

# Public Consultation on DZ 3602: *Timber and wood-based products for use in building*

## Brief to inform feedback on draft standard

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This brief provides an overview of the key changes that are included in this draft standard DZ 3602 Timber and wood-based products for use in buildings. It outlines the rationale for changes in this standard and is intended to inform readers' feedback on the draft standard.

NZS 3602 Timber and wood-based products for use in buildings sets out specifications for timber and wood-based products that are required to ensure specific building components are sufficiently durable to function for a specified intended life. This standard was published in 2003 and has not been revised since then.

NZS 3602 is a core resource for a wide range of people in the building industry, complementing the design and construction methods and details set out for timber-framed buildings in NZS 3604 and for other timber structures designed using DR NZS AS 1720.1:20XX Timber structures<sup>1</sup>.

In October 2016, as part of the revision of the standard, Standards New Zealand sought information from industry on additional timber products that could be included in the updated standard, to incorporate newer wood-based products such as heat-modified timber, non-biocidal modified timber, and wood plastic composite.

This revision of NZS 3602 addresses requirements for the preservation of timber framing that have changed since the 2003 edition. This draft includes a new section 4 Requirements for large format timber elements to achieve 50-year durability, with provisions for large format timber elements specifically designed using NZS AS 1720.1 (see footnote 1) to achieve 50-year durability provision.

The draft also incorporates some amendments specified in New Zealand Building Code (NZBC) Acceptable Solution B2/AS1. Other modifications to NZS 3602 are in response to changes in material design, types, and selection, to incorporate new knowledge, and to extend the range of situations where specific naturally durable species can be used. The clause numbering and layout of the standard have also been aligned with other recent New Zealand standard publications.

The key changes that this revision addresses are as follows.

### **1. New Section 4 – Inclusion of large format timber elements**

Section 4 of this draft includes requirements for large format timber elements to achieve 50-year durability that are specifically designed using NZS AS 1720.1. While the standard has previously included engineered wood products, the new section includes cross laminated timber (CLT) and large dimensional glulam and laminated veneer lumber (LVL).

### **2. Inclusion of modified wood products**

The draft proposes the inclusion of two new non-biocidal wood modification protection systems for sawn timber, namely Dimethylol-dihydroxy-ethylene-urea (DMDHEU) and acetylated wood, which are to be specified in NZS 3640\*.

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<sup>1</sup> DR NZS AS 1720.1 is currently in development, and is intended to supersede NZS 3603:1998. It is expected to be released for public consultation in December 2017.

### **\*Alignment with NZS 3640**

NZS 3640:2003 Chemical preservation of round and sawn timber is being revised at the same time as this standard and public consultation on the draft is expected to occur simultaneously with consultation on DZ 3602.

## **3. Inclusion of alternative species**

The draft extends the range of situations where specific naturally durable species can be used. For example, uses of durability class 1 and 2 timbers have been extended for components exposed to exterior weather conditions and dampness but not in direct ground contact. Furthermore, a number of new alternative timber species have been included in this draft, where data was available, for various end uses.

- (a) Natural durability rating is measured using the Australasian natural durability classification system (AS 5604:2003 Timber - Natural durability ratings). The average life of durability class 2 timber exposed above ground is between 20 to 40 years.
- (b) Some durability class 2 timbers have been included in section B of Table 1 for applications exposed to exterior weather conditions but not in ground contacts. However, there is no in-service test data to support their use in these conditions. Suitability for use in specific end-uses is normally assessed from a combination of field and service tests.
- (c) The durability class 3 timber test specimens (50 mm x 50 mm stakes) have an average life in ground contact of between 5-15 years and exposed above ground of 10 – 20 years. Therefore, untreated timber with durability class 3 has not been included in section B of Table 1.
- (d) It is proposed that only un-treated heartwood of durability class 3 timber, previously included in NZS 3602: 2003, be used in hazard class H1.2 conditions. Boron treatment is required for all sapwood of durability class 3 timber.
- (e) A number of new timber species with durability class 3 are proposed to be added, with the requirement that sapwood be required to be treated for use in hazard class H1.2 conditions (with full sapwood boron treatment with 0.40% m/m in the cross section as per NZS 3640). Table 1 in NZS 3602 requires 50-year durability performance in situations protected from the weather, but where there is a risk of moisture content conducive to decay.
- (f) There is no framing decay test data available for many of the durability class 3 timbers. Species in that durability class are loosely divided into two groups based on whether their durability was towards the top or the bottom of the natural durability range. Radiata pine is a durability class 3 timber (towards the lower end of the range) and requires H1.2 treatment, so other timber species at the lower end of the durability class 3 range should also be preservative treated for use in hazard class H1.2 conditions.
- (g) There was a proposal to include poplar in the tables. Heartwood of poplar is durability class 4 (non-durable) so both the sapwood and heartwood would require preservative treatment to meet the durability performance requirements for hazard class H1.2. There was no test data provided to demonstrate that it would provide the same durability as H1.2 treated radiata pine or information available on the treatability of heartwood poplar using boron salts. Therefore, poplar was not included for H1.2 applications

- (h) Heartwood of larch has traditionally been included as a naturally durable species for framing. Other species within the same in-ground durability class as larch require treatment. Accelerated framing trials conducted using the Australasian Wood Preservation Committee (AWPC) method have demonstrated poor performance of larch samples after only one year's exposure to conditions simulating intermittent wetting within a non-drying, leaky building. However, the tables have no new treatment requirements for larch because there has been no in-service failure information that justifies it requiring treatment. Public feedback, particularly in-service information, will be useful for deciding whether or not larch should remain untreated.

#### **4. Branding of alternative species**

A new clause (2.11.2) has been added requiring alternative species to be branded so they can be identified by those on selling and using these products. Public feedback is sought on this clause and specifically the branding requirements.

#### **5. Consistency with B2/AS1**

This revised draft standard incorporates most of the New Zealand Building Code acceptable solution B2/AS1 amendments, as appropriate.

The current Acceptable Solution allows low risk areas such as internal floors (excluding wet areas such as bathroom and laundry) and walls to use untreated LVL and this has not been changed.

The exceptions for the use of preservative-free (untreated) Douglas fir within Clause 3.2.2.2 of Acceptable Solution B2/AS1 are considered to be outside the scope of NZS 3602. The exceptions, which depend on NZS 3604, on Acceptable Solution B2/AS1, and on other geometric and design constraints, are therefore expected to remain in B2/AS1.

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## Public comment information

### Status

This document is a proposed New Zealand standard under the Standards and Accreditation Act 2015. Issued as a draft in this form, it provides the required statutory opportunity for consideration and comment by the bodies and persons having an interest in the standard.

### How to comment

Closing date for comments **2 March 2018**.

There are two preferred methods for submitting comments.

- (1) You can submit comments via the Standards New Zealand website at <https://www.standards.govt.nz/developing-standards/comment-on-draft-standards/> in the 'New Zealand draft standards' tab, using the 'submit comments' button below this standard's entry. The electronic system is limited to text only and does not recognise engineering notation, equations or symbols.
- (2) You can submit comments using the downloadable public comment form, available at <https://www.standards.govt.nz/assets/Drafts/DZ-NZS-3602-Public-comment-draft.docx>. Please email the completed form to [SNZPublicComments@