

Composite Poles, Columns & Brackets

Document No. ETS 0118

Amendment No. 0

14/09/26

Revision History

Initial release.

Important Disclaimer

As the information contained in this publication is subject to change from time to time, Endeavour Energy gives no warranty that the information is correct or complete at the time of its use or is a definitive statement of procedures.

Endeavour Energy reserves the right to vary the content of this publication as and when required. You should make independent inquiries to satisfy yourself as to the correctness and accuracy of the content. Endeavour Energy is not liable to any persons in respect of anything done or not done by any such person in reliance, whether in whole or in part, on this document.

Copyright

This publication is copyright protected. No part of this document may be reproduced by any process without the written permission of Endeavour Energy, except as permitted under the Copyright Act 1968 (Cth).

Contact Information

The latest version of this document and other standards, are located on Endeavour Energy's standards website located at:

<https://www.endeavourenergy.com.au/Working-with-us/Standards-forms-and-guides/Standards>

Document Control

Documentation content coordinator: Asset Engineering Manager

Contents

1	Purpose	5
2	Scope	5
3	References	5
4	Definitions and Abbreviations	6
5	Actions	8
5.1	<i>General requirements</i>	8
5.1.1	Service condition and durability	8
5.1.1.1	Durability parameters	9
5.2	<i>Technical Requirements</i>	9
5.2.1	Manufacturing Requirements	9
5.2.2	Working loads and lengths	10
5.2.3	Size and Tolerances	10
5.2.4	Weight	11
5.2.5	Deflection	11
5.2.6	Resin	11
5.2.7	Coating and colouring	12
5.2.8	Joints	12
5.2.9	Holes and fittings	13
5.2.10	Hatches	13
5.2.11	Accessories	13
5.2.11.1	Pole Tip Cap	13
5.2.11.2	Butt Plate	13
5.2.11.3	Identification plate	14
5.2.12	Installation	14
5.2.13	Handling	15
5.2.14	Repair	15
5.2.15	Compatibility and Interchangeability	15
5.2.16	Workability	15
5.2.17	Reliability	16
5.2.18	Packing & Delivery	16
5.3	<i>Testing Requirements</i>	16
5.3.1	General test requirements	16
5.3.2	Type Test	17
5.3.2.1	Mechanical tests	17
5.3.2.2	Electrical tests	18
5.3.2.3	Fire tests	18
5.3.2.4	UV tests	18
5.3.3	Type Accreditation and reporting requirements	19
5.3.4	Batch testing	20
5.4	<i>Supplier Requirements</i>	20
5.4.1	Quality Assurance	20
5.4.2	Samples	20
5.4.3	Service History	20
5.4.4	Environmental Considerations	21
5.4.5	Variations Over Time	21

Composite Poles, Columns & Brackets

5.4.6	Safety Data Sheet	21
5.4.7	Documentation to be provided with this Proposal	21
5.4.8	Technical Design Data	21
5.4.9	Failure Mode and Effects Analysis (FMEA)	22
5.4.10	Addition of Successful Supplier(s) to the AML	22
6	Authorities and Responsibilities	23
7	Appendix 1 – Specified Items	24
8	Appendix 2 – Drawings	26

1 Purpose

To specify the requirements for composite support structures used on the Endeavour Energy electrical network.

2 Scope

This specification covers the design, testing, and delivery of composite support structures to be installed as part of Endeavour Energy's electrical networks. This specification shall form the basis for which Endeavour Energy shall evaluate tender proposals.

3 References

External Regulations		
Electricity Supply Act 1995 (NSW)		
Electricity Supply (Safety and Network Management) Regulation 2026		
National Electricity (NSW) Law 1997		
National Electricity Rules		

External Standards		
Standard No.	Year	Title
AS1170.2	2021	Structural design actions – Wind actions
AS1530.8.1	2018	Methods for fire tests on building materials, components and structures - Tests on elements of construction for buildings exposed to simulated bushfire attack - Radiant heat and small flaming sources
AS 2700S	2011	Colour Standards for General Purposes
AS 5577	2013	Electricity network safety management systems
AS/NZS 7000	2016	Overhead Line Design Standard
AS/NZS ISO 9001	2016	Quality Management Systems – Requirements
AS/NZS ISO 14001	2016	Environmental Management Systems – Requirements with guidance for use
ASTM D2303	2020	Standard test methods for liquid containment, inclined plane tracking and erosion of insulating materials
ASTM D635	2022	Standard test method for rate of burning and/or extent and time of burning of plastics in a horizontal position
ASTM E84	2023	Standard test method for surface burning characteristics of building materials
ASTM D570	2022	Standard Test Method for water absorption of plastics

Composite Poles, Columns & Brackets

ASTM D5229	2020	Standard Test Method for Moisture Absorption Properties and Equilibrium Conditioning of Polymer Matrix Composite Materials
ENA Doc 01	2019	ENA National Electricity Network Safety Code (Doc 01-2008)
Eurocomp Design code and handbook	1996	Structural design of Polymer Composites
IEC 62631-3-1	2023	Dielectric and resistive properties of solid insulating materials – Part 3-1: Determination of resistive properties (DC methods) – Volume resistance and volume resistivity – General method
IEC 60587	2022	Electrical insulating materials used under severe ambient conditions – Test methods for evaluating resistance to tracking and erosion
AS/NZS IEC 60060.1	2026	High-voltage test techniques – Part 1: General terminology and test requirements
AS/NZS IEC 60060.2	2026	High-voltage test techniques – Part 2: Measuring systems
ASTM G 154	2023	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Materials

Company Policies and Procedures

Company Policy (Network) 9.1.6 – Approved Materials List
 Company Policy (Network) 9.2.5 – Network Asset Design
 Company Policy (Network) 9.7.1 – Network Asset Construction
 Company Procedure (Network) ENG 0002 Network Standards Framework

4 Definitions and Abbreviations

Term	Definition
AML	Approved Material List
AS	Australian Standard
ASTM	ASTM International, American Society for Testing and Materials
Bending Moment (kN.m)	A measure of the tendency of a load to cause a pole or column to bend.
Composite column	A composite support structure intended for street lighting applications, typically baseplate-mounted and supporting luminaires, bracket, and associated equipment.
Composite pole	A composite support structure intended for overhead electrical network applications, including the support of conductors, cables, transformers, and associated electrical equipment.
DFT	Dry film thickness is a measure of the thickness of a coating (such as paint or powder) once it has fully cured
FMEA	Failure mode and effects analysis
GP	General purpose

Composite Poles, Columns & Brackets

ICEA	Insulated Cable Engineers Association
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardisation
LEL	Lower exclusion limit. This is calculated as the mean of the sample size minus 1.65 times the standard deviation.
NATA	National Association of Testing Authorities
NZS	New Zealand Standard
Shear Force (kN)	A force that tends to cause adjacent parts of a pole or column to slide relative to one another.
Support structure	Any pole, column, bracket, outreach, adapter, or other structural member used to support electrical or lighting equipment.
Torsional Load (kN.m)	A twisting load that causes a pole or column to rotate about its longitudinal axis.

5 Actions

5.1 General requirements

Composite support structures shall be designed to meet the dimensional, structural, durability and serviceability requirements of the applicable standards referenced in this specification, including AS/NZS 7000 and other relevant Australian or international standards.

They shall be designed to withstand the specified working loads and the associated bending moments, torsional loads, shear forces and other design actions applicable to their intended service and installation conditions. Compliance shall be demonstrated by analysis, testing, or a combination of both, acceptable to Endeavour Energy.

Poles and columns shall exhibit uniform strength and stiffness characteristics irrespective of the direction of loading, unless otherwise approved by Endeavour Energy. Brackets and other non-symmetrical support structures shall demonstrate adequate strength, and stiffness in their intended orientation and loading direction(s).

All specified items shall minimise the number of components and connection details to facilitate manufacture, transportation, installation, inspection, maintenance and replacement throughout the service life of the asset.

Composite materials, joints, attachments and any embedded or ancillary components shall be designed to maintain structural integrity and durability for the applicable service life under the environmental and operational conditions defined in this specification.

5.1.1 Service condition and durability

All support structures supplied shall be designed to achieve maintenance-free performance throughout their nominated design service life under the environmental conditions specified in Table 1 – Environmental Conditions. The materials, coatings, connections and structural components shall maintain their required strength, serviceability, and durability throughout the design service life without requiring structural replacement due to normal environmental degradation. Manufacturers shall state the guaranteed design service life of the support structures in their offer and provide supporting engineering analysis, testing, field performance data, or other evidence demonstrating compliance.

Table 1 – Environmental Conditions

Condition	Environmental Limits
Ambient Temperatures	Maximum: 50°C Minimum: -15°C
Solar Radiation Levels	1100 W/m ² with high ultraviolet content.
Wind Loading	As specified in AS/NZS 7000
Precipitation	Maximum annual rainfall range 1800 – 2400mm. Minimum annual rainfall range 0 – 100mm.
Humidity	Extreme range of relative humidity from 10% to 100%.
Pollution levels	Pollution level – IV very heavy Areas of coastal salt spray and/or industrial pollution with equivalent salt deposit densities up to 3.0 g/m ² .
Isokeraunic level	Maximum of 60 thunderstorm days per year

Composite Poles, Columns & Brackets

5.1.1.1 Durability parameters

The following durability parameters shall be considered:

- **Resistance to corrosion:** Support structures and associated hardware shall be resistant to corrosion, biological attack, and environmental degradation under the conditions specified in Table 1 – Environmental Conditions. Materials and components located below the groundline shall also be resistant to degradation associated with exposure to aggressive soil environments. Below-ground degradation shall not adversely affect dimensional stability or structural strength throughout the design service life.
- **Fire performance:** Support structures must have a good fire resistance to both bushfires and pole top fires. Tests must be conducted on composite poles to compare fire performance as indicated in clause 5.3.2.3 Fire tests. Refer to Table 5 – Other type test requirements for details.
- **Resistance to water related damage:** The support structures shall be resistant to moisture ingress and shall not exhibit osmotic blistering, delamination, or other moisture-induced deterioration during its design service life.
- **Durability of adhesives, coatings and fastenings:** Adhesives, coatings, and mechanical fastening systems shall maintain their required performance throughout the design service life and be supported by suitable test evidence.
- **Resistance to lightning and power arcs:** Support structures shall resist lightning and power arc exposure without significant loss of mechanical or electrical performance. Compliance shall be demonstrated by the electrical tests specified in this document.
- **Resistance to electrical ageing:** Support structures shall maintain their electrical and structural performance throughout the design service life when subjected to electrical stresses encountered in service. Compliance shall be demonstrated by the relevant electrical tests specified in this document.

5.2 Technical Requirements

5.2.1 Manufacturing Requirements

Support structures shall be manufactured to a high standard of workmanship and finish. Internal and external surfaces shall be free from defects, voids, cracks, delamination, exposed fibres, or other imperfections that may adversely affect strength, durability, serviceability, or design life.

Support structures shall maintain the specified geometry, dimensions, and tolerances throughout their length. Tapered support structures shall have a smooth and uniform taper from base to tip. Non-tapered support structures shall maintain a consistent cross-section throughout their length.

Fibre reinforcement shall be arranged and distributed throughout the laminate to provide adequate strength and stiffness under the specified bending moment, torsional load, and shear force loading conditions. The manufacturing process shall ensure a consistent laminate structure and minimise defects that could impair structural performance or durability.

Support structures shall be designed and manufactured to prevent the accumulation of water within the structure. The pole tip shall be sealed against the ingress of water and contaminants by means of a manufacturer-installed pole tip cap. An equivalent sealing arrangement may be considered. Suitable provisions shall be provided for drainage and ventilation where required.

All edges shall be smooth and free from burrs, sharp edges, or other features that may create stress concentrations, compromise coatings, or present handling hazards.

The structure shall be constructed from composite materials suitable for the environmental conditions specified in this document and capable of achieving the specified design service life.

The structural design shall account for the effects of creep, fatigue, ageing, and environmental degradation over the specified design service life. Any material strength reduction factors adopted in the design shall be

Composite Poles, Columns & Brackets

stated by the supplier and supported by recognised design standards, published technical literature, test data, or engineering analysis acceptable to Endeavour Energy.

