Ergon Energy Corporation Limited

Technical Specification for Hardwood Crossarms

ETS07-02-01
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13. Reliability .......................................................................................................................... 7
   13.1 Service Life ................................................................................................................. 7
14. Training ............................................................................................................................. 8
15. Environmental Considerations ....................................................................................... 8
16. Information to be Provided .............................................................................................. 8
   16.1 Specific Technical Requirements .............................................................................. 8
   16.2 Checklist of Supporting Documentation .................................................................... 8
17. Appendix A.1 – Acceptable Species .............................................................................. 9
18. Appendix A.1 – Acceptable Species… (Cont’d) ............................................................... 10
19. Attachment 1 – Supplier Details ..................................................................................... 11
20. Attachment 2 – Specific Requirements / Guaranteed Particulars ................................ 12
22. Attachment 4 – Drawings for Fabricated Crossarms ..................................................... 14
1. **Purpose and Scope**

   This specification sets out the requirements for treated and untreated hardwood crossarms for use on overhead electricity distribution systems in a totally exposed environment.

2. **References**

2.1 **Applicable Standards**

   The crossarms shall comply with the relevant parts of the following Standards and all amendments issued from time to time except where varied by this specification.

<table>
<thead>
<tr>
<th>STANDARD</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS/NZS 1148</td>
<td>Timbers-Nomenclature Australian, New Zealand and imported species</td>
</tr>
<tr>
<td>AS 1720</td>
<td>Timber structures</td>
</tr>
<tr>
<td>AS/NZS 2878</td>
<td>Timbers - Classification into strength groups</td>
</tr>
<tr>
<td>AS 3818</td>
<td>Timber- Heavy structural products- Visually graded</td>
</tr>
<tr>
<td>AS 4491</td>
<td>Glossary of terms used in timber related Standards</td>
</tr>
<tr>
<td>ISO 9001</td>
<td>Quality management systems - Requirements</td>
</tr>
</tbody>
</table>

3. **Drawings**

3.1 **Drawings by the Purchaser**

   Refer to Attachment 4 – Drawings for Fabricated Crossarms

   When fabricated crossarms are specified by the Purchaser, the details of the drilling of crossarms and the installation of gang nail shunt plates shall be in accordance with the drawings attached, which form part of this specification.

4. **Service Conditions**

   The crossarms will be exposed to the following environmental conditions:

   | Temperatures       | 45°C summer day time  
   |                   | -5°C winter night time |
   | Solar Radiation Level | 1000 Wm² with high ultraviolet content |
   | Precipitation      | Tropical summer storms with gust wind speeds above 160 km/h, and an annual rainfall in excess of 1 500 mm |
   | Humidity           | Extreme range of relative humidities from 10% to 100% which causes substantial shrinkage and swelling stresses in the timber |
   | Pollution          | Areas of coastal salt spray and/or industrial pollution with equivalent salt deposit densities in the range 2.0 to 3.0 gm⁻² |
5. Design and Construction

5.1 Application
Examination of crossarms in service has revealed that the abovementioned environmental extremes have a more adverse effect on the top surface of the crossarm than on the sides or bottom surface of the crossarm. As the deterioration of the top surface of the crossarm in service is accelerated by voids and imperfections which may hold water, the quality of the top surface must be of the highest standard. Hence, only minimal imperfections on the top surface of the crossarm will be allowed.

For the purpose of stress grading the dimension of the top surface will be nominated by the purchaser.

5.2 Species
5.2.1 Timber shall be supplied in accordance with the species shown in Appendix A.1 of this specification.

5.2.2 Timber species have been selected based on the following criteria:

a) Acceptable Durability Class 1 and 2.

b) Acceptable Seasoning Degrade - High density and low tangential shrinkage. (Species with low density combined with high tangential shrinkage have been shown to perform poorly).

5.3 Grading of Timber
5.3.1 The timber shall be visually stress graded in accordance with AS 3818.4. The minimum stress grade for timber supplied to this specification shall be F17. Grade 1 and Grade 2 cross-arms are acceptable for strength 1 and 2 timbers. Grade 1 cross-arms only are acceptable for strength group 3 timbers.

5.3.2 Top Surface - Permissible Imperfections
No imperfections are permitted with the exception of those allowed under the clause 9.4 of AS 3818.4.

Total want shall not exceed the values shown in QESI Drawing No 07-02-01.

5.3.3 All Other Surfaces - Clarification of Requirements
All other surfaces of the hardwood crossarm shall conform to the grade limitation of Grades No. 1 and No. 2 cross-arms in accordance with AS 3818.4 except that:

a) For untreated crossarms, all sapwood is to be trimmed and the resulting defect measured as for want. In the event of a dispute, a dimethyl yellow spot test shall be used to determine the presence of sapwood.

b) Gum pockets, included bark strands, overgrowths of injury, primary rot, termite galleries and end splits are not permitted.

c) A smooth shallow depression not exceeding 200 mm long by 50 mm wide and 3 mm deep shall be permitted.

d) Imperfections occurring close to an arris shall be trimmed and treated as want.
5.3.4 The following additional defects are permissible on the painted surfaces where specified (refer Clause 5.6):

- Other holes shall not exceed 10 mm diameter, shall not number more than four (4) and shall be well scattered, i.e. they shall be spaced along and across the grain by not less than six times the diameter of the holes.

