Equipment Technical Specification

Timber Poles

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1.0 PURPOSE

To specify the requirements for timber poles used on the Endeavour Energy electrical network.

2.0 SCOPE

This specification covers the requirements for the supply of full length preservative treated hardwood poles to be used as part of the Endeavour Energy overhead network.

3.0 REFERENCES

Internal
Company Policy (Network) 9.2.5 – Network Asset Design
Company Policy (Network) 9.7.1 – Network Asset Construction
Network Management Plan December 2013 Review
Annexure 1 – Acceptable timer species
Annexure 2 – Pole details

External
ENA National Electricity Network Safety Code (Doc 01-2008)
AS 1604.1-2012 – Specification for preservative treatment Sawn and round timber
AS 1720.2-2006 – Timber Structures – Part 2: Timber Properties
AS 3818.1-2009 – Timber- heavy structural products-Visually graded – General requirements
AS 3818.11-2009 – Timber- heavy structural products-Visually graded – Utility poles
AS 5604-2005 – Timber – Natural durability ratings
AS/NZS 2878-2000 – Timber – Classification into strength groups
AS/NZS 4676-2000 – Structural design requirements for utility service poles

4.0 DEFINITIONS AND ABBREVIATIONS

AS/ NZS
Australian Standard / New Zealand Standard

CCA
copper chromium arsenic, a chemical compound used to preserve wood.

critical zone
The part of the pole that is between 1000mm above the ground line and 600mm below the ground line.

Dry side
A strip of exposed deadwood, bordered by callus and formed by injury to the living tree.
5.0 TIMBER POLES

5.1 General requirements

This specification, including drawings and schedules, defines the requirements for the supply of preservative treated hardwood poles complying with the requirements of Sections 1, 2, 3 and 5 of AS 3818.11. Where this specification and AS 3818.11 vary (as stated in Clause 5.2), this Specification will take precedence.

Terms used throughout this specification relating to timber poles are in accordance with AS/NZS 4491.

5.2 Requirements exceeding Australian Standards

The following requirements are detailed in this standard, which are above those contained in AS 3818:

- Barrel and end splits (Clause 6.8) – maximum 500mm end split length in the butt
- Mechanical damage (Clause 6.9) – No damage allowed in the critical zone. Damage not to exceed 1000mm in length and a minimum of 10mm thick sapwood for Durability 2 species following any trimming of an area affected by mechanical damage.
- Dry side (Clause 6.10) – Not permitted in Durability 2 poles and not to exceed 5% of the pole circumference and 1000mm in length for Durability 1 poles.

6.0 TECHNICAL REQUIREMENTS

6.1 Pole dimensions

Pole dimensions shall be in accordance with Annexure 2.

Poles shall not be less than the lengths specified however they may exceed the lengths specified by a maximum of 100mm.

Pole dimensions shall not be less than the diameters specified. Pole having diameters greater than those specified will be accepted provided that the actual diameters do not exceed the specified diameters by more than 50mm at the top and 80mm at the ground line.

The deviation in the diameter of the pole, when measured at the pole butt and the ground line, shall be less than 5%.

Pole embedment depths shall be as per applicable design standards.

6.2 Timber species

The acceptable hardwood timber species are shown in Annexure 1.

6.3 Species identification

Each pole shall be clearly branded on the butt with the species identification letters (see Table 1 of AS 1720.2 or Annexure 1) by painting, branding or other acceptable means to ensure legibility until a permanent brand is applied.

A permanent species identification brand shall be applied to the pole butt after preservative treatment and prior to delivery. This permanent brand shall be by means of painting species identification code letters with white paint in lettering 75mm high.
6.4 Grade description

The requirements of Clause 2.2 and 3.2 in AS 3818.11 shall apply to all hardwood poles referred to in this specification.

6.5 Straightness

The straightness of poles shall be to Select Grade in accordance with Clause 1.5.4, Table 1.5 and Figure 1.5, AS 3818.11. In addition, it must be possible to erect the poles in a circular hole of diameter 760mm drilled out by a post-hole borer, without further alteration to the hole.

6.6 Ovality

In accordance with Clause 1.5.3 in AS 3818.11, the smallest diameter of a pole (D\text{min}) shall be not less than eighty (80) percent of the greatest diameter (D\text{max}) at any cross-section over a maximum of eighty (80) percent of the length of the pole.

\[
D_{\text{min}} \geq 80\% \times D_{\text{max}}
\]

Figure 1: Ovality dimensions

6.7 Trimming

All limbs and projections are to be neatly trimmed, care being taken that no downward cuts are made in the poles. The trimming shall be carried out by means of a portable planing machine before treatment and both the tops and butts of poles shall be sawn square.