Endeavour Energy reserves the right to reject any support structure having a substantial defect, such as exposed or protruding fibres, uneven coating thickness, incorrect positioning of holes, or any defect that may adversely affect the strength, serviceability, durability, or appearance of the pole. If repairs are deemed appropriate, they may be carried out only with prior approval from Asset Engineering Manager. Where remedial works take place, the service life, stiffness and strength of repaired poles must be no less than undamaged poles.

5.2.2 Working loads and lengths

Suppliers may offer support structures for all or part of the nominated range and shall clearly identify the lengths and working load ratings for which compliance is offered. Suppliers may also include additional support structures beyond those specified, provided they comply with all requirements of this specification and are supported by the relevant technical documentation.

The minimum required pole lengths and working load ratings are specified in Appendix 1 – Specified Items. Suppliers shall clearly identify the lengths and working load ratings for which compliance is offered.

5.2.3 Size and Tolerances

Tolerances for fabrication shall be in accordance with the dimensional tolerances outlined in

Table 2 – Breakdown of the dimensional tolerances used for composite poles below.

Table 2 – Breakdown of the dimensional tolerances used for composite poles

Parameter	Pole Type	Tolerance
Length of pole	Non slip jointed poles	±50 mm
	One slip joint	+150 mm and -100 mm
	Two slip joint	+250 mm and -200 mm
	Three slip joint	+300 mm and -250 mm
Straightness of pole	All Poles	0.20% of total length
Overall cross-sectional dimensions (diameter) of pole		± 1%
		Min ± 0.5 mm
		Max ± 10 mm
Distance between critical hole centres*		±2 mm
Distance between non-critical centres		±10 mm
Distance between step bolt anchorages		±20 mm
Uppermost hole from top of pole		±10 mm
Hole positions measured on circumference		±3 mm
Angle between holes and longitudinal axis of pole		2°
Other dimensions		±10 mm
Pole mass (for handling)	+10% and –5%.	
Non-Tapered / Straight Round Pole Diameter		

Composite Poles, Columns & Brackets

Maximum outer diameter	Poles $\leq$ 15.5 m	465 mm
	Poles $>$ 15.5 m	560 mm
Minimum outer diameter	All poles	200 mm
Tapered Pole Diameter		
Maximum outer diameter	Poles $\leq$ 15.5 m	560 mm
	Poles $>$ 15.5 m	860 mm
Minimum outer diameter	Poles $\leq$ 15.5 m	100 mm
	Poles $>$ 15.5 m	160 mm

5.2.4 Weight

The supplier shall state the mass of each support structure offered.

The mass shall be based on the complete assembled structure, including all permanently attached components.

Weight shall be minimised to facilitate transportation, handling, storage, installation, and replacement activities.

The mass of each support structure shall be included in drawings, technical data sheets, and tender submissions.

Lower mass will be regarded favourably during tender evaluation, provided all other technical requirements are satisfied.

5.2.5 Deflection

When subjected to the rated working load, the maximum lateral deflection of the pole, measured above ground level, shall not exceed:

- 5% of the above-ground pole length for poles up to and including 15.5 m in length; and
- 4% of the above-ground pole length for poles greater than 15.5 m in length.

Compliance shall be demonstrated by testing or engineering analysis acceptable to Endeavour Energy.

For the purpose of calculating deflection, it may be assumed that the pole is installed so that the depth in ground is equal to 10% of the length of the pole plus 600 mm.

Composite columns and brackets shall be designed in accordance with the requirements of ETS 0102.

5.2.6 Resin

The resin system shall be a thermosetting resin suitable for the specified service conditions and design service life. The resin shall incorporate additives or properties that provide flame retardancy, low shrinkage, and resistance to environmental degradation.

The resin system shall be resistant to microbiologically influenced degradation, including attack from sulphur-producing and hydrogen-producing bacteria that may be present in soil environments.

Suppliers shall provide details of the resin system selected, together with supporting evidence demonstrating its suitability for the specified service life and environmental conditions, including resistance to bacterial attack where relevant.

5.2.7 Coating and colouring

Support structures shall have a protective coating system that provides electrical insulation and tracking resistance properties and low toxicity under normal operating conditions. Additionally, the coating shall:

- be durable.
- be maintenance-free.
- be resistant to UV exposure, environmental stress cracking, adverse weather conditions, detergents, salt spray, typical airborne pollutants and chemical attack from soil and concrete environments.
- provide flame-retardant properties to the product.
- remain intact over the service life of the pole or column.
- provide a high level of abrasion resistance.
- maintain adhesion to the composite substrate throughout the service life of the pole or column.
- provide impact resistance suitable for normal handling, installation, and service conditions.

The supplier shall provide details of the coating system including:

- material
- thickness (μm)
- fire resistance
- method of application
- electrical resistance
- dielectric strength
- water absorption
- toxicity index

The preferred colour for composite poles shall be 'green-grey' (N32) to align with CCA-treated timber poles. Composite columns and brackets may be supplied in alternative colours to suit project-specific requirements, including finishes that approximate the appearance of galvanised steel columns (N35). The supplier shall provide available colour options.

The coating shall provide a surface finish with a smooth to lightly textured appearance and shall have water absorption of $<0.03\%$ when tested in accordance with ASTM D570. The coating shall be subject to an accelerated weathering test as outlined in Table 5 – Other type test requirements 5.3.2.4 of this specification.

A non-slip surface treatment is preferred and will be regarded as a desirable feature during tender evaluation.

Suppliers shall also provide details demonstrating the resistance of the pole and coating system to damage and deterioration at the groundline interface resulting from agricultural equipment, domestic tools, and similar mechanical impacts.

5.2.8 Joints

Support structures with joints must be of slip-joint (interference fit) or bolt assembled design. No pole joint shall be located between the attachment points for the top and bottom phases of an overhead line circuit.

All joints must be designed to develop the necessary strength of the joint location. Supporting calculations or evidence must be provided confirming that the joints have sufficient capacity for the duty intended. Suppliers shall provide evidence of the slip-joint retention capacity and demonstrate that the joint will not separate under serviceability or ultimate limit state loading.

Joints must be designed and manufactured to prevent the ingress of water into the lower section of the pole once the joint has been assembled.

Marking must be provided at all joints to allow proper alignment and (for slip joints) complete overlap of the joint. The axis of the pole must not be distorted after joining multiple sections.

Composite Poles, Columns & Brackets

It is imperative that the design of joints enables multiple piece poles to be assembled on rough, uneven or sloping ground.

5.2.9 Holes and fittings

Composite poles shall be manufactured with all required holes and supplied with all associated fittings in accordance with the relevant drawings listed in Appendix 2 – Drawings.

All holes shall pass diametrically through the pole, perpendicular to the longitudinal axis. The manufacturer shall verify that all holes are free of any obstructions that would impair the attachment of relevant fittings by insertion or screwing.

Holes shall be fitted with appropriate plastic plugs prior to delivery of the poles. Any ferrules required as part of the pole design shall be supplied and installed in accordance with the manufacturer's specifications.

Where pole steps are fitted to the poles, as nominated in Endeavour Energy's drawings, the steps shall be securely anchored by systems such as slip-in steps with mounting brackets that are inserted into the pole. Step bolt anchors shall be capable of sustaining, without visible damage, non-concurrent load cases of a pull-out load of 4 kN and bending and shear forces of 1.5 kN applied in all directions.

Where on-site modifications are required, poles and columns shall be capable of being drilled by Endeavour Energy without adversely affecting structural integrity, durability, or service life. The Supplier shall advise in its offer of any precautions that must be taken if their poles are drilled or cut.

5.2.10 Hatches

Composite columns shall be provided with two electrical hatches with minimum clear access openings of 100 mm × 600 mm and 100 mm × 300 mm, respectively.

Offers for composite poles incorporating an electrical hatch with a minimum clear access opening of 205 mm × 625 mm will be viewed favourably during the technical evaluation process.

5.2.11 Accessories

5.2.11.1 Pole Tip Cap

All poles and columns shall be fitted with a pole tip cap or be provided with an equivalent integral pole top sealing arrangement approved by Endeavour Energy. Where a separate pole tip cap is provided, it shall be secured using a minimum of three (3) corrosion-resistant galvanised or stainless-steel fixing screws or other fastening system recommended by the pole manufacturer.

Holes for all cap fixing screws shall be pre-drilled in accordance with the pole manufacturer's recommendations. Self-tapping installation without pre-drilling shall not be permitted.

Any trimming or cutting of the pole top required to achieve a correct cap fit shall be kept to an absolute minimum and carried out in accordance with the pole manufacturer's instructions. The pole tip cap size shall be selected to suit the pole top dimensions and provide a secure fit without excessive trimming.

Where painted support structures are requested by Endeavour Energy, the tip cap must be powder coated with the same colour.

Details of the pole tip cap design, materials, corrosion protection system and method of attachment to the pole shall be included in the tender submission.

5.2.11.2 Butt Plate

The pole or column butt shall be provided with a durable end-sealing system to prevent the ingress of water, soil, insects and other contaminants into the pole structure. The sealing system shall be supplied or

Composite Poles, Columns & Brackets

approved by the pole manufacturer and shall remain effective for the design life of the pole under normal service conditions.

Where mechanical fixings are used to secure the butt cap or sealing arrangement, fixing holes shall be pre-drilled in accordance with the pole manufacturer's recommendations. Self-tapping installation without pre-drilling shall not be permitted.

Details of the pole butt plate design, materials, corrosion protection system and method of attachment to the pole shall be included in the tender submission.

5.2.11.3 Identification plate

A permanent marking must be impressed on a metal nameplate fixed to the supporting structure to the requirements of Endeavour Energy drawing 053999 for poles and 341259 for columns and brackets.

The nameplate must contain the following information, in the following order:

- manufacturer – Location;
- month of Manufacture – Year of Manufacture;
- pole Length – m;
- working load – kN WL;
- ultimate load – kN ULS;
- pole Mass – kg;
- manufacturer's serial number;
- Endeavour Energy name; and
- Endeavour Energy pole code.

The information must be inscribed in letters or numbers as applicable not less than 5mm high. The nameplate should remain visible and legible for the intended life of the pole and should have reasonable resistance to vandalism.

Unless otherwise specified by Endeavour Energy, the identification plate should be installed at:

- **Distribution poles:** 2.6 m plus 10% of the pole length, measured from the butt end of the pole; and
- **Transmission poles:** 1.5 m above finished ground level. Refer to Endeavour Energy drawing 367719 for minimum foundation depth.

The mass of a sample pole must be measured, recorded and checked for compliance with the stated figures. The measured mass must be clearly marked on the butt plate of the pole, together with the length and pole strength to enable easy identification at the pole yard.

Drawings must be provided with the offer showing the general arrangement of pole nameplates.

For composite columns and brackets refer to requirements of ETS 0102.

5.2.12 Installation

Composite poles shall be designed for direct-buried installation and backfilled with soil and/or concrete. Footings shall comply with the requirements of drawings 011981 and 367719 respectively.

Composite columns shall be designed for baseplate mounting. Baseplate dimensions and hole patterns shall be compatible with Endeavour Energy standard Type 2 and Type 3 ragbolt foundations as detailed in Drawings 015021 and 056741. Proposals for in-ground mounting will be considered.

Suppliers shall provide installation instructions for each support structure offered, including single-piece and multi-piece pole configurations.

The supplier may be required to demonstrate the installation process at an Endeavour Energy site.

5.2.13 Handling

All support structures covered by this specification must be constructed to allow handling, erection and transport without causing damage to the item. The manufacturer shall provide details of the preferred lifting techniques and any special equipment required. Recommended storage methods and any temporary support arrangements, including pole stands, cradles and fixtures required during storage, handling and dressing operations, shall also be provided.

The manufacturer will nominate the minimum number of bearing points for each pole or column, for both transportation and storage, and the minimum dimensions recommended for each bearer, together with the maximum unsupported overhang allowable during transportation or storage.

A non-permanent mark must be provided to indicate the point of attachment for a lifting sling or slings.