If these additional defects are in the top surface, they shall be filled before painting. If they occur on any of the vertical faces they shall be filled or made self-draining. The holes shall be filled with a suitable shrink resistant epoxy filler.

5.3.5 If the time of inspection, testing and acceptance by the purchaser takes place some time after the initial grading by the supplier to this specification, allowance will be made by the purchaser for defects arising from moisture loss. These allowances will include increases in width of surface checks, development of seasoning checks associated with tight knots, end checks and splits and the formation of longitudinal shakes (ring or water shakes) not evident "green off saw" and shall not be the sole cause for the total rejection of a delivery.

**Note:** No allowance shall be made in this regard with respect to other defects otherwise limited or prohibited by this specification, ie knot-size, unsound knots, gum pockets, loose or tight gum veins, bark or overgrowth of injury, sloping grain, etc.

5.3.6 The visual stress grading of hardwood crossarms in accordance with this specification shall only be carried out by personnel certified as qualified in visual stress grading techniques for hardwood timber by either:

- a) Timber Queensland; or
- b) The Forest Industries Training & Education Consortium; or
- c) The Technical and Further Education (TAFE) College; or
- d) Recognised equivalent training organisations in other States of Australia.

5.3.7 The Supplier shall state in the offer the names of qualified staff who will be carrying out the visual stress grading of crossarms to be supplied under this specification together with details of their qualifications.

5.4 End Grain Sealing and Treatment

5.4.1 On completion of sawing, the timber shall be sealed on the end grain with a suitable wood sealing compound. Following this, nail plate connectors shall be applied to the ends of the timber.

5.4.2 Nail plate connectors shall be manufactured from galvanised steel having a minimum thickness of 1.2 mm. The percentage coverage of end grain by nail plate connectors shall be at least 50% of the surface area and nail plate connectors shall not be located within 8 mm of the edges of the timber.

5.4.3 Further, to reduce the likelihood of checking/splitting of knots (where they are permitted), a suitable wood sealing compound shall be applied to the knots.

5.4.4 Hydroseal, Petroleum Jelly, Moblicer M or similar alternatives are acceptable sealants for end grain sealing and knots. The sealant should not contain colouring.
5.4.5 The supplier shall state in the offer, the wood sealing compound proposed for use. Further, a Safety Data Sheet for the sealing compound, shall be submitted with the offer.

5.4.6 Alternative sealant proposals are subject to the approval of the purchaser and shall be supported by documentary evidence of satisfactory performance.

5.5 Preservative Treated Crossarms

5.5.1 The graded quality for preservative treated crossarms shall be the same as for untreated crossarms as specified in Clause 5.3 of this specification except that sapwood is permitted and wane is also permitted as per the want requirements given in Clause 5.3.

5.5.2 Where practical, any sapwood contained in treated crossarms should be included in the top surface of the crossarm as defined in QESI Drawing No. 07-02-01.

5.5.3 The preservative shall be copper chrome arsenate (CCA) or ammoniacal chrome quaternary (ACQ) with components and retention levels appropriate to H3 level as defined in the Timber Utilization and Marketing Act 1987 (Queensland) or latest amendment thereof. Minimum preservative penetration and retention levels shall be in accordance with the Notification under the Timber Utilization and Marketing Act 1987 (Queensland) published in the Queensland Government Gazette on 27 June 1987 or latest amendment thereof.

5.5.4 Variations to the specified penetration and retention levels, shall be permitted only upon the written approval of the purchaser.

5.5.5 At the time of delivery, the surface of the crossarm shall be dry and clean of residual sludge.

5.5.6 Treatment plants supplying preservative treated crossarms under this specification shall comply with the authorisation to use an approved preservative treatment and registration of brand provisions of the Timber Utilization and Marketing Act 1987 (Queensland) or latest amendment thereof.

5.6 Painted Crossarms

5.6.1 It has been found that weathering of the top surface of crossarms can be reduced by the application of an appropriate paint system to that surface.

5.6.2 The graded quality for painted crossarms shall be the same as for unpainted crossarms as specified in Clause 5.3.

5.6.3 The cross-arms supplied under this specification shall be painted on the top surface only.

5.6.4 The following paint system is acceptable as it has been found to exhibit long term performance on unseasoned hardwood in exposed environmental conditions.
Application:
- One coat of DULUX Weatherprime Acrylic paint or similar alternative applied by brush followed by;
- two coats of DULUX Weathershield Acrylic paint or similar alternative applied by brush roller; and
- applied strictly in accordance with the manufacturer’s specification.

Colour:
- White or other light shade approved by the purchaser.

5.6.5 The supplier shall confirm in the offer, the painting system proposed to be used.

5.6.6 Alternative paint system proposals are subject to the approval of the purchaser and shall be supported by documentary evidence of long term performance on unseasoned hardwood in exposed environmental conditions similar to those outlined in Clause 4.

