



Construction timbers in Queensland

Book 1: Definitions and descriptions

Revised edition: March 2013

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Construction timbers in Queensland

Properties and specifications for satisfactory performance of construction timbers in Queensland

**Class 1 and Class 10 buildings (houses, carports, garages, greenhouses
and sheds)**

Book 1: Definitions and descriptions

Revised 2013

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Purpose

This publication (in two books) describes the properties of timbers used in the construction of Class 1 and Class 10 buildings in Queensland. It also provides recommendations for the appropriate and serviceable use of timbers across the state.

Legal status

This publication is noted as a primary referenced document in the Queensland variations to the Building Code of Australia (BCA, Australian Building Codes Board) under the *Queensland Building Act 1975*.

Succession

This publication replaces:

Hopewell, G (ed.) 2006, *Construction timbers in Queensland: properties and specifications for satisfactory performance of construction timbers in Queensland—Class 1 and Class 10 buildings*, books 1 and 2, Department of Primary Industries and Fisheries, Queensland.

Any consideration of timber used in construction in Queensland during the period May 2007 to May 2010 should refer to the provisions detailed in the 2006 edition.

Amendments

1 (2013, June) Book 2, Index number 531, *Mastixiodendron pachyclados* (garo garo, origin PNG) natural durability ratings revised to: Above-ground (4); In-ground (4).

Introduction

The Queensland Department of Lands Sub-Department of Forestry first issued *Pamphlet no. 1: North Queensland building timbers and specifications for their use* in 1939 (Queensland Forest Service 1939). The purpose of this publication was to promote greater service efficiency in timber and encourage the proper use of a wider range of north Queensland building timbers. A complementary paper providing detail on 100 southern Queensland timbers—*Pamphlet no. 2: South Queensland building timbers and specifications for their use*—was issued in 1947 (Queensland Forest Service 1947).

The original issue of pamphlet no. 1 was exhausted shortly after World War II, and in 1951 it was revised and enlarged to include 171 timbers (Queensland Forest Service 1951). Pamphlets 1 and 2 were superseded in 1964 when *Pamphlet no. 5: Queensland building timbers and specifications for their use* (Queensland Forest Service 1964) was issued. This provided detailed data on building applications for 360 timbers from all parts of the state. It was reprinted several times until a complete revision resulted in the publication of *Technical pamphlet no. 1* in October 1991 (Smith et al. 1991).

Between 1991 and 2006, there were significant changes in construction technologies, timber resources, industry recommendations and Australian Standards relevant to building in Queensland. Examples include:

- the scarcity of native rainforest species due to significant areas of this resource being classified with World Heritage status
- subsequent increased importation of Asian, Pacific Island, South American and African rainforest species
- the introduction of design service life specifications for timber applications and designation of decay hazard zones based on regional climatic conditions
- the introduction of above-ground durability and termite resistance classes
- the introduction of machine-graded pine (MGP and SP grades)
- revised botanical (scientific) names
- changes to the Timber Framing Code *AS 1684 series Residential timber—framed construction parts 2 and 3* (Standards Australia 2006a,b)
- the introduction of novel termite treatments.

These changes were included or acknowledged as appropriate in the original edition of *Construction timbers in Queensland*.

This publication (books 1 and 2) replaces *Construction timbers in Queensland* (Hopewell 2006). Amendments include consideration of the repeal of the *Timber Utilisation and Marketing Act 1987* (TUMA) and revised local government boundaries due to amalgamations.

The Building Code of Australia (BCA) includes a specific requirement for the use of suitable materials in construction. In addition, the Australian Building Codes Board have published a guide for technical committees, manufacturers and others on the durability and life-expectancy requirements for building materials, assemblies and sub-assemblies for use in accordance with the BCA (Australian Building Codes Board 2002). *Construction timbers in Queensland* provides information on the properties and performance of timber that will satisfy these requirements. Further, structural timber scheduled for the appropriate conditions of use in this publication will meet the 'construction deemed to satisfy' provisions of the BCA.

Short title

This publication may be referred to as CTIQ (*Construction timbers in Queensland*) 1 and 2, to represent two separate documents—Book 1 and Book 2.

Scope

This publication lists the more important wood properties of commercial timbers used for construction in Queensland. It also provides requirements and conditions of use for these timbers to provide appropriate design service life in various construction applications. The correct specification of timber will usually require consideration of a range of timber properties including, but not limited to, stress grade, durability class, moisture content and insect resistance. For the specification of timber sizes and spans, relevant Australian Standards and design manuals should be consulted—e.g. Australian Standard *AS 1684 series Residential timber—framed construction parts 2 and 3* (Standards Australia 2006a,b).

Book 1 explains the terms used, with reference to nomenclature, origin and timber properties presented under specific column headings in the schedules (Book 2). It also explains target design life, applications and decay hazard zones, presented in the schedules. Book 1 includes:

- definitions of abbreviations, codes and symbols used in schedules A, B and C
- descriptions relating to timber species, origin and properties contained in Book 2, schedules A, B and C (Part 1, columns 1–10, tan-coloured tables)
- descriptions relating to applications, target design life and decay hazard zones contained in Book 2, schedules A, B and C (Part 2, columns 11–18, blue-coloured tables)
- conditional use codes
- advisory codes
- an appendix (informative).

Book 2 consists of reference tables, presented as **schedules A, B and C**:

- **Schedule A** contains **commercial mixtures** of unidentified timbers (the most usual market presentation of various Australian open forest and rainforest hardwoods) and of some Australian and imported softwoods.
- **Schedule B** contains **Australian-grown timber species**, including both natural forests and plantations.
- **Schedule C** contains timbers **imported** into Australia from overseas.

Each schedule has two parts presenting data in tables.

Part 1 (tan-coloured tables) lists:

- construction timbers in alphabetical order by standard trade name
- botanical name/s
- region of origin
- timber properties.

Part 2 (blue-coloured tables) lists:

- target design life (i.e. 5-year, 15-year and 50-year categories)
- approved construction uses for each species or species group
- decay hazard zones for above-ground and in-ground applications
- codes denoting approval, conditions for use (C1 to C17 and H1 to H5) or non-approval
- advisory codes (A1 to A9), where applicable.

In Part 2 of the schedules, a tick symbol (✓) under an application indicates that the corresponding timber species or species group is approved for applications within that category. For some uses, a timber may be used only if it meets a certain minimum condition or provision indicated by a restrictive **C** or **H** code. When a timber species or species group is not allowed for a particular application a cross (**X**) is used to denote prohibition.

The advisory codes **A1** to **A9** (schedules, Part 2) highlight specific characteristics that may affect performance, but are informative only and not normative (mandatory) requirements. Additional advisory information is given in the Appendix.

The recommendations made in this publication assume that good building practice will be carried out.

Additional wood properties information can be found at www.timberanswers.com

Definitions, abbreviations, codes and symbols used in schedules A, B and C

✓ Allowed for this application (unless qualified by a restrictive code indicating mandatory conditions for use)—see conditional use codes

X Not allowed for this application

— No reliable data at the time of publication

A Australia, non-Queensland states

A1–A9

Advisory codes used in column 18, Part 2 of Book 2; described in Book 1, page 29

Acclimatisation

The process of exposing timber articles to the average in-service environment in which they will be installed

ADD Air-dry density—timber density at 12% moisture content

Ag Above-ground

Ag:A Above-ground decay hazard zone A; least potential for decay

Ag:B Above-ground decay hazard zone B; lower potential than zone Ag:C and greater potential than zone Ag:A for above-ground decay

Ag:C Above-ground decay hazard zone C; lower potential than zone Ag:D and greater potential than zone Ag:B for above-ground decay

Ag:D Above-ground decay hazard zone D; greatest potential for decay

AF Africa

AP Asia–Pacific region: Papua New Guinea, Malaysia, Indonesia, Philippines, Fiji, Solomon Islands

Applications

Construction applications with similar environments and conditions of use have been grouped into seven applications in columns 11 to 17 (see Table 8 for examples)

Approved

Approved by the person, body or authority empowered under state legislation to give that approval

Approved preservative

A preservative treatment approved under AS 1604

APVMA

Australian Pesticides and Veterinary Medicines Authority

AS Australian Standard, published by Standards Australia (www.saiglobal.com)

AS/NZS

Australian/New Zealand Standard, jointly published by Standards Australia and Standards New Zealand, and distributed by SAI Global Limited (www.saiglobal.com)

Basic density

Oven-dry mass divided by green-soaked volume, expressed in kg/m³

BCA Building Code of Australia

Building Act

The *Queensland Building Act 1975*

C1–C17

Conditional use codes used in Part 2 of Book 2; described in Book 1, page 28

CA Central America

CCA Copper chrome arsenate

Class 1 and Class 10 buildings

Class 1= houses; Class 10 = sheds, garages, carports

CTIQ *Construction timbers in Queensland* (this publication)

Density

Mass divided by volume, expressed in kg/m³ when describing timber

Durability rating

A value in a four-class rating system indicating a timber species' resistance to fungal organisms that cause decay (rot)—two ratings are provided for each species or species group (above-ground durability rating and in-ground durability rating), to be applied in accordance with the corresponding situation; the ratings apply to sound, untreated (natural) heartwood

EMC Equilibrium moisture content—the moisture content to which timber approaches where it would neither lose nor gain moisture from the surroundings

E Europe

EWPA

Engineered Wood Products Association of Australasia

Exposed

Not fully protected from weather

Genus A taxonomic category ranking below a family and above a species; related species exhibiting similar botanical characteristics

Genera

Plural form of genus

GLTAA

Glued Laminated Timber Association of Australia

GPa Gigapascals—unit of measure for pressure; giga = 10⁹

Hardness

A material's ability to resist indentation and its degree of difficulty in working with hand tool blades; strongly correlated with density

Hardwoods

Trees, and their timber, of the dicotyledon angiosperm (flowering) botanical group; includes members of the *Eucalyptus* (most 'gums' and ironbarks), *Corymbia* (spotted gum and bloodwoods), *Shorea* (meranti) and many other genera—the term doesn't imply that the actual timber is necessarily hard; for example, *Ochroma* spp. (balsa) and *Toona ciliata* (red cedar) are classified botanically as hardwoods.

Heart-in material

Low-density material within 50 mm of the pith

Heartwood

The central core of dead wood providing support to the tree

hf Hem-fir—commercial mixture of *Tsuga* spp. and *Abies* spp.

High shrinkage

Having an average tangential shrinkage of 10% or more, when drying from the green condition to 12% moisture content

H level

A number prefixed by the letter 'H' identifying the biological hazards to which the timber is to be exposed and the appropriate conditions of use—the 'H level' (e.g. H1 and H2) is used to prescribe the extent of preservative treatment (retention and penetration) required when combined with the timber's natural durability to protect the wood against the biological hazard/s identified.

H1 (H level 1)

The minimum level of preservative treatment required to protect the timber from attack by insects other than termites—H1 preservative treatments are suitable in above-ground, well-ventilated situations protected from weather and wetting.

H2 (H level 2)

The minimum level of preservative treatment required to protect the timber from attack by insects, including termites—H2 preservative treatments are suitable in above-ground, well-ventilated situations protected from weather and wetting.