5.2.14 Repair

The supplier shall provide, with the tender offer, documented procedures for the repair of composite support structures, including the following repair scenarios:

- Repair of damaged or abraded surface coatings;
- Repair of damaged painted surface coating through repainting;
- Repair of damaged fibre-reinforced composite matrix;
- Repair of puncture, abrasion, or impact damage assessed as having no adverse effect on the structural capacity of the pole; and
- Repair of heat-related damage resulting from bushfires or grass fires.

The repair procedures shall identify:

- The repair methodology;
- Materials and consumables required for the repair;
- Surface preparation requirements;
- Inspection and acceptance criteria following repair; and
- Any safety precautions or environmental controls required for undertaking repairs in the field.

The supplier shall identify any damage limits beyond which repair is not permitted, and replacement of the pole is required.

The supplier may be required to demonstrate the repair process at an Endeavour Energy site.

5.2.15 Compatibility and Interchangeability

The support structures shall be compatible with existing Endeavour Energy standard and legacy pole-top hardware without requiring modification to the hardware.

The composite poles shall be capable of being drilled to accommodate a 22 mm diameter hole at locations required for the installation of standard network attachments. The poles shall be capable of accommodating attachments installed by drilling, bolting, screwing, or other manufacturer-approved attachment methods.

Suppliers shall identify any non-drillable locations, reinforced zones, minimum hole spacings, edge-distance requirements, or other limitations associated with drilling and attachment installation.

For tapered poles, the taper shall be uniform over the length of the pole.

5.2.16 Workability

Composite Poles, Columns & Brackets

The supplier shall provide procedures for on-site drilling, cutting, and modification of composite poles. The procedures shall identify any precautions necessary to ensure the strength, durability, electrical performance, and service life of the pole are not adversely affected.

The supplier shall provide the mass and centre of gravity of each support structure type offered, together with any handling, lifting, transport, and storage requirements.

5.2.17 Reliability

Comments on the reliability and performance of the items offered, for a minimum service life of 55 years under the specified system and environmental conditions shall be submitted with the offer. Such comments shall include evidence in support of the reliability and performance claimed including information of failure mode and effect analysis. Where the items offered have been found to be defective or fail under normal service conditions within the last 24 months the supplier may be requested to provide documented evidence that shows how the changes implemented have rectified the problem(s).

Suppliers are encouraged to provide evidence supporting service lives in excess of 55 years. Offers demonstrating a service life of 80 years or greater may be viewed favourably as part of the technical evaluation process.

5.2.18 Packing & Delivery

All items supplied shall be suitably packaged to deliver the items undamaged, giving due consideration to the methods and distance of transportation and handling. Poles and columns shall be packed so that there is no surface contact between poles or possible damage to the coating or other painted finishes, etc. during delivery.

The supplier is responsible for the delivery and unloading of the items to the Endeavour Energy pole yard or project location. It is the responsibility of the supplier to ensure that any third party used for the loading, transportation and unloading of materials is aware and follows the approved safe work method for the above-mentioned tasks.

Each delivery document shall be provided with the following information:

- manufacturer's name;
- purchaser's name (i.e. Endeavour Energy);
- order number;
- item description;
- quantity;
- manufacturer's serial numbers; and
- total mass (kg).

5.3 Testing Requirements

5.3.1 General test requirements

Where a pole or column has been tested to a standard different to those listed in the following sections, or where the supplier believes an alternate test demonstrates a similar characteristic of the pole or column, the supplier shall submit documentation on how the proposed standard/test differs from the indicated standard.

Composite Poles, Columns & Brackets

5.3.2 Type Test

5.3.2.1 Mechanical tests

Table 3 – Mechanical type test requirements

Standard	Reference clause	Test	Pass Criteria
AS/NZS 7000	8.5 & Appendix J	Serviceability and strength limit-state testing in accordance with AS/NZS 7000 for the working loads specified in Appendix 1.	- For serviceability, the test specimen shall satisfy the applicable serviceability requirements. Under a 500 Pa wind condition or the AS/NZS 7000 High Serviceability condition, as applicable, all measured serviceability indicators, including maximum deflection, shall be within the specified limits for the pole application. - For strength, the test specimens must withstand the applicable strength limit-state test load for not less than 2 minutes. - The results of this test as per Clause 8.5.4 of AS/NZS 7000 must be provided with the offer.
	Appendix J	Crushing Torque	Must have minimum crushing torque of 150 Nm.
	Appendix FF	Deflection testing in accordance with Appendix FF at the specified working load.	- Compliance with criteria outlined in clause 5.2.5. - The results of this type test in accordance with Appendix FF, Clause FF6 of AS/NZS 7000 shall be provided with the offer.
-	-	Bolt pull through test	- A tensile load of 20.0 kN shall be applied to a M20 through bolt fitted with a standard washer and installed in the composite pole. - The composite pole and connection assembly shall exhibit no pull-through, cracking, delamination, permanent deformation, or other damage affecting structural integrity.
-	-	Stay Wrap Compression Test	- A representative stay wrap shall be installed on the composite pole and subjected to a tensile load of 88 kN. - The composite pole shall exhibit no crushing, cracking, delamination, excessive deformation, or other damage affecting structural integrity.

5.3.2.2 Electrical tests

Table 4 – Electrical type test requirements

Standard	Test Name	Test Description	Pass Criteria
AS/NZS IEC 60060	BIL Test	Basic Impulse Level (BIL) test.	- The pole shall achieve a minimum Basic Impulse Level of 300 kV/m. - The test report shall state the achieved BIL value. - Details of any observed reduction in mechanical strength following the lightning impulse withstand test shall be provided, where available.
-	Power Frequency Withstand Test	Power frequency withstand testing.	- The pole shall successfully withstand the applied power frequency voltage. - The achieved withstand voltage shall be reported.
IEC 60587 (Method 2), ASTM D2303	Inclined plate tracking test	Test specimens must be tested to 2.5 kV for 1 hour and increased to 2.75kV for 1 hour as per Method 2.	Current in the high voltage circuit does not exceed 60 mA or the specimen does not display any holes from erosion.
Note: Electrical and UV type tests shall be conducted only after the complete removal of any mould release agents used during manufacture. Where applicable, the test report shall confirm that mould release agents were removed prior to commencement of testing.			

5.3.2.3 Fire tests

In addition to the fire resistance test detailed in Table 5 – Other type test requirements, the test report shall include the time to ignition, burning rate, temperatures reached, and whether the material continues to sustain combustion after removal of the ignition source. The test report shall also identify any hazardous combustion residues or by-products and provide details of the residual structural strength of the pole following fire exposure.

Composite poles should preferably maintain structural integrity following fire exposure and require only surface repair. Where this is not achieved, the supplier shall provide details of the extent of damage and any repair or replacement requirements.

Where the supplier offers a fire-protection system, coating, wrap, barrier, or other product intended to improve the fire performance of the pole, details of the product and its demonstrated performance shall be included in the tender submission.

5.3.2.4 UV tests

In addition to the accelerated UV test detailed in Table 5 – Other type test requirements, the supplier shall submit documentation to demonstrate that the mechanical strength of items offered is not compromised when exposed to the Australian environment over the life of the asset.

Composite Poles, Columns & Brackets

Table 5 – Other type test requirements

Standard	Test Name	Test Description	Pass Criteria
AS 1530.8.1	Fire resistance test	Bushfire resistance testing of composite poles.	- Testing shall be conducted in accordance with AS 1530.8.1 to a minimum BAL-40 level. - Test reports shall include ignition time, heat flux, temperatures reached, burning rate and flame propagation characteristics. - Complete test results shall be submitted with the offer.
ASTM G 154	Accelerated UV test	Accelerated UV ageing test	- Specimen (with coating) must be tested for a minimum of 10,000 hours - No significant colour change, cracking, peeling, blistering or coating deterioration shall occur. - Minor loss of gloss is acceptable. - No fibre blooming of the specimens will be accepted. - Test results shall be submitted with the offer.

5.3.3 Type Accreditation and reporting requirements

Type tests must be provided for each support structure and will qualify all structures with similar performance characteristics to the tested support structure. Documentation must be provided to justify the performance characteristic ranges submitted.

All type tests shall be carried out by a testing authority/laboratory holding accreditation:

- by NATA Australia; or,
- by an accreditation authority recognised by NATA Australia.

Tests from other testing authorities may be accepted at the discretion of Endeavour Energy.

All type test reports shall be accompanied by copies of the accreditation certificate(s) issued to the testing laboratory. The accreditation certificate(s) shall be valid for the relevant test(s) and for the duration of the test(s).

Type tests shall be less than ten (10) years old. Type tests beyond this limit may be submitted provided sufficient information to demonstrate that the manufacturing process, raw materials, design, and quality control processes have not significantly changed since the original test date is also submitted with the offer.

All documentation submitted (including reports, tests, testing procedures/policies, calibration certificates and the like) shall be in English.

Type test certificates shall specify the overall dimensional details of the support structure, test assembly, procedure, test requirement and test results. Test certificates only indicating that the items have passed without listing the test conditions above will be deemed non-compliant.

Ultimate strength and serviceability tests may be substituted by theoretical capacity reports for each structure confirming that the material meet all the technical requirements. Detailed calculations supporting these reports shall be provided (design assumptions used to establish the nominated ratings and capacities), accompanied by a structural engineer's certificate.

The certification shall be from an engineer with the following qualifications:

- must be a Chartered Professional Engineer (CPEng) of Engineers Australia;
- must be a member of the Structural College of the Engineers Australia; and

Composite Poles, Columns & Brackets

- must be registered in the National Professional Engineers Register of Engineers Australia for Structural Engineering.

Overseas qualifications covering the above three (3) criteria, assessed and agreed by Engineers Australia, or acceptable to the Engineering Delivery Manager, may be considered.

Calculations provided shall be complete in all ways to allow Endeavour Energy to independently employ a certified structural engineer to produce theoretical support structure capacity reports.

5.3.4 Batch testing

Batch tests must be carried out on every batch of poles or columns produced to demonstrate quality assurance of items supplied.

Batch test certificates must be supplied with each order/delivery and shall specify that the poles or columns meet the requirement of this specification. All routine and batch tests may be conducted at the manufacturing facility's test laboratory on the condition that sufficient evidence is provided with the offer to demonstrate the testing facility's capability to perform the specified tests. As a minimum, the following information must be provided:

- Qualifications/experience of testing staff;
- Test procedures for all routine/batch tests;
- Testing facility quality control procedures; and
- Test instrument calibration certificates/procedures.

As part of the assessment process, Endeavour Energy will specify in writing if they accept the routine/batch tests being conducted at the manufacturing facility's test laboratory.

The supplier must propose the frequency and type of tests to be performed as part of the batch testing.

5.4 Supplier Requirements

5.4.1 Quality Assurance

The supplier and/or manufacturer shall document and maintain a Quality System in conformity with AS/NZS ISO 9001 or equivalent international standard. The supplier shall submit a current certificate of their Quality System with the offer.

The costs incurred by Endeavour Energy due to quality issues of product shall be borne by the supplier. These costs will include, but are not limited to finding, testing, transport and pre-installation and post installation costs.

5.4.2 Samples

Samples of items may be requested and shall be supplied for evaluation by Endeavour Energy during the evaluation process. Samples shall be provided at no cost to Endeavour Energy within the timeframe stipulated at the time of request.

Drawings showing all dimensions of the items, marking and applicable data sheets shall be provided with the samples.

The supplier shall also provide a written statement that the samples represent the products being offered in all respects.

5.4.3 Service History

The supplier shall provide with the offer information on:

Composite Poles, Columns & Brackets

- the period of service achieved by items offered within Australian service conditions.
- Australian electricity supply authorities who have a service history of the items offered; and
- contact names and phone numbers of relevant employees of those supply authorities who can verify the service performance claimed.

5.4.4 Environmental Considerations

Suppliers shall provide comment on environmental sustainability of the design and materials used in the manufacture of items offered. At a minimum, this shall include:

- waste reduction and management practices.
- end-of-life recyclability of the pole and/or column and recommended disposal method.
- the use of re-usable packing and/or recyclable packaging materials.

5.4.5 Variations Over Time

The supplier shall notify the purchaser in writing of any proposed change to the design, materials, manufacturing processes, or any other aspect of the items at least six (6) months prior to the intended implementation date.

Approval of variation will be at the sole discretion of Endeavour Energy.

