes

NOTES:

1. PILOT CABLE TO BE SECTIONALISED AT 1000m INTERVALS IN A JUNCTION BOX ATTACHED TO POLE. CABLE TO BE STRAIGHT THROUGH JOINTED BETWEEN JUNCTION BOXES, JOINTS TO BE A POLE POSITIONS WHERE POSSIBLE.
2. CATERNARY WIRE 17/2.75 SC/G2) TO BE EARTHED AT APPROXIMATELY 500m INTERVALS. EARTH WIRE TO BE DISCONTINOUS CLOSE TO SUBSTATION. EARTH WIRES TO BE PROTECTED WITH PVC CONDUIT FOR 2m FROM GROUND AT POLE BASE. CATERNARY EARTHS TO BE AT LEAST 0.6m FROM ALL OTHER EARTHING SYSTEMS ON POLES. INSULATED WIRE TO BE RUN IN GROUND TO ELECTRODE LOCATED AT LEAST 4m FROM HV/SC POLE ALONG LINE FOOTING RESISTANCE TO BE LESS THAN 10Ω.
3. PILOT SCREEN TO BE DISCONTINUOUS AT MID-POINT OF RUN. SCREEN TO BE EARTHED AT SUBSTATION ENDS ONLY. MIN POINT INSULATION TO WITHSTAND MIN 5kV FOR 5 SECS. SCREEN EARTH TO BE AT LEAST 0.6m FROM ALL OTHER EARTHING SYSTEMS ON POLE AND TO HAVE FOOTING RESISTANCE LESS THAN 30Ω, REMOTE EARTH AS FOR CATERNARY EARTH ON HV/SC POLE.
4. AT ALL TIMES CATERNARY AND WRAPPING WIRES AS WELL AS PILOT CABLE ARE TO BE KEPT AS FAR AS POSSIBLE FROM POLE STEEL.



SCHEMATIC DIAGRAM EARTHING DETAILS

DIMENSIONS ARE IN MILLIMETRES
UNLESS OTHERWISE STATED

ALTERATIONS	
ORIGINAL ISSUE	

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DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	07/MAR/19

TITLE: PILOT CABLE EARTHING SCHEMATICS AND NOTES

SCALE: NTS

A4

D - OHC - M008 - SD - 004

REVISION: A

12.10 Earthing Practices

Additional Earthing

ADDITIONAL EARTHING TO OBTAIN REQUIRED EARTH RESISTANCE VALUES

WHEN THE REQUIRED EARTH RESISTANCE VALUES CANNOT BE OBTAINED, OR IN AREAS WHERE LOW RESISTANCE VALUES ARE GENERALLY DIFFICULT TO ACHIEVE, A SOIL RESISTIVITY TEST MUST BE DONE. IF A LOWER RESISTIVITY LAYER IS FOUND BENEATH THE HIGHER RESISTIVITY TOP LAYER (FIG 1) THEN IT IS WORTH WHILE DRIVING DEEPER ELECTRODES UNTIL THE REQUIRED EARTH RESISTANCE VALUE IS OBTAINED.
HOWEVER, IF THE LOWER LAYER HAS HIGHER RESISTIVITY (FIG 2), THEN DRIVING/DRILLING ELECTRODES HAS NO BENEFIT AND IS A WASTAGE OF RESOURCES. IN THIS CASE INSTALLING ADDITIONAL EARTH ELECTRODES AT SOME DISTANCE AWAY, UNTIL THE DESIRED VALUE IS REACHED, MAY BE THE SOLUTION.

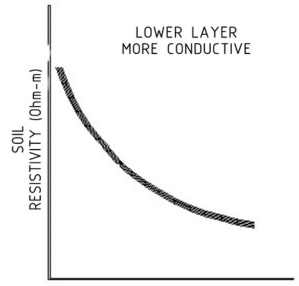


FIGURE 1

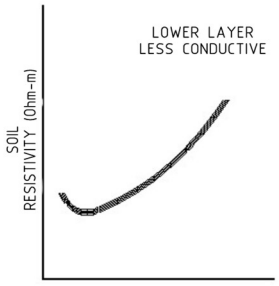


FIGURE 2

ADDITIONAL EARTH RODS MUST BE INSTALLED AT A DISTANCE NO CLOSER THAN TWO THIRD ROD LENGTHS. IN MULTI-LAYERED SOILS WHERE AN UNDERLYING LAYER OF LOW RESISTIVITY SOIL IS ENCOUNTERED, THE LENGTH PENETRATING THIS LAYER MAY BE TAKEN AS THE EFFECTIVE EARTH ROD LENGTH.