Note 1: For timber treated to H2

For timber treated to H2, for use south of the Tropic of Capricorn only, the designated treatment brand is H2 (F). The designated brand of timber that may be used throughout Queensland is H2.

H3 (H level 3)

The minimum level of preservative treatment required to protect the timber from attack by decay fungi and insects, including termites—H3 preservative treatment offers protection in situations above-ground, exposed to the weather or periodic wetting. Depending on the application, preservative treatment to provide protection in H3 conditions can involve one of two levels. The lower retention must not be used in a load-bearing application where routine inspection and maintenance cannot be readily carried out. The lower retention level applies only to vertical (water-shedding) applications that are able to be regularly maintained. In Australian Standard AS 1604.1-2005 these constraints are signified in the brand by the letter 'A'; that is, H3A.

H4 (H level 4)

The minimum level of preservative treatment required to protect the timber from attack by insects, including termites, and severe decay—H4 treatments are suitable for use in situations where the timber is in contact with the ground or is continually damp. H4 is appropriate for less critical 'non-structural' applications and/or where the decay hazard zone indicates a lower in-ground hazard.

H5 (H level 5)

The minimum level of preservative treatment required to protect the timber from attack by insects, including termites, and very severe decay—H5 treatments are used in situations where timber is in contact with the ground or fresh water.

Ig In-ground

Ig:A In-ground decay hazard zone A; least potential for decay

Ig:B In-ground decay hazard zone B; lower potential than zone Ig:C and greater potential than zone Ig:A for in-ground decay

Ig:C In-ground decay hazard zone C; lower potential than zone Ig:D and greater potential than zone Ig:B for in-ground decay

Ig:D In-ground decay hazard zone D; greatest potential for decay

Joint group

For the purpose of joint design, timber is classified into six joint groups—J1 to J6 for the unseasoned or green condition, and a further six joint groups JD1 to JD6 for the seasoned or dry condition

kg/m³ Kilograms per cubic metre—standard expression for mass per unit volume (density) of timber

Local government

Local government as defined in the *Queensland Building Act 1975*

LVL Laminated veneer lumber—glued, veneer-based product in which the grain direction of the constituent veneers is mostly longitudinal

Lyctine susceptibility

A timber's propensity to infestation by lyctine insects, principally the powderpost beetle *Lyctus brunneus*

MPa Megapascal—unit of measure for pressure (mega = 10⁶)

MGP Machine-graded pine

N New South Wales

NA North America

Natural durability

Natural resistance of the outer heartwood to decay and termites

Non-structural

Not load-bearing or not supporting in function

NZ New Zealand

Origin The likely geographical source area of the timber

Pith First-formed wood, weaker than the wood that forms around it; in most hardwoods it is often unnoticeable but in softwoods it can be prominent and 3–13 mm wide

Protected

In relation to the weather and other dampness, not exposed to the elements and not liable to become damp due to rain or any other source of moisture under normal conditions of use—exposed timbers may be considered fully protected for the applications listed in this publication where a roof or structural overhang provides protection against wetting by rain driven at angles of less than 30 degrees from the vertical

Q Queensland

Qc Central Queensland; from Gladstone north to Bowen (latitudes 24° S to 20° S)

Qn Northern Queensland; from Bowen (latitude 20° S) northwards

Qs Southern Queensland; from Queensland – New South Wales border to Gladstone (latitudes 28° S to 24° S)

QTIEWA

Queensland Timber Importers, Exporters and Wholesalers Association

S South Australia

Sapwood

Wood, outside the heartwood, containing living cells which conduct water and mineral salts from the roots to the crown

Seasoned (as used in this publication)

- Structural framing timber—having an average moisture content not exceeding 15% at a time when the main gravity loads are applied
- Other timber and timber products—having a moisture content for seasoned timber as defined by the relevant Australian Standard (for interior milled products, usually 9% to 14%) or, where no standard exists, between 10% and 15% or within a moisture content range as agreed by purchaser and supplier for a particular location or purpose

Softwoods

Trees, and their timber, of the gymnosperm (cone-bearing) botanical group; includes members of the *Pinus* (pine), *Picea* (spruce), *Abies* (fir), *Callitris* (cypress) and *Thuja* (western red cedar) genera—the term doesn't imply that the actual timber is necessarily soft

SP Machine-graded structural pine

Species group

Two or more timber species with similar properties, not readily separated by visual means and therefore sold as a commercial mixture

spf Commercial mixture of spruce-pine-fir, *Picea* spp., *Pinus* spp. and *Abies* spp.

Strength group

Group representing the inherent strength of a timber species—there are seven strength groups for unseasoned timber (S1 to S7) and eight for seasoned timber (SD1 to SD8)

Stress grade

The classification of a piece of timber for structural purposes, by means of visual, machine or other grading or sorting methods, to the relevant Australian Standard, to indicate its characteristic structural properties and stiffness

Structural

Load-bearing or supporting in function

Structural properties

The mechanical properties of timber; used in design calculations for construction

Termite resistance

A two-class system advising whether the heartwood is resistant (R) to termite attack or not (NR) as specified in AS 5604-2005

Timber Design Code

Australian Standard *AS 1720.1-1997 Timber structures—design methods* (Standards Australia 1997a, or its successor)

TP1 *Technical pamphlet no. 1: Building timbers—Properties and recommendations for their use in Queensland* (Smith et al. 1991)

TQ Timber Queensland Limited

TUMA The *Timber Utilisation and Marketing Act 1987*, or its successor

Well ventilated

When applied to under-floor areas, cross-ventilated by openings not more than 1 metre from every corner and otherwise evenly spaced in both external and internal walls, so as to provide an area of unobstructed free airspace not less than 7500 mm²/metre length of wall for tongue and groove (T&G) feature flooring, whether laid over other sheet flooring or not and not less than the requirements prescribed by the BCA for other flooring

Descriptions relating to timber species, origin and properties contained in Book 2, schedules A, B and C (Part 1, columns 1–10, tan-coloured tables)

Note 2: Headings

Headings correspond to columns 1 to 10 in Part 1 of schedules A, B and C.

Column 1: Index number

An index number has been allocated to each standard trade name for a construction timber species or species group in schedules A, B and C. Index numbers link species' scientific names and synonyms listed in the botanical index with the standard trade names used in the schedules.

Column 2: Standard trade name

Standard trade names are generally taken from *AS/NZS 1148-2001 Timber—nomenclature—Australia, New Zealand and imported species* (Standards Australia 2001) and *Technical pamphlet no. 2: Queensland timbers—Their nomenclature, density and lyctine susceptibility* (Cause et al. 1989). These publications can be used to establish the correct standard trade name or preferred name of a timber before consulting the schedules in Book 2 of CTIQ. See also www.timberanswers.com

The chronological alphabetical style follows, which is used by Standards Australia (2001). Where a standard trade name comprises more than one word, the alphabetical listing is based on the noun in the name (e.g. ironbark, grey). This ensures that all the ironbarks within a schedule are conveniently grouped together.

In Schedule C, common marketing name synonyms for imported timbers are provided to enable readers to link it with the standard trade name and corresponding properties and uses for the species. For example, timbers of *Intsia* species are available in the Queensland market as merbau and kwila, depending on the source of origin. Therefore, if readers searched for merbau, they would be directed to kwila, the standard trade name for *Intsia* species.

Column 3: Botanical name

The only true name for a timber species is its botanical name. Botanical nomenclature (scientific name) reflects timber species' names current at December 2005 (Standards Australia 2001; Cause et al. 1989; L Jessup, Senior Principal Botanist [Queensland Herbarium, Environmental Protection Agency] 2005, pers. comm., March; The Australian National Botanic Gardens 2005; The International Plant Names Index 2005). Only the genus is recorded for commercial mixtures comprised of multiple species with similar properties or those unable to be readily separated in the market. Botanical names are not provided for commercial mixtures comprising many genera, such as for unidentified rainforest timbers and imported softwoods.

The 'Index of botanical names' (at the end of this book) lists current scientific names of timber species alphabetically, in italics. Previously used synonyms are also included in

small italics in the index. The botanical index is linked to schedules A, B and C with index numbers allocated to each species' trade name. The reader can look up current and older scientific names of timbers in the botanical index and use the index number(s) to find the current (2005) trade and botanical name(s) listed in the schedules.

Hardwood timber sourced from open forests has been classified into three broad groups based on geographical areas, corresponding to column 1, index numbers 1, 2 and 3 in Schedule A, Book 2:

- **Category a** timbers include open-forest hardwoods (predominantly *Eucalyptus* species) sourced from Western Australia, South Australia and Victoria, excluding high-shrinkage timbers.
- **Category b** timbers include mixed, high-shrinkage species sourced from Tasmania, Victoria and the tableland regions of New South Wales (predominantly *Eucalyptus* species).
- **Category c** timbers include open-forest hardwoods (predominantly *Eucalyptus* and *Corymbia* species) sourced from Queensland and New South Wales, excluding highland 'ash'-type eucalypts.

Column 4: Origin

'Origin' refers to the likely geographical source of the timber.

The geographical origins and corresponding codes for timber species listed in Part 1 of schedules A, B and C are given in Table 1. In Schedule A, mixed Australian species group origins are allocated on a state basis. Imported timber groups in Schedule A are coded as for Schedule C species. In Schedule B the Queensland-grown species origins relate to three broad geographical zones. In Schedule B interstate timbers are given the code A, meaning Australia, non-Queensland states. In Schedule C, origins are based on broad global regions.

If specific states or countries of occurrence are required for these timbers, refer to *AS/NZS 1148-2001 Timber—nomenclature—Australian, New Zealand and imported species* (Standards Australia 2001).

Table 1 Interpreting geographical origins in schedules A, B and C

A	Australian states other than Queensland	NA	North America
N	New South Wales	E	Europe
Qs	Queensland – from New South Wales border to Gladstone (to latitude 24° S)	SA	South America
Qc	Queensland - from Gladstone to Bowen (latitudes 24° S to 20° S)	AF	Africa
Qn	Queensland - from Bowen (latitude 20° S) northwards	NZ	New Zealand
S	South Australia	AP	Asia–Pacific (includes Papua New Guinea, Malaysia, Indonesia, the Philippines, Fiji, Solomon Islands)
T	Tasmania		
V	Victoria		
W	Western Australia		

Column 5: Density

Density is defined as mass per unit volume and, for timber, this varies with moisture content. Density values shown in kilograms per cubic metre (kg/m³) in column 5, Part 1 in the schedules are average values to the nearest 5 kg for the species in the air-dry (seasoned, 12% moisture content) condition, based on the most reliable information available at the time of publication. Where a species or species group is known to have high variability, a range is provided. **More information on the implications of timber density is given in the Appendix.**

Column 6: Strength groups

Unseasoned and seasoned strength groups have been assigned to each species and species group in this publication. They are listed in column 6, Part 1 of the schedules. These strength groups have been classified according to the principles set out in *AS/NZS 2878-2000 Timber—classification into strength groups* (Standards Australia 2000a). Separate strength classifications have been given to seasoned and unseasoned timber due to differences in the mechanical properties of defect-free timber of a given species in each condition. The code **S** symbolises unseasoned timber and **SD** symbolises seasoned (dry) timber.