Any variation approved by Endeavour Energy shall be subject to the supplier providing, at its own cost, such test results, documentation, and product samples as Endeavour Energy reasonably requires to demonstrate that the varied items continue to comply with the requirements of this specification and are otherwise acceptable to Endeavour Energy.

5.4.6 Safety Data Sheet

Safety Data Sheet for all materials used in the manufacture of the items shall be supplied with the offer for evaluation by Endeavour Energy.

5.4.7 Documentation to be provided with this Proposal

The following documents shall be submitted with a tender offer:

1. Statement of conformance with this specification.
2. Fully dimensioned drawings of each item offered, including pole mass and marking details.
3. Design service life information and supporting evidence.
4. Installation procedures for pole tip caps, identification plates, and any supplied accessories.
5. Details of the coating system, including material, thickness, application method, fire performance, electrical properties, water absorption, and toxicity.
6. Test reports and supporting evidence demonstrating compliance with this specification.
7. Reliability and service history information.
8. Details of packing, handling, transport, and product marking.
9. Training, installation, and maintenance documentation.
10. Current Quality Management System certification.
11. Environmental sustainability and end-of-life management information, including recycling options and associated costs.
12. Safety Data Sheets for all relevant materials.
13. Details and test results for any fire protection products or systems offered to enhance pole fire performance.

5.4.8 Technical Design Data

Composite Poles, Columns & Brackets

The supplier shall provide technical design data sufficient to enable modelling of the offered poles, columns and brackets within Endeavour Energy approved design software. As a minimum, the supplier shall provide:

- load limitations including any restrictions on attachments, equipment mounting or drilling locations; and
- electronic design files where available, including PLS-CADD, Neara, step file or other compatible modelling data.

Updated technical design data shall be provided whenever changes are made to approved products.

5.4.9 Failure Mode and Effects Analysis (FMEA)

The supplier must supply Endeavour Energy with a failure mode and effects analysis (FMEA) of support structures. The FMEA must indicate experienced failures, and also the mean time between failures (MTBF), and the recommended maintenance regime and maintenance tasks and intervals.

5.4.10 Addition of Successful Supplier(s) to the AML

On award of contract for the composite poles, columns and brackets, Endeavour Energy will list the successful tenderer for items covered by that contract in the AML. Technically compliant composite poles from alternate suppliers may be listed in the AML at the sole discretion of Endeavour Energy.

Respondents shall also note that Endeavour Energy only evaluates materials as part of a tender process. Suppliers who do not tender would not be evaluated outside a tender process and would have to wait for the next tender to submit their offer for evaluation.

6 Authorities and Responsibilities

Listed below are the positions or groups of positions that have specific authorities and responsibilities associated with this specification.

General Manager Future Grid and Asset Management has the authority and responsibility for:

- approving major changes to this specification in accordance with ENG 0002, including any variations;
- making all decisions concerning compliance with this specification;
- delegating any of these authorities and responsibilities to the **Head of Asset Management and Digital**.

Head of Asset Management and Digital has the authority and responsibility for:

- approving minor changes to this specification in accordance with ENG 0002;
- making recommendations to the **General Manager Future Grid & Asset Management** for major changes in respect to this specification.
- Making recommendations concerning compliance in respect to this specification.

Asset Engineering Manager has authority and responsibility for:

- periodic review of this technical specification for industry best practice and Endeavour Energy's requirements;
- reviewing all test reports submitted;
- making recommendations to the **Head of Asset Management and Digital** based on industry best practice;

The **Head of Procurement** has overall responsibility for ensuring that all poles purchased by Endeavour Energy comply with the requirements of this specification.

Manufacturers/suppliers shall be responsible for:

- maintaining awareness of their responsibilities and conformance requirements under this specification.
- checking all products supplied to Endeavour Energy comply with this specification.
- checking that an effective safety, environmental and quality auditing system is in place.
- implementing this Specification and keeping Endeavour Energy or other responsible equivalent officers informed of any factors that may prevent them from accepting responsibility for its full implementation.

The **Head of Customer Network Solutions** is responsible for ensuring that all designs prepared by Level 3 Accredited Service Providers and installations undertaken by Level 1 Accredited Service Providers comply with the requirements of this specification.

The **Head of Engineering Design** is responsible for ensuring that all designs prepared by Endeavour Energy designers comply with the requirements of this specification.

7 Appendix 1 – Specified Items

Table 6 – Specified composite poles

Item No.	Pole length (m)	Working Load (kN)
FP8/30	8	30
FP9.5/4	9.5	4
FP9.5/8	9.5	8
FP9.5/12	9.5	12
FP11/4	11	4
FP11/8	11	8
FP11/12	11	12
FP12.5/4	12.5	4
FP12.5/8	12.5	8
FP12.5/12	12.5	12
FP12.5/18	12.5	18
FP14/8	14	8
FP14/12	14	12
FP15.5/8	15.5	8
FP15.5/12	15.5	12
FP17/8	17	8
FP17/12	17	12
FP18.5/8	18.5	8
FP18.5/12	18.5	12
FP20/8	20	8
FP20/12	20	12
FP21.5/8	21.5	8
FP21.5/12	21.5	12
FP23/8	23	8
FP23/12	23	12

Composite Poles, Columns & Brackets

Table 7 – Specified composite streetlight columns

Item	Luminaire Mounting Height (m)
FC6.5	6.5
FC7.5	7.5
FC9.0	9.0
FC10.5	10.5
FC12.0	12.0

Table 8 – Specified composite streetlight bracket

Item	Bracket Length (m)	Spigot (NB)
FB1.5/25	1.5	25
FB3.0/25	3.0	25
FB4.5/25	4.5	25
FB1.5/32	1.5	32
FB3.0/32	3.0	32
FB4.5/32	4.5	32

Note: Suppliers are encouraged to offer approved streetlighting adaptors and extensions referenced in ETS0102 as part of their tender submission.

8 Appendix 2 – Drawings

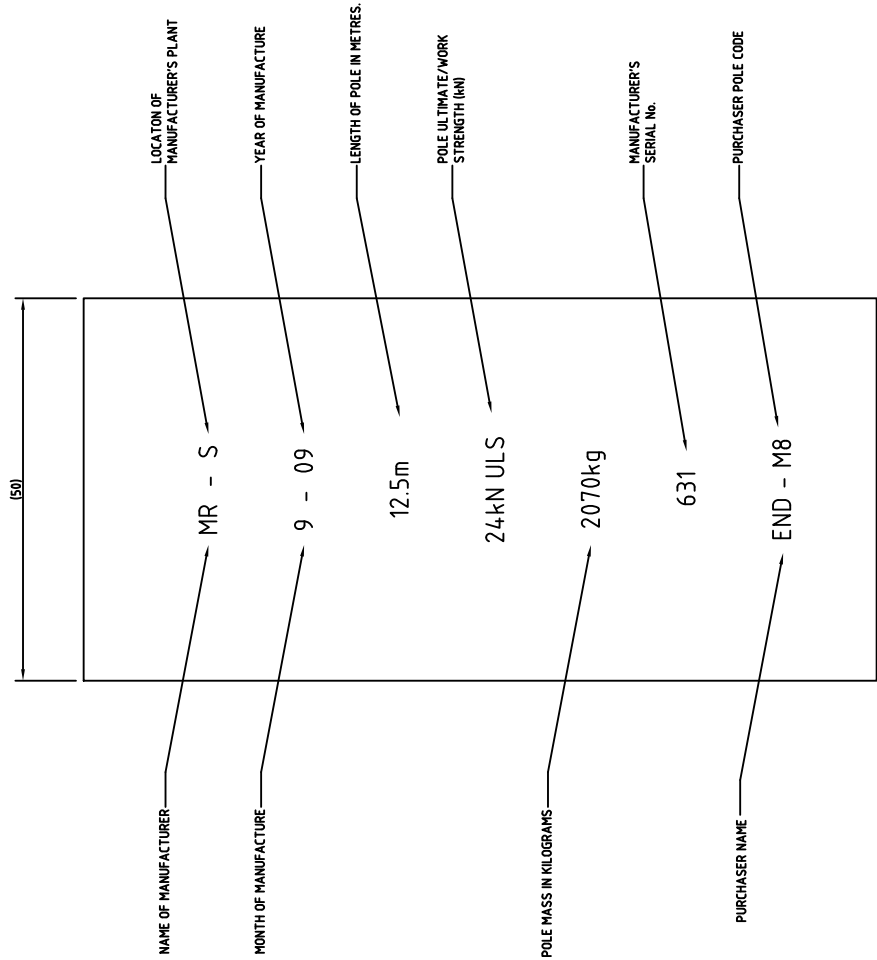
Table 9 – Drawings associated with this specification

Drawing Number	Drawing Title
053999	Identification plate for concrete and steel poles
280236	Overhead transmission 33kV concrete pole type 50C UGOH hole former & ferrule layout
282831	Stay pole hole former & ferrule layout
288603	Overhead transmission 33kV concrete pole type 50V UGOH hole former & ferrule layout
331149	Concrete / steel hole former & ferrule layout
339927	132kV pole type '80 series' hole & ferrule layout
339928	33kV / 66kV pole type '60 series' hole & ferrule layout
339929	66kV pole type '70 series' hole & ferrule layout
367719	Overhead Transmission Pole Foundation Details
011981	Overhead Construction Pole Footings Detail
015021	Type 2 Ragbolt Assembly Fabrication Detail
056741	Type 3 Ragbolt Assembly Fabrication Detail

[illegible]

NOTES

1. MATERIAL: STAINLESS STEEL OR APPROVED MATERIAL, SIZE 3 X 50 X LENGTH TO SUIT.
2. IDENTIFICATION CHARACTERS TO BE A MINIMUM OF 5mm HIGH.
3. IDENTIFICATION CHARACTERS TO BE INDENTED INTO SURFACE OF PLATE.



CHARACTERS SHOWN ARE FOR
DEMONSTRATION PURPOSES ONLY.

				©All rights and the copyright in this drawing are the property of Endeavour Energy. It is to be used for the specific project, location and site only. It is not to be copied, reproduced, modified or otherwise used without the written consent of Endeavour Energy.	
				APPROVED C.BROWN	
				DO NOT SCALE DIMENSIONS IN MILLIMETRES	
				REFERENCE DRAWINGS	
				MAINS DEVELOPMENT MANAGER	
				W.Islay	
				078310	
				050871	
				053999 K	
				SHEET No 1 OF 1 SHEETS	