5.7 Fabricated Crossarms

5.7.1 When fabricated crossarms are specified by the Purchaser, the details of the drilling of the crossarms and the installation of gang nail shunt plates shall be in accordance with the attached drawings in Attachment 4.

5.7.2 All drilled holes shall be on the centre line of the crossarm and square to the surfaces unless otherwise specified.

5.7.3 The installation of the gang nail shunt plates shall be carried out after the preservative treatment of the crossarm and the painting of the top surface.

5.7.4 The holes on the gang nail shunt plates shall be located symmetrically around the drilled crossarm holes to enable the latter to be reamed if required during line erection.

5.8 Sizes and Tolerances

5.8.1 Crossarm dimensions shall be as specified by the purchaser and shall be supplied clean sawn.

5.8.2 Tolerances shall be as follows:

<table>
<thead>
<tr>
<th></th>
<th>± 3mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>finished width and thickness</td>
<td>± 3mm</td>
</tr>
<tr>
<td>length of crossarm</td>
<td>+ 25mm, - 0mm</td>
</tr>
<tr>
<td>squareness of cross section</td>
<td>± 2mm</td>
</tr>
<tr>
<td>squareness of end trimming</td>
<td>± 2mm</td>
</tr>
<tr>
<td>hole diameter</td>
<td>+ 1mm, - 0 mm</td>
</tr>
<tr>
<td>squareness of holes to surfaces</td>
<td>± 2mm</td>
</tr>
<tr>
<td>symmetry of holes on crossarm and gang nail shunt plate</td>
<td>26mm dia holes± 0.5mm</td>
</tr>
<tr>
<td>other holes</td>
<td>± 2mm</td>
</tr>
</tbody>
</table>
5.9 Identification and Marking

5.9.1 The hardwood crossarms supplied under this specification shall be legibly branded on the TOP SURFACE (after painting, where painting is required) with the appropriate recognised quality identification system. Metal identification discs shall be used for recording the following details:

a) The words "CROSSARM F17" or "X-ARM F17".
b) The Strength Group of the timber (ie "S1/S2" or "S3").
c) The grading source (ie Company Name or Mill Number).
d) In the case of preservative treated crossarms, the registered brand of the treatment plant and H level as prescribed in the Timber Utilization and Marketing Act 1987 (Queensland) or latest amendment thereof.
e) Weight of the crossarm in kg.

5.9.2 The Supplier shall fix the marked disc in the space available on the gang nail plate by driving a 50mm long nail firmly through the centre of the disc plate into the grain of the crossarm end face. Crossarms delivered with missing discs may be rejected.

5.9.3 Nail plate drawing 01-15-01 and identification disc drawing 1019701-01 are attached for reference.

6. Alternate Option

Supplier is encouraged to provide offers to supply crossarms processed from regraded old poles that are no longer in use. This kind of offers shall be accompanied by service history in Australian conditions and other reports to support their capabilities.

7. Performance and Testing

7.1 Testing

For preservative treated crossarms, preservative treatment tests shall be taken on each charge. With each delivery of crossarms, the successful supplier shall supply certificates to the satisfaction of the purchaser of the retention and penetration levels as specified in Clause 5.5.

8. Risk Assessment

There is no requirement for manufacturer provided safety risk assessments for the items covered in this specification.

9. Quality Assurance

9.1 Certification

The supplier of hardwood crossarms shall have a quality system in place complying with AS/NZS/ISO 9001. In addition the supplier shall also have one of the following schemes in place:

a) Queensland Timber Board (QTB) Accredited Product Certification; or

b) Timber Queensland (TRADAC) Product Certification Scheme.
9.2 Quality Assurance Annexure
The supplier's attention is drawn to the relevant Quality Assurance Annexure which forms an integral part of this specification.

9.3 Documentary Evidence
Documentary evidence shall be provided concerning the level of quality system certification associated with the supplier. This document shall include the Capability Statement associated with the Quality System Certification.

10. Samples

10.1 Production Samples
When requested, samples of selected items shall be submitted to assist in the evaluation of the offer.

10.2 Sample Delivery
Each sample shall be delivered freight free, suitably crated and packaged and labelled with the following information:

<table>
<thead>
<tr>
<th>Name of Supplier and the Contract No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract Item Numbers</td>
</tr>
<tr>
<td>Any supporting data on features or characteristics</td>
</tr>
</tbody>
</table>

11. Packaging and Marking

11.1 General
All items are to be supplied in accordance with the packaging and delivery requirements detailed in QESI Drawing No. 07-02-02 or as otherwise nominated by the Purchaser.

12. Service Performance
Suppliers shall state:

<p>| | |</p>
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>the period of service achieved by the items offered within Australian service conditions;</td>
</tr>
<tr>
<td>b)</td>
<td>Australian electricity supply authorities who have a service history of the items offered; AND</td>
</tr>
<tr>
<td>c)</td>
<td>Contact names and phone numbers of relevant employees of those supply authorities who can verify the service performance claimed.</td>
</tr>
</tbody>
</table>

13. Reliability

13.1 Service Life
The quality of the crossarms shall be such that when they are erected at the top of power poles to support power line conductors, the 5 percentile service life shall be a minimum of 15 years (i.e. 95 crossarms out of 100 will still be in service after 15 years). The expected minimum average service life is 20 years. The grading and species listed in this specification have been selected to meet this requirement.
14. **Training**

Training material in the form of drawings, instructions and/or audio visuals may be required to be provided for the items accepted under the offer.