WHENEVER DRILLED HOLES ARE USED, A BENTONITE-GYPSUM OR SIMILAR PRODUCT MUST BE PLACED IN THE HOLE WITH THE EARTH ELECTRODE. THE ELECTRODE MUST BE VIBRATED AND A DRY MIXTURE OF BENTONITE AND GYPSUM INSERTED DOWN THE HOLE UNTIL FULL.
THE VIBRATION FACILITATES THE PLACING OF THE MIX AND HELPS ELIMINATE THE POSSIBILITY OF VOIDS FORMING ALONG THE ELECTRODE. SUBSEQUENT ABSORPTION OF MOISTURE BY THE BENTONITE CAUSES SUFFICIENT SWELLING TO ESTABLISH A GOOD CONTACT BETWEEN THE ELECTRODE AND THE SURROUNDING GROUND. THE GYPSUM IS INCLUDED AS A NON-TOXIC CONDUCTIVITY ENHANCER, MAINLY FOR THE SURROUNDING SOIL, AS THE MOIST BENTONITE IS ITSELF A SATISFACTORY CONDUCTOR.

IF A DRY MIX CANNOT BE INSERTED DUE TO THE PRESENCE OF MOISTURE OR DUE TO THE COLLAPSING OF THE HOLE, THEN A WET MIX OF BENTONITE AND GYPSUM MUST BE INSERTED. THE MIXTURE MUST HAVE THE CONSISTENCY OF A THICK SOUP AND BE PUMPED DOWN THE HOLE WITH A MUD PUMP TO ENSURE THAT IT REACHES ALL THE WAY DOWN. IF THERE IS A LOT OF MOISTURE PRESENT, PLASTER OF PARIS MAY HAVE TO BE ADDED TO THE MIXTURE SO THAT IT WILL SET HARD AND NOT BE WASHED AWAY.

IN HILLY (ROCKY) AREAS IT IS OFTEN DIFFICULT TO OBTAIN THE REQUIRED EARTH RESISTANCE. E.G 30Ω FOR HV. DEEP DRILLING TO PENETRATE THE ROCK IS TOO COSTLY. BY INSTALLING THREE OR MORE RODS EQUALLY SPACED AT APPROXIMATELY 1.5M AND CONNECTING THE RODS, EARTH RESISTANCE CAN BE SUBSTANTIALLY REDUCED. IF THE EARTH RESISTANCE IS STILL GREATER THAN 30Ω, CONTACT STANDARDS DEPARTMENT TO CONFIRM IF THE VALUE IS ACCEPTABLE.

NOTES:

1. BEFORE EXPENDING AT SIGNIFICANT COST, THE PROBLEM OF ADDING EARTHING SHOULD BE REFERED BACK TO THE OVERHEAD LINE DESIGNER TO ASSES IF AN UNDERSLUNG EARTHWIRE OR OHEW RISER DESIGN COULD BE A MORE ECONOMICAL DESIGN AND CONSTRUCT.
2. A TASNETWORKS ASSET / FIELD ENGINEER MUST BE CONSULTED WHERE APPROPRIATE EARTHING VALUES CANNOT BE REACHED.

DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED

ALTERATIONS: ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	07/MAR/19

TITLE: EARTHING PRACTICES - ADDITIONAL EARTHING

SCALE: NTS

A4

D - OHC - M009 - SD - 001

REVISION: A

Earthing Enhancing Compound

GENERAL

UNDER SOME SOIL CONDITIONS, SUCH AS GRITTY GRAVEL OR ROCKY GROUND, IT CAN BE DIFFICULT TO ACHIEVE THE EARTH RESISTANCE BY NORMAL METHODS. THE APPLICATION OF A COMPOUND SUCH AS LO-OHM2 CAN REDUCE EARTHING RESISTANCE BY UP TO 50%.