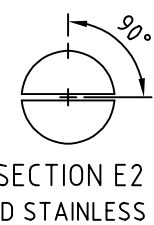
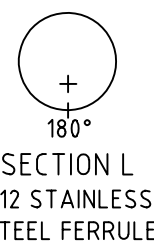
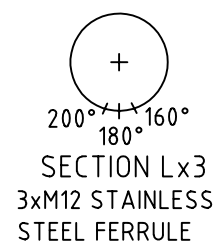
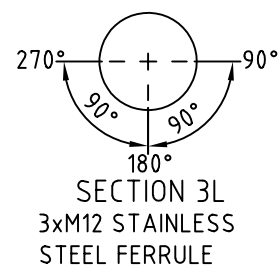
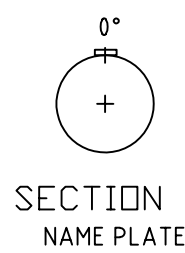
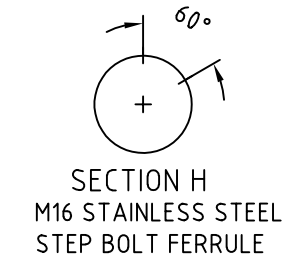
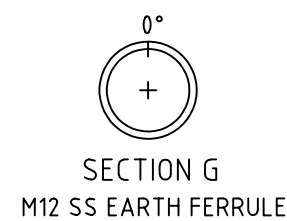
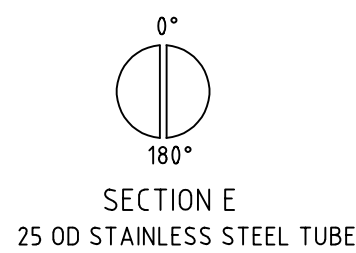
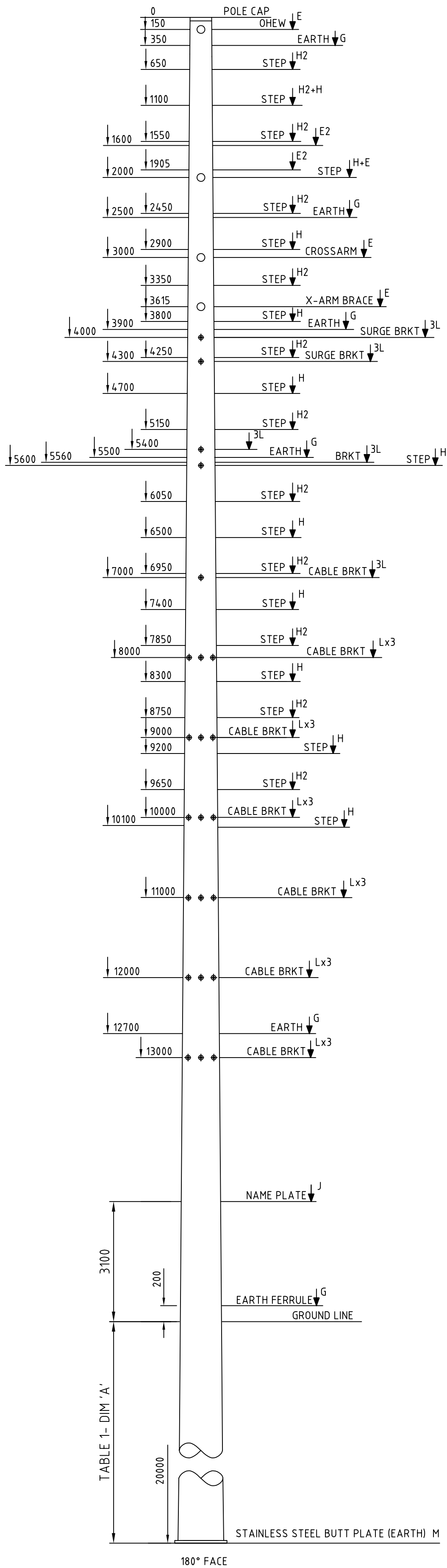
AMENDMENTS		
A	ORIGINAL ISSUE	
Job No.		
B	DR'N	F.M.
	CH'D	R.L.
	DATE	21/8/03
	JOB No	BTE3004A
TMM	C.H.B.	
SECTION U-U ADDED. CABLE SLOT QTY WAS '3'.		
C	DR'N	BF
	CH'D	RL
	DATE	07.09.06
	JOB No	RA104626
DSM	CB	
REDRAWN, GENERAL REVISION		
D	DR'N	BF
	CH'D	R.L.
	DATE	03.08.07
	JOB No	RA104626
DSM	J. Broadhead	
SECTION M-M DELETED		
E	DR'N	BM
	CH'D	SD
	DATE	30-07-13
	JOB No	
OH&UG MM	D.MATE	
SECTION A-A DELETED.		
CABLE SLOT DETAIL DELETED		
CABLE SLOT DELETED.		
DIM A & B ADDED.		
EARTH DIM ADDED.		
TABLE 1 ADDED.		
F	DESIGN	N/A
	DR'N	K.T.
	CH'D	JB/RL
	DATE	31.10.14
TMDM	S.F.Williams	
NMM	D.Mate	
TABLE & POLE SECTION REVISED.		

CONSTRUCTION TOLERANCE	
DIMENSION	TOLERANCE
0 TO 500mm	± 2mm
501 TO 10 000mm	± 10mm
POLE LENGTH	± 50mm

TABLE 1 (UGOH Structures)		
LENGTH OF POLE (m)	POLE DETAILS	
	POLE STRENGTH (UTS kN)	DIMENSION 'A' (mm)
20	32	3400
	40	3800
	60	4400
# Dimension 'A' to be confirmed with foundation design.		

LEGEND			
SYMBOL	DESCRIPTION	QTY	DRG
E ○	25 OD STAINLESS STEEL TUBE	6	050871
G +	M12 STAINLESS STEEL EARTH FERRULE	6	050871
H ⊕	M16 STAINLESS STEEL STEP FERRULE COMPLETE WITH STEP BOLT	22	050871
I ≡	NAME PLATE	1	053999
L ⊕	M12 STAINLESS STEEL FERRULE.	33	050871
M	S/S EXTERNAL BUTT PLATE EARTH	1	-

		Ⓢ This drawing and the copyright therein is the property of Endeavour Energy and may not be copied, reproduced, distributed, loaned or used without the written consent of Endeavour Energy.	
	ORIGINAL SCALE NIL	APPROVED K. Oliver	
DRAWN	N.C.		
DATE	07.07.03		
CH'D	R.L.		



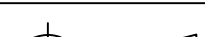
33kV UG/OH CONSTRUCTION (HORIZ)			398007
REFERENCE DRAWINGS			
DO NOT SCALE DIMENSIONS IN MILLIMETRES		AUTHORISED D. Asvestas / C. Brown	
SION 50C UG/OH LAYOUT	MGR TRANSMISSION CAPITAL PROJECTS		12.08.03
	A2P	280236	Rev. F
		SHEET No 1 OF 1 SHEETS	

[illegible]

CONSTRUCTION TOLERANCE	
DIMENSION	TOLERANCE
0 TO 500mm	± 2mm
501 TO 10 000mm	± 10mm
POLE LENGTH	± 50mm

TABLE 1 (UGOH Structures)		
LENGTH OF POLE (m)	POLE DETAILS	
	POLE STRENGTH (UTS kN)	DIMENSION 'A' (mm)
21.4	32	3500
	40	3900
	60	4600
# Dimension 'A' to be confirmed with foundation design.		

LEGEND			
SYMBOL	DESCRIPTION	QTY	DRG
E 	25 OD STAINLESS STEEL TUBE FOR M20 BOLT.	4	050871
G 	M12 STAINLESS STEEL EARTH FERRULE	6	050871
H 	M16 STAINLESS STEEL STEP FERRULE COMPLETE WITH STEP BOLT	26	050871
I 	NAME PLATE	1	053999
L 	M12 STAINLESS STEEL FERRULE.	35	050871
M	S/S EXTERNAL BUTT PLATE EARTH	1	-

		33kV UG/OH CONSTRUCTION (VERT)		398008	
This drawing and the copyright therein is the property of Endeavour Energy and may not be copied, reproduced, distributed, loaned or used without the written consent of Endeavour Energy.		REFERENCE DRAWINGS			
ORIGINAL SCALE NIL		APPROVED K. Oliver		DO NOT SCALE DIMENSIONS IN MILLIMETRES	
AUTHORIZED D. Asvestas / C. Brown		MGR TRANSMISSION CAPITAL PROJECTS			
DATE 07.07.03		OVERHEAD TRANSMISSION 33kV CONCRETE POLE TYPE 50V UG/OH HOLE FORMER & FERRULE LAYOUT		19.07.04	
CH'D R.L.		A2P		Rev. F	
				SHEET No 1 OF 1 SHEETS	

H

		REFERENCE DRAWINGS	
DO NOT SCALE DIMENSIONS IN MILLIMETRES	AUTHORISED D. Asvestas / J. Broadhead		
	MGR TRANSMISSION CAPITAL PROJECT DEVELOPMENT		19.10.09
	A2P	339927	Rev. D
		SHEET No 1 OF 1 SHEETS	

AMENDMENTS

A

ORIGINAL ISSUE

Job No.

CA104907

B

DR'N

M.C.

CH'D

R.L.

DATE

09-03-10

JR No

N/A

C

REMOVED TO ALIGN POLE STEP SPACING WITH DISTRIBUTION STANDARD.

DSM

J.B.

DR'N

S.F.

CH'D

E.W.

DATE

27-09-24

JR No

N/A

D

REMOVAL OF ONE HOLE FERRULE, TWO EARTHING FERRULE RELOCATED. NOTES UPDATED. CONSTRUCTION TOLERANCE TABLE DELETED. TABLE 1 UPDATED. SECTIONS ADDED.

EDM

K.S.

DR'N

S.F.

CH'D

E.W.

DATE

05-12-24

JR No

N/A

NOTES 5-7 ADDED. LEGEND UPDATED. TABLE 1 UPDATED.

EDM

K.S.

NOTES

1. POLE STEPS ARE REQUIRED TO BE INSTALLED FROM 8.3M ABOVE GROUND LEVEL. WHERE NORMAL VEHICLE ACCESS IS NOT AVAILABLE (OFF ROAD) POLE STEPS WILL BE REQUIRED FROM 6M ABOVE GROUND LEVEL. ALL CONCRETE AND STEEL POLES SHOULD HAVE FERRULES FROM 6M REGARDLESS.

2. DISTRIBUTION FERRULES AND HOLE FORMERS:-
A) ONLY REQUIRED IF SPECIFIED AND IN ACCORDANCE WITH ORG: 331149
B) FIRST (HIGHEST) DISTRIBUTION HOLE FORMER ABOVE GROUND POSITION TO BE SPECIFIED.
C) MINIMUM HOLE FORMER HEIGHT ABOVE GROUND = 4.6M

3. HOLES & FERRULES TO SUIT CONSTRUCTION 61S/C, 62S/C, 63S/C, 64S/C, 65S/C, 66S/C.

4. ALLOWABLE CONSTRUCTION TOLERANCE FOR STEEL POLES IS +/- 25.4MM FOR SINGLE SEGMENT POLES AND +/-25.4MM PER SEGMENT FOR MULTI SEGMENT POLES

5. WHERE CORROSION PROTECTION IS SPECIFIED, THE AFFECTED EARTH FERRULE SHALL BE RELOCATED 100MM ABOVE THE COATING.

6. WHERE TOUCH PROTECTION IS SPECIFIED, THE ID TAG SHALL BE RELOCATED 100MM ABOVE THE COATING.

7. A 22MM ID INSPECTION HOLE SHALL BE LOCATED 650MM ABOVE GROUND LEVEL FOR STEEL POLES ONLY.

LOCATION OF POLE STEP FERRULE OR STEEL POLE STEP CLIP

180°

0°

SECTION E1 - E1
25Ø HOLE

270°

90°

SECTION E2 - E2
25Ø HOLE

0°

0°

SECTION G - G
M12 EARTH FERRULE

0°

0°

SECTION I - I
IDENTIFICATION PLATE

DIRECTION OF LINE

30°

120°

SECTION A - A
POLE STEP FACE

Table 1

Steel				Concrete	
Length of Pole	Pole Strength	Dimension 'E'	Qty of Pole Step Ferrule	Dimension 'E'	Qty of Pole Step Ferrule
17	32	3100	22	3100	22
18.5	32	3200	25	3200	25
	40	3600			
	60	4200			
20	32	3400	27	3400	28
	40	3600			
	60	4400			
21.4	32	3500	30	3500	30
	40	3700			
	60	4200			
23	32	3600	34	3600	34
	40	3900			
	60	4300			
24	-	-	-	3700	36
	-	-	-	4200	
	-	-	-	4800	
	-	-	-	4800	

LEGEND

SYMBOL	DESCRIPTION		QTY	DRG
	CONCRETE	STAINLESS STEEL FERRULE Ø22 ID	12	
	STEEL	HOLE Ø25 ID		
	EARTHING FERRULE LOCATION M12		5	
	POLE STEP FERRULE LOCATION M16		REFER TABLE ABOVE	
	IDENTIFICATION PLATE		1	053999

LENGTH OF POLE: REFER TABLE 1

POLE STEP FERRULES AT 455mm CENTRES: REFER TABLE 1 FOR QUANTITY

0°

90°

POLE STEP FACE

11/22kV/LV FERRULES: REFER NOTE 1

DISTANCE MEASURED FROM TOP OF POLE IN DRG 331149 TO LOWEST POLE STEP IN DRG 331149

DO NOT SCALE
DIMENSIONS IN MILLIMETRES

AUTHORISED
D. Asvestas / J. Broadhead

MGR TRANSMISSION CAPITAL PROJECT DEVELOPMENT

19.10.09

A2P

339928

D

SHEET No 1 OF 1 SHEETS

AMENDMENTS

A

ORIGINAL ISSUE

Job No.

CA104907

B

DR'N

M.C.