Suppliers shall state the availability of training materials which should include but is not limited to the following topics:

- Handling
- Storage
- Application (particularly in areas of heavy coastal pollution)
- Installation
- Maintenance
- Environmental performance
- Electrical performance
- Mechanical performance
- Disposal

15. **Environmental Considerations**

Suppliers are required to comment on the environmental soundness of the design and the materials used in the manufacture of the items offered. In particular, comments should address such issues as recyclability and disposability at the end of service life.

16. **Information to be Provided**

16.1 **Specific Technical Requirements**

For the crossarms offered, details with respect to the supplier as well as their source(s) of timber, shall be stated in **Attachment 1** of this specification.

16.2 **Checklist of Supporting Documentation**

**Attachment 3** details a checklist of supporting technical documentation which is required to be submitted with the offer.
## 17. Appendix A.1 – Acceptable Species

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Botanical Name</th>
<th>Durability Class</th>
<th>Strength Group to AS 2878 (Note 2)</th>
<th>Minimum Accept. Crossarm Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>ash, Crow's</td>
<td>Flindersia australis</td>
<td>1</td>
<td>S2</td>
<td>No.2</td>
</tr>
<tr>
<td>ash, hickory</td>
<td>Flindersia ifflaiana</td>
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<td>S1</td>
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<td>blackbutt</td>
<td>Eucalyptus pilularis</td>
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<td>S2</td>
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<tr>
<td>bloodwood, brown</td>
<td>Eucalyptus trachyploia</td>
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<td>Eucalyptus ngilifloia</td>
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<td>Eucalyptus terminalis</td>
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<td>Eucalyptus cambageana</td>
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<td>box, grey</td>
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<tr>
<td>box, yellow</td>
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<td>cadaga</td>
<td>Eucalyptus torelliana</td>
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<tr>
<td>carbeen</td>
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<td>No.2</td>
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<tr>
<td></td>
<td>Eucalyptus paniculata</td>
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<td>S1</td>
<td>No.2</td>
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<td></td>
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## Appendix A.1 – Acceptable Species… (Cont’d)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Botanical Name</th>
<th>Durability Class</th>
<th>Strength Group to AS 2878 (Note 2)</th>
<th>Minimum Accept Crossarm Grade</th>
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<tr>
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<td>Eucalyptus fibrosa subsp. fibrosa</td>
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<td>S1</td>
<td>No.2</td>
</tr>
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<td>ironbark, red, narrow-leaved</td>
<td>Eucalyptus crebra</td>
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<td>S2</td>
<td>No.2</td>
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<td>ironbark, silver-leaved</td>
<td>Eucalyptus melanophloia</td>
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<td>(S2)</td>
<td>No.2</td>
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<td>S1</td>
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<td>Eucalyptus pellita</td>
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<td>S2</td>
<td>No.2</td>
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<tr>
<td></td>
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<td>S2</td>
<td>No.2</td>
</tr>
<tr>
<td></td>
<td>Eucalyptus umbra subsp. carnea</td>
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<td>S2</td>
<td>No.2</td>
</tr>
<tr>
<td></td>
<td>Eucalyptus tenuipes</td>
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<td>S2</td>
<td>No.2</td>
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<tr>
<td>messmate, Gympie</td>
<td>Eucalyptus cloeziana</td>
<td>1</td>
<td>S2</td>
<td>No.2</td>
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<td>penda, brown</td>
<td>Xanthostemon chrysanthus</td>
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<td>(S2)</td>
<td>No.2</td>
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<td>Xanthostemon whitei</td>
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<tr>
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<td></td>
<td>Eucalyptus globoidea</td>
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<td></td>
<td>Eucalyptus phaeotricha</td>
<td>2</td>
<td>S3</td>
<td>No.1</td>
</tr>
<tr>
<td>tallowwood</td>
<td>Eucalyptus microcorys</td>
<td>1</td>
<td>S2</td>
<td>No.2</td>
</tr>
<tr>
<td>woollybutt, northern</td>
<td>Eucalyptus miniata</td>
<td>2</td>
<td>(S2)</td>
<td>No.2</td>
</tr>
<tr>
<td>yapunyah, mountain</td>
<td>Eucalyptus ochrophylia</td>
<td>1</td>
<td>(S2)</td>
<td>No.2</td>
</tr>
<tr>
<td></td>
<td>Eucalyptus thozetiana</td>
<td>1</td>
<td>(S2)</td>
<td>No.2</td>
</tr>
</tbody>
</table>

**Note 1:** Durability classifications in accordance with Table 4 of the Notification under the Timber Utilization and Marketing Act 1987 (Queensland) published in the Queensland Government Gazette on 27 June 1987.

