

Steel Poles

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For enquiries regarding the content of this document, please contact the Standards Coordinator on 133 718.

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1 Documentation Scope

This specification covers the design, engineering, manufacture, testing, supply and delivery of galvanised steel power poles installed as part of Endeavour Energy's electrical networks.

2 References

External Regulations

Electricity Supply Act 1995 (NSW)

External Standards

Standard No.	Year	Title
AS 2700S	2011	Colour Standards for General Purposes
AS 3894.3	2002	Site testing of protective coatings – Determination of dry film thickness
AS 3894.9	2003	Site testing of protective coatings – Determination of adhesion
AS 4100	2020	Steel Structures
AS 4506	2005	Metal finishing – Thermoset powder coatings
AS/NZS 1163	2016	Cold-formed structural steel hollow sections
AS/NZS 1365	1996	Tolerances for flat-rolled steel products
AS/NZS 1554.1	2014	Structural steel welding – Welding of steel structures
AS/NZS 1554.5	2014	Structural steel welding – Welding of steel structures subject to high levels of fatigue loading
AS/NZS 2312.1	2014	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Paint Coatings
AS/NZS 2312.2	2014	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Hot Dip Galvanizing
AS/NZS 3678	2016	Structural steel – Hot-rolled plates, floorplates and slabs
AS/NZS 4600	2018	Cold-formed steel structures
AS/NZS 4680	2006	Hot dip galvanised (zinc) coatings on fabricated ferrous articles
AS/NZS 7000	2016	Overhead line design

Company Policies and Procedures

Company Policy (Network) 9.2.5 – Network Asset Design
 Company Policy (Network) 9.7.1 – Network Asset Construction
 Appendix 1 – Specified items

3 Definitions and Abbreviations

Term	Definition
AS	Australian Standard
Earthing Ferrule	Section of a pole threaded to allow the bolted connection of an earthing conductor for the purpose of carrying high fault currents
Ferrule	Threaded insert placed in the pole to allow the attachment of fittings to the pole with a bolt.
GP	General purpose
NATA	National Association of Testing Authorities
NZS	New Zealand Standard
SP	Structural Purpose

4 Actions

4.1 General requirements

The poles must be designed to the dimensions and strength requirements specified in accordance with **AS/NZS 7000** and other standards and codes referenced therein. The poles must be capable of withstanding the design ultimate moments, torque and shear forces although these forces may not be applied concurrently.

Poles must have uniform cantilever and shear strength characteristics irrespective of the direction of loading.

The design of steel members and components must conform to the requirements of AS 4100 and AS/NZS 4600 as applicable. The design must be as such to keep the number of different parts to a minimum in order to facilitate transport, erection and inspection.

4.1.1 Service conditions and durability

All poles supplied must be designed to achieve compliance to Appendix D of AS/NZS 7000 for an exposure class B2 (ie. nominal service life of 35-75 years). The pole caps and groundline insulating coating must provide the same durability as that of the pole.

4.2 Technical Requirements

4.2.1 Ultimate loads, lengths & dimensions

The ultimate loads and lengths required under this specification are detailed in Appendix 1 – Specified Items of this specification.

Preferred dimensions for tapered poles are:

- maximum diameter- 560mm for all distribution poles and 860mm for all transmission poles.
- minimum diameter - 100mm for all distribution poles. 160mm for all transmission poles.
- minimum wall thickness - 4mm.
- fixed taper – Any value between 20 to 26mm/m is preferred.

4.2.2 Fabrication

The grade of steel used in the manufacture of all poles must be grade C450 as per AS/NZS 1163 or grade 450 as per AS/NZS 3678. All components must be fabricated using jigs and machines so that close tolerances are maintained. Burred and sharp edges, weld spatter, weld slag and galvanising slag are to be avoided.

The detailing of the steelwork must minimise the possibility of brittle fracture. The manufacturing procedures carried out on the steelwork must eliminate plastic deformation and minimise the build-up of residual stresses during fabrication.

The drilling, punching, cutting, pressing and bending of all fabricated steelwork must prevent any possibility of irregularities occurring that might introduce difficulties in the erection of the structures on site.

