

Australian Standard™

**Timber—Heavy structural products—
Visually graded**

Part 4: Cross-arms for overhead lines

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- CSIRO, Manufacturing and Infrastructure Technology
- Curtin University of Technology
- Forest and Forest Products Employment Skills
- Housing Industry Association
- Master Builders Australia
- Plantation Timber Association of Australia
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Australian Standard™

**Timber—Heavy structural products—
Visually graded**

Part 4: Cross-arms for overhead lines

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PREFACE

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee TM-003, Timber Grading, to supersede AS 3818.4—2000. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to provide producers and users of timber cross-arms with requirements for the visual grading and selection of species of such timbers intended for use in supporting overhead utility services.

This Standard is intended to be used in conjunction with AS 3818.1. It is Part 4 of the AS 3818 series, *Timber—Heavy structural products—Visually graded*, which is composed of the following parts:

- Part 1: General requirements
- Part 2: Railway track timbers
- Part 3: Piles
- Part 4: Cross-arms for overhead lines
- Part 5: Mine lift guides
- Part 6: Decking for wharves and bridges

The grades given in this Standard are based on those in previous Australian Standards for cross-arms and on Structural Grades 1 and 2 of AS 2082, *Timber—Hardwood—Visually stress-graded for structural purposes*, with particular regard to the requirements of cross-arms in use.

Appendices have been included to give—

- (a) advice on information required for purchasing orders; and
- (b) design properties applicable to particular stress grades and species.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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STANDARDS AUSTRALIA**Australian Standard****Timber—Heavy structural products—Visually graded****Part 4: Cross-arms for overhead lines****1 SCOPE**

This Standard sets out minimum requirements for visual grading of cross-arms intended for use in supporting overhead utility services.

NOTE: Purchasing guidelines are given in Appendix A.

2 APPLICATION

This Standard shall be used in conjunction with AS 3818.1 to specify timber cross-arms. Species for cross-arms are listed in AS 3818.1. Stress grades applicable to strength groups are given in this Standard.

3 PURPOSE AND CONTEXT OF USE**3.1 Function**

Cross-arms form the supporting crosspiece fixed to utility services poles from which overhead utility services are suspended.

3.2 Action

Cross-arms are subjected to—

- (a) loads acting directly on the cross-arm;
- (b) loads transmitted through bolts from the suspended cables including dead load, wind action and other loads;
NOTE: In some areas icing will also affect the loads carried by cross-arms.
- (c) loads due to tension in the suspended cables especially at the end of cable runs;
- (d) the effects of exposure such as ultraviolet radiation, temperature and moisture change; and
- (e) deterioration of the timber due to insect and fungal attack.

4 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1720 Timber structures

1720.1 Part 1: Design methods

3818 Timber—Heavy structural products—Visually graded

3818.1 Part 1: General requirements

5604 Timber—Natural durability ratings

5 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 3818.1 apply.

6 DESIGN

Stress grades for cross-arms of a given strength group shall be in accordance with Appendix B. These stress grades shall be used for designing cross-arms in accordance with AS 1720.1.

7 TIMBER SPECIES

7.1 General

Species for cross-arms are listed in AS 3818.1. *list at back*

Species other than those listed in AS 3818.1 may be graded to this Standard subject to agreement between the purchaser and supplier.

NOTE: Care should be taken to determine the correct strength group and durability rating when the species is not listed in AS 3818.1. Further information on the identity and properties of species is available from State Forestry Departments and the CSIRO.

Where cross-arms are supplied as a mixture of species and the timber is not marked or branded as required by AS 3818.1, then the strength group applicable to the species of the lowest strength group in the parcel shall apply to the whole parcel, and the durability class applicable to the species of the lowest durability class in the parcel shall also apply to the whole parcel.

No timber species with an average density below 360 kg/m^3 at 12 percent moisture content shall be accepted nor any piece with exceptionally low density.

NOTE: The lower density species need extra care in regard to assessing spike, nail and connector holding capacity.