**Note 2:** The Strength Group classifications shown in brackets are only provisional available.
19. Attachment 1 – Supplier Details

<table>
<thead>
<tr>
<th>Supplier's Name and Address</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name and Address of Mill</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source(s) of timber:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest name(s) and State(s)</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name and Address of Chemical Treatment plant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

SIGNATURE OF TENDERER: _________________________________
20. **Attachment 2 – Specific Requirements / Guaranteed Particulars**

The Tenderer will complete this attachment and guarantee the particulars provided. Attach additional sheets as necessary.

<table>
<thead>
<tr>
<th>Name of Staff Member</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DETAILS OF WOOD SEALING COMPOUND BEING PROPOSED FOR USE.**

**DETAILS OF THE PAINTING SYSTEM PROPOSED TO BE USED.**

**SERVICE PERFORMANCE**
- Period of service of items offered within Australian Service Conditions: ___________ Years
- Australian Electricity Supply authorities who have service history of the items offered:

<table>
<thead>
<tr>
<th>Authority</th>
<th>Contact Name</th>
<th>Phone No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STATE THE AVAILABILITY OF TRAINING MATERIALS:**

**COMMENT ON ENVIRONMENTAL SOUNDNESS OF THE DESIGN AND THE MATERIALS USED IN THE MANUFACTURE OF THE ITEMS OFFERED:**

**Note:** All requested supporting documentation is to be attached to this Attachment.

**NAME OF TENDERER:**

**ADDRESS OF TENDERER:**

**SIGNATURE:** __________________ FOR AND ON BEHALF OF TENDERER

**DATE:** __________________

<table>
<thead>
<tr>
<th>CLAUSE Ref.</th>
<th>PARTICULARS</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Have full and comprehensive details been submitted WITH the tender documents</td>
<td></td>
</tr>
<tr>
<td></td>
<td>associated with each of the following items?</td>
<td></td>
</tr>
<tr>
<td>Clause 5.4.5</td>
<td>Safety Data Sheet for wood sealing compound to be submitted.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Clause 9.3</td>
<td>Documentary evidence of the suppliers quality system certification</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Clause 13.1</td>
<td>Reliability - Any proposals which will satisfy the performance specification</td>
<td>Yes/No</td>
</tr>
<tr>
<td></td>
<td>or increase the service life.</td>
<td></td>
</tr>
</tbody>
</table>

NAME OF TENDERER:

ADDRESS OF TENDERER: __________________________________________

SIGNATURE: __________________________ FOR AND ON BEHALF OF TENDERER

DATE: __________________________
22. Attachment 4 – Drawings for Fabricated Crossarms

<table>
<thead>
<tr>
<th>DRAWING No.</th>
<th>REV</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-02-01</td>
<td>A</td>
<td>Crossarm Wane and Want Limits</td>
</tr>
<tr>
<td>07-02-02</td>
<td>B</td>
<td>Crossarm Pack Size</td>
</tr>
<tr>
<td>875133-01</td>
<td>D</td>
<td>22/33kV Intermediate Crossarm.</td>
</tr>
<tr>
<td>875133-02</td>
<td>E</td>
<td>22/33 kV Strain/Term. Crossarm.</td>
</tr>
<tr>
<td>875133-03</td>
<td>D</td>
<td>11kV Intermediate Crossarm.</td>
</tr>
<tr>
<td>875133-04</td>
<td>E</td>
<td>11kV Strain/Term. Crossarm.</td>
</tr>
<tr>
<td>875133-05</td>
<td>D</td>
<td>11/22/33 Fuse/Link Crossarm</td>
</tr>
<tr>
<td>875133-06</td>
<td>D</td>
<td>LV Intermediate/Angle Crossarm</td>
</tr>
<tr>
<td>875133-07</td>
<td>E</td>
<td>LV Strain/Termination Crossarm</td>
</tr>
<tr>
<td>875133-08</td>
<td>D</td>
<td>33kV Strain/Termination Crossarm to suit EDO/Link</td>
</tr>
<tr>
<td>923271-01</td>
<td>B</td>
<td>11/22/33kV Rural Delta Suspension 2.7m Crossarm</td>
</tr>
<tr>
<td>923271-03</td>
<td>OA-01</td>
<td>11kV Urban Intermediate 2.4m Crossarm</td>
</tr>
<tr>
<td>923271-04</td>
<td>OA-01</td>
<td>22/33kV Urban intermediate 2.7m Crossarm</td>
</tr>
<tr>
<td>923271-05</td>
<td>OA</td>
<td>22/33kV Rural Intermediate 2.7m Crossarm</td>
</tr>
<tr>
<td>923271-06</td>
<td>OB</td>
<td>22/33kV Rural Intermediate 3.3m Crossarm</td>
</tr>
<tr>
<td>923271-07</td>
<td>OA-01</td>
<td>11/22/33kV Urban strain/termination 2.4m Crossarm</td>
</tr>
<tr>
<td>923271-08</td>
<td>OA-01</td>
<td>11/22/33kV Urban strain/termination 2.7m Crossarm</td>
</tr>
<tr>
<td>923271-09</td>
<td>OA</td>
<td>11/22/33kV Rural strain/termination 2.7m Crossarm</td>
</tr>
<tr>
<td>923271-10</td>
<td>OB</td>
<td>11kV Rural Intermediate 3m Crossarm</td>
</tr>
<tr>
<td>SD 03-0056</td>
<td>01</td>
<td>66kV Overhead Mains - Standard Crossarms S1 – S4</td>
</tr>
<tr>
<td>SD03-0057</td>
<td>01</td>
<td>66kV Overhead Mains for Crossarm S5 – S8</td>
</tr>
<tr>
<td>01-15-01</td>
<td>B</td>
<td>Nail Plate (hand Installed)</td>
</tr>
<tr>
<td>1019701-01</td>
<td>0A</td>
<td>Identification Disc Harwood Crossarms</td>
</tr>
</tbody>
</table>
Technical Specification for Hardwood Crossarms