All poles must be formed by pressing, rolling or bending the material to provide a smooth surface. All changes in material thickness must be made so that the outer surface of pole sections has a smooth appearance. All flat-rolled steel components must be manufactured using techniques to minimise material distortions and achieve the dimensional tolerances specified in AS/NZS 1365. The thickness of all formed sections material must be within the tolerances specified in AS/NZS 3678.

Gusset plates are to be reduced to the minimum dimensions possible with all surplus material, such as sharp corners, cropped for safety and aesthetic reasons. The minimum thickness for gusset plates must be 5mm.

4.2.2.1 Welding

All welding must be in accordance with AS/NZS 1554.1 or AS/NZS 1554.5 as appropriate and must be capable of withstanding the mechanical forces and electrical currents (see Clause 4.2.1 and Clause 4.2.7 respectively) that the pole will be subjected to during normal and fault conditions.

4.2.3 Joints

Poles with joints must be of slip-joint (interference fit) or bolt assembled design. No pole joint is to exist between the attachment points for the top and bottom phases of an overhead line circuit. Cross-section welding of poles to form one section of the required length is not acceptable.

All joints must be designed to develop the necessary strength of the pole at that point. Supporting calculations or evidence must be provided confirming that the joints have sufficient capacity for the duty intended. 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.

Due to the terrain in which steel poles may be installed, it is imperative that the design of joints enables multiple piece poles to be assembled on rough, uneven or sloping ground.

4.2.4 Galvanising

Poles must be hot-dip galvanised and comply with AS/NZS 4680. The average weight of zinc coating per square metre of actual surface of any member, minimum local and the minimum average coating thickness must not be less than the values specified in Table 1 of AS/NZS 4680.

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Galvanising must be done after the completion of all marking, cutting, machining, punching, drilling, bending, welding or any other manufacturing procedure, except for tapping of holes/ferrules as required. Steelwork must be galvanised in individual pieces, and both inner and outer surfaces must be galvanised. Any distortion caused by the galvanising process must be corrected before delivery.

The zinc coating must be inspected for visual uniformity. The coating must be adherent, smooth and continuous, as well as free from lumps, blisters, gritty areas, uncoated spots, acid and black spots, dross and flux, or other defects.

The Supplier must have an approved quality system in place to certify that the specification requirements for quality and thickness of galvanizing material are met. Such system must provide for destructive coating checks by a chemical stripping method or a non-destructive process control checking of the coating thickness on complete pole members. The Supplier must submit the details of this quality system with the offer.

As an option, the Supplier must also offer poles with a dull finish. In order to reduce sun glare, Endeavour Energy may order dull finish poles with the dull finish consistent over the entire pole length. Dull finish should not diminish the required design life of the pole. Details on how the dull finish is achieved is to be provided with the offer.

4.2.4.1 Marine/Industrial Atmosphere Galvanising

For areas close to the coastline and in industrial areas Endeavour Energy may request a greater zinc coating thickness of at least 130% of the standard galvanising thickness to be applied.

As an option, the Supplier must also offer the application of corrosion inhibiting paint with 100 microns Dry Film Thickness (DFT) of zinc rich primer coat followed by 50 microns DFT of top coat with aluminum colour as an alternative to the 130% galvanising requirement. Details on this painting method and its performance against the additional galvanising requirement must be provided with the offer.

4.2.5 Tolerances

Tolerances for fabrication must be in accordance with dimensional tolerances outlined in Table 1.

Table 1: Breakdown of the dimensional tolerances used for steel poles.

Parameter	Pole Type	Tolerance
Length of pole (or segment)	Non-slip jointed poles	±25.4 mm
	Slip jointed poles	±25.4 mm per segment
Straightness of pole	All poles types	0.20% of total length
Overall cross-sectional dimensions (diameter) of pole		±1%
		min ±0.5 mm
		max ±10 mm
Out- of-Roundness		±2%
Distance between critical hole centres*		±2 mm
Distance between non-critical centres		±10 mm
Distance between step bolt anchorages		±20 mm

Parameter	Pole Type	Tolerance
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%.
straightness in any one plane		AS/NZS 1163

*Critical hole centres are the spacings measured between holes (rather than from the pole tip, or cumulative distances from the pole tip).