7.2 Ordering

The order shall nominate the grade of cross-arm together with one or more of the following:

- (a) Stress grade.
- (b) Durability class.
- (c) Strength group.
- (d) Species.

NOTE: It is preferred that the order nominate both the stress grade (see AS 3818.1) and durability class (see AS 5604) of the cross-arms.

Where only the durability class is nominated, any species listed in AS 3818.1 for cross-arms, which is of that durability class or better, shall be accepted.

Where only the strength group is nominated, any species listed in AS 3818.1 for cross-arms, which is of that strength group or better, shall be accepted.

Where only the stress grade is nominated, any species listed in AS 3818.1 for cross-arms, which meets that stress grade or better when graded to this Standard, shall be accepted.

Where no species is nominated, any species listed in AS 3818.1 for cross-arms shall be accepted, provided that the nominated requirements are met.

NOTE: Information that should be supplied in purchasing orders is given in Appendix A.

8 DIMENSIONS, SIZES, TOLERANCES AND SQUARENESS

The timber shall be sawn to the ordered dimensions except that the following maximum tolerances shall be permitted:

- (a) Width..... $\pm 3 \text{ mm}$.
- (b) Thickness..... $\pm 3 \text{ mm}$.

- (c) Length.....—0 +25 mm.
- (d) Squareness.....±2 degrees,
that is, where the angle at the arrises is nominally 90 degrees, the angle shall be
within the range 90 ±2 degrees.

Tolerances are subject to the grading check clause in AS 3818.1.

NOTE: It is recognized that the tolerances required for particular applications may vary from those given herein and the purchaser and supplier should agree to any variations.

9 CROSS-ARMS—GRADE DESCRIPTIONS

9.1 General

The methods of measurement of characteristics, grade limitations and grading, assessment of combinations of characteristics and preservative treatment are set out in AS 3818.1.

9.2 Grade 1 Cross-arms—Grade description

Each Grade 1 cross-arm shall be well sawn and free of faulty heart, loose gum veins, gum pockets, shakes, cross fractures, splits, brashness, decay and other characteristics liable to affect the utility of the cross-arm.

Where present in graded pieces, singly or in combinations, the following characteristics shall be within the limits prescribed in this Clause (see also AS 3818.1, *characteristics within limits for want and wane and mechanical damage*):

- (a) *Sound intergrown knots*—
- (i) not within the central 300 mm of length of the cross-arm;
 - (ii) not within 300 mm of each end; and
 - (iii) not exceeding one-seventh of the width of the surface on which they occur.
- (b) *Holes*—
- (i) *diameter up to and including 3 mm*—not exceeding 12 in any 100 mm × 100 mm or equivalent area of the surface on which they occur; and
 - (ii) *diameter exceeding 3 mm*—as for knots (see Item (a) above).
- (c) *Termite galleries*—
- (i) *where they are enclosed*—not permitted; and
 - (ii) *where they are not enclosed (fully open to inspection)*—as for want and wane (see Item (g) below).
- (d) *Slope of grain*—not exceeding 1 in 15.
- (e) *Tight gum veins*—
- (i) *width measured radially*—not exceeding 3 mm;
 - (ii) *individual length*—not exceeding one-third of the length of the cross-arm;
 - (iii) *aggregate length*—not exceeding the length of the cross-arm; and
 - (iv) not extending through the cross-arm from one surface to the opposite surface.
- (f) *Checks other than internal*—
- (i) *width*—not exceeding 3 mm;
 - (ii) *individual length*—not exceeding one quarter of the length of the cross-arm; and
 - (iii) *intersecting an end, length*—not exceeding 100 mm.

- (g) *Want, wane and untreated sapwood, in aggregate or individually—*
- (i) not exceeding one tenth of the cross-sectional area; and
 - (ii) not exceeding one third of the width of the edge on which it occurs and not exceeding one half of the width of the face on which it occurs.

NOTE: Properly treated sapwood is not considered to be a problem (see AS 3818.1). Untreated sapwood may decay during service and increase the risk of cross-arm fires. The purchaser may specify with the order that cross-arms be free of untreated sapwood.