Poles which have had large limbs, knots and the like planed off, shall not be accepted. For the purpose of this Clause, large is defined as a diameter exceeding 20% of the circumference of the pole measured at the position of the limb or knot. The diameter of the limb or knot is the distance measured between two lines parallel to the longitudinal axis of the pole.

Trimming at the butt end of poles is to be kept to a minimum to enable the sapwood band measurement to be carried out.

6.8 Barrel checks and end splits

Barrel checks and end splits shall be assessed by comparison with the ratings given in Tables 1.7.1 and 1.7.2 in AS 3818.11. Poles shall only be accepted that meet the requirements for both barrel check and end split for poles rated as “A” in accordance with AS 3818.18 and the tables below:
Table 1- End splits rating

<table>
<thead>
<tr>
<th>Specified ground line diameter</th>
<th>Width of end split (measured at the circumference)</th>
<th>Maximum limit of all end splits at each end</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not exceeding 300mm</td>
<td>≤ 6mm</td>
<td>Unlimited</td>
</tr>
<tr>
<td></td>
<td>&gt; 6mm and ≤ 10mm</td>
<td>Aggregate width (measured at the circumference) not exceeding 10% of the circumference</td>
</tr>
<tr>
<td></td>
<td>&gt; 10mm</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Exceeding 300mm</td>
<td>≤ 6mm</td>
<td>Unlimited</td>
</tr>
<tr>
<td></td>
<td>&gt; 6mm and ≤ 15mm</td>
<td>Aggregate width (measured at the circumference) not exceeding 15% of the circumference</td>
</tr>
<tr>
<td></td>
<td>&gt; 15mm</td>
<td>Not permitted</td>
</tr>
</tbody>
</table>

Table 2– Barrel checks rating

<table>
<thead>
<tr>
<th>Specified ground line diameter</th>
<th>Width of barrel check</th>
<th>Maximum limit of all barrel checks at any cross section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not exceeding 300mm</td>
<td>≤ 3mm</td>
<td>Unlimited</td>
</tr>
<tr>
<td></td>
<td>&gt; 3mm and ≤ 7mm</td>
<td>Aggregate width not exceeding 10% of the circumference</td>
</tr>
<tr>
<td></td>
<td>&gt; 7mm</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Exceeding 300mm</td>
<td>≤ 3mm</td>
<td>Unlimited</td>
</tr>
<tr>
<td></td>
<td>&gt; 3mm and ≤ 10mm</td>
<td>Aggregate width not exceeding 10% of the circumference</td>
</tr>
<tr>
<td></td>
<td>&gt; 10mm</td>
<td>Not permitted</td>
</tr>
</tbody>
</table>

- Barrel checks shall have a maximum depth of 10mm for Durability 1 species timber and a maximum depth of 15mm for Durability 2 species timber
- End splits in the butt of the pole shall not exceed 500mm in length

The following plates shall be fitted:

**Pole Butt:** Annular galvanised steel gang nails of a diameter as can be accommodated without projection beyond the circumference of the pole

**Pole Top:** 125mm x 100mm galvanised steel gang nail shall be fitted to the top of all poles

The fitting of gang nails to the butt and top of poles must take place immediately after poles are sawn to length and before any full length preservative treatment process.

To prevent end splitting the Contractor shall coat the top and butt of each pole with a brushable wax after the CCA treatment. The use of an alternative end seal product may be considered upon application by the Contractor.
6.9 Mechanical damage

Mechanical damage will only be allowed as described below:

**Axe marks**

- Across the grain – radial depth not exceeding 5mm with none in the critical zone
- Parallel with the grain – depth not exceeding 5mm and not in a continuous line

**Tong and cant-hook punctures**

- Not allowed in the critical zone.
- Outside of the critical zone, there shall only be:
  - Only a few punctures; and
  - Individual areas shall not exceed an area equivalent to 40mm x 40mm
  - Does not extend into the heartwood.

**Other mechanical damage**

- Not allowed in the critical zone.
- Outside of the critical zone, the width of the damage shall not exceed 10% of the pole circumference and not extending into the heartwood.
- Damage not to exceed one (1) metre in length.
- After trimming areas affected by mechanical damage, the remaining sapwood of Durability 2 species shall not be less than 10mm thick.

6.10 Dry side

Dry side is permitted in Durability 1 species poles only, provided: it does not occur in the critical zone; the width does not exceed 5% of pole circumference; and, the length is not more than one (1) metre.

Dry side is not permitted in Durability 2 species poles.