Notwithstanding these requirements, the tolerances to be achieved must enable the steel work to be erected to comply with erection tolerances without distress to the pole footing.

4.2.6 Deflection

Deflection of the height above ground, under an applied load of 50% of the ultimate strength of the pole, must be less than 5% for distribution poles and 4% for transmission poles. 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 600mm.

4.2.7 Electrical properties

The poles are considered conductive and must provide a continuous earthing path from the top to the bottom (including the joint/s) throughout the life of the pole.

All earthing and bonding connections, joints between separate sections, as well as the body of the pole itself, must be capable of passing a current of 13.1 kA for one second for distribution poles and 26 kA for one second for transmission poles.

4.2.8 Additional protection

Two coating options are to be available for the poles, as outlined in Table 2.

Table 2: Additional coating protection options.

Coating option	Function
Touch potential protection (Clause 4.2.8.1)	- Provide groundline corrosion protection barrier for the pole. - Provide touch potential barrier for members of the public coming into contact with the pole.
Corrosion protection (Clause 4.2.8.2)	Provide groundline corrosion protection barrier for the pole.

The coating must be UV stabilised.

The coating must also be resistant to bushfires, and the coating must not be hazardous to humans and fauna. Additionally, no toxic material are to be released before or after the passing of a bushfire.

The following details on the coating must be provided with the offer:

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- coating material type and properties;
- electrical insulating properties of the coating;
- coating thickness;
- application process;
- resistance to vandalism (e.g. scratching with a sharp object such as a knife, peeling);
- resistance to weathering - Ultraviolet rays, temperature fluctuations, contaminants;
- resistance to damage during transportation, handling and installation;
- test details to demonstrate groundline corrosion protection;
- repair procedure at site in case of coating damage;
- service life of the coating;
- safety Data Sheet for the coating material;
- voltage withstand per mm of the coating (for touch potential coating only); and
- test details to prove the coating to be a touch potential barrier up to 40 kV and how many coatings were required to satisfy the test (refer to Clause 4.3.1). Also the details of the effects of ageing on the voltage withstand performance of the coating must be provided (for touch potential coating only).

4.2.8.1 Touch potential protection

These poles must be coated from 0.5m below groundline to 2.5m above groundline (3m total).

The minimum level of insulation for one layer of the coating must be 20 kV in dry conditions between the conductive pole and the outside coating that the public may come into contact. Multiple coatings may be requested to provide a specified level of insulation (e.g. 40 kV).

The coating must be designed to prevent any ingress of moisture between the insulating coating and the pole which could accelerate pole corrosion.

The service life of the coating must be at least the same as the pole service life.

4.2.8.2 Corrosion protection

Groundline corrosion protection coating is to be applied 0.5m below groundline to 0.5m above groundline (1m total) or other area as nominated at the time of ordering. Refer to Endeavour Energy drawing 367719 for minimum foundation depth for transmission poles.

The coating must be applied as soon as possible after hot dip galvanising process. Where required, abrasion of the galvanised coating must be carried out in accordance with AS/NZS 4680 Appendix I. Care is to be taken to verify that product does not enter tapped holes. Where a painted method is used, surface preparation must be in accordance with AS/NZS 2312. Refer to Clause 4.3.1 of this specification for testing of painted coatings.

The coating must be designed to prevent any ingress of moisture between the insulating coating and the pole which could accelerate pole corrosion.

The service life of the coating must be at least the same as the pole service life.

4.2.9 Accessories

4.2.9.1 Identification plate

A permanent marking must be impressed on a metal nameplate fixed to the pole to the requirements of Endeavour Energy drawing 053999.

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

- manufacturer – Location;
- month of Manufacture – Year of Manufacture;
- pole Length – m;
- 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 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 nameplate should be installed at:

- 2.6m plus 10% of pole length when measured from the butt for distribution poles and,
- 1.5m above the ground line for transmission poles. Refer to Endeavour Energy drawing 367719 for minimum foundation depth.

The mass of each 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.