- (h) *Bow and spring—*not exceeding 12 mm per 1 m of length.
- (i) *Twist—*not exceeding 1 mm per 1 m of length.

9.3 Grade 2 Cross-arms—Grade description

Each Grade 2 cross-arm shall be well sawn and free of faulty heart, loose gum veins, gum pockets, shakes, cross fractures, splits, brashness, decay and other characteristics liable to affect the utility of the cross-arm.

Where present in graded pieces, singly or in combinations, the following characteristics shall be within the limits prescribed in this Clause (see also AS 3818.1, *characteristics within limits for want and wane and mechanical damage*):

- (a) *Sound intergrown knots—*
 - (i) not within the central 300 mm of length of the cross-arm;
 - (ii) not within 300 mm of each end; and
 - (iii) not exceeding one-quarter of the width of the surface on which they occur.
- (b) *Holes—*
 - (i) *diameter up to and including 3 mm—*not exceeding 20 in any 100 mm × 100 mm or equivalent area of the surface on which they occur; and
 - (ii) *diameter exceeding 3 mm—*as for knots (see Item (a) above).
- (c) *Termite galleries—*
 - (i) *where they are enclosed—*not permitted; and
 - (ii) *where they are not enclosed (fully open to inspection)—*as for want and wane (see Item (g) below).
- (d) *Slope of grain—*not exceeding 1 in 10.
- (e) *Tight gum veins—*
 - (i) *width measured radially—*not exceeding 3 mm;
 - (ii) *individual length—*not exceeding one-third of the length of the cross-arm;
 - (iii) *aggregate length—*not exceeding the length of the cross-arm; and
 - (iv) not extending through the cross-arm from one surface to the opposite surface.
- (f) *Checks other than internal—*
 - (i) *width—*not exceeding 3 mm;
 - (ii) *individual length—*not exceeding one third of the length of the cross-arm; and
 - (iii) *intersecting an end, length—*not exceeding 100 mm.
- (g) *Want, wane and untreated sapwood, in aggregate or individually—*
 - (i) not exceeding one fifth of the cross-sectional area; and
 - (ii) not exceeding one third of the width of the edge on which it occurs and not exceeding one half of the width of the face on which it occurs.

NOTE: Properly treated sapwood is not considered to be a limiting characteristic (see AS 3818.1). Untreated sapwood may decay during service and increase the risk of cross-arm fires. The purchaser may specify with the order that cross-arms be free of untreated sapwood.

- (h) *Bow and spring*—not exceeding 12 mm per 1 m of length.
- (i) *Twist*—not exceeding 1 mm per 1 m of length.

9.4 Optional top surface grade

Where specified, the top surface of cross-arms may be graded according to the requirements given below.

NOTE: Examination of cross-arms in service has revealed that environmental extremes have a greater adverse effect on the top surface of the cross-arm than the side or bottom surfaces of the cross-arm. As the deterioration of the top surface of the cross-arm in service is accelerated by voids and characteristics that may hold water, the quality of the top surface should be of a high standard. To address these concerns, an optional set of top surface requirements for both Grade 1 and Grade 2 cross-arms is specified below.

Where a cross-arm has been graded in accordance with this Clause, the top surface shall be marked as such by the producer.

Where painting of the top surface is specified, the mark shall be applied after painting.

The limitations of the respective grades (Grade 1 cross-arms, Grade 2 cross-arms), shall apply to the top surface except for the following altered limits:

- (a) *Holes*—
 - (i) *diameter up to and including 3 mm*—not exceeding 12 in any 100 mm × 100 mm or equivalent area of the surface on which they occur; and
 - (ii) *diameter exceeding 3 mm*—not permitted.
- (b) *Termite galleries*—not permitted.
- (c) *Tight gum veins*—
 - (i) *width measured radially*—not exceeding 3 mm;
 - (ii) *individual length*—not exceeding 200 mm;
 - (iii) *aggregate length*—not exceeding 600 mm; and
 - (iv) not extending from one surface to another surface.
- (d) *Checks other than internal*—
 - (i) *width*—not exceeding 1.5 mm;
 - (ii) *individual length*—not exceeding one third of the length of the cross-arm; and
 - (iii) *intersecting an end, length*—not exceeding 100 mm.
- (e) *Want and wane, in aggregate or individually*—not exceeding one third of the width of the top surface and not exceeding one third of the surface adjacent to the top surface.
- (f) *Untreated sapwood*—not permitted (sapwood may be removed and the resulting missing material assessed as want).