Classifications without brackets (i.e. S and SD listings) have been derived from mechanical test data using small, clear specimens. When shown in brackets—e.g. (S2), (SD3)—these are provisional assessments based on density and/or limited mechanical test data. Provisional classifications can be used with confidence as they are assessed conservatively.

There are seven strength groups for unseasoned timber, ranging downwards from S1 (strongest) to S7 (weakest); and eight strength groups for seasoned timber, ranging downwards from SD1 to SD8.

Strength group classifications applied to species groups or broader marketing categories (e.g. 'mixed hardwoods', 'pine', 'spruce-pine-fir') are those applicable to the lowest rated species in the group. There are occasional exceptions where it is known that lower rated species have a relatively small influence on the mechanical properties of mixtures as marketed.

When used in conjunction with the grade-quality descriptions from the relevant Australian Standards for structural timbers, strength group classifications enable stress grades to be allocated. The structural properties for these are given in *AS 1720.1-1997 Timber structures—design methods* (Standards Australia 1997a).

The system of stress grading is fundamental to the structural use of timber under the provisions of *AS 1720.1-1997 Timber structures—design methods* (Standards Australia 1997a), *AS 1684 series Residential timber—framed construction parts 2 and 3* (Standards Australia 2006a,b) and the Building Code of Australia (*Queensland Building Act 1975*).

Note 3: Stress grades

Stress grades, and hence structural properties, for a species or species group can be allocated by several means. In order of precedence, these are:

- *determination by full size in-grade testing in accordance with AS 4063-1992 Timber—stress graded—in-grade strength and stiffness evaluation (Standards*

Australia 1992)

- confirmation of traditional 'F' grades (based on strength group or visual grade relationships) using full-size in-grade testing in accordance with AS 4063-1992 Timber—stress graded—in-grade strength and stiffness evaluation (Standards Australia 1992)
- traditional 'F' grades based solely on strength group or visual grade relationships determined from small, clear properties testing.

Stress grades determined by in-grade testing

The following species or species groups have had their stress grades established by full-size, in-grade testing programs:

- seasoned and unseasoned white cypress designated F4, F5 and F7
- seasoned hoop pine designated F5, F7 and F8
- seasoned plantation Pinus species (maritime, slash, radiata and Caribbean pines) designated MGP10, MGP12 and MGP15, as well as SP1, SP2, SP3 and SP4
- seasoned Victorian ash designated A17.

The stress grades and structural properties given for these species concur with AS 1720.1-1997 Timber structures—design methods (Standards Australia 1997a) and AS 1720.2 Timber structures—timber properties (Standards Australia 2006c).

Traditional stress grades confirmed or adjusted by in-grade testing

The following species or species groups have had their traditional stress grades confirmed by full-size, in-grade testing:

- north-eastern Australian hardwoods, including spotted gum, blackbutt, ironbarks
- north American Douglas fir
- spruce-pine-fir
- Australian-grown plantation Pinus species, including slash, maritime, radiata and Caribbean pines.

The stress grades and structural properties given for these species concur with AS 1720.1-1997 Timber structures—design methods (Standards Australia 1997a) and AS 1720.2-2006 Timber structures—timber properties (Standards Australia 2006c).

Traditional stress grades based on strength grouping

For species or species groups not covered by in-grade testing, the range of possible stress grades can be determined from Table 2 and the strength groups given under column 6 in Part 1 of schedules A, B and C. For structural properties, refer to AS 1720.1-1997 Timber structures—design methods (Standards Australia 1997a).

Table 2⁽ⁱ⁾ Traditional stress grades by strength group and visual grade for unseasoned (S) and seasoned (SD) timber

Unseasoned strength group	S1 S2 S3 S4 S5 S6 S7								
Seasoned strength group	SD1	SD2	SD3	SD4	SD5	SD6	SD7	SD8	
Visual grades	Stress grades								
Structural 1	F34	F34	F27	F22	F17	F14	F11	F8	F7
Structural 2	F34	F27	F22	F17	F14	F11	F8	F7	F5
Structural 3	F27	F22	F17	F14	F11	F8	F7	F5	F4
Structural 4	F22	F17	F14	F11	F8	F7	F5	F4	—
Structural 5 ⁽ⁱⁱ⁾	—	—	—	—	F7	F5	F4	—	—

Source: AS 2878-2000 Timber—classification into strength groups (Standards Australia 2000a)

(i) This table does not apply to white cypress (*Callitris glaucophylla*), which has equivalent strength properties in both seasoned and unseasoned conditions, with available stress grades of F7, F5 and F4.

(ii) The visual grade 'Structural 5' only applies to softwoods (eg, *Pinus*, *Picea*, *Larix*, *Araucaria* and *Abies* species).

Stress grades applicable to timber graded by a mechanical process are recorded on the piece by branding or colour-coded markings in accordance with the relevant Australian Standard. Applicable structural properties and other engineering design data (including joint design) are published in AS 1720.1-1997 Timber structures—design methods (Standards Australia 1997a).

The F grades applicable to seasoned structural timber apply only when the average moisture content in the piece does not exceed 15% at the time when the main gravity loads are applied. Timber which is partially seasoned to not more than 20% for use under certain applications must be allocated an F grade appropriate to the unseasoned timber strength or joint group, or be specially designed in accordance with the requirements of AS 1720.1-1997 Timber structures—design methods (Standards Australia 1997a).

Note 4: Manufactured products

Most engineered and panel products such as glued, laminated timber (glulam), laminated veneer lumber (LVL) and I-beams have specific structural properties for each proprietary product or grade. Characteristic properties for these materials can be obtained from the appropriate Australian Standard or the product manufacturer or relevant industry association (e.g. GLTAA for glulam and EWPA for plywood and LVL).

Note 5: Framing sizes

Framing sizes, spans, spacings and other design information for timber species of a particular stress grade may be obtained from the AS 1684 series Residential timber—framed construction parts 2 and 3 (Standards Australia 2006a,b), or may be derived by calculation based on the requirements of the Australian Standard AS 1720.1-1997 Timber structures—design methods (Standards Australia 1997a) or from manufacturers or industry association information.

Column 7: Joint groups

Under column 7 in Part 1 of the schedules, joint groups for seasoned timber are provided for all species. Joint groups for unseasoned timber have also been provided where published basic density data was available at the time of publication (2010). The structural use of timber recommended in this document requires the application of adequate jointing and fastening procedures in accordance with the joint design data and specifications presented in the *AS 1684 series Residential timber—framed construction parts 2 and 3* (Standards Australia 2006a,b), or *AS 1720.1-1997 Timber structures—design methods* (Standards Australia 1997a).

The code **J** is used to denote joint groups for unseasoned timber and **JD** for seasoned (dry) timber. There are six joint groups for unseasoned timber, ranging downwards from J1 to J6; and six joint groups for seasoned timber, ranging downwards from JD1 to JD6. The joint group classification of species groups uses the rating applicable to the lowest rated species in the group.

Column 8: Natural durability ratings

Note 6: Natural durability of timber

Timbers in schedules A, B and C are allocated separate natural durability ratings for above-ground and in-ground situations, in accordance with AS 5604-2005 Timber—natural durability ratings (Standards Australia 2005a). These ratings are listed under column 8 in Part 1 of the schedules.

Because many variables are involved, it is very difficult to classify timbers accurately in terms of their resistance to decay, so the ratings are based on a range of years of expected service life.

The rating system used in AS 5604-2005 Timber—natural durability ratings (Standards Australia 2005a) is based on the average life (range in years) of test specimens of sound, untreated heartwood (35 mm × 35 mm for the above-ground tests and 50 mm × 50 mm for the in-ground trials). Where no data exist to confirm an above-ground rating, a provisional above-ground rating denoted by brackets—e.g. (2)—is provided in column 8 in Part 1 of the schedules, based on the timber's in-ground rating.

The performance and life expectancy of timber used in specific applications and environments will be influenced greatly by many other factors in addition to the natural durability ratings. These other factors include:

- *presence or absence of preservative treatment*
- *the manufacturing process*
- *detailing, supplementary protection and maintenance*
- *climate and environmental conditions*
- *member size and orientation of wide surface.*

*Member size is important because an increase in sectional area generally results in a corresponding increase in expected service life. **This is why the target design lives for some applications listed in Part 2 of the schedules extend to 50 years despite the life expectancy indicated by durability rating definitions described in AS 5604-2005 Timber—natural durability ratings (Standards Australia 2005a) and reproduced in Table 3.** In construction, timber member dimensions would normally exceed the section*

sizes of specimens used in trials and the construction timber should provide satisfactory performance, providing normal good building practice and maintenance is followed and the timber meets the grade quality requirements for the application.

Table 3 Natural durability ratings system for heartwood

Durability class	Above-ground life expectancy	In-ground life expectancy
1	> 40 years	> 25 years
2	15 to 40 years	15 to 25 years
3	7 to 15 years	5 to 15 years
4	0 to 7 years	0 to 5 years

Source: AS 5604-2005 Timber—natural durability ratings (*Standards Australia 2005a*)

Note 7: Untreated sapwood

The untreated sapwood of all timber species is regarded as class 4 (non-durable), regardless of heartwood rating.

Note 8: Regulatory durability performance requirements

The building regulation framework in Australia is performance-based, and specifically addresses health, safety and amenity as primary objectives. While the Building Code of Australia (BCA, Australian Building Codes Board 2006) currently does not have specific durability performance requirements, it does have implicit requirements, and it contains prescriptive deemed-to-comply solutions, acceptable construction practices and verification procedures.

The Australian Building Codes Board has published a guideline on durability in buildings (Australian Building Codes Board 2002). This explains the implicit requirements of the BCA that should be followed by manufacturers and specifiers wishing to satisfy the BCA's requirements.

The administration and application of the BCA is devolved by legislation to state and territory authorities and/or private certifiers, who then have to interpret and apply relevant standards or acceptable solutions.

The hierarchy of building regulations in Australia for timber and durability is as follows:

- The BCA is adopted by all states and territories under an intergovernmental agreement (IGA) between the Australian Government and the states and territories.
- The BCA, in turn, calls on primary references such as Australian Standards and documents such as AS 1684 series (*Standards Australia 2006*), also known as the Timber framing code and AS 1720.1-1997 (*Standards Australia 1997a*), also known as the Timber structures code and in some cases, individual states may adopt variations that call on state-specific references such as Construction timbers in Queensland (CTIQ).
- BCA primary-referenced documents call up secondary references such as the AS 1604 series for the specification for preservative treatment of timber (*Standards Australia 2004a,b,c 2005b,c*) and AS 5604 (*Standards Australia 2005a*) on natural durability ratings.

CTIQ reflects the performance expectations implicit in the BCA as at 2010.

Above-ground natural durability ratings

Where data was available, timbers have been allocated an above-ground durability class. Where reliable data was not available, provisional above-ground durability classifications based on published in-ground ratings have been allocated. In the schedules (Book 2), these provisional ratings are shown in brackets—e.g. (4) in column 8, Part 1. This means the timber has a provisional above-ground durability rating of 4. Table 3 gives the four ratings (life-expectancy definitions) of the above-ground durability scale.

In-ground natural durability ratings

The predicted performance of a timber in contact with the ground (and therefore exposed to decay and termites), is determined by an allocated in-ground durability rating. The in-ground durability rating refers to the performance of the heartwood. The ratings apply to sound, mature heartwood with a minimum cross-section thickness of 40 mm. Table 3 gives the four rating definitions of the in-ground durability scale.