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

4.2.9.2 Inspection hole

A 22mm hole located 650mm above nominated ground line shall be provided for all steel poles. The hole is to allow for the use of a "light scope" or similar optical inspection tool. The hole shall be drilled prior to galvanising and application of the protective insulating coating. The insulating coating shall penetrate the hole by the full thickness of the metal to protect the exposed metalwork. The hole shall be plugged with a black polyethylene threaded plug. The plug shall be installed prior to poles being delivered to Endeavour Energy.

4.2.9.3 Pole tip cap

All poles must be fitted with a galvanised pole tip cap. The tip cap must be securely fitted to the pole and welded to prevent easy removal of cap or the entry of moisture into the pole. The fitting of the pole tip cap must not reduce the corrosion resistance of the pole at any point. The service life of the tip cap must be the same as the pole.

Where painted poles are requested by Endeavour Energy, the tip cap must be powder coated with the same colour as the pole.

Details on pole tip cap construction and how it is secured to the pole must be provided with the offer.

4.2.9.4 Pole butt plate/cap

Poles must be supplied with a galvanised plate welded to the base of the pole as shown in **Figure 1**. The grade of the butt plate must be grade 250 as per AS/NZS 3678. The butt plate must be marked with the overall length, ultimate strength and measured weight of the pole.

Details on pole butt plate construction and how it is secured to the pole must be provided with the offer.

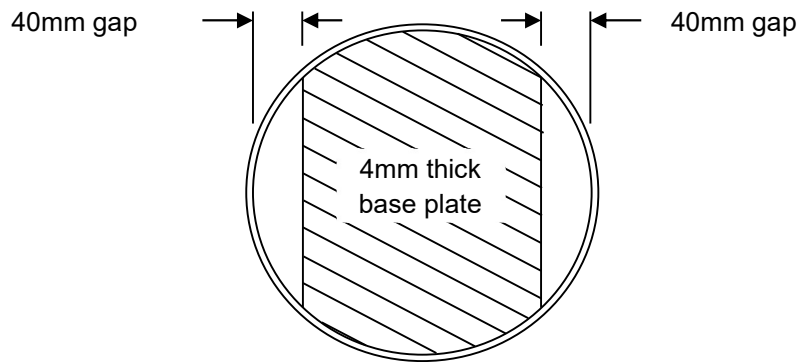


Figure 1: Minimum requirements for the pole butt place/cap.

4.2.9.5 Holes, earthing ferrules and fittings

All the poles supplied must be capable of being drilled at the site by Endeavour Energy. The Supplier must advise in the offer any precautions that must be taken if their poles are drilled or cut.

All holes must be free of burrs. The holes must be prepared prior to the hot dip galvanising process. After galvanising, the holes must be tapped.

Holes, earthing ferrules and fittings must be provided in accordance with the relevant drawings listed in Appendix 1.

Where pole steps are fitted to the poles, as nominated in Endeavour Energy's drawings, the steps must be securely anchored by systems such as welded brackets or slip-in steps with mounting brackets that are inserted into the pole. Step bolt anchors must be capable of sustaining, without visible damage, non-concurrent load cases of a pull-out load of 4kN, and bending and shear forces of 2.4kN applied in all directions.

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

The earthing ferrule must be capable of carrying a minimum of 13.1 kA for one second for distribution poles and 26 kA for one second for transmission poles, provide a flat surface and be welded to the pole with a continuous all round weld.

Holes and earthing ferrules must be fitted with appropriate plastic plugs prior to delivery of the poles.

4.2.10 Painting

Due to aesthetic conditions, Endeavour Energy may request painting of some poles. If painted poles are requested, the Supplier must paint the outside faces of the poles above ground level including all nuts, bolts and other fittings.

Where colour painting is required, Endeavour Energy will select the colour per pole from the range of colours specified in AS 2700S. The painting process must use a two-pack polyurethane paint finish applied over the exterior galvanising. The painting must use 100 microns DFT of primer followed by 50 microns DFT of top coat.