LO-OHM2 (SI 11.74.30)

THIS COMPOUND IS AN OFF WHITE POWDER WHICH IS MIXED WITH WATER TO FORM A CREAMY CONSISTENCY. IT IS POURED AROUND EARTH RODS IN ROCK HOLES AND EARTH WIRE IN TRENCHES. BASICALLY IT A BLEND OF NON-HAZARDOUS MATERIALS WITH CALCIUM SULPHATE DIHYDRATE PREDOMINATING. THE MIX PERMEATES THE SOIL AND WHEN IT GELS, BINDS THE SOIL TOGETHER IN A SOLID, YET FLEXIBLE MASS. THE RESIN ABSORBS WATER WHICH HOLDS IN FINE PIPES WITHIN IT'S STRUCTURE, YET MAINTAINING ITS CONDUCTIVE PROPERTIES AND RESISTANCE TO LEACHING OVER LONG PERIODS.

SAFE HANDLING

LO-OHM IS A NON HAZARDOUS BLEND OF MATERIALS AND NO SPECIAL PRECAUTIONS ARE NECESSARY IN ITS FIELD APPLICATION. IT IS NOT A COMBUSTIBLE MATERIAL THEREFORE NOT A FIRE OR EXPLOSION RISK BUT STORE AND TRANSPORT IN A DRY PLACE. NORMAL HYGIENE SHOULD APPLY, SUCH AS WASHING AFTER HANDLING MATERIAL PRIOR TO EATING. FOR EYE AND SKIN CONTACT, WASH WITH WATER. IF SWALLOWED IN LARGE AMOUNTS INDUCE VOMITING. IT IS RECOMMEND THAT PVC GLOVES BE WORN. WEAR GOGGLES AND DUST MASK IN THE PRESENCE OF DUST. -REFER MATERIALS DATA SHEET

SPILLS AND DISPOSAL

IF MIX IS SPILLED OVER SOIL SPREAD AS MUCH AS POSSIBLE. SPILLED POWDER SHOULD BE SWEPT UP AND NOT BE REUSED. NO SPECIAL PRECAUTIONS ARE NECESSARY FOR DISPOSAL, MAY BE THROWN ON WASTE DUMPS BURIED OR SPREAD ON GROUND.

MIXING

MEASURE THE REQUIRED QUANTITY OF COMPOUND AND ADD TO WATER IN THE RECOMMENDED RATIO (SEE TABLE). AGITATE OR STIR BRISKLY UNTIL A CREAMY CONSISTENCY IS ACHIEVED. IF MIXTURE IS TO BE PUMPED USE 2 PARTS WATER TO 1 PART LO-OHM2. ENSURE THAT PUMPS AND LINES ARE FLUSHED WITH CLEAN WATER AFTER USE.
CLEAN MIXING TANKS BETWEEN MIXES.

NOTE: ADD THE POWDER SLOWLY TO PREVENT FORMATION OF LUMPS.
SETTING TAKES PLACE IN SEVERAL MINUTES, DEPENDING ON WATER TEMPERATURE (i.e. THE WARMER THE WATER THE FASTER THE REACTION TIME).

MIXING INSTRUCTIONS

GROUND TYPE	WATER/10kg SACK
DRY SOIL, DRY CLAY, ROCK AND SABDSTONE	15 LITRES (APPROX. SETTING TIME 30 MINS)
WET SOIL, WET CLAY, SAND	12 LITRES (APPROX. SETTING TIME 20 MINS)
PEBBLES, SMALL STONES, VERY POROUS GROUND	10 LITRES (APPROX. SETTING TIME 15 MINS)

DIMENSIONS ARE IN MILLIMETRES
UNLESS OTHERWISE STATED

ALTERATIONS: ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	08/MAR/19

TITLE: EARTHING PRACTICES
EARTH ENHANCING COMPOUND

SCALE: NTS

A4

D - OHC - M010 - SD - 001

REVISION: A

Earthing Enhancing Compound

APPLICATION

A. EARTH RODS INSTALLED IN HOLES DRILLED IN ROCK

UP TO TWO EARTH RODS MAY BE JOINED END TO END IN ONE HOLE WHICH IS THEN FILLED WITH COMPOUND.
HOLES UP TO 30m DEEP CAN BE DRILLED AND FILLED WITH COMPOUND USING EARTH WIRE RATHER THAN RODS.
FOR THE COMMON, SINGLE EARTH ROD HOLES, MIX FOR TWO HOLES AT A TIME (USING A HALF BAG TO 7 LITRES WATER).
POUR PROMPTLY VIA A FUNNEL WITH THE ROD IN PLACE, CAREFULLY AVOIDING ANY AIR ENTRAPMENT BY POURING SLIGHTLY TO ONE SIDE AND NOT 'FLOODING' THE HOLE.
BEND ANY PROTRUDING ROD ENDS BEFORE ANY SETTING TAKES PLACE TO AVOID DISTURBING BOND LATER.

