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Timber — Natural durability ratings



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- Australian Timber Importers Federation
- Construction Information Systems (NATSPEC)
- Engineered Wood Products Association of Australasia
- Forest and Wood Products Australia
- Forestry Corporation of NSW
- Glued Laminated Timber Association of Australia
- National Centre for Timber Durability and Design Life
- Timber Preservers Association of Australia

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Preface

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee TM-012, Timber Grading and Preservation, to supersede AS 5604—2005.

The objective of this document is to provide natural durability ratings for timber species used by producers, specifiers, and users of timbers products, in order to provide a comparison of the expected performance of untreated timber against biological hazards. It will reduce problems associated with the existence of different lists in different Standards that do not agree with each other.

The major changes in this edition are as follows:

- (a) Editorial revisions, including updated references.
- (b) Updates to the timber natural durability ratings, reflecting the latest research data.

The terms “normative” and “informative” are used in Standards to define the application of the appendices 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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Introduction

Natural durability may be defined as the inherent resistance of the heartwood of a timber species to decay, termites, and marine borer attack, and of the sapwood of a timber species to lyctid borer attack. Classification of the durability of a species is not something that can be done with great precision because of the variability of wood properties within species, even within the individual tree, as well as the variable nature of the hazard to which the timber will be exposed. Natural durability is determined largely by extractives, which are formed when sapwood changes into heartwood. The composition and amount of extractives in heartwood can vary between individual trees. Tree age can also influence natural durability. Current findings are that if the timber density of a species is within the range found in mature trees, then natural durability is usually similar. However, further research in this area is required.

The performance of untreated heartwood externally above ground will generally be better than its performance in the ground. For timber used externally in-ground, a rating of the durability of the species' heartwood considers exposure to attack by both decay and termites. Because of this combined assessment, the classification does not truly reflect the special qualities of some species (e.g. brush box, which is very resistant to termites but much less so to decay).

A further consideration is the size of the specimen at risk. While it will take longer for termites or decay fungi to destroy a larger cross-section, large samples can also retain moisture for longer periods after wetting, accelerating the decay, especially internally. All untreated sapwood has poor resistance to biological attack by decay fungi, termites and marine borers.

In the context of this document, natural durability ratings refer to the timber performance when exposed to average environmental conditions for the desired end use. In the selection of species for a particular location, prior local experience should be used to guide performance expectations in that area. The extent of decay and termite and marine borer hazard varies greatly in a continent with such a wide range of climates. Durability against one group of organisms (for example, fungi) does not necessarily mean resistance to others, such as termites or marine borers.

The natural durability ratings given in this document are based upon expert opinions and assessments from a wide range of sources including, but not limited to: CSIRO, state forest organizations, port authorities, and forest products consultants.

Australian Standard®

Timber — Natural durability ratings

1 Scope

This document provides natural durability ratings for a number of Australian and imported timber species, to provide users with a relative comparison of the expected performance of untreated timber against biological hazards (fungi, insects and marine borers).

It is not intended that these ratings will be used as stand-alone criteria for determining the suitability of timber species for particular products, applications or environments. The actual performance of timber may vary depending on climatic conditions at any given location and the actual performance of the timber products depends on the design. The performance and life expectancy of timber used in specific applications and environments will be greatly influenced by many other factors in addition to the natural durability ratings. These other factors may include the following:

- (a) Proportion of juvenile wood.
- (b) Presence or absence of preservative treatment.
- (c) Supplementary protection and maintenance.
- (d) Climate (including weathering).
- (e) Macro- and micro-environmental conditions.
- (f) Human influence.
- (g) Design in which it is used.

This document is intended to assist with the development of other Standards and specifications for timber products and applications.

NOTE 1 An attempt has been made to account for the more aggressive termite of the northern areas of Australia and to account for the increased durability achieved for timbers not in contact with the ground.

NOTE 2 This document does not provide natural durability ratings against the following hazards:

- (a) Physical or mechanical hazards (including weathering).
- (b) Chemical hazards.
- (c) Fire hazards.

NOTE 3 [Appendix B](#) provides additional information on species names.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS/NZS 1604.1, *Preservative-treated wood-based products, Part 1: Products and treatment*

3 Terms and definitions

For the purpose of this document, the definitions given in AS/NZS 4491 and those below apply. Where the definitions below differ from those in AS/NZS 4491, for the purpose of this document those given below apply.