The painting is to be completed as soon as practicable after the hot dip galvanising process. The galvanising surface is to be free of contaminants prior to painting and prepared in accordance with AS/NZS 2312. The surface preparation and the application of the finish coats must be to the

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paint manufacturer's directions. Where required, abrasion of the galvanised coating must be carried out in accordance with AS/NZS 4680 Appendix I.

The paintwork is to be free from defects upon arrival at the designated site to the satisfaction of Endeavour Energy. Before commencement of painting work, approval from Endeavour Energy must be obtained on the proposed method of application and of the type of paint to be used, including colour. Care must be taken to limit the damage to any painted surfaces during transportation, handling and erection.

4.2.11 Installation

The distribution and transmission poles must be designed for direct buried footings, backfilled with soil and/or concrete. Suppliers shall provide installation instructions for pole type (single piece or two piece). If required, supplier may be asked to provide demonstration at one Endeavour Energy sites.

4.2.12 Handling

All poles covered by this specification must be constructed to allow handling, erection and transport without causing damage to the poles. In particular, the manufacturer must supply details of preferred lifting techniques, including any special equipment required, and recommended storage methods.

The manufacturer will nominate the minimum number of bearing points for each particular pole, 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 or a weld mark must be provided to indicate the point of attachment for a lifting sling or slings.

4.2.13 Repairs

Endeavour Energy reserves the right to reject any pole having a substantial defect, such as dents or distortions of the metal, welding slag, flaking zinc, incorrect positioning of holes or ferrules, breaks in the corrosion protection coating, partially blocked holes or threads, or defects of any other kind. If repairs are deemed appropriate, they may be carried out only with prior approval from Manager Engineering Delivery. Where remedial works takes place, the service life, stiffness and strength of repaired poles must be no less than undamaged poles. Repairs to the pole shall not impair the effectiveness of the earthing circuit.

4.2.14 Bushfire Resilience

Endeavour Energy requires evidence of the durability of poles in respect to one or more grass fires or bush fires. Compliance with the Forest & Wood Products Australia Limited publication: "Assessing the ability of a large-scale fire test to predict the performance of wood poles exposed to severe bushfires and the ability of fire retardant treatments to reduce the loss of wood poles exposed to severe bushfires" (Project No: PNA014-0708) would be considered favourably. This publication can be used as a reference to heat exposure test methods in the absence of other relevant specifications.

4.2.15 Structural drawings, pole capacity calculations and properties

The following must be provided with the offer:

- Structural drawings for all the poles offered. The drawings must show typical markings, basic dimensions, hole, ferrule and step locations as well as section shape of the poles at the tip and base of the pole, and locations where the shape varies from typical.
- Theoretical pole capacity reports for all the poles offered. This must include all calculations and assumptions used to ascertain the pole's loading capability. These reports must be accompanied by a Structural Engineer's certificate confirming that all poles meet the technical requirements of this specification.
- Detailed calculations supporting the reports for all the poles offered. Calculations provided shall be complete in all ways to allow Endeavour Energy to independently employ a certified Structural Engineer to produce theoretical pole capacity reports to determine that all poles meet the technical requirements of this specification. The pole geometry and material properties for all the poles offered, for modeling in line design software PLS-CADD and Pole 'n' Wires.

4.2.16 Delivery requirements

All items supplied must be suitably packaged to deliver the items undamaged, giving due consideration to the methods and distance of transportation and handling. Poles must be packed so that there is no metal to metal contact or possible damage to the groundline protection systems or other painted finishes, etc. during delivery.

Each delivery document must be provided with the following information:

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

4.3 Testing Requirements

4.3.1 Type tests

Type tests must be provided for each pole structure type (single piece poles and multi-piece poles) and will qualify all poles with similar performance characteristics to the tested pole. Documentation must be provided to justify the performance characteristic ranges submitted.

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

Type tests must 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,

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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) must be in English.

Type test certificates must specify the overall dimensional details of the poles, 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.

The type tests required to be submitted with the offer are listed in

Table 3 and Table 4.

Ultimate strength and serviceability tests may be substituted by theoretical pole capacity reports for each pole confirming that the poles meet all the technical requirements. Detailed calculations supporting these reports shall be provided, 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
- 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 pole capacity reports.

Table 3: The type test requirements for a galvanised steel pole.