100 x 100 CROSS-SECTION
a + b must be less than 35mm.
c + d must be less than 35mm.

100 x 150 CROSS-SECTION
a + b must be less than 35mm.
c + d must be less than 50mm.

150 x 100 CROSS-SECTION
a + b must be less than 50mm.
c + d must be less than 35mm.

WANE/WANT – PERMISSIBLE LIMITS
METHOD OF DESCRIPTION – LENGTH x TOP SURFACE x SIDE (mm)

CROSSARM WANE/WANT LIMITS

FILE: 07-02-01.DWG | A
## Technical Specification for Hardwood Crossarms

### BLANK SIZES

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 x 100</td>
<td>4 holed</td>
</tr>
<tr>
<td>200 x 100</td>
<td>5 edged</td>
</tr>
<tr>
<td>300 x 100</td>
<td>3 holed</td>
</tr>
<tr>
<td>300 x 100</td>
<td>3 edged</td>
</tr>
<tr>
<td>300 x 100</td>
<td>4 holed</td>
</tr>
</tbody>
</table>

### PACK SIZES TO BE USED ON THE AUTOMATIC CROSSARM DRILL

<table>
<thead>
<tr>
<th>Item</th>
<th>Crossarm Dimensions</th>
<th>Grade/Size</th>
<th>Surface to Be Painted or Graded</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2700 x 50 x 100</td>
<td>0560</td>
<td>KD 50</td>
</tr>
<tr>
<td>2</td>
<td>3000 x 50 x 100</td>
<td>0580</td>
<td>LP 50</td>
</tr>
<tr>
<td>3</td>
<td>2700 x 50 x 100</td>
<td>1080</td>
<td>LP 50</td>
</tr>
<tr>
<td>4</td>
<td>2700 x 50 x 100</td>
<td>1090</td>
<td>UP 50</td>
</tr>
<tr>
<td>5</td>
<td>3600 x 50 x 100</td>
<td>1094</td>
<td>UP 50</td>
</tr>
<tr>
<td>6</td>
<td>3000 x 50 x 100</td>
<td>1107</td>
<td>UP 50</td>
</tr>
<tr>
<td>7</td>
<td>2700 x 50 x 100</td>
<td>15119</td>
<td>UP 50</td>
</tr>
</tbody>
</table>

**CROSSARM PACK SIZE**

07-02-02

**QES**

Queensland Electricity Supply Industry
Technical Specification for Hardwood Crossarms

Top View

Front View

Nail Plates: Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Technical Specification ETS 07 02 01. Nail plate connectors not required on the end grain of laminated softwood crossarms.

Drilled holes in both hardwood and laminated softwood crossarms to be fitted with nail plate connector orientated as shown.

Nail plate connectors to be manufactured in accordance with E.R.E.I. dwg 01-15-01.

Drilling: Drilled holes to be on centre line and perpendicular to crossarm face.

Tolerance: As specified on drawing.

Painting: Crossarm top surface to be painted as detailed in Technical Specification ETS 07 02 01

Stock Codes:
0104158 2700x100x100
0104157 2700x100x125
2410413 2700x100x150

Ergon Energy Corporation Limited ABN 65 087 646 062
Technical Specification for Hardwood Crossarms

NAIL PLATES:
Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Technical Specification ETS 07 02 01. Nail plate connectors not required on the end grain of laminated softwood crossarms.

Dilled holes in both hardwood and laminated softwood crossarms to be fitted with nail plate connector orientated as shown.

Nail plate connectors to be manufactured in accordance with Q.E.S.I. dwg. 01-15-C1.

DRILLING:
Dilled holes to be on centre line and perpendicular to crossarm face.

TOLERANCE:
As specified on drawing.

PAINTING:
Crossarm top surface to be painted as detailed in Technical Specification ETS 07 02 01.

STORES CODES:
- 2410421 2700x100x100
- 2410430 2700x125x100
- 0104155 2700x160x100
- 0104150 2700x175x100

SUPERcedes 22A4-6192
NAIL PLATES:

Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Technical Specification ETS 07 02 01. Nail plate connectors not required on the end grain of laminated softwood crossarms.

Drilled holes in both hardwood and laminated softwood crossarms to be fitted with nail plate connector orientated as shown.

Nail plate connectors to be manufactured in accordance with Q.E.S.I. doc. 01-16-01.

DRILLING:

Drilled holes to be on centre line and perpendicular to crossarm face.