3.1

natural durability

inherent resistance of —

- (a) the heartwood of a timber species to bacterial degradation, fungal decay, termite attack, or marine borer attack; and,
- (b) the sapwood of a timber species to lyctid borer attack

3.2

lyctid

group of beetles (including powderpost beetles and lyctine borers) that attack the sapwood of some hardwood timber species

4 Lyctid susceptibility

[Appendix A](#) lists a number of timber species that are resistant to lyctid attack. The method for detection of lyctid-susceptible sapwood shall be as specified in AS/NZS 1604.1.

NOTE 1 All chemicals used in Australia to protect timber from fungal, insect or marine borer attack must be registered with the Australian Pesticides and Veterinary Medicines Authority (APVMA).

NOTE 2 A number of species listed in [Appendix A](#) are deemed to be not susceptible and do not need to be tested, however, where there is doubt about a species not shown in the list, the user is referred to the test in AS/NZS 1604.1 for confirmation.

NOTE 3 Softwoods are not lyctid-susceptible.

NOTE 4 Attack by lyctid beetle is confined to the sapwood of certain hardwoods. The two elements that most commonly limit the susceptibility of a species are pore diameter and starch content. Pore diameter is too small (<90 µm) in only a few hardwood species to permit attack, hence susceptibility is usually governed by starch content.

5 Termite resistance

[Appendix A](#) lists a number of timber species that are deemed to have a high resistance to termites, with a focus upon those with resistance to the most economically damaging species, *Coptotermes acinaciformis*. Ratings may not be suitable for resistance to *Mastotermes*, a second group of more aggressive termites that are prevalent north of the Tropic of Capricorn.

For all timber species listed as resistant, only the heartwood may be resistant to attack by termites. Untreated sapwood of any species shall be regarded as susceptible to attack. Inner heartwood (nearer the pith) is also termed juvenile wood and may be considered less resistant to attack than the outer heartwood.

NOTE 1 Different timber species have different levels of resistance to various species of termite. Local experience should be referred to for specific installations.

NOTE 2 Within a species, timbers can vary in termite resistance from tree to tree as well as within the same tree. In addition, the termite-resistance of timber exposed above the ground may be superior to its resistance in the ground.

NOTE 3 Resistance to termites has been drawn from in-ground durability tests on timber specimens cut from mature trees in the presence of wood-rotting fungi (see Note 4). Where data from such tests are not available, termite resistance is based on recognized durability ratings obtained from many years of experience with the particular timber in service. Reference was made to AS/NZS 1604.1, AS 1720.2 and AS/NZS 1148 in compiling the list of termite-resistant timbers given in [Appendix A](#).

NOTE 4 For information on termite resistance of imported timbers not listed in [Appendix A](#), refer to Keating and Bolza, 1982.

6 Natural durability and marine borer resistance classes

The classification system is based on the average life expectancy, as given in [Tables 1](#) and [2](#), for a species used in-ground, externally above ground or in marine waters.

NOTE 1 Consideration should be given to the fact that the classification is very broad and is not intended to distinguish between the relative merits of species in the same classification.

NOTE 2 Generally, marine borer hazard is more severe in the northern waters of Australia than it is in the southern waters. Experience has shown that a general rule of thumb for differentiating between northern and southern is to regard north of Perth in the west, and north of Batemans Bay in the east, as northern waters. Obviously the separation between northern waters and southern waters cannot be exact and so, care should be taken by the specifier when a site is around the line of differentiation.

Table 1 — Natural durability — Probable life expectancy

Class	Probable in-ground life expectancy (years)	Probable external above-ground life expectancy (years)
1	Greater than 25	Greater than 40
2	15 to 25	15 to 40
3	5 to 15	7 to 15
4	0 to 5	0 to 7

NOTE 1 The ratings in this table are based on expert opinions and the performance of the following test specimens:

(a) In-ground: 50 × 50 mm heartwood test specimens at four sites around Australia.

(b) Above-ground: 35 × 35 mm heartwood test specimens at 11 sites around Australia.

NOTE 2 As further reliable evidence becomes available, these ratings may require amending.

NOTE 3 The heartwood of an individual piece of timber may vary from the species' nominated classification.

NOTE 4 Above-ground conditions equate to outside above-ground, subject to periodic moderate wetting as Hazard Class 3 in AS/NZS 1604.1.