6.11 Borer holes

All timbers which are susceptible to borers must be treated with a suitable insecticide as soon as practicable after cutting, to prevent infestation during seasoning.

Poles with borer holes will only be accepted where the holes are not clustered in a manner that would impair the strength or integrity of the sapwood. For the purpose of this clause, the integrity of the sapwood should be assessed by any or all, as appropriate, of the following methods:

- a) Probing with a sharp implement.
- b) Sounding with a hammer.
- c) Taking core samples to full sapwood depth to ascertain the extent of larval tunnel damage.

6.12 Glyptotermes holes

All poles shall be free of Glyptotermes attack.
6.13 Sapwood and dressing

In a zone which extends from the butt of the pole to one (1) metre above the ground line, the poles shall be:

- Debarked;
- Free of mud and dirt; and,
- The sapwood shall be intact.

Only the sapwood defects listed above shall be permissible outside of this zone.

The minimum depth of sapwood for both Durability 1 and 2 species, measured at the pole butt, shall be 12mm.

All butts and tops must be cut square and any end coating shall be removed unless it can be shown that the coating material does not inhibit penetration of preservatives, in accordance with Section 5 of AS 3818.11.

6.14 Pole cap

A galvanised steel pole cap shall be tightly fitted to the top of each pole using a minimum of three (3) 40mm x 12-11 gauge, galvanised, hexagon head, self-tapping screws.

In fitting the pole cap to the pole, trimming shall be kept to an absolute minimum and carried out prior to treatment to ensure adequate protection of the top of the pole (for example, a 230mm cap will fit poles with a top diameter in the range of 230mm to 250mm).

6.15 Identification disc

Every pole shall have the information listed below stamped on a 50mm diameter corrosion resistant disc. The disc layout shall be in accordance with Clause 5.6 of AS 3818.11, with the following information and order. No other disc layout options will be considered.

a) Registered plant identification number
b) Individual pole number
c) Length in metres / Working load in kN / Ultimate load in kN
d) Code letters for the timber species/Year of treatment
e) Hazard level / Preservation type

Figure 2: Pole identification disc layout
The information disc shall be recessed into the pole at two (2) metres above the ground line and located so that it is readily accessible for inspection when the pole is in service.

The maximum permissible loads shall be stated in terms of both Working Strength and Ultimate Load Capacity (the value of the concentrated load which, if applied at the pole tip, would produce at ground level the design bending moments and shear forces for the strength limit state in accordance with AS/NZS 4676). Working Strength and Ultimate Load Capacity values for all poles are set out in detail in Annexure 3.

6.16 Full length preservative treated poles

6.16.1 Treatment type

All poles shall be treated with CCA timber preservative in accordance with the requirements of section 5 of AS 3818.11. The preservative penetration shall be in accordance with the requirements for hazard class H5 specified in Clause 6.2 of AS 1604.1.

The CCA formulation shall be in accordance with the requirements of Table B2 in AS 1604.1. The Contractor shall submit full details of the method of treatment, the CCA formulation used together with a guarantee of durability. The CCA formulation used to treat the poles shall not be changed unless approved by Endeavour Energy.

Should the Contractor feel that a preservative other than that nominated above would be advantageous in the elimination of sapwood degradation, especially soft rot fungus, details of such preservative should be supplied for consideration.

6.16.2 Preservative retention

Preservation retention for CCA poles shall be in accordance with the requirements of Table H5 in AS 1604.1.

6.16.3 Surface condition

The surface of full length preservative treated poles shall be in accordance with the requirements of Clause 5.4 in AS 3818.11. The surface shall be free of preservative residues, exudates, efflorescence and sawdust that is likely to result in:

- Ingestion or inhalation of harmful chemicals;
- Contamination of skin, clothing or equipment; and/or
- Reduced safety in handling and transport.

6.17 Sampling methods

Poles shall be tested for the preservative penetration and preservative retention. These test results shall be determined by using any of the approved methods described in AS 3818.11, Appendix C. These methods include:

a) Assessment by means of statistical sampling
b) The use of a product certification scheme
c) Assurance using the acceptability of the Contractor’s quality system
d) Other such means proposed by the Contractor and acceptable to Endeavour Energy.

The procedure for determining the treatment results using any one of the above methods are given in AS 3818.11, Clauses 5.3 and 5.5.
The sampling rate, core sampling procedures and assessment of results processes described in AS 3818.11, Appendix C, Clause C1, C2 and C3 are acceptable.

Endeavour Energy reserves the right to carry out various tests, including taking of solid core samples at any time from poles consigned to the Endeavour Energy at the Contractor’s premises or at Endeavour Energy’s storage locations.