Note 9: Round timbers

Round timbers with a complete annulus of preservative-treated sapwood (H4 or H5) will have life expectancies significantly greater than those given in Table 3.

Column 9: Lyctine susceptibility

The sapwood of **all** softwoods (*Pinus*, *Callitris*, *Picea*, *Larix*, *Araucaria*, *Agathis*, *Pseudotsuga*, *Thuja* and *Abies* species) and the sapwood of **some** hardwood species are immune to lyctine attack (i.e. infestation and damage by the powderpost beetle, primarily *Lyctus brunneus*). The sapwood of all other (lyctine-susceptible) hardwoods is rendered non-susceptible to attack by lyctine borers when immunised by preservative treatment. Another option for processors or suppliers is to remove lyctine-susceptible sapwood during processing.

The use of non-immunised lyctine-susceptible timber representing a greater cross-sectional area than permitted under want and wane allowances in the relevant Australian Standard is not recommended in permanent buildings in Queensland.

All species recognised as being non-susceptible to lyctine attack are listed with the symbol **NS** in column 9, Part 1 of the schedules. All other species are considered lyctine-susceptible—these species are identified with the symbol **(s)**. Where laboratory tests (conducted in accordance with the approved protocols or commercial evidence) have confirmed susceptibility, the symbol **S** is used. These codes are summarised in Table 4.

Table 4 Interpreting lyctine susceptibility in the schedules

Code in schedules	Lyctine susceptibility status
NS	Non-susceptible to lyctine attack
(s)	Unconfirmed
S	Confirmed lyctine-susceptible

The protection of sapwood in lyctine-susceptible timbers is based on a minimum preservative treatment of hazard level 1 (H1 or H level 1).

H1 (H level 1): In a well-ventilated place where the timber is kept off the ground and completely protected from weather and wetting—preservative treatment is designed to reduce the likelihood of attack by insects other than termites

Column 10: Termite resistance

In Part 1 of the schedules, subterranean termite resistance of heartwood is classified in column 10 as either **R**, for those species highly resistant to termites; or **NR**, where the timber is known to have little or no resistance to termites. Where reliable data is lacking, a timber species is classified as non-resistant until authoritative, contrary evidence becomes available. These codes and their definitions are summarised in Table 5.

While some *Pinus* species have heartwood designated as **R**, for practical and commercial purposes due to the extent of the sapwood present, they are required to be treated to H2 to achieve termite resistance.

Table 5 Interpreting resistance to subterranean termites in the schedules

Code in schedules	Termite resistance
R	Highly resistant
NR	Low or no resistance or no reliable data

The corresponding minimum treatment (H level) for termite protection is H2.

H2 (H level 2): In a well-ventilated place where the timber is kept off the ground and completely protected from weather and wetting—preservative treatment is designed to reduce the likelihood of attack by insects, including termites

Note 10: Termite management systems

On 1 January 2001, the Queensland provisions of the BCA were amended to address the installation of termite management systems in Class 1 buildings (houses) and Class 10 buildings (sheds, garages, carports and greenhouses). Specifically, the provisions require termite management systems in new buildings (Building Codes Queensland 2000).

Descriptions relating to applications, target design life and decay hazard zones contained in Book 2, schedules A, B and C (Part 2, columns 11–18, blue-coloured tables)

This section includes information relevant to Book 2, Part 2, schedules A, B and C. General information is provided for target design life, applications, decay hazard zones for both above-ground and in-ground applications, and seasoning requirements.

Target design life

In the schedules (Book 2, Part 2), three categories for target design life (5, 15 and 50 years) are provided in association with different applications.

Target design life, as it relates to timber usage in this publication, refers to the anticipated satisfactory service life of a timber member, if assembled and maintained in accordance with good building practice and the requirements specified in this document.

Queensland has a long-established culture of using timber as the preferred material for a wide variety of applications in construction. Within a single dwelling, there is usually a range of design life expectancies for different components. This means that at the time of design and construction it is envisaged that some timber components will have a shorter service life than others, which will be expected to provide satisfactory service for the full life of the structure.

Factors such as ease of access for maintenance, relative cost of materials and labour for assembly, and propensity for refitting due to changes in fashion or the introduction of new materials mean that different components of structures may only be expected to provide satisfactory performance for 5 years (eg, battens or fence palings), while other components are required to provide a service life of 50 years (e.g. roof trusses and house stumps).

Part 2 of the schedules nominates approved construction applications for commercial timbers in Queensland according to three target design life categories:

- target of 5 years service
- target of 15 years service
- target of 50 years service.

Applications (columns 11–17)

In the schedules (Part 2), seven categories for applications are provided for each timber species or species group under column headings **11** to **17**. The headings refer to applications with similar requirements, which are described in the section, 'Building members, target design life and applications', and Table 8, with examples of typical applications. These categories apply to commercial timber usage in the construction of Class 1 buildings (houses), Class 10 buildings (carports, garages, greenhouses, sheds) and associated landscaping.

The classification of timbers into applications in schedules A, B and C assumes that normal, good design, construction and maintenance practices will be followed, particularly in regard to avoiding the creation of damp, poorly ventilated situations.

Deficiencies that lead to the development of damp situations are water-trapping design, faults in flashing, sarking and other forms of damp-proofing in and around wet areas such as bathrooms, and in roof and external wall framing. Practices such as filling sub-floor cavities between false joists on slabs (pugging), the use of moisture-retaining types of wall insulation and inadequate provision for free air movement through vented wall, roof and sub-floor cavities also lead to damp, poorly ventilated situations. The specification or use of durable timbers is not to be regarded as a substitute for good building practice.

Where the applications refer to a weather-exposed or in-ground application, the columns in Part 2 of the schedules are further subdivided into broad decay hazard zones based on those described in the *Timber service life design guide* (MacKenzie et al. 2005) and rationalised to Queensland local government boundaries.

Above-ground decay hazard zones (columns 13 and 16)

Climate is one of the most significant environmental factors affecting the serviceability and performance of construction timbers. Subtropical to tropical climates with periods of warm temperatures and high humidity pose a higher risk of attack by fungal organisms that cause decay than drier climates. In recognition of the strong correlation between climate and decay hazard, CTIQ incorporates a system of classifying local government areas into above-ground decay hazard zones. These classifications are based on data from maps produced in the *Timber service life design guide* (MacKenzie et al. 2005).

The above-ground decay hazard zones for Queensland are classified as:

Ag:A—Least potential for above-ground decay

Ag:B—Lower potential than zone Ag:C and greater potential than zone Ag:A for above-ground decay

Ag:C—Lower potential than zone Ag:D and greater potential than zone Ag:B for above-ground decay

Ag:D—Greatest potential for above-ground decay

These zones and the corresponding local governments are shown in Figure 1 and listed in Table 6.

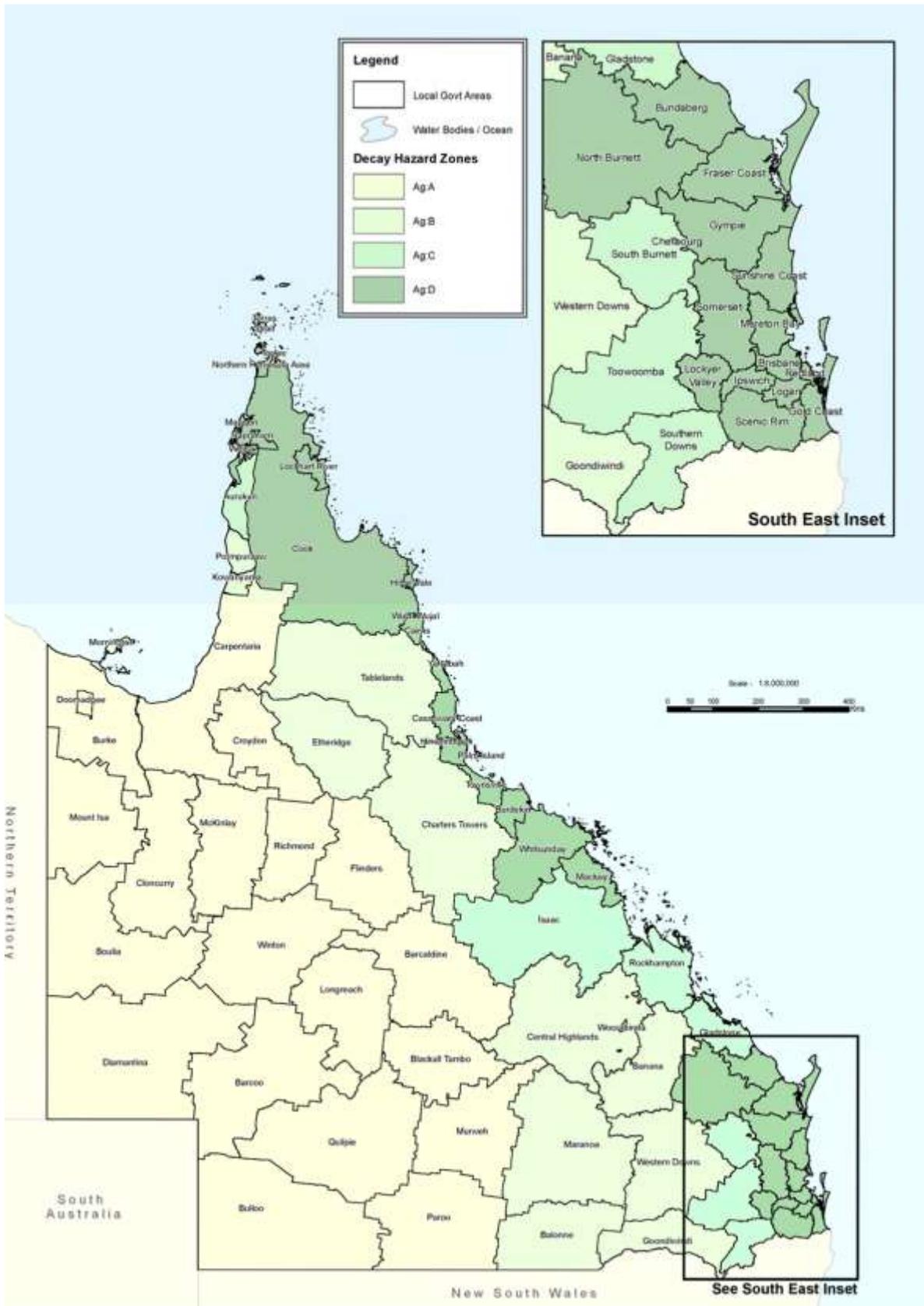


Figure 1 Above-ground decay hazard zones for Queensland

Table 6 Queensland local governments and corresponding above-ground decay hazard zones