TOLERANCE:

As specified on drawing.

PAINTING:

Crossarm top surface to be painted as detailed in technical specification ETS 07 02 01

STORES CODES:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0104151</td>
<td>2400x100x100</td>
</tr>
<tr>
<td>0104152</td>
<td>2400x100x125</td>
</tr>
<tr>
<td>2410386</td>
<td>2400x100x150</td>
</tr>
</tbody>
</table>

SUPERCODES 22-44-8102

Ergon Energy Corporation Limited ABN 50 087 646 062
TOP VIEW

NAIL PLATES: Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Technical Specification ETS 07 02 01. Nail plate connectors not required on the end grain of laminated softwood crossarms.

Drilled holes in both hardwood and laminated softwood crossarms to be fitted with nail plate connector oriented as shown.

Nail plate connectors to be manufactured in accordance with Q.E.S.I. dwg. 01-15-01.

DRILLING: Drilled holes to be on centre line and perpendicular to crossarm face.

TOLERANCE: As specified on drawing.

PAINTING: Crossarm top surface to be primed as detailed in technical specification ETS 07 02 01.

STORES CODES:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2410307</td>
<td>2400x100x100</td>
</tr>
<tr>
<td>2410406</td>
<td>2400x125x100</td>
</tr>
<tr>
<td>0104155</td>
<td>2400x150x100</td>
</tr>
<tr>
<td>0104155</td>
<td>2400x175x125</td>
</tr>
</tbody>
</table>

SUPRENGEDCES 22-A4-61394
NAIL PLATES: Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Technical Specification ETS 07 02 01. Nail plate connectors not required on the end grain of laminated softwood crossarms.

Drilled holes in both hardwood and laminated softwood crossarms to be fitted with nail plate connector orientated as shown.

Nail plate connectors to be manufactured in accordance with Q.E.S.I. dwg. 01-15-01.

DRILLING: Drilled holes to be on centre line and perpendicular to crossarm face.

PAINTING: Crossarm top surface to be painted as detailed in Technical Specification ETS 07 02 01.

STORES CODE: 010443 2400x100x100
NAIL PLATES: Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Technical Specification ETS 07 02 01. Nail plate connectors not required on the end grain of laminated softwood crossarms.

DRILLING: Drilled holes to be on centre line and perpendicular to crossarm face.

TOLERANCE: As specified on drawing.

PAINTING: Crossarm top surface to be painted as detailed in technical specification ETS 07 02 01.

STORES CODES: 010427 2400x100x100
Technical Specification for Hardwood Crossarms

**NAIL PLATES:** Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Technical Specification ETS 07 02 01. Nail plate connectors not required on the end grain of laminated softwood crossarms.

**DRILLING:** Drilled holes to be on centre line and perpendicular to crossarm face.

**TOLERANCE:** As specified on drawing.

**PAINTING:** Crossarm top surface to be painted as detailed in technical specification ETS 07 02 01.

**STORES CODES:**
- 010462B 2400x150x100
- 2404660 2400x175x125

---

**ERGON ENERGY CORPORATION LTD**

NETWORK HARDWARE
LV STRANDEMAGEMENT CROSSARM
POLE MOUNTED

**875133-07**

---

Page 23 of 37 Specification ETS07-02-01 Ver 7 Ergon Energy Corporation Limited ABN 50 087 646 062
Technical Specification for Hardwood Crossarms

NAIL PLATES:
- Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Technical Specification ETS 07 02 01.
- Nail plate connectors not required on the end grain of laminated softwood crossarms.
- Drilled holes in both hardwood and laminated softwood crossarms to be fitted with nail plate connector orientated as shown.
- Nail plate connectors to be manufactured in accordance with Q.E.S.I. dwg. 01-15-01.

DRILLING:
- Drilled holes to be on centre line and perpendicular to crossarm face.

TOLERANCE:
- As specified on drawing.

PAINTING:
- Crossarm top surface to be painted as detailed in technical specification ETS 07 02 01.
NAIL PLATES: Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in O.E.S.I. Technical Specification TS 07 02 01. Drilled holes to be filled with nail plate connector orientated as shown. Nail plate connectors to be manufactured in accordance with O.E.S.I. spec. O1-14-01.

DRILLING: Drilled holes to be on centre line and perpendicular to crossarm face.

STORES CODES: 0105048 2700x100x125
0105050 2700x100x125
Technical Specification for Hardwood Crossarms

NAIL PLATES:
Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Q.E.S.I. Technical Specification TS 07 02 01.

Drilled holes to be fitted with nail plate connectors orientated as shown.

Nail plate connectors to be manufactured in accordance with Q.E.S.I. dwhg. 01-16-01.

DRILLING:
Drilled holes to be on centre line and perpendicular to crossarm face.

STORES CODES:
2417293 2400x100x100
2417331 2400x100x125
NAIL PLATES: Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Q.E.S.I. Technical Specification TS 07 02 01.

Drilled holes to be fitted with nail plate connectors orientated as shown.

Nail plate connectors to be manufactured in accordance with Q.E.S.I. deg. 01-15-01.