Standard	Reference clause	Test	Pass Criteria
AS/NZS 7000	7.4 and Appendix FF	• The Ultimate Strength values for the poles are as specified in Appendix 1 - Specified items	• Pole deflection under forces on the pole of not less than 50% of its ultimate strength must not exceed 5% for distribution poles and 4% for transmission poles of the pole length above ground. • The results of this type test in accordance with Appendix FF, Clause FF6 must be provided with the offer.
AS/NZS 7000	8.5	• The strength and serviceability of the poles are as specified in Appendix 1 - Specified items	• For serviceability, the test specimen must comply with the serviceability requirements as 500Pa wind condition or maximum deflection in line with AS7000 "high" serviceability conditions and the measured serviceability indicators are within the specified limits appropriate to the pole application. • For strength, the test specimens must comply with the strength requirements of this Standard if the specimens are able to withstand the 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.

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AS/NZS 1554.1	4	- Tests to demonstrate qualification of procedure and personnel. The tests must be witnessed and the reports signed by a NATA accredited representative. - Completed welds must be inspected in accordance with Clause 6 and 7 of AS/NZS 1554.1.	- The level of imperfections allowed in welds must be those in Table 6.2.1 of AS/NZS 1554.1. - Test reports complying with Clause 6.8 of AS/NZS 1554.1 must be provided with the offer.
-	-	The pole's earthing system must be capable of safely conducting the energy associated with a system earth fault without damage to the pole.	- A minimum fault current level of 13.1 kA for 1 second for distribution poles and 26 kA for 1 second for transmission poles is required. - Evidence may comprise of design calculations or test reports.
		- Conduct voltage tests on the insulation coating using the following voltages: 20 kV 30 kV 40 kV - If the test fails, apply an additional coat, record the insulation thickness and repeat the failed voltage test. - Repeat until the insulation coating passes all voltage tests.	- One layer of the insulation coating has a minimum insulation level 20 kV. - One or more layers of the insulation coating has a minimum insulation level of 40 kV.

Table 4: The type test requirements for the optional paint coatings.

Standard	Reference clause	Test	Pass Criteria
AS 3894.3	-	Dry Film Thickness	- Thickness is as requested by Endeavour Energy. - Coating damage is to be spot repaired after any destructive testing.
AS 3894.9	-	Adhesion (Tape test)	- Adhesion is as requested by Endeavour Energy. - Coating damage is to be spot repaired after any destructive testing.
AS 3894.9	-	Adhesion (Pull-off test) – To be carried out only when tape testing is unsuitable or when specially requested by Endeavour Energy.	- Adhesion is as requested by Endeavour Energy. - Coating damage is to be spot repaired after any destructive testing.

Where pole painting is required, the paint thickness may be measured by Endeavour Energy at the time of delivery. If the minimum thickness has not been provided, the Supplier will be responsible for repainting the pole at no additional cost to Endeavour Energy.

4.3.2 Routine tests

All routine 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 the testing staff;
- test procedures for all routine 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 batch tests being conducted at the manufacturing facility's test laboratory.

The welding and other routine test reports required are listed in

Table 5 and Table 6.

Table 5: The routine test requirements for welding.

Standard	Reference clause	Test	Pass Criteria
AS/NZS 1554.1	7.3	• SP and GP welds must be visually scanned for defects.	• Confirm that the welds have been made in accordance with the specification requirements.
AS/NZS 1554.1	6.2.2	• The first 2 welds of each weld type must be visually examined.	• If problems are found, all welds for that welder must be visually examined until specified quality is achieved consistently.
AS/NZS 1554.1	6.2.2	• 10% of GP Category welds must be visually examined.	• If problems are found the visual examination must be increased to 25% for that welder until the specified quality is achieved consistently. • If additional problems are found the visual examination must be increased to 100% until the specified quality is achieved consistently. • If lack of fusion or cracking is suspected, Magnetic Particle or Liquid Penetrant testing must be carried out in accordance with AS/NZS 1554.1 Clauses 6.5 & 6.6 as a minimum.
AS/NZS 1554.1	6.2.2	• 100% of SP Category welds must be visually examined.	• If lack of fusion or cracking is suspected, Magnetic Particle or Liquid Penetrant testing must be carried out in accordance with AS/NZS 1554.1 Clauses 6.5 & 6.6, as a minimum.
AS/NZS 1554.1	6.3 & 6.4	• A minimum of 10% of all SP Category shop welding must be Non Destructively Tested by either Radiography, or Ultrasonic testing.	• If problems are found, increase testing to 100% for that welder until specified quality is achieved consistently.