CH'D

R.L.

DATE

09-03-10

JR No

N/A

REVISED TO ALIGN POLE STEP SPACING WITH DISTRIBUTION STANDARD.

C

DSM

J.B.

DR'N

S.F.

CH'D

E.W.

DATE

27-09-24

JR No

N/A

ADD ONE HOLE FERRULE. TWO EARTHING FERRULE RELOCATED. NOTES UPDATED. CONSTRUCTION TOLERANCE TABLE DELETED. TABLE 1 UPDATED. SECTIONS ADDED.

D

EDM

K.S.

DR'N

S.F.

CH'D

E.W.

DATE

05-12-24

JR No

N/A

NOTES 5-7 ADDED. LEGEND UPDATED. TABLE 1 UPDATED.

EDM

K.S.

NOTES

1. POLE STEPS ARE REQUIRED TO BE INSTALLED FROM 8.3M ABOVE GROUND LEVEL. WHERE NORMAL VEHICLE ACCESS IS NOT AVAILABLE (OFF ROAD) POLE STEPS WILL BE REQUIRED FROM 6M ABOVE GROUND LEVEL. ALL CONCRETE AND STEEL POLES SHOULD HAVE FERRULES FROM 6M REGARDLESS.

2. DISTRIBUTION FERRULES AND HOLE FORMERS:-
A) ONLY REQUIRED IF SPECIFIED AND IN ACCORDANCE WITH ORG: 331149
B) FIRST (HIGHEST) DISTRIBUTION HOLE FORMER ABOVE GROUND POSITION TO BE SPECIFIED.
C) MINIMUM HOLE FORMER HEIGHT ABOVE GROUND = 4.6M

3. HOLES & FERRULES TO SUIT CONSTRUCTION 71C, 72C, 73C, 74C, 75C, 76C, 78C, 78X & 79C.

4. ALLOWABLE CONSTRUCTION TOLERANCE FOR STEEL POLES IS +/- 25.4MM FOR SINGLE SEGMENT POLES AND +/-25.4MM PER SEGMENT FOR MULTI SEGMENT POLES

5. WHERE CORROSION PROTECTION IS SPECIFIED, THE AFFECTED EARTH FERRULE SHALL BE RELOCATED 100MM ABOVE THE COATING.

6. WHERE TOUCH PROTECTION IS SPECIFIED, THE ID TAG SHALL BE RELOCATED 100MM ABOVE THE COATING.

7. A 22MM ID INSPECTION HOLE SHALL BE LOCATED 650MM ABOVE GROUND LEVEL FOR STEEL POLES ONLY.

LOCATION OF POLE STEP FERRULE OR STEEL POLE STEP CLIP

180°

0°

SECTION E1 - E1

25Ø HOLE

270°

90°

SECTION E2 - E2

25Ø HOLE

0°

0°

SECTION G - G

M12 EARTH FERRULE

0°

0°

SECTION I - I

IDENTIFICATION PLATE

DIRECTION OF LINE

30°

120°

SECTION A - A

POLE STEP FACE

Table 1

Steel				Concrete	
LENGTH OF POLE	POLE STRENGTH	DIMENSION 'E'	Qty of Pole Step Ferrule	DIMENSION 'E'	Qty of Pole Step Ferrule
17	32	3100	22	3100	22
	32	3200	25	3200	25
18.5	40	3600		3600	
	60	4200	27	4200	28
20	32	3400		3400	30
	40	3600	30	3800	
21.4	60	4400		4400	34
	32	3500	34	3500	
23	40	3700		3900	-
	60	4200	-	4600	
24	32	3600		3600	36
	40	3900	-	4100	
24	60	4300		4700	
	-	-	-	3700	-
24	-	-	-	4200	-
	-	-	-	4800	36

LEGEND

SYMBOL	DESCRIPTION		QTY	DRG
⊕	CONCRETE	STAINLESS STEEL FERRULE Ø22 ID	14	
	STEEL	HOLE Ø25 ID		
+	EARTHING FERRULE LOCATION M12		5	
⊕	POLE STEP FERRULE LOCATION M16		REFER TABLE ABOVE	
⊠	IDENTIFICATION PLATE		1	053999

POLE STEP FACE

0°

LENGTH OF POLE: REFER TABLE 1

550

1000

385

615

1385

615

1900

1600

650

POLE STEP FERRULES AT 455mm CENTRES: REFER TABLE 1 FOR QUANTITY

A

E1

E2

G

POLE STEP FACE

90°

150

150

2050

1900

1800

305

305

11/22kV/LV

FERRULES: REFER NOTE 1

DISTANCE MEASURED FROM TOP OF POLE IN DRG 331149 TO LOWEST POLE STEP IN DRG 331149

A

E1

E2

G

⊕

+

⊕

⊠

ORIGINAL SCALE

NONE

APPROVED

M. Cupples

END

OVERHEAD TRANSMISSION 66kV POLE TYPE '70 SERIES' HOLE & FERRULE LAYOUT

DO NOT SCALE

DIMENSIONS IN MILLIMETRES

AUTHORISED

D. Asvestas / J. Broadhead

MGR TRANSMISSION CAPITAL PROJECT DEVELOPMENT

19.10.09

A2P

339929

Rev.

D

SHEET No 1 OF 1 SHEETS

AMENDMENTS		
A	ORIGINAL ISSUE	
Job No.		
B	DESIGN	N/A
	DR'N	K.T.
	CH'D	JB/RL
	DATE	31.10.14
TMDM		S.F.Williams
NMM		D.Mate
STEEL POLES TABLE ADDED.		
C	DESIGN	M.B.
	DR'N	M.B.
	CH'D	M.A/R.D
	DATE	11-03-25
EDM		K.SHANAHAN
DATE		11-03-25
ROADBASE MATERIAL ADDED. PLAIN FOUNDATION. REMOVED		
D	DESIGN	N/A
	DR'N	TV
	CH'D	MA/MB
	DATE	15.12.25
A.E.M.		S.P.
ROAD BASE FOOTING ADDED		

NOTES

1. THESE FOUNDATIONS ARE MINIMUM DIAMETER AND DEPTH FOR MEDIUM BEARING SOILS.
2. TIMBER POLE DIMENSIONS ARE MINIMUM FOR 85MPa TIMBER POLES.
3. CONCRETE/STEEL POLES ARE SHOWN AS LENGTH (m)/ULTIMATE STRENGTH (kN) TIMBER POLES ARE SHOWN AS LENGTH/PI RATING AS PER DISC ON POLE.
4. FOUNDATION DEPTHS SHALL BE VERIFIED USING SOFTWARE LPile OR EQUIVALENT.
5. FOUNDATION DIMENSIONS SHALL BE VERIFIED AGAINST THE GEOTECHNICAL INVESTIGATION REPORT.
6. STEEL LINER/CONCRETE PIPE IS PROJECT SPECIFIC.
7. REFER DWG (TBA) FOR THE POLE BASE BISCUIT.

FOUNDATION INSTALLATION NOTES

PLAIN FOUNDATIONS

1. MIX EXCAVATED MATERIAL WITH DRY CEMENT (RATIO 5:1 - VOLUMES OF EXCAVATED MATERIAL TO 1 VOLUME OF DRY CEMENT)
2. COMPACT IN LAYERS (200mm) AND SLOPE AWAY FROM POLE TO NATURAL SURFACE LEVEL

CONCRETE FOUNDATIONS

1. INSTALL 25MPa READYMIX CONCRETE TO WITHIN 450mm OF SURFACE FOR TIMBER POLES AND 200mm OF SURFACE FOR CONCRETE POLES.
2. COMPACT IN LAYERS WITH EXCAVATED MATERIAL FOR BALANCE OF FOUNDATION (450mm) FOR TIMBER POLES AND 200mm FOR CONCRETE POLES)
3. SUBSTITUTE PREMIXED OR CONCRETE MIXED ON SITE (RATIO 4 GRAVEL, 2 SAND AND 1 CEMENT) FOR INACCESSIBLE/REMOTE SITES.
4. SUBSTITUTE QUICK SET CONCRETE FOR POLE REPLACEMENT WITH LIMITED CURING TIME.

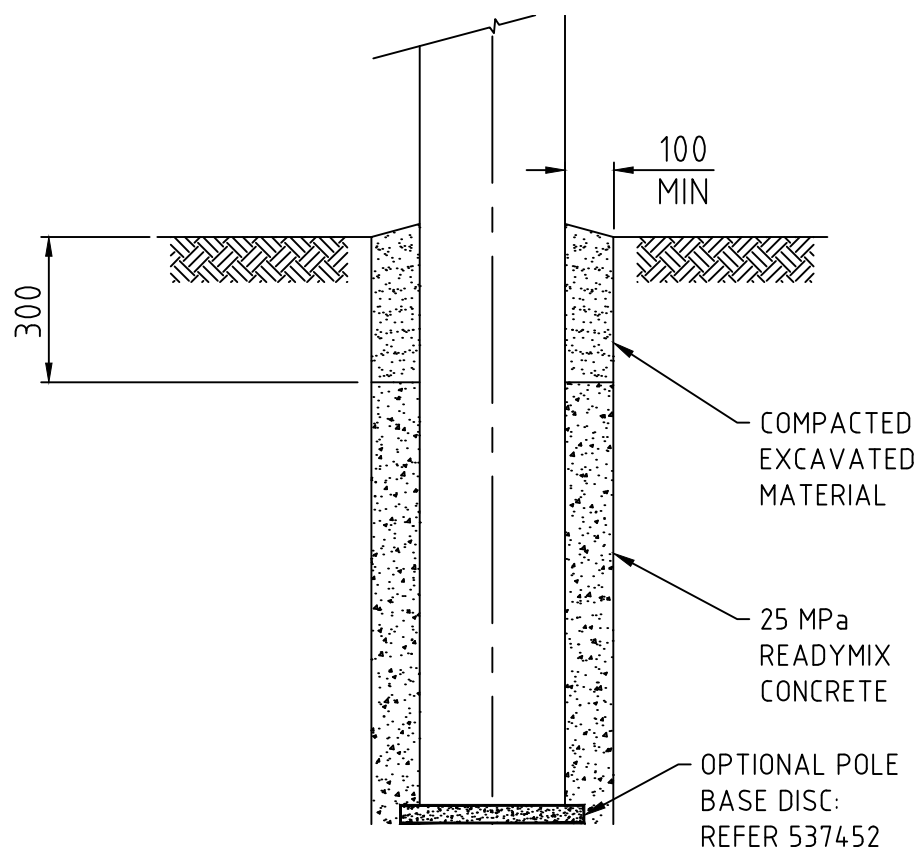
ROADBASE AND CEMENT FOUNDATIONS

1. MIX ROADBASE WITH DRY CEMENT (5:1 - 5 VOLUMES OF ROADBASE AND 1 VOLUME OF CEMENT)
2. COMPACT IN LAYERS (200MM) AND SLOPED AWAY FROM THE POLE TO NATURAL SURFACE.
3. THIS FOUNDATION IS SUITABLE FOR NORMAL TO GOOD SOIL. ROADBASE SHALL BE PROCURED FROM AN APPROVED VENDOR WITH LESS CLAY CONTENT AND MORE OF SAND CONTENT. USE TWO CEMENT BAGS FOR THE BOTTOM OF THE FOUNDATION TO FORM A BASE. ADD WATER, COMPACT WELL AND HYDRAULIC RAM. USE ROAD BASE BACKFILL IN LAYERS FOLLOWING TWO BAGS OF CEMENT, COMPACT WELL AND HYDRAULIC RAM. BACK FILL THE TOP 300MM WITH ROAD BASE OR NATIVE SOIL MATERIAL AND COMPACT WITH HYDRAULIC RAM.