Local govt.	Ag:zone	Local govt.	Ag:zone	Local govt.	Ag:zone	Local govt.	Ag:zone
A		Croydon	Ag:A	Lockyer Valley	Ag:D	Richmond	Ag:A
Aurukun	Ag:C	D		Logan Gold Coast	Ag:D	Rockhampton	Ag:C
B		Diamantina	Ag:A	Longreach	Ag:A	S	
Balonne	Ag:B	Doomadgee	Ag:A	M		Scenic Rim	Ag:D
Banana	Ag:B	E		Mackay	Ag:D	Somerset	Ag:D
Barcaldine	Ag:A	Etheridge	Ag:B	Maranoa	Ag:B	South Burnett	Ag:B
Barcoo	Ag:A	F		Mapoon	Ag:D	Southern Downs	Ag:C
Blackall Tambo	Ag:A	Flinders	Ag:A	McKinlay	Ag:A	Sunshine Coast	Ag:D
Bouli	Ag:A	Fraser Coast	Ag:D	Moreton Bay	Ag:D	T	
Brisbane	Ag:D	G		Mornington	Ag:A	Tablelands	Ag:B
Bulloo	Ag:A	Gladstone	Ag:C	Mount Isa	Ag:A	Toowoomba	Ag:C
Bundaberg	Ag:D	Goondiwindi	Ag:B	Murweh	Ag:A	Torres	Ag:D
Burdekin	Ag:D	Gympie	Ag:D	N		Torres Strait	Ag:D
Burke	Ag:A	H		Napranum	Ag:D	Townsville	Ag:D
C		Hinchinbrook	Ag:D	North Burnett	Ag:D	W	
Cairns	Ag:D	Hope Vale	Ag:D	Northern Peninsula Area	Ag:D	Weipa	Ag:D
Carpentaria	Ag:A	I		P		Western Downs	Ag:B
Cassowary Coast	Ag:D	Ipswich	Ag:D	Palm Is.	Ag:D	Whitsunday	Ag:D
Central Highlands	Ag:B	Isaac	Ag:C	Paroo	Ag:A	Winton	Ag:A
Charters Towers	Ag:B	K		Porpuraaw	Ag:B	Woorabinda	Ag:B
Cherbourg	Ag:B	Kowanyama	Ag:B	Q		Wujal Wujal	Ag:D
Cloncurry	Ag:A	L		Quilpie	Ag:A	Y	
Cook	Ag:D	Lockhart River	Ag:D	R		Yarrabah	Ag:D

In-ground decay hazard zones (columns 14 and 17)

In-ground decay hazard zones have also been defined to describe the relative hazard for in-ground decay. These are based on Australian decay hazard zones as described in the *Timber service life design guide* (MacKenzie *et al.* 2005) and rationalised to Queensland local government boundaries to align with the building approval process (Figure 2).

The four decay hazard zones for in-ground decay are classified as:

Ig:A—Least potential for in-ground decay

Ig:B—Lower potential than zone Ig:C and greater potential than zone Ig:A for in-ground decay

Ig:C—Lower potential than zone Ig:D and greater potential than zone Ig:B for in-ground decay

Ig:D—Greatest potential for in-ground decay

Defining in-ground decay hazard zones enables better utilisation of our timber resources. For example, a moderately durable (class 3) timber species would not be suitable for in-ground use in the wet tropics (zone Ig:D, the highest potential for in-ground decay), but could be expected to give satisfactory performance if used in the arid zone (zone Ig:A, low hazard) provided it is also protected from termites. Table 7 lists Queensland local governments and their corresponding in-ground decay hazard zones.

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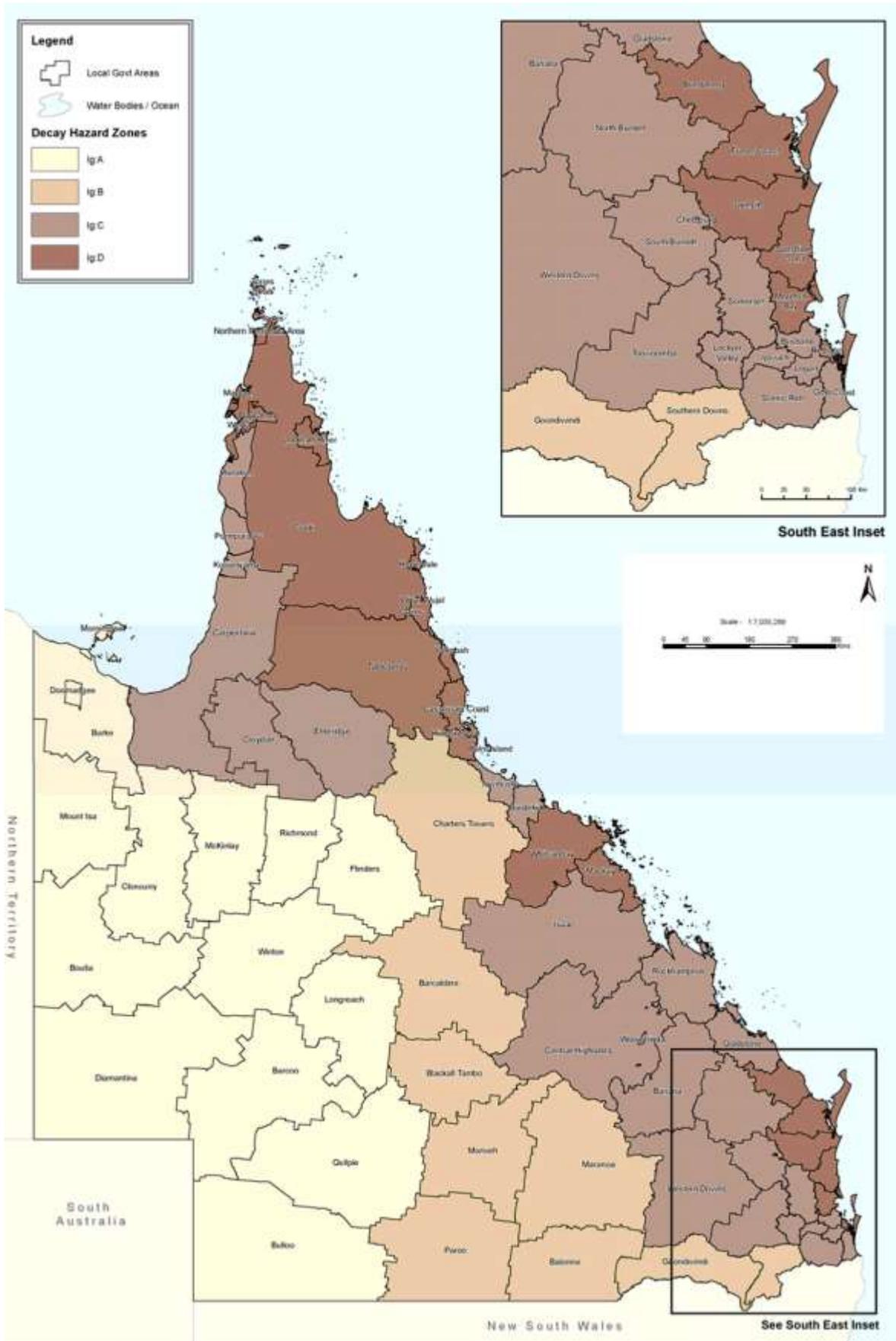


Figure 2 In-ground decay hazard zones for Queensland

Table 7 Queensland local governments and corresponding in-ground decay hazard zones

Local govt.	Ig:zone	Local govt.	Ig:zone	Local govt.	Ig:zone	Local govt.	Ig:zone
A		Croydon	Ig:C	Lockyer Valley	Ig:C	Richmond	Ig:A
Aurukun	Ig:C	D		Logan Gold Coast	Ig:C	Rockhampton	Ig:C
B		Diamantina	Ig:A	Longreach	Ig:A	S	
Balonne	Ig:B	Doomadgee	Ig:A	M		Scenic Rim	Ig:C
Banana	Ig:C	E		Mackay	Ig:D	Somerset	Ig:C
Barcaldine	Ig:B	Etheridge	Ig:C	Maranoa	Ig:B	South Burnett	Ig:C
Barcoo	Ig:A	F		Mapoon	Ig:D	Southern Downs	Ig:B
Blackall Tambo	Ig:B	Flinders	Ig:A	McKinlay	Ig:A	Sunshine Coast	Ig:D
Bouli	Ig:A	Fraser Coast	Ig:D	Moreton Bay	Ig:D	T	
Brisbane	Ig:D	G		Mornington	Ig:A	Tablelands	Ig:D
Bulloo	Ig:A	Gladstone	Ig:C	Mount Isa	Ig:A	Toowoomba	Ig:C
Bundaberg	Ig:D	Goondiwindi	Ig:B	Murweh	Ig:B	Torres	Ig:D
Burdekin	Ig:C	Gympie	Ig:D	N		Torres Strait	Ig:D
Burke	Ig:A	H		Napranum	Ig:D	Townsville	Ig:C
C		Hinchinbrook	Ig:D	North Burnett	Ig:C	W	
Cairns	Ig:D	Hope Vale	Ig:D	Northern Peninsula Area	Ig:D	Weipa	Ig:D
Carpentaria	Ig:C	I		P		Western Downs	Ig:C
Cassowary Coast	Ig:D	Ipswich	Ig:C	Palm Is.	Ig:D	Whitsunday	Ig:D
Central Highlands	Ig:C	Isaac	Ig:C	Paroo	Ig:B	Winton	Ig:A
Charters Towers	Ig:B	K		Pormpuraaw	Ig:C	Woorabinda	Ig:C
Cherbourg	Ig:C	Kowanyama	Ig:C	Q		Wujal Wujal	Ig:D
Cloncurry	Ig:A	L		Quilpie	Ig:A	Y	
Cook	Ig:D	Lockhart River	Ig:D	R		Yarrabah	Ig:D

Conditional use codes in schedules A, B and C

The following symbols and codes appear in the schedules to denote a timber's recommended uses and conditions of use (if applicable).

Where a timber species is recommended for a particular application, a tick symbol (✓) is given in the corresponding application column in the schedules. Conversely, where a timber is not approved for a particular application, it has a cross symbol (X) for that application.

Timbers allocated a **C** or **H** code under an application column are recommended for use in that application, provided the specification and timber used meets the minimum provision denoted by the codes defined here:

- C1** De-sapped for portion in-ground contact if untreated
- C2** Minimum dimensions to be 100 mm × 100 mm
- C3** Minimum dimensions to be 150 mm × 150 mm
- C4** Minimum dimensions to be 200 mm × 200 mm
- C5** Round timber only—minimum treatment level H4
- C6** Round timber > 200 mm diameter only—minimum treatment level H4
- C7** Round timber > 200 mm diameter only—minimum treatment level H5
- C8** Round timber > 300 mm diameter only—minimum treatment level H5
- C9** Round timber > 400 mm diameter only—minimum treatment level H5
- C10** Recommended to be partially seasoned to not more than 20% moisture content
- C11** Not permitted for in-ground poles in pole frame construction; must be set on stirrups or similar
- C12** Single species only, free of heart-in material (material within 50 mm of the tree pith)
- C13** De-sapped for portion in-ground contact—minimum diameter 200 mm
- C14** De-sapped for portion in-ground contact—minimum diameter 300 mm
- C15** De-sapped for portion in-ground contact—minimum diameter 400 mm
- C16** Seasoned
- C17** For weather-exposed door jambs and mullions; can only be used in non-structural applications subject to compliance with industry recommendations
- H3** Minimum H3 level of preservative treatment
- H4** Minimum H4 level of preservative treatment
- H5** Minimum H5 level of preservative treatment

Advisory codes used in Part 2 of schedules A, B and C (column 18)

Advisory codes are included (column 18 in the schedules) to emphasise characteristics of a species that might affect performance in some applications:

- A1** High shrinkage
- A2** Variable density, hardness and strength depending on origin or species
- A3** Gum veins common
- A4** To be painted or protected against the Queensland pine beetle
- A5** Usually knotty
- A6** Included bark is sometimes present
- A7** Finishes sometimes affected by resin bleed
- A8** Latex canals common
- A9** Corrodes ferrous fastenings when wet

Advisory information on a range of important issues is also included in the Appendix.