Steel Poles

-	-	All circumferential or other full penetration butt welds must be 100% magnetic particle or liquid penetration tested.	No defects.
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Table 6: Other routine test requirements.

Standard	Reference clause	Test	Pass Criteria
AS/NZS 4680	Table 1	- Batch tests must be performed to check the thickness and quality of galvanising. - The no. of samples for batch tests must be 2 per 100 poles produced with a minimum of two samples for any batch.	The average weight of zinc coating per square metre, the minimum local and the minimum average coating thickness must not less be than the values specified in Table 1 of AS/NZS 4680.

5 AUTHORITIES AND RESPONSIBILITIES

General Manager Future Grid & Asset Management shall have the authority and responsibility for:

- approving major changes to this standard (in accordance with table 4 of GAM0001), including any variations.
- making all decisions concerning compliance with this standard.
- delegating any of these authorities and responsibilities to the **Head Of Asset Management & Digital**.

Head Of Asset Management & Digital shall have the authority and responsibility for:

- approving minor changes to this standard (in accordance with table 4 of GAM0001) and making recommendations to the **General Manager Future Grid & Asset Management** for major changes in respect to this standard; and
- making recommendations concerning compliance in respect to this standard.

Engineering Delivery Manager shall have authority and responsibility for:

- periodic review of this Technical Specification based on industry best practice and Endeavour Energy's network requirements.
- reviewing all test reports submitted and making recommendations to the **Head of Asset Management & Digital**.

Manager Supply Chain has overall responsibility for ensuring that all poles purchased by Endeavour Energy comply with the requirements of this instruction.

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 poles installed by Level 1 Accredited Service Providers comply with the requirements of this standard.

Appendix 1 – Specified items

Table 7: Details of the specified items for distribution steel poles.

Pole code/Item No.	Pole length (m)	Ultimate strength (kN)	Pole code on identification plate (Cat No.)	Hole/ferrule layout Endeavour Energy Drawing no.
H2S	8	60	H2	282831
H3S	10	60	H3	
M4S	9.5	24	M4	331149
M6S	11	24	M6	
M8S	12.5	16	M8	
M9S	12.5	24	M9	
M12S	12.5	40	M12	
M14S	14	16	M14	
M15S	14	24	M15	
M16S	15.5	16	M16	
M17S	15.5	24	M17	

Note: Poles over 12.5m to be supplied in two pieces.

Table 8: Details of the specified items for transmission steel poles.

Type	Pole length (m)	Ultimate strength (kN)	Pole code on identification plate (Cat. No.)	Hole/ferrule layout Endeavour Energy Drawing no.
60 series	17	32	60S	339928
	18.5	32		
	18.5	40		
	18.5	60		
	20	32		
	20	40		
	20	60		
	21.4	32		
	21.4	40		
	21.4	60		
	23	32		
	23	40		
	23	60		
70 series	18.5	32	70S	339929
	18.5	40		
	18.5	60		
	20	32		
	20	40		
	20	60		
	21.4	32		
	21.4	40		
	21.4	60		
	23	32		
	23	40		
	23	60		
80 series	18.5	32	80S	339927
	18.5	40		
	18.5	60		
	20	32		
	20	40		
	20	60		
	21.4	32		
	21.4	40		
	21.4	60		
	23	32		
	23	40		
	23	60		
Joint Use*	-	-	-	331149

*poles required for joint use (transmission and distribution) may require the additional holes indicated in Drawing no. 331149.

Appendix 2 – Drawings

Table 9: Drawings associated with this specification.

Drawing Number	Drawing Title
053999	Identification plate for concrete and steel poles
282831	Stay pole 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