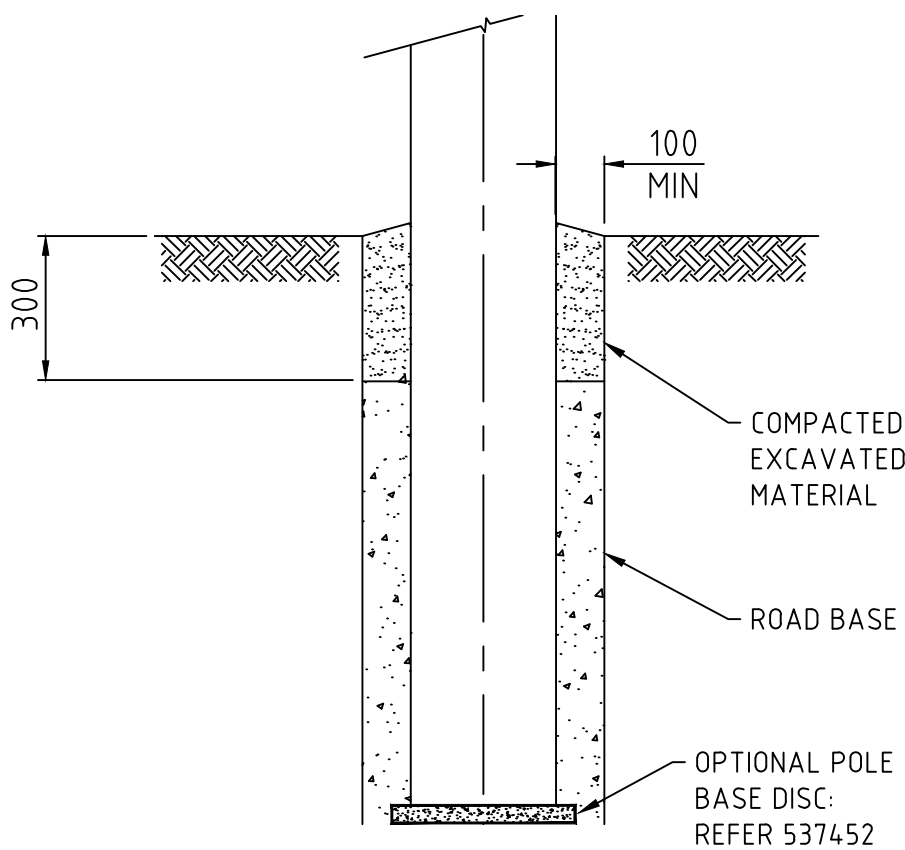
CONCRETE POLES					
POLE CODE (m/kN)	TIP DIA (mm) (NOM)	BUTT DIA (mm) (NOM)	MASS (kg) (NOM)	HOLE DIA (mm) DH	MIN DEPTH UNSTAYED (m) D
8/60	405	525	2370	900	3.0
17/ 32	315	570	3770	900	3.1
17/40	360	615	4375	900	3.5
17/60	450	705	5445	900	4.3
18.5/32	315	593	4230	900	3.2
18.5/40	360	638	4910	900	3.6
18.5/60	450	728	6195	1000	4.2
20/32	315	615	4730	900	3.4
20/40	360	660	5450	900	3.8
20/60	450	750	6870	1000	4.4
21.4/32	315	636	5270	900	3.5
21.4/40	360	681	5920	900	3.9
21.4/60	450	771	7540	1000	4.6
23/32	315	660	5790	900	3.6
23/40	360	705	6630	900	4.1
23/60	450	795	8320	1000	4.7
24/32	315	675	6150	900	3.7
24/40	360	720	7030	900	4.2
24/60	450	810	8810	1000	4.8

STEEL POLES					
POLE CODE (m/kN)	TIP DIA (mm) (NOM)	BUTT DIA (mm) (NOM)	MASS (kg) (NOM)	HOLE DIA (mm) DH	MIN DEPTH UNSTAYED (m) D
18.5/32	250	621	1,110	900	3.2
18.5/40	255	708	1,230	900	3.6
18.5/60	310	774	1,660	1000	4.2
20.0/32	250	625	1,240	900	3.4
20.0/40	255	746	1,370	1000	3.6
20.0/60	310	813	1,850	1000	4.4
21.4/32	250	680	1,360	900	3.5
21.4/40	255	781	1,510	1000	3.7
21.4/60	310	849	2,020	1200	4.2
23.0/32	250	702	1,590	900	3.6
23.0/40	255	810	1,770	1000	3.9
23.0/60	310	877	2,370	1200	4.3

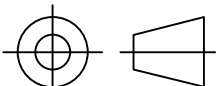
TIMBER POLES					
POLE CODE (m/kN)	TIP DIA (mm) (MIN)	BUTT DIA (mm) (MIN)	MASS (kg) (MIN)	HOLE DIA (mm) DH	MIN DEPTH UNSTAYED (m) D
17/4	190	338	357	750	2.3
17/8	264	411	430	750	2.3
17/12	316	463	482	750	2.3
18.5/4	190	352	372	750	2.35
18.5/8	264	426	447	750	2.35
18.5/12	318	480	500	750	2.35
20/4	190	365	387	750	2.5
20/8	266	441	463	750	2.5
20/12	321	496	517	750	2.5
21.5/4	190	379	402	750	2.65
21.5/8	267	456	479	750	2.65
21.5/12	322	511	534	750	2.65
23/4	190	389	414	750	2.8
23/8	266	467	492	750	2.8
23/12	322	523	538	750	2.8

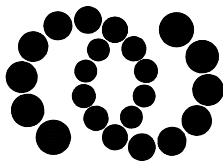


CONCRETE FOUNDATION (C)
(TIMBER POLE)



ROAD BASE AND CEMENT FOUNDATION (RB) (CONCRETE/STEEL OR TIMBER POLE)

		© This drawing and the copyright therein is the property of Endeavour Energy and may not be copied, reproduced, distributed, loaned or used without the written consent of Endeavour Energy.	
		ORIGINAL SCALE	
DRAWN		IJH	
DATE		07/02/12	
CH'D		RL	
		APPROVED W. Leong	



Endeavour Energy

OVERHEAD TRANSMISSION POLE FOUNDATION DETAILS

REFERENCE DRAWINGS			
DO NOT SCALE DIMENSIONS IN MILLIMETRES		AUTHORISED D. Asvestas / G. Schafer	
SIGN N	MGR TRANSMISSION PROJECT DEVELOPMENT		17.02.12
	A2P	367719	Rev. D
		SHEET No 1 OF 1 SHEETS	

AMENDMENTS

A

ORIGINAL
ISSUE

J R No.

NA

D

DR'N

CH'D

DATE

JR No

C.R.T.

C.R.T.

24-10-94

930208

REDRAWN: OH SHEET.

E

DR'N

CH'D

DATE

JR No

C.R.T.

C.R.T.

01-8-95

950099

DRG SIZE WAS OH.

F

DR'N

CH'D

DATE

JR No

C.R.T.

C.R.T.

23-12-96

960080

SHEET WAS A2.

MPDO

CHB

NOTES

1. FOR PLAIN FOOTINGS USE MINIMUM AUGER SIZE.

2. PLAIN FOOTINGS TO BE USED FOR IN-LINE POLES ONLY.

3. POLE CODE: 9.5/4 DENOTES
POLE LENGTH 9.5 METRES,
POLE STRENGTH 4 KILONEWTONS.

FOOTING DETAILS

1. PLAIN FOOTING

THIS FOOTING IS FOR INTERMEDIATE POLES SET IN GOOD TO MEDIUM BEARING SOIL. HOLE DEPTH MAY BE REDUCED BY 200mm FOR POOR ROCK, SHALE ETC. NATURAL ROUND POLES TO BE DESAPPED 450mm ABOVE AND BELOW GROUND LINE.

2. CONCRETE FOOTING

THIS FOOTING IS FOR ANGLE TERMINATION TEE OFF & ABS POLES IN GOOD, MEDIUM & POOR BEARING SOIL. A 100mm MINIMUM RADIAL THICKNESS OF 5:1 CONCRETE MIXTURE (IE 5 VOLUMES OF CRUSHED ROCK TO 1 VOLUME OF CEMENT) TO BE PLACED AROUND POLE AS SHOWN. NATURAL ROUND POLES TO BE DESAPPED 450mm ABOVE AND BELOW GROUND LINE.

3. ROCK FOOTING

IN SOLID ROCK, DEPTH OF HOLE MAY BE REDUCED, DEPENDING ON ROCK STRUCTURE AND APPLICATION. BACKFILL TO WITHIN 450mm BELOW GROUND LINE SHALL CONSIST OF ROCKS BOUND WITH CONCRETE AS SHOWN. NATURAL ROUND POLES TO BE DESAPPED 450mm ABOVE & BELOW GROUND LINE.

4. BAULK FOOTING

THE BAULK FOOTING IS TO BE USED IN BAD BEARING SOILS.
THE UPPER BAULK SHOULD BE 250mm X 100mm X SUITABLE LENGTH HARDWOOD, HOUSED & SPICKED WITH 2 POLE STEPS, OR BOLTED TO POLE WITH M16 GALVANISED BOLTS, & SHOULD REST AGAINST UNDISTURBED SOIL. IF REQUIRED, A LOWER BAULK OF SIMILAR SIZE SHOULD BE USED, HOUSED & FIXED AS ABOVE. DESAPPED ROUND TIMBER LOGS OF EQUIVALENT SIZE MAY BE USED AS BAULKS.

5. GENERAL

BACKFILL SHOULD BE WELL RAMMED. WHERE POLES ARE SET IN CONCRETE OR ASPHALT SURFACES, THE SURFACE SURROUNDING THE POLE SHOULD BE REINSTATED WITH A 25mm THICKNESS OF CEMENT MORTAR OR ASPHALT, SLIGHTLY INCLINED TOWARDS THE POLE.

POLE CODE	MINIMUM AUGER SIZE	MINIMUM HOLE DEPTH	MAXIMUM LOAD AT CROSSARM (kN)	MAXIMUM LOAD AT COMPOSITE CONSTN (kN)
9,5/4 11/4 12.5/4	450	1550 1700 1850	4	6
9.5/8 11/8 12.5/8 14/8	750 600 750 600 600	1550 1700 1850 1850 2000	8	10
9.5/12 11/12 12.5/12 14/12	900 750 600 900 750 600	1550 1700 1850 2000 2150 2300	12	15
12.5/18 8/15 8/30	900 750 750	2000 2150 2400 2400	18 15 30	21 -- --

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

BAULK FOOTING

PLAIN FOOTING

CONCRETE FOOTING

ROCK FOOTING

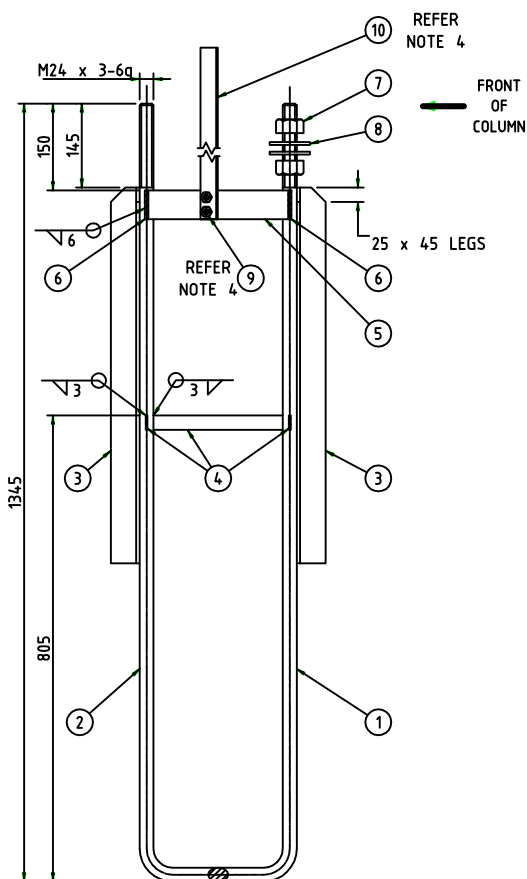
BAULK FOOTING

AMENDMENTS	
A	ORIGINAL ISSUE
B	DRN DJZ EHD GVH DATE 25-8-97 JR No - - REDRAWN TO DOS FORMAT.
C	MMA GVH DRN DJM EHD ST DATE 29-8-00 JR No - - NOTE & PAINT REQUIREMENT MOVED.
D	M.A.E. W.I. DRN BTB EHD DH DATE 18-1-11 JR No - - DRAWING TITLE UPDATED.
B	M.A.E. T.P.