B. EARTH RODS PARTLY DRIVEN INTO SOIL

IN THIS SITUATION EARTH RESISTANCE CAN BE IMPROVED BY POURING COMPOUND AROUND THE TOP OF THE EARTHING ROD.

EXCAVATE A HOLE APPROXIMATELY 600mm SQUARE BY AT LEAST 450mm DEEP, BEND THE ROD TO THE BOTTOM OF THE HOLE AND POUR THE COMPOUND.

NORMALLY USE HALF BAG TO 7 LITRES OF WATER PER HOLE

C. EARTH WIRE ALONG TRENCH

WHERE RODS CANNOT BE SUCCESSFULLY DRILLED OR DRIVEN IN BUT DIGGING IS REASONABLE, EXCAVATE TRENCH AND POUR COMPOUND OVER EARTH WIRE RUN.
TRENCH TO BE AT LEAST 450mm WIDE AND DEEP.
USE ONE BAG OF COMPOUND PER 4m OF TRENCH LENGTH.
IF TRENCH DIGGER IS AVAILABLE, APPLY THIS QUANTITY OVER LONGER LENGTH COMMENSURATE WITH NARROWER WIDTH.

D. EQUIPMENT REQUIRED:

WATER CONTAINERS
MIXING BUCKET, PREFERABLY WITH LITRE GRADUATIONS.
MIXING ROD, SUCH AS 30mm DIAMETER CONDUIT.
PETROL FUNNEL FOR DRILLED HOLES.