Seasoning and timber moisture content

Seasoning refers to the process of drying moisture from timber. It is undertaken for two important reasons:

1. to improve structural performance—a prerequisite to the allocation of seasoned timber strength (SD) and joint groups (JD) is that the average moisture content in the piece be no more than 15%
2. to improve stability—appearance-grade, milled products (e.g. strip flooring, parquetry, decking, panelling, chamferboard cladding, mouldings, furniture and joinery) should be seasoned to ‘pre-shrink’ them prior to use.

Following these provisions means that the timber will have satisfactory performance with respect to appearance and stability, and the seasoning recommendations of the Australian Standards have been considered in this context. Australian Standards set different moisture content ranges for different products (but usually 9% to 14% for interior milled products) reflecting the type of timber and product application.

Refer to the Appendix for further information on the implications of timber moisture content on product performance.

Building members, target design life and applications

Table 8 is an alphabetical listing of building members linked to applicable target design life and application number/s corresponding to column number/s in Book 2.

Table 8 Building members, target design life and applications

Building member	Environment	Target design life (yrs)	Application (column no. in schedules A, B and C)
Architraves	Protected	15	12
Balusters	Exposed	50	16
	Protected	50	15
Barge boards	Exposed	15	13
Battens	Between stumps	5	11
	Under lining or cladding	50	15
	External wall	15	13
	Greenhouse	15	13
	Pergola	15	13
Beams	Roof, ceiling	50	15
	Exposed	50	16
Bearers	Protected	50	15
	Exposed	50	16
Binders and braces	Protected	50	15
Boards (non-structural)	Exposed	15	13
	Protected	15	12
Bracing	Exposed	50	16
	Protected	50	15
Brackets	Protected	15	12
Capping	Exposed	15	13
Carved work	Exposed	15	13
	Protected	15	12
Cladding	Exposed	15	13
Columns	Exposed	50	16
	Protected	50	15
Decking	Structural, commercial and industrial foot traffic	50	16
	Domestic	50	16
Doors	Exposed	15	13
	Protected	15	12
Eaves, soffits	Protected	15	12
End-stops	Exposed	15	13
Engineered products	Exposed	50	16
	Protected	50	15
Fascias	Exposed	15	13
Fences, gates	Palings	5	11
	Posts	15	14
	Rails	15	13

Table 8 Building members, target design life and applications

Building member	Environment	Target design life (yrs)	Application (column no. in schedules A, B and C)
Flooring	Non-structural or overlay	15	12
	Protected, structural	50	15
Foundation timbers	In-ground	50	17
Framing (wall, floor, roof)	Exposed	50	16
	Protected	50	15
Framing	Greenhouse	15	14
Handrails	Exposed	50	16
	Protected	50	15
Jambs (door, window)	Exposed	15	13
	Protected	15	12
Joinery (non-structural)	Exposed	15	13
	Protected	15	12
Joists	Exposed	50	16
	Protected	50	15
Landings	Exposed	15	13
Lattice panels	Exposed	5	11
	Protected	5	11
Lining	Exposed	15	13
	Protected	15	12
Lintels	Protected	50	15
Mouldings	Exposed	15	13
	Protected	15	12
Mullions	Exposed	50	16
	Protected	50	15
Newel posts	Exposed	50	16
	Protected	50	15
Pergolas	Framing	15	13
	Posts in-ground	15	14
	Posts above-ground	15	13
Plates, top and bottom	Exposed	50	16
	Protected	50	15
Poles, posts	Pergolas	15	14
	House/deck, in-ground	50	17
	House/deck, above-ground	50	16
	House, protected	50	15
Purlins	Protected	50	15
Rafters and ridges	Exposed	50	16
	Protected	50	15
Railings, non-structural	Exposed	15	13
	Protected	15	12
Railings, structural	Exposed	50	16
Retaining walls	Non-structural	15	14
	Structural ¹	50	17

Table 8 Building members, target design life and applications

Building member	Environment	Target design life (yrs)	Application (column no. in schedules A, B and C)
Reveals	Protected	15	12
Sheeting, non-structural, non-bracing	Exposed	15	13
	Protected	15	12
Sills	Foundation	50	17
Skirting	Protected	15	12
Stair treads	Exposed	50	16
	Protected	50	15
Step, stair risers and treads, fully supported	Exposed	15	13
	Protected	15	12
Step, stair stringers	Exposed	50	16
	Protected	50	15
Struts	Exposed	50	16
	Protected	50	15
Studs	Exposed	50	16
	Protected	50	15
Stumps	In-ground	50	17
Trusses	Exposed	50	16
	Protected	50	15
Weatherboards	Exposed	15	13
Window boards	Exposed	15	13
	Protected	15	12

¹ For the purposes of retaining walls:

(a) 'moderate importance' means anything other than 'high importance'

(b) 'high importance' means retaining walls:

- (i) where the total height of the wall and or the fill or cut retained by the wall is greater than 2 m, or
- (ii) that provide support to a building and structures such as an in-ground swimming pool, carport, garage or a deck more than 1 m above ground level beneath, where these buildings or structures are not supported by other independent means such as piers and the like that extend beyond the zone of influence of the retaining wall, or
- (iii) that support another retaining wall described in (i) or (ii) above.

Five-year target design life applications (column 11)

Target design life	Environment	Schedule reference
5 years	Protected from and/or exposed to the weather	Column 11

Environment

- Fully protected from and/or exposed to the weather or other dampness
- Clear of the ground, well drained and/or ventilated and with free air circulation
- Non-structural (not load-bearing or not supporting in function)

Conditions of use

- C and H codes—none applicable for 5-year target design life applications
- Unless otherwise specified for appearance reasons, sawn timber may contain untreated non-lyctine-susceptible sapwood provided that the combination of such sapwood and any associated wane does not exceed the wane limits permitted by the relevant Australian Standard

Treatment (other than for termites)

- Any lyctine-susceptible sapwood must be treated to minimum H1 level in accordance with the provisions of AS 1604

Termite protection

- Where termite-resistant timber is required in accordance with the BCA, it may be either:
 - timber classified as naturally termite resistant (R in column 10) or
 - timber classified as not resistant (NR in column 10) that has been treated to minimum H2 level in accordance with the provisions of AS 1604

Examples

Building members with a 5-year target design life are listed in Table 8.

Fifteen-year target design life applications (columns 12, 13 and 14)

Target design life	Environment	Schedule reference
15 years	Protected	Column 12

Environment

- Fully protected from the weather or other sources of dampness
- Clear of the ground, well ventilated and with free air circulation
- Structural and non-structural

Conditions of use

- As indicated by C and H codes for high shrinkage timber species and species groups

Treatment (other than for termites)

- Any lyctine-susceptible sapwood must be treated to minimum H1 level in accordance with the provisions of AS 1604

Termite protection

- Where termite-resistant timber is required in accordance with the BCA, it may be either:
 - timber classified as naturally termite resistant (R in column 10) or
 - timber classified as not resistant (NR in column 10) that has been treated to minimum H2 level in accordance with the provisions of AS 1604

Examples

Protected building members with a 15-year target design life are listed in Table 8.

Target design life	Environment	Schedule reference
15 years	Weather-exposed	Column 13

Environment

- Exposed to or not fully protected from the weather or other sources of dampness
- Clear of the ground, well drained and ventilated and with free air circulation
- Structural and non-structural, relatively accessible for maintenance or replacement

Conditions of use

- As indicated by C and H codes for each species in each of the four above-ground decay hazard zones (Ag:A, Ag:B, Ag:C and Ag:D)
- Unless otherwise required by the relevant Australian Standard or by explicit specification, timber for sawn weatherboards, fascias and barge boards may be unseasoned except if subject to the requirements of any C codes in the schedules
- Unless otherwise specified for appearance reasons, timber may contain untreated, non-lyctine-susceptible sapwood provided that the combination of such sapwood and any associated wane does not exceed the wane limits permitted by the relevant Australian Standard

Treatment (other than for termites)

- Above-ground durability class 2, 3 and 4 timbers coded as suitable for these uses must meet the minimum requirements of H3 level in accordance with AS 1604 and may contain limited amounts of unpenetrated or inadequately treated heartwood comprising no more than 20% of the cross-section of the piece at any point
- Any sapwood, except as allowed above, must be treated to minimum H3 level in accordance with the provisions of AS 1604

Termite protection

- Where termite protection is required in accordance with the BCA it may be either:
 - timber classified as naturally termite resistant (R in column 10) may be used provided any sapwood is treated to minimum H3 level or
 - timber classified as not resistant (NR in column 10) that has been treated to minimum H3 level in accordance with the provisions of AS 1604

Examples

Weather-exposed building members with a 15-year target design life are listed in Table 8.

Target design life	Environment	Schedule reference
15 years	In-ground	Column 14

Environment

- In-ground or in contact with the ground or in poorly ventilated, persistently damp conditions
- Structural (load-bearing or supporting in function)
- Relatively accessible for maintenance or replacement

Conditions of use

- As indicated by C and H codes for each species in each of the four in-ground decay hazard zones (Ig:A, Ig:B, Ig:C and Ig:D)
- Unless otherwise specified for appearance reasons, sawn timber may contain untreated non-lyctine-susceptible sapwood provided that the combination of such sapwood and any associated wane does not exceed the wane limits permitted by the relevant Australian Standard

Treatment and termite protection

- In-ground durability class 3 and 4 timber coded as suitable for these uses must meet the minimum requirements of H4 level in accordance with AS 1604 and may contain limited amounts of unpenetrated or inadequately treated heartwood provided:
 - in sawn timber, not exceeding the want and wane limits permitted by the relevant Australian Standard (where no such standard exists, this unpenetrated heartwood must not exceed 20% of the cross-sectional area of the piece and not extend face to face or edge to edge through the piece)
 - in round timber, not extending beyond half the radius from the central axis of the piece, as determined at end sections
 - any sapwood, except as allowed above, must be treated to H4 level in accordance with the provisions of AS 1604
 - timber classified as not resistant (NR in column 10) used as members forming or directly supported on primary foundations are to be protected against subterranean termite access by soil treatment and/or physical barriers in accordance with *AS 3660.1-2000 Termite management part 1—new building work* (Standards Australia 2000b)

Examples

Building members in ground contact or in persistently damp conditions with a 15-year target design life are listed in Table 8.