Table 2 — Marine borer resistance — Probable life expectancy

Class	Probable marine-borer-resistance life expectancy in southern waters (years)
1	Greater than 60
2	41 to 60
3	21 to 40
4	0 to 20, usually less than 5

NOTE Marine borer resistance is based on natural round piles containing 350 mm diameter of heartwood in southern seas reaching from Perth in the west to Batemans Bay in the east. Only Class 1 timbers can be expected to give reasonable service life (12 to 30 years) in northern waters (refer to Cookson and Scown, 2008).

Appendix A (normative)

Timber natural durability ratings

A.1 General

[Table A.1](#) lists species and their ratings for various aspects of natural durability.

The ratings apply only to the species indicated by their botanical/scientific names. Where a preferred common name covers more than one species and one of the species is not given a rating, ratings given to the other species shall not be applied to that species, regardless of the fact that it is included in the preferred common name with the others. The supplier should identify the species in question. The user should determine whether to apply the species group durability rating. For example, *C. henryi* in the spotted gum group cannot be confirmed to have the same ratings as the group listings.

For all timbers, sapwood shall be regarded as non-durable, unless preservative-treated in accordance with AS/NZS 1604.1. Generally, the inner heartwood (the first few growth rings around the pith) has lower natural durability than the rest of the heartwood.

NOTE The list is by no means complete and is subject to change, particularly when the resource varies, e.g. the production from a young, fast growth plantation compared with a mature, higher density resource. This caveat is exemplified by some sources of jarrah, notably in Western Australia where termite resistance may be affected. In this regard, it is emphasized that “termite resistance” is not the same as “termite proof”, wherein the latter may still be affected by the presence of decay since termites can be attracted to decaying wood.

A.2 Key to [Table A.1](#)

The following key is used in [Table A.1](#):

- = no information available at publication
- D_{ig} = in-ground natural durability class
- D_{ag} = above-ground natural durability class

A.3 Notes to [Table A.1](#)

A.3.1 Column 1 — Standard common name and scientific/botanical name

The standard common names used in [Table A.1](#) to refer to the timber species are as given in AS/NZS 1148.

NOTE The common names listed in this appendix may cover one or more timber species. Species that are not specifically given a rating under their botanical names are not covered by this document. For example, “meranti (*Shorea*)” covers a range of species. Unless a particular species is identified, the lowest rating for a genus should be applied.

A.3.2 Column 2 — Lyctid susceptibility of sapwood

Lyctid susceptibility of sapwood shall be classified as follows:

- (a) S — Susceptible.
- (b) NS — Not susceptible.

NOTE The lyctid susceptibility of alpine ash and mountain ash timber shows a consistent variation depending on its origin, for example:

- (a) Tasmania — S.
- (b) New South Wales — NS.
- (c) Victoria — NS.

If the origin of the timber is not known with certainty, the timber should be regarded as susceptible.

A.3.3 Column 3 — Termite resistance of heartwood

Termite resistance of heartwood shall be classified as follows:

- (a) R — Resistant to termites.
- (b) NR — Not resistant to termites.

Species not listed, or where there is no rating given (“—”), should be assumed to be not resistant to termites unless there is evidence to the contrary provided in the form of field testing under similar conditions.

A.3.4 Column 4 — Natural durability class of heartwood

See [Table 1](#).

A.3.5 Column 5 — Marine-borer resistance of heartwood

See [Table 2](#).

A.4 Natural durability ratings of timber species

See [Table A.1](#) for a list of species by common name, then latin name. For a list of species by latin name then common name, see [Appendix B](#).

Table A.1 — Natural durability ratings of timber species

1	2	3	4		5
Standard common name and scientific/botanical name	Lyctid susceptibility of sapwood	Termite resistance of heartwood (inside above ground — applicable to H2 in AS/NZS 1604.1)	Natural durability class of heartwood		Marine-borer resistance of heartwood
			Outside above ground, D_{ag}	In-ground contact, D_{ig}	
alan <i>Shorea albida</i>	S	R	2	2	—
alder, bluish <i>Sloanea australis</i>	S	—	—	4	4
alder, brown <i>Caldcluvia paniculosa</i>	S	NR	—	4	4
alder, pink <i>Gillbeea adenopetala</i>	NS	NR	—	4	4
alder, rose <i>Caldcluvia australiensis</i>	NS	NR	3	4	4
almond, rose <i>Owenia venosa</i>	NS	R	1	1	—