DIMENSIONS ARE IN MILLIMETRES
UNLESS OTHERWISE STATED

ALTERATIONS: ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	08/MAR/19

TITLE: EARTHING PRACTICES
EARTH ENHANCING COMPOUND

SCALE: NTS

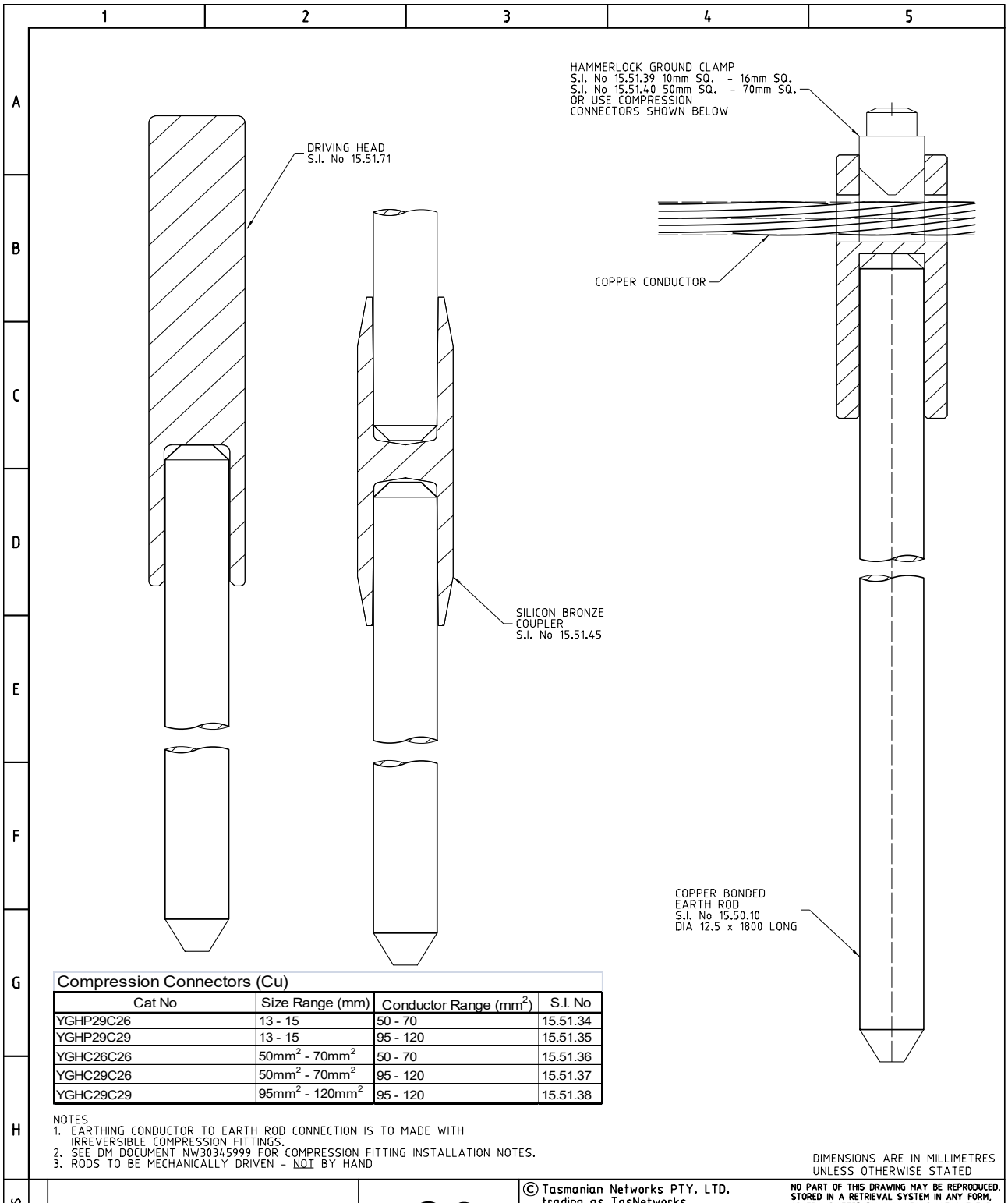
A4

D - OHC - M010 - SD - 002

REVISION: A

12.11 Earthing Components

Multiple Rod Deep Driving Earthing Systems



Compression Connectors (Cu)

Cat No	Size Range (mm)	Conductor Range (mm^2)	S.I. No
YGHP29C26	13 - 15	50 - 70	15.51.34
YGHP29C29	13 - 15	95 - 120	15.51.35
YGHC26C26	$50mm^2$ - $70mm^2$	50 - 70	15.51.36
YGHC29C26	$50mm^2$ - $70mm^2$	95 - 120	15.51.37
YGHC29C29	$95mm^2$ - $120mm^2$	95 - 120	15.51.38

NOTES
1. EARTHING CONDUCTOR TO EARTH ROD CONNECTION IS TO MADE WITH IRREVERSIBLE COMPRESSION FITTINGS.
2. SEE DM DOCUMENT NW30345999 FOR COMPRESSION FITTING INSTALLATION NOTES.
3. RODS TO BE MECHANICALLY DRIVEN - NOT BY HAND

DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED

ALTERATIONS: ORIGINAL ISSUE

TasNetworks

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DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	08/MAR/19