NOTE: Properly treated sapwood is not considered to be a problem (see AS 3818.1). Untreated sapwood may decay during service and increase the risk of cross-arm fires. The purchaser may specify with the order that cross-arms be free of untreated sapwood.

APPENDIX A
GUIDANCE FOR PURCHASERS
(Informative)

A1 INFORMATION THAT SHOULD BE INCLUDED IN PURCHASING ORDERS

Purchasers requiring supply of timber to this Standard should state in any contract document, order form, or other request for supply, the following items where applicable:

- (a) Product type, i.e., cross-arm.
- (b) The number of this Australian Standard, i.e., AS 3818.4.
- (c) The stress grade, durability class (see AS 5604), strength group, species or combination of these (see note).
- (d) Dimensions.
- (e) Intended use (see AS 3818.1 for considerations on durability and AS 5604 for natural durability ratings).
- (f) Length—particularly whether the order is a set length or in multiples of short lengths or random length with a minimum length.
- (g) Tolerances (only when not prescribed by, or when varied from, this Standard).
- (h) Seasoned or unseasoned (timbers complying with this Standard are generally only available unseasoned).
- (i) If required, level of treatment and the type of the preservative required.
- (j) Method of controlling end splits, (e.g., nail plate or water repellent) and time of application (e.g., within 48 h of sawing).

NOTE: Timber should be specified according to its particular use and attention should be paid to the desired features of the timber and the expected performance. It is preferred that the order nominate both the stress grade and durability class of the cross-arms. Natural durability ratings for both in-ground and aboveground exposure are given in AS 5604.

A2 STORAGE AND MAINTENANCE

Cross-arms form part of a structure in which they would be expensive and often difficult to replace; therefore, to facilitate a long service life of the timbers, timber should be carefully and properly stored before and after purchase and prior to use, to avoid degrade, and a proper inspection and maintenance procedure should be adopted after the structure has been built.

APPENDIX B
DESIGN PROPERTIES

(Normative)

For cross-arms graded in accordance with this Standard, the stress grades for species not listed in AS 3818.1 are given in Table B1.

For design properties appropriate to particular stress grades and species see AS 1720.1.

TABLE B1
STRESS GRADES FOR CROSS-ARMS

Strength group	Stress grade	
	Grade 1 cross-arms	Grade 2 cross-arms
S1	F27	F22
S2	F22	F17
S3	F17	F14
S4	F14	F11

NOTE: Where a species is not listed or a strength group has not been given for a species in AS 3818.1, further information may be available from state timber organizations.

Marlborough Lines Ltd

Cross Arm Timber use.

1. Approx 100,000 lineal metres in service or 10 kilometres and made up of about 44,000 individual pieces.
2. Used in 100x100 and 100x150 sections.
3. Currently supplied from the northern east coast of Australia.
 - Spotted Gum E. Maculata
 - Ironbark – approx 8 species.
4. Harvested under “Codes of Practice for Native Forest production”, a set of ecological and environmental standards which ensure that the forest can regenerate to maintain its “productivity and biosecurity” values.
5. Cross arms as supplied are treated to H3 (CCA) level, seal compound and gang plates applied at ends.
6. Comply to AS 3818.4 Standard. (Heavy Timber Standard for Cross Arms for Overhead Lines).
7. Marlborough Lines annual usage is 2000 to 2500 lineal metres per year.
8. Current supplier Trans Pacific Timbers Ltd, Auckland.

GH 28.04.15

Check with
Robert
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