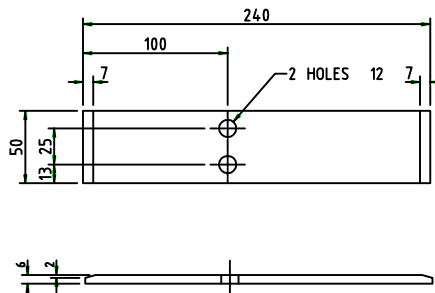
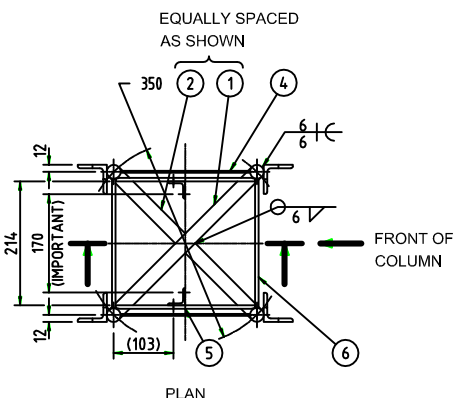
NOTE:

1. RAGBOLT TO BE ALL WELDED CONSTRUCTION IN ACCORDANCE WITH AS 1554.1. WELD SYMBOLS COMPLY WITH AS 1103.3.
2. RAGBOLT TO BE HOT DIP GALVANISED AFTER FABRICATION IN ACCORDANCE WITH AS 1650.
3. SCREW THREADS TO BE LIGHTLY OILED PRIOR TO ASSEMBLY.
4. ITEMS 9 & 10 ARE OPTIONAL EXTRAS AND ARE ONLY TO BE SUPPLIED WITH RAGBOLT ASSEMBLY IF SWITCHBOARD IS TO BE INSTALLED WITHIN STREET LIGHT COLUMN.

ITEM	PART	ORG	DESCRIPTION	QTY	REMARK
1	SS14121	-	BAR STEEL ROUND 24 DIA x 3005 LG.	1	
2	SS14121	-	BAR STEEL ROUND 24 DIA x 1490 LG.	2	
3	SS12307	-	ANGLE STEEL 50 x 50 x 6 x 650 LG.	4	
4	-	-	BAR STEEL FLAT 25 X 3 X 223 LG.	4	
5	SS12781	-	BAR STEEL FLAT 50 x 6 x 240 LG.	2	
6	SS12781	-	BAR STEEL FLAT 50 x 6 x 223 LG.	2	
7	SW11762	-	NUT STEEL HEX GALV M24	8	
8	1103530	-	WASHER STEEL FLAT 50 GALV 24	8	
9	SB10827	-	BOLT STEEL HEX HD GALV M10 X 25 LG C/W NUT & SPRING WASHER	A/R	NOTE 4
10	SB12269	079879	BRACKET LH & RH HDRA SWITCHBOARD MOUNTING	A/R	NOTE 4



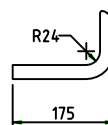
SECTIONAL ELEVATION



DETAIL ITEM 5



ITEM 1
BENDING DETAIL



ITEM 2
BENDING DETAIL

STOCK CODE: SR13771

	©This drawing and the copyright therein is the property of Endeavour Energy and may not be copied, reproduced, distributed, loaned or used without the written consent of Endeavour Energy.
ORIGINAL SCALE	APPROVED S. HAYDON
DRAWN DJZ	- -
DATE 25-6-97	- -
EHD GVH	- -

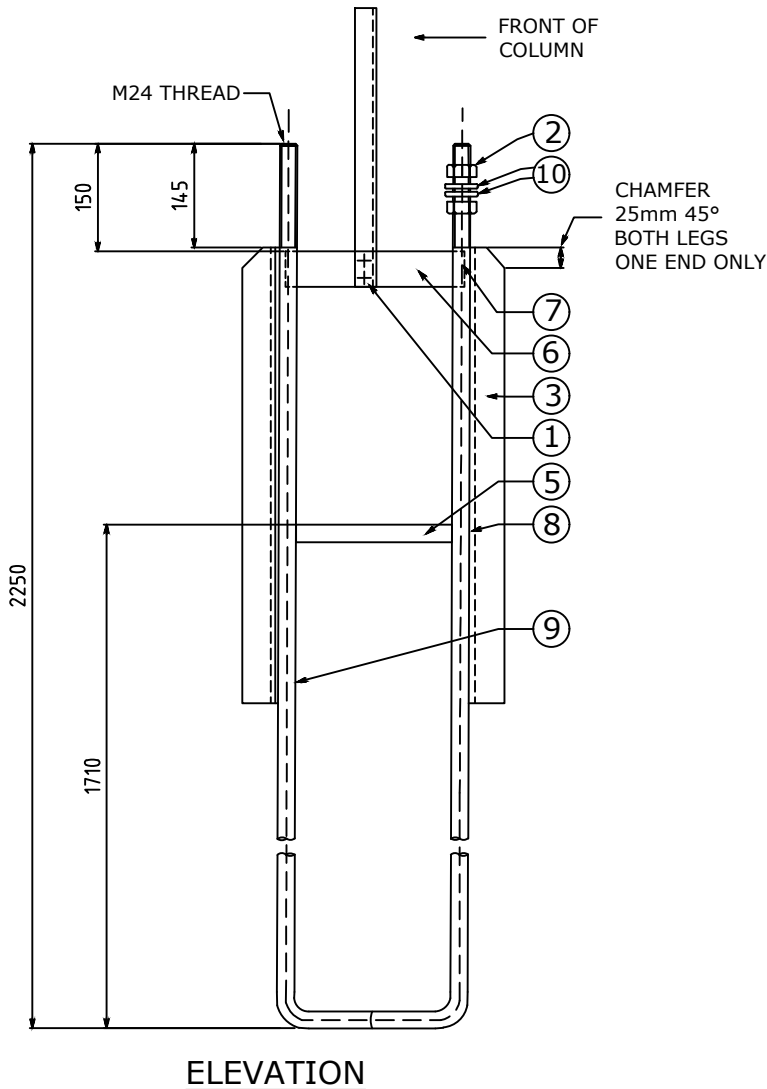


TYPE 2 RAGBOLT ASSEMBLY
FABRICATION DETAIL

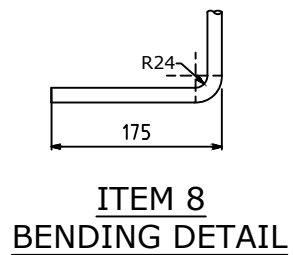
REFERENCE DRAWINGS	
DO NOT SCALE DIMENSIONS IN MILLIMETRES	AUTHORISED W. Isley
MANAGER HNTWORK MAINS ASSETS	25-4-97
A4	015021 V
SHEET No 1 OF 1 SHEETS	

AMENDMENTS			
A	ORIGINAL ISSUE		
B	DR'N	BGH	
	CH'D	BGH	
	DATE	24.11.95	
	UR No	--	
NOTE 6 AMENDED. NOTE 7 ADDED. ITEM 3 WAS REDUCED. NOTE 4 WAS OMITTED. APPROXIMATE 300 EPOXY MASTIC COATING.			
C	DR'N	W.I.	
	CH'D	FM/GF	
	DATE	27.5.05	
	UR No	--	
DRG FRAME WAS PCC			
D	MAE	W.I.	
	DR'N	BIB	
	CH'D	D.H.	
	DATE	12.4.2010	
	UR No	--	
CHANGES TO DRAWING FRAME.			
E	MAE	I.P.	
	DR'N	BIB	
	CH'D	D.H.	
	DATE	9.1.2010	
	UR No	--	
CHANGES TO DRAWING TITLE.			
F	MAE	I.P.	
	DR'N	S.F.	
	CH'D	E.W.	
	DATE	29-11-24	
	UR No	N/A	
REPLACED STOCK CODE BY MATERIAL NO			
	EDM	K.S	

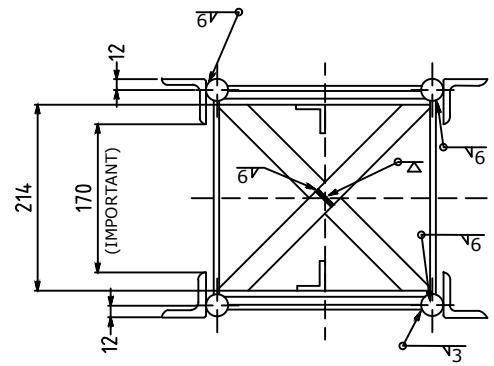
- NOTES:
1. ALL MATERIAL & FABRICATION TO BE IN ACCORDANCE WITH 'STEEL STRUCTURES CODE' AS1250.
 2. SCREW THREAD ON ITEMS NO. 2, NO. 8 & NO. 9 TO CONFORM TO AS1275 'METRIC SCREW THREADS FOR FASTENERS' & TO HAVE A CLASS 6H/6G FIT.
 3. ALL COMPONENTS TO BE HOT DIP GALVANISED TO AS1650 'GALVANISED COATINGS ON FERROUS ARTICLES' AFTER FABRICATION EXCEPT ITEN NO. 2 & THREADED PORTION OF ITEMS NO. 8 & NO. 9 WHICH MUST COMPLY WITH AS1214 'HOT DIP GALVANISED COATINGS ON FASTENERS (METRIC COARSE THREAD SERIES)'.
 4. ASSEMBLY TO BE COATED WITH JOTUN JOTAMASTIC B7 EPOXY BASED PRIMER – TOP COAT (COLOUR TO BE "RED 49"). THIS COATING IS USED AS PROTECTION AGAINST CORROSION AND ELECTROLYSIS.
 5. SCREW THREADS ON ITEMS NO. 2, NO. 8 & NO. 9 TO BE LIGHTING OILED PRIOR TO ASSEMBLY.
 6. ITEM NO. 4 TO FINISH FLUSH WITH LOWER EDGE OF ITEM 6 AS SHOWN. ITEM 4 IS AN OPTIONAL EXTRA ONLY TO BE SUPPLIED WITH RAGBOLT IF SWITCHBOARD IS TO BE INSTALLEDWITHIN STREETLIGHT COLUMN.
 7. ITEM 4 – SWITCHBOARD MOUNTING BRACKET (DRAWING NO. 079879, MATERIAL No. 1000007401)



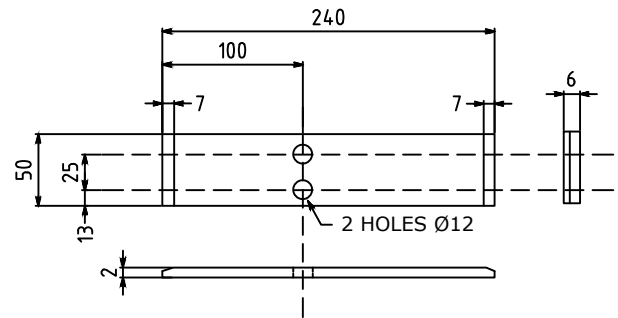
ELEVATION



10	WASHER STEEL SQUARE GALV 24	8
9	STEEL ROD Ø24 x 2405 LG	2
8	STEEL ROD Ø24 x 2395 LG	2
7	STEEL FLAT BAR 50 x 6 x 223 LG	2
6	STEEL FLAT BAR 50 x 6 x 240 LG (REF DET)	2
5	STEEL FLAT BAR 25 x 3 x 223 LG	4
4	MOUNTING BRACKET HD6A SWITCHBOARD (REF NOTE 6 & 7)	1
3	STEEL ANGLE 50 x 50 x 6.5 x 650 LG	4
2	NUT STEEL HEX GALV M24	8
1	BOLT STEEL HEX HD GALV MID x 25 LG C/W NUT & SPRING WASHER	4
ITEM	DESCRIPTION	QTY



PLAN



DETAIL ITEM 6

MATERIAL NO: 1000008031

DO NOT SCALE
DIMENSIONS IN MILLIMETRES

TYPE 3 RAGBOLT ASSEMBLY
FABRICATION DETAILS

REFERENCE DRAWINGS

AUTHORISED
P. THOMSON
CHIEF ELECT ENG
24.6.80

056741

SHEET No 1 OF 1 SHEETS

DRWN	DJZ	APPROVED	DJZ
DATE	24.6.80		
CH'D	DJZ		