DRILLING: Drilled holes to be on centre line and perpendicular to crossarm face.

STORIES CODES: 2417319 2700x100x100 2417085 2700x100x125
NAIL PLATES: Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Q.E.S.I. Technical Specification TS 07 02 01.

Drilled holes to be fitted with nail plate connectors orientated as shown.

Nail plate connectors to be manufactured in accordance with Q.E.S.I. dwg. 01-15-01.

DRILLING: Drilled holes to be on centre line and perpendicular to crossarm face.

STORES CODES: 2417228 2700x100x100
2417226 2700x100x125
2417244 2700x100x150
NAIL PLATES: Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Q.E.S.I. Technical Specification TS 07.02.01.

Drilled holes to be fitted with nail plate connectors orientated as shown.

Nail plate connectors to be manufactured in accordance with Q.E.S.I. dwg. 01-15-01.

DRILLING: Drilled holes to be on centre line and perpendicular to crossarm face.

STORES CODES:
- 2418003 3300x100x100
- 0105049 3300x100x125
- 0105051 3300x100x150
NAIL PLATES: Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in G.E.S.I. Technical Specification TS 07-02-01.

Drilled holes to be fitted with nail plate connector orientated as shown.

Nail plate connectors to be manufactured in accordance with G.E.S.I. dwg. 01-15-01.

DRILLING: Drilled holes to be on centre line and perpendicular to crossarm face.

STORES CODES: 2417/03 3400x100x100
2417/04 3400x125x100
2417/05 3400x150x100
NAIL PLATES: Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Q.E.S.I. Technical Specification TS 07 02 01.

Drilled holes to be fitted with nail plate connector orientated as shown.

Nail plate connectors to be manufactured in accordance with Q.E.S.I. dwg. 01-15-01.

DRILLING: Drilled holes to be on centre line and perpendicular to crossarm face.

STORES CODES:
- 2419011 2700x100x100
- 2417137 2700x125x100
- 2417145 2700x150x100
- 2419003 2700x175x125
NAIL PLATES: Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in Q.E.S.I. Technical Specification TS 07 02 01.

Drilled holes to be fitted with nail plate connector orientated as shown.

Nail plate connectors to be manufactured in accordance with Q.E.S.I. dwg. 01-15-01.

DRILLING: Drilled holes to be on centre line and perpendicular to crossarm face.

STORES CODES:

2417251 2700x100x100
2417269 2100x125x100
2417277 2700x150x100
2417285 2700x175x125
Technical Specification for Hardwood Crossarms

HAIL PLATES:

Hardwood crossarms to be supplied with nail plate connectors applied to the end grain of each end of the arm as detailed in O.E.S.I. Technical Specification TE.07.02.01.

Drilled holes to be fitted with nail plate connector orientated as shown.

Nail plate connectors to be manufactured in accordance with O.E.S.I. spec. 01-15-01.

DRILLING:

Drilled holes to be on centre line and perpendicular to crossarm face.

STORES CODES:

2422429 300x100x120
2422430 300x100x150
2422418 300x100x130

NETWORK HARDWARE

115V RURAL INTERMEDIATE 3.0M CROSSARM POLE BRACKET MOUNTED

ERGON ENERGY CORPORATION LTD ABN 50 087 646 062

Page 33 of 37
TYPE S5 - 3600 x 150 x 100
DEVIAION (WISHBONE) 66/2

TYPE S6 - 5100 x 150 x 100
DOUBLE POLE SUSPENSION 66/6, 66/6A

TYPE S7 - 6000 x 100 x 150
DOUBLE POLE STRAIN & DEVIATION 0°-90° 66/7

TYPE S8 - 2400 x 150 x 100
INTERMEDIATE SUSPENSION 66/1A & 1B

66kV OVERHEAD MAINS
STANDARD CROSSARMS
S5 - S8

N.Q.E.B.

REV.
104/95

SUB. CRC REC. APPR.

SD03-0057-0
REFERENCE: -
RATING: -
TOLERANCE: As specified on drawing
MATERIAL: Galvanized sheet in accordance with AS 1397
Grade G2.7275 (Galvobond or equivalent).
Thickness - 12mm nominal.
Number of nails: 40 min - 60 max.
FABRICATION: -
PROTECTIVE COAT: -
MARKING: -
PACKAGING: Cartons of 80 to 100.
CROSSARM TYPE

HAZARD LEVEL

GRADING SOURCE

STRENGTH GROUP

WEIGHT (kg)

Ø4 HOLE FOR NAIL

DETAILS OF TREATMENT

XXX / XX

XXX - XX

H5

2

XXXX

XX

MATERIAL: Aluminium or Aluminium Alloy

FABRICATION: Disc to be formed Convex before fitting to crossarm and face
(To be flattened during fitting into recesses in crossarm and faces)

DIMENSIONS: Diameter 50 ± 1.5 mm
Thickness 2 ± 0.5 mm

LETTERING: Letters and Numbers to be 6mm minimum,
legibly and indelibly formed with metal punch or engraved on disc.

NOTES:

1. REGISTERED BRAND To be in accordance with the Timber Utilization and Marketing Act
1987 (Queensland) or latest amendment thereof.