TITLE: EARTHING COMPONENTS-MULTIPLE ROD DEEP DRIVING EARTHING SYSTEM

SCALE: NTS

A4

D - OHC - M011 - SD - 001

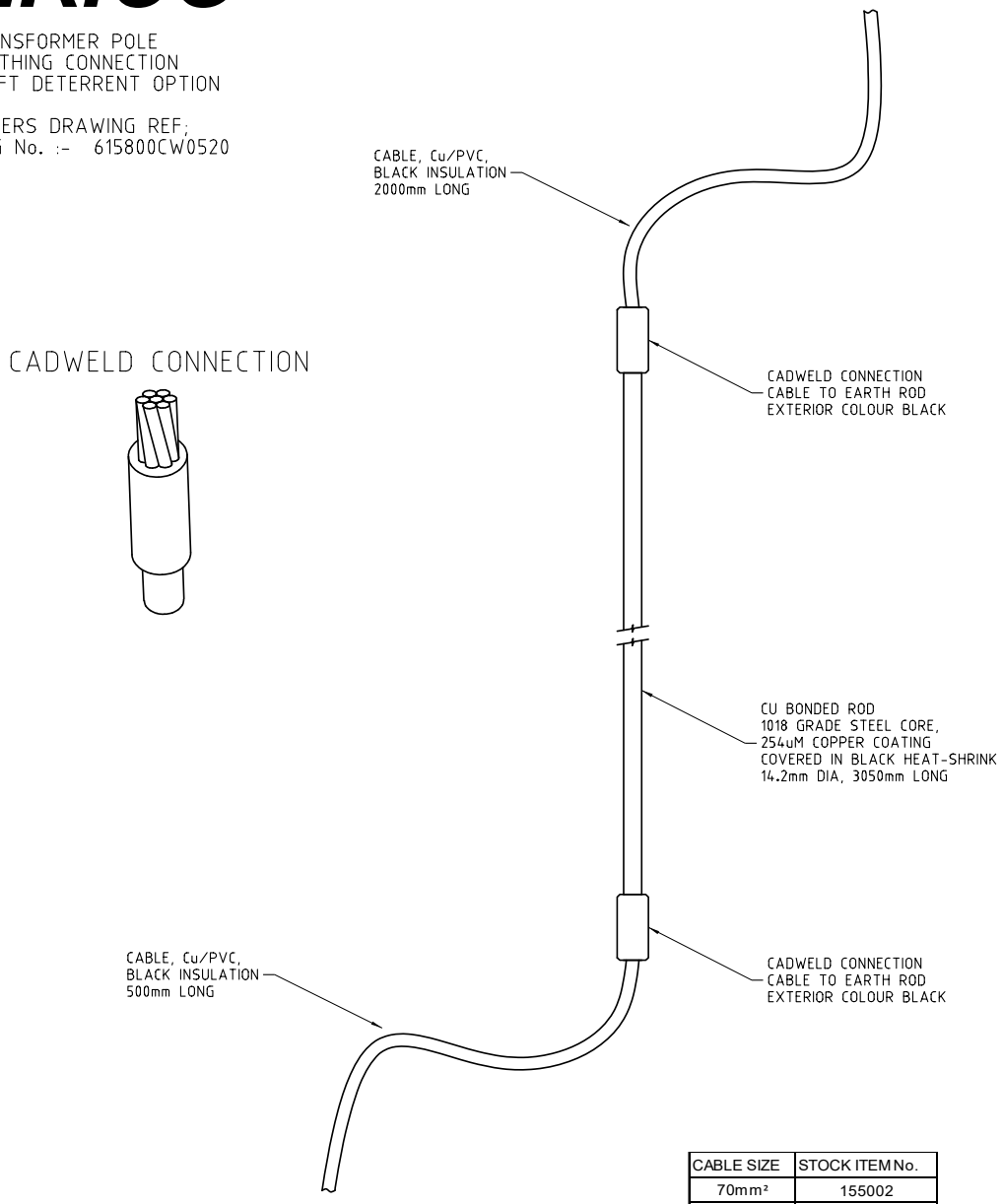
REVISION: A

Anti-Theft Deterrent Option – 70 to 120mm^2 Cable

ERICO

TRANSFORMER POLE
EARTHING CONNECTION
THEFT DETERRENT OPTION

MAKERS DRAWING REF;
DWG No. :- 615800CW0520



CADWELD CONNECTION

CABLE SIZE	STOCK ITEM No.
70mm²	155002
120mm²	155003

NOTES:

1. THIS ASSEMBLY IS INTENDED TO REPLACE TRADITIONAL COPPER EARTH CABLE WITH COPPER BONDED STEEL CONDUCTOR
2. ERICO COPPER BONDED STEEL CONDUCTOR IS MANUFACTURED USING 1080 STEEL. THE COPPER IS APPLIED ELECTROLYTICALLY, FORMING A METALLURGICAL BOND BETWEEN THE STEEL CORE AND THE COPPER
3. COMPLIES WITH AS 3000, BS 7430, ANSI, UL 467, EN50164-1&2

DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED

ALTERATIONS: ORIGINAL ISSUE

TasNetworks

DRAWN	CS PRO-SOLUTIONS
DESIGNED BY	ELECTRO
CHECKED BY	H.WESTBURY
APPROVED BY	-
DATE APPROVED	08/MAR/19

TITLE: EARTHING COMPONENTS
EARTHING CONNECTION 70mm2 Cu & 120mm2 CABLE
THEFT DETERRENT OPTION

SCALE: NTS

A4

D - OHC - M011 - SD - 002

REVISION: A