Fifty-year target design life applications (columns 15, 16 and 17)

Target design life	Environment	Schedule reference
50 years	Protected	Column 15

Environment

- Fully protected from the weather or other dampness
- Clear of the ground, well ventilated and with free air circulation
- Structural and/or non-structural

Conditions of use

- As indicated by C and H codes in column 15 for each species
- For applications involving feature flooring, refer to the advisory notes in Appendix regarding the implications of moisture content, density and hardness

Treatment (other than for termites)

- Any lyctine-susceptible sapwood must be treated to minimum H1 level in accordance with the provisions of AS 1604

Termite protection

- Where termite-resistant timber is required in accordance with the BCA, it may be either:
 - timber classified as naturally termite resistant (R in column 10) or
 - timber classified as not resistant (NR in column 10) that has been treated to minimum H2 level in accordance with the provisions of AS 1604

Examples

Protected building members suitable for a 50-year target design life are listed in Table 8.

Target design life	Environment	Schedule reference
50 years	Weather-exposed	Column 16

Environment

- Exposed to or not fully protected from the weather or other sources of dampness
- Clear of the ground, well drained and ventilated and with free air circulation
- Structural and non-structural

Conditions of use

- As indicated by C and H codes for each species in each of the four above-ground decay hazard zones (Ag:A, Ag:B, Ag:C and Ag:D)
- All timbers for use as prefabricated structural frames to external door and window openings to be seasoned, irrespective of general coding under column 16 in schedules A, B and C
- Unless otherwise specified for appearance reasons, sawn timber may contain untreated non-lyctine-susceptible sapwood, provided that the combination of such sapwood and associated wane does not exceed wane limits required by the relevant Australian Standard

Treatment (other than for termites)

- Above-ground durability class 2, 3 and 4 timbers coded H3 under column 16 are suitable for these uses if the timber achieves the minimum requirements of H3 level as defined in AS 1604 and may contain limited amounts of non-penetrated or inadequately treated heartwood provided:
 - in sawn timber, not exceeding the wane and wane limits permitted by the relevant Australian Standard (where no such standard exists, non-penetrated heartwood must not exceed 20% of the cross-sectional area of the piece and not extend face to face or edge to edge through the piece)
 - in round timbers, not extending beyond half the radius from the central axis of the piece, as determined at end sections
 - any sapwood, except as allowed above, must be treated to minimum H3 level
 - treatment must be in accordance with the provisions of AS 1604

Termite protection

- Where termite-resistant timber is required in accordance with the BCA it may be either:
 - timber classified as naturally termite resistant (R in column 10) or
 - timber classified as not resistant (NR in column 10) that has been treated to minimum H3 level in accordance with the provisions of AS 1604
- Structural members, such as poles and posts held clear of the ground by stirrups in pole frame and similar applications, are to be protected against subterranean termite access by soil treatment and/or physical barriers in accordance with *AS 3660.1-2000 Termite management part 1—new building work* (Standards Australia 2000b)

Examples

Weather-exposed building members with a 50-year target design life are listed in Table 8.

Target design life	Environment	Schedule reference
50 years	In-ground	Column 17

Environment

- In-ground or in contact with the ground or poorly ventilated, persistently damp conditions
- Structural (load-bearing, structural or supporting in function)
- Difficult to access for maintenance or replacement

Conditions of use

- As indicated by C and H codes for each species in each of the four in-ground decay hazard zones (Ig:A, Ig:B, Ig:C and Ig:D)
- Unless otherwise specified for appearance reasons, sawn timber may contain untreated non-lyctine-susceptible sapwood provided that the combination of such sapwood and any associated wane does not exceed the wane limits permitted by the relevant Australian Standard
- Timber is to be free from untreated lyctine-susceptible sapwood
- In-ground durability class 3 and 4 timbers coded H5 are suitable for these uses, **except for poles in-ground in pole frame construction**, if preservative treated to H5 level in accordance with AS 1604 and may contain limited amounts of unpenetrated or inadequately treated heartwood:
 - in sawn timber, not exceeding the wane and wane limits permitted by the relevant Australian Standard (where no such standard exists, this heartwood must not exceed 20% of the cross-sectional area of the piece and not extend face to face or edge to edge through the piece)
 - in round timbers, not extending beyond half the radius from the central axis of the piece, as determined at end sections

Treatment and termite protection

- In-ground durability class 2, 3 and 4 timbers coded as suitable for these uses must meet the minimum requirements of H5 level in accordance with AS 1604 and may contain limited amounts of unpenetrated or inadequately treated heartwood not comprising more than 20% of the cross-section of the piece at any point
- Any sapwood, except as allowed above, must be treated to minimum H5 level in accordance with the provisions of AS 1604
- Timber classified as not resistant (NR in column 10) used as members forming or directly supported on primary foundations are to be protected against subterranean termite access by soil treatment and/or physical barriers in accordance with *AS 3660.1-2000 Termite management part 1—new building work* (Standards Australia 2000b)

Examples

Building members in ground contact or in persistently damp conditions with a 50-year target design life are listed in Table 8.

Appendix: Additional advisory information (informative)

Wood density

Wood density has considerable influence in classifying and scheduling species for use. Informative remarks relating to hardness, based on timber densities, are provided in Table A1.

Table A1 Density, hardness and utilisation

Air-dry density (range)	Hardness description	Remarks
< 480 kg/m ³	Very soft	Very poor resistance to indentation; not recommended for uncovered flooring and bench tops; easy to work with hand tools
485–560 kg/m ³	Soft	Poor resistance to indentation; suitable for flooring in lightly trafficked areas such as bedrooms Suitability for use in high-traffic areas is to be determined by a specifier
565–800 kg/m ³	Firm	Suitable for flooring; generally easy to work with hand tools
805–960 kg/m ³	Hard	Excellent resistance to wear and indentation in flooring, step treads and bench tops
> 965 kg/m ³	Very hard	As above—some species difficult to work and require sharp tool edges

Seasoning and moisture content

Research has shown that in-service moisture contents will vary on a seasonal basis and may differ from the target manufacturing range. In addition, other factors relating to house design, heating and cooling systems, and the micro-climate of the particular locality can have a significant influence on in-service moisture contents. Installation and finishing practices need to accommodate both the adjustment to climatic conditions associated with the in-service environment and the seasonal movement that will occur in that climate.

Relative humidity is the major influence determining whether seasoned products will absorb moisture from the air and swell or lose moisture to air and shrink. If the moisture content of timber products is close to the average in-service moisture content, seasonal changes in humidity will result in small dimensional changes. The average equilibrium moisture content (EMC) of timber used indoors is often 1% to 3% below that of timber articles, components and assemblies used in outdoor applications.

Acclimatisation before installation

Acclimatisation is appropriate for 'feature' interior applications, such as flooring, where information obtained from timber moisture-content testing indicates that the moisture content of the timber to be used varies from the average EMC for the in-service environment by more than 2%.

Time of sale

At the time of sale, moisture content for timber supplied for feature products, such as floors, must meet the following requirements:

- Hardwoods 9–14% moisture content with the average of 11% (*AS 2796.1-1999 Timber—hardwood—sawn and milled products—part 1: product specification*, Standards Australia 1999)
- Softwoods 9–14% moisture content with the average 11% (*AS 4785.1-2002 Timber—softwood—sawn and milled products*, Standards Australia 2002)
- White cypress 10–15% moisture content with the average 12% (*AS 1810-1995 Timber—seasoned cypress pine—milled products*, Standards Australia 1995)

Time of use or installation

The range nominated by the relevant standard may not be appropriate for all in-service environments. Prior to installation the installer should ascertain whether the timber moisture content is appropriate for the in-service environment. Moisture-content testing is done in accordance with *AS/NZS 1080.1-1997 Timber—methods of test—moisture content* (Standards Australia 1997b).

If timber is installed at an average moisture content that is higher than the average in-service moisture content, greater shrinkage can be expected after installation. Similarly, timber installed at an average moisture content lower than the average in-service moisture content will swell after installation and allowance needs to be made during installation to accommodate this potential for expansion.

Where appropriate, acclimatisation can be used to raise or lower the average moisture content of the timber supplied, to bring it closer to its average in-service moisture content. Acclimatising should therefore be considered when the average in-service moisture content is high (e.g. 14% in the tropics) or low (e.g. 9% in inland regions or with air-conditioning used continuously).

The usual method of acclimatising timber products is to stack boards in such a way as to allow free air movement to all surfaces. With products such as flooring, boards may be loose laid for a period prior to fixing until they have equalised to the average in-service conditions.

At the time of construction, if conditions are not similar to the average in-service conditions, acclimatisation may be detrimental (e.g. acclimatising during dry weather in a normally humid climate).

Acclimatisation is usually only effective in an air-conditioned building if the air-conditioning is operating at the time or, in dry localities during normal weather conditions. The species

type, period and method of acclimatisation will also influence how effective the process is. For some higher density species that are slow to lose or take up moisture, acclimatisation may have little effect. Acclimatising products such as flooring and paneling in dry climates does not remove the need to provide for expansion during periods of wet weather.

For more information on best practice for installing flooring, see Hayward (2005).

Grade and quality

Most timber products have a relevant Australian Standard that provides specifications for grade and quality. Australian Standards should be referenced in specifications to define grade and quality. For some products, such as flooring, the Australian Standards also recognise and permit manufacturers to define their own grades. Specifiers should ensure that the grade they require is clearly defined.

Timber preservatives

Immunsation by some preservative treatments impart colour to sapwood. This tends to reduce contrast between sapwood and heartwood in timbers having dark or brownish heartwood colours. For feature applications where the owner or specifier does not desire this sapwood shading, timber free from sapwood on the face or immunsation by a colourless preservative should be specified.

Weather-exposed decking timber

The service life of decking fully exposed to sunlight and the weather will be enhanced by the application of a protective finish system to all joints and exposed surfaces at the time of construction and as a regular maintenance procedure in accordance with manufacturer or Timber Queensland recommendations. Pale-coloured finishes are preferred. A tongue and grooved profile is not suitable for external flooring and decking applications.

Restrictions on use of CCA-treated timber products

The Australian Government Australian Pesticides and Veterinary Medicines Authority (APVMA) recently reviewed the use of copper chrome arsenate (CCA) as a timber treatment, reinforcing its status as a safe, durable and inexpensive way to preserve wood for most outdoor purposes (Australian Pesticides and Veterinary Medicines Authority 2005).

The APVMA has adopted a precautionary position, however, by requiring some restrictions on certain timber products where there may be exposure to children. Consequently, since 12 March 2006 it has been an offence to sell CCA preservative chemical for treating timber products intended for use as garden furniture, picnic tables, exterior seating, children's play equipment, patio and domestic decking, and handrails.

Products that are not garden furniture, picnic tables, exterior seating, children's play equipment, patio and domestic decking, and handrails may continue to be treated with CCA, but these products will be required to be marked with the words 'Treated with copper chrome arsenate'.

Queensland pine beetle

In schedules A, B and C, known susceptibility to **Queensland pine beetle** is given by the advisory code **A4**. Timbers in the family Araucariaceae, including indigenous hoop (*Araucaria cunninghamii*), kauri (*Agathis* spp.) and bunya (*Araucaria bidwillii*) pines and imported klinki pine (*Araucaria hunsteinii*, Papua New Guinea), are susceptible to attack by the Queensland pine beetle (*Calymnaderus incisus*) when used within the coastal zone of south-east Queensland east of the Great Dividing Range and extending from Murwillumbah (New South Wales) to Bundaberg (approximate latitude 25° S). However, protection against attack in interior building uses can be easily achieved by adopting one of the following measures:

- total enclosure in construction, for example as framing in double sheeted walls (full sarking with brick veneer) or in fully ceiled roof cavities
- painting or other film finishing of surfaces exposed as, for example, beams, flooring, lining, joinery or mouldings
- treatment with an approved insecticide (AS 1604.1-2005, Standards Australia 2005b).