6.18 Inspection

Endeavour Energy reserves the right to inspect the manufacturing facilities of poles prior to awarding the contract, or at any time during the contract period.

Endeavour Energy reserves the right to inspect and approve all poles provided during the contract period. This inspection may take place at either the Contractor's works or at point of delivery.

7.0 DRAWINGS

<table>
<thead>
<tr>
<th>Drawing no.</th>
<th>Drawing Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>015370</td>
<td>Overhead Construction, Cap for Wood Pole, Detail</td>
</tr>
</tbody>
</table>
8.0 AUTHORITIES AND RESPONSIBILITIES

**General Manager Asset Management** shall have the authority and responsibility for:

- approving Technical Specifications, including any variations.
- making all decisions concerning compliance in respect to this Specification.
- approving nominations of Endeavour Energy’s representatives.
- delegating any of these authorities and responsibilities to the Manager Asset Standards and Design.

**Manager Asset Standards and Design** shall have the authority and responsibility for:

- endorsing this specification and making recommendations to the General Manager Asset Management.
- making recommendations concerning compliance in respect to this Specification.
- making nominations of Endeavour Energy’s representatives for tender evaluations.
- approving the relevant actions required and outlined in this specification.

**Mains Assets Manager** shall have authority and responsibility for:

- reviewing this specification based on industry best practice and Endeavour Energy’s network requirements.
- clarifying all the technical aspects of this specification to the stakeholders.

**Project Manager** shall have authority and responsibility to check that all poles installed comply with the requirements of this specification.

**Commercial Manager** shall have the authority and responsibility to check that the poles purchased through the tender process 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.

**Contractor Operations Manager, Network Connections Branch** shall be responsible for:

ensuring that all poles installed by Level 1 Accredited Service Providers comply with the requirements of this instruction.

9.0 DOCUMENT CONTROL

**Documentation content coordinator:** Mains Assets Manager

**Documentation process coordinator:** Standards Process Coordinator
## ANNEXURE 1: ACCEPTABLE TIMBER SPECIES

<table>
<thead>
<tr>
<th>AS 1720.2 ref.no.</th>
<th>Standard trade common name</th>
<th>Botanical name</th>
<th>AS 3818.1 species brand</th>
<th>AS 5604 durability rating</th>
<th>AS/NZS 2878 strength group (unseasoned)</th>
</tr>
</thead>
<tbody>
<tr>
<td>84</td>
<td>Blackbutt</td>
<td>E.pilularis</td>
<td>BB</td>
<td>2</td>
<td>S2</td>
</tr>
<tr>
<td>126</td>
<td>Box, Grey</td>
<td>E.microcarpa</td>
<td>GB</td>
<td>1</td>
<td>S2</td>
</tr>
<tr>
<td>127</td>
<td>Box, Coast Grey</td>
<td>E.bosistoana</td>
<td>CB</td>
<td>1</td>
<td>S1</td>
</tr>
<tr>
<td>266</td>
<td>Gum, Grey</td>
<td>E.canaliculata</td>
<td>GG</td>
<td>1</td>
<td>S1</td>
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<td>293</td>
<td>Gum, Spotted</td>
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<td>SG</td>
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<td>S2</td>
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<td>326</td>
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<td>E.fibrosa</td>
<td>BI</td>
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<td>S1</td>
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<td>S1</td>
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<td>391</td>
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<td>E.microcorys</td>
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</table>
## ANNEXURE 2: POLE DETAILS

<table>
<thead>
<tr>
<th>Pole size (Length/ working load)</th>
<th>Ultimate Limit Stress (kN)</th>
<th>Minimum diameters of poles - Strength Group 1 (100 MPa)</th>
<th>Minimum diameters of poles - Strength Group 2 (85 MPa)</th>
<th>Stock Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Top (mm)</td>
<td>Groundline (mm)</td>
<td>Butt (mm)</td>
</tr>
<tr>
<td>8m/30kN</td>
<td>124</td>
<td>355</td>
<td>409</td>
<td>434</td>
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<tr>
<td>9.5m/4kN</td>
<td>19</td>
<td>170</td>
<td>248</td>
<td>263</td>
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<td>9.5m/8kN</td>
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<td>226</td>
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<td>52</td>
<td>267</td>
<td>345</td>
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<td>36</td>
<td>231</td>
<td>322</td>
<td>339</td>
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<td>275</td>
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<tr>
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<td>54</td>
<td>281</td>
<td>385</td>
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<td>12.5m/18kN</td>
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<td>242</td>
<td>386</td>
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<td>56</td>
<td>292</td>
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