Timbers susceptible to the Queensland pine beetle, as indicated in schedules A, B and C, should be protected against such attack by one of the methods above when used in fully protected applications within the defined geographic region.

The preservative treatments prescribed for H levels H1, H2, H3, H4 and H5 of the species concerned will prevent Queensland pine beetle attack.

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AS 5604-2005 Timber—natural durability ratings, Australian Standard.

Index of botanical names

Current names for Australian species are in italics (e.g. *Corymbia maculata*). Imported species are in bold italics (e.g. ***Pseudotsuga menziesii***). These current names appear in schedules A, B and C. Synonyms and other alternative names are in small italics (e.g. *Tristania conferta*). These names do not appear in schedules A, B, and C but are included in the index so the timber can still be located.

Index numbers locate the species in the schedules (Book 2).

Abbreviations: sp.—species; spp.—more than one species; subsp.—subspecies; aff.—similar to; AFO—Atherton Forestry Office; RFK—Rain Forest Key (Atherton)

Botanical name	Index no.	Botanical name	Index no.
<i>Abarema grandiflora</i>	423	<i>Acmena divaricata</i>	383
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<i>Planchonella</i> spp.	582	<i>Pseudomorus brunoniana</i>	202
<i>Planchonella xerocarpa</i>	155	<i>Pseudoweinmannia lachnocarpa</i>	281
<i>Plathyenia reticulata</i>	551	<i>Pseudotsuga menziesii</i>	529a,529b
<i>Pleiococca wilcoxiana</i>	42	<i>Pterocarpus indicus</i>	590
<i>Pleiogynium cerasiferum</i>	356	<i>Pterocymbium</i> spp.	494
<i>Pleiogynium solandri</i>	356	<i>Pterygota macrocarpa</i>	543
<i>Pleiogynium timorense</i>	356	<i>Pullea stutzeri</i>	14
<i>Podocarpus amara</i>	339	<i>Pygeum turnerianum</i>	20
<i>Podocarpus elatus</i>	340	Q	
<i>Podocarpus grayi</i>	340	<i>Quercus</i> spp.	568,569
<i>Podocarpus ladei</i>	340	<i>Quintinia sieberi</i>	359
<i>Podocarpus neriifolius</i>	340	R	
<i>Podocarpus spicatus</i>	557	<i>Randia cochinchinensis</i>	180
<i>Podopetalum ormondii</i>	53	<i>Randia densiflora</i>	180
<i>Polyalthia michaelii</i>	56	<i>Randia fitzalanlii</i>	179
<i>Polyalthia nitidissima</i>	56	<i>Randia racemosa</i>	180
<i>Polyosma alangiacea</i>	18	<i>Rapanea achradifolia</i>	371
<i>Polyscias australiana</i>	48	<i>Rapanea variabilis</i>	371
<i>Polyscias elegans</i>	49	<i>Ratonia pyriformis</i>	445
<i>Polyscias murrayi</i>	50	<i>Ratonia stipitata</i>	158
<i>Pometia</i> spp.	598	<i>Rhodamnia acuminata</i>	273
<i>Pongamia glabra</i>	357	<i>Rhodamnia argentea</i>	270
<i>Pongamia pinnata</i>	357	<i>Rhodamnia blairiana</i>	272
<i>Pouteria castanosperma</i>	116	<i>Rhodamnia costata</i>	270
<i>Premna acuminata</i>	461	<i>Rhodamnia rubescens</i>	271
<i>Premna glabrata</i>	461	<i>Rhodamnia sessiliflora</i>	272
<i>Premna lignum-vitae</i>	207	<i>Rhodamnia trinervia</i>	271
Proteaceae (family)	570	<i>Rhodosphaera rhodanthema</i>	409
<i>Protium australasicum</i>	160	<i>Rhus rhodanthema</i>	409
		<i>Ristantia pachysperma</i>	332
		<i>Rockinghamia angustifolia</i>	228

Botanical name	Index no.	Botanical name	Index no.
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Sandoricum spp.	540	<i>Sloanea langii</i>	134
Sapotaceae (family)	566,567	<i>Sloanea macbrydei</i>	132
<i>Sarcocephalus bartlingii</i>	148	<i>Sloanea woollsii</i>	135
<i>Sarcocephalus coadunatus</i>	148	<i>Sphalmium racemosum</i>	297
<i>Sarcocephalus papagola</i>	148	<i>Sphenostemon lobosporus</i>	58
<i>Sarcocephalus undulatus</i>	148	<i>Stemonurus australianus</i>	55
<i>Sarcomelicope simplicifolia</i> subsp. <i>simplicifolia</i>	44	<i>Stenocarpus reticulatus</i>	293
<i>Sarcopteryx stipata</i>	158	<i>Stenocarpus salignus</i>	308
<i>Sarcotoechia lanceolata</i>	446	<i>Stenocarpus sinuatus</i>	314
<i>Schizomeria ovata</i>	75	<i>Sterculia acerifolia</i>	233
<i>Schizomeria whitei</i>	75	<i>Sterculia caudata</i>	234
Schizomeria spp.	507	<i>Sterculia discolor</i>	232
<i>Scolopia braunii</i>	410	<i>Sterculia diversifolia</i>	230
<i>Scolopia brownii</i>	410	<i>Sterculia laurifolia</i>	426
Scorodocarpus borneensis	546	<i>Sterculia quadrifida</i>	235
<i>Semecarpus australiensis</i>	355	<i>Sterculia shillinglawii</i>	426
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<i>Sersalicia australis</i>	21	<i>Streblus pendulinus</i>	202
<i>Sersalisia laurifolia</i>	155	<i>Strychnos arborea</i>	117
Shorea inaequilateralis	594	<i>Strychnos axillaris</i>	117
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<i>Sideroxylon australe</i>	21	Swietenia spp.	550
<i>Sideroxylon chartaceum</i>	353	<i>Symplocos cochinchinensis</i> ssp. <i>thwaitesii</i> var. <i>stawellii</i>	206
<i>Sideroxylon euphlebium</i>	111	<i>Symplocos cochinchinensis</i> ssp. <i>thwaitesii</i> var. <i>thwaitesii</i>	205
<i>Sideroxylon laurifolium</i>	155	<i>Symplocos spicata</i>	206
<i>Sideroxylon obovatum</i>	118	<i>Symplocos stawellii</i>	206
<i>Sideroxylon pohlmanianum</i>	118	<i>Symplocos thwaitesii</i>	205
<i>Sideroxylon richardii</i>	155	<i>Syncarpia glomulifera</i>	459
Sindora spp.	595	<i>Syncarpia hillii</i>	406
<i>Siphonodon australis</i>	225	<i>Syncarpia laurifolia</i>	459
<i>Siphonodon membranaceus</i>	225	<i>Syncarpia procera</i>	99
<i>Siphonodon pendulus</i>	226	<i>Syncarpia subargentea</i>	99
<i>Sloanea australis</i> subsp. <i>parviflora</i>	11	<i>Synima cordieri</i>	439
		<i>Synoum glandulosum</i>	373

<i>Synoum muelleri</i>	373	T	
<i>Syzygium alliiigneum</i>	394	<i>Tarrietia actinophylla</i>	316
<i>Syzygium australe</i>	385	<i>Tarrietia argyrodendron</i>	317
<i>Syzygium bungadinnia</i>	382	<i>Tarrietia argyrodendron</i> var. <i>peralata</i>	319
<i>Syzygium canicortex</i>	405	<i>Tarrietia trifoliolata</i>	317
<i>Syzygium coolminianum</i>	402	<i>Tectona grandis</i>	599
<i>Syzygium cormiflorum</i>	381	<i>Terminalia arenicola</i>	169
<i>Syzygium corynanthum</i>	391	<i>Terminalia melanocarpa</i>	169
<i>Syzygium crebrinerve</i>	400	<i>Terminalia porphyrocarpa</i>	169
<i>Syzygium dictyophiebium</i>	396	<i>Terminalia sericocarpa</i>	168
<i>Syzygium endophloium</i>	399	<i>Terminalia</i> spp.	600
<i>Syzygium floribundum</i>	404	<i>Terminalia thozetii</i>	169
<i>Syzygium forte</i> subsp. <i>forte</i>	388	<i>Ternstroemia cherryi</i>	57
<i>Syzygium francisii</i>	400	<i>Tetrasynandra laxiflora</i>	63
<i>Syzygium gustavioides</i>	390	<i>Tetrasynandra pubescens</i>	63
<i>Syzygium johnsonii</i>	400	<i>Thuja plicata</i>	517
<i>Syzygium kuranda</i>	392	<i>Tieghemella heckelii</i>	558
<i>Syzygium luehmannii</i>	384	<i>Tieghemopanax elegans</i>	49
<i>Syzygium oleosum</i>	402	<i>Tieghemopanax murrayi</i>	50
<i>Syzygium paniculatum</i>	385	<i>Timonius rumphii</i>	452
<i>Syzygium papyraceum</i>	395	<i>Timonius sericens</i>	452
<i>Syzygium rubiginosum</i>	388	<i>Timonius timon</i>	452
<i>Syzygium sayeri</i>	396	<i>Toechima erythrocarpum</i>	446
<i>Syzygium</i> sp. (=1FO/2968,=RFK/728)	394	<i>Toechima lanceolatum</i>	446
<i>Syzygium</i> sp. (=RFK/1891)	395	<i>Toona australis</i>	143
<i>Syzygium</i> sp. (=RFK/2511)	399	<i>Toona calantas</i>	511
<i>Syzygium</i> sp. (=RFK/3030)	387	<i>Toona ciliata</i>	143
<i>Syzygium</i> sp. aff. <i>S. luehmannii</i>	405	<i>Toona</i> spp.	516
<i>Syzygium</i> sp. aff. <i>S. claviflorum</i>	391	<i>Trema amboinensis</i>	142
<i>Syzygium suborbiculare</i>	389	<i>Trema orientalis</i>	142
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<i>Syzygium trachyphloium</i>	401	<i>Tristania exiliflora</i>	100
<i>Syzygium wesa</i>	387	<i>Tristania grandiflora</i>	104
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Botanical name	Index no.	Botanical name	Index no.
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<i>Tristaniopsis exiliflora</i>	100	<i>Wrightia millgar</i>	149
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V		<i>Xanthostemon brachyandrus</i>	329
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<i>Villaresia smythii</i>	61	<i>Xanthostemon pachyspermus</i>	331
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<i>Vitex acuminata</i>	461	<i>Xanthostemon whitei</i>	330
<i>Vitex glabrata</i>	461	<i>Xylocarpus australasicum</i>	275
<i>Vitex lignum-vitae</i>	207	<i>Xylocarpus granatum</i>	275
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<i>Waterhousea hedraiophylla</i>	398	<i>Zanthoxylum veneficum</i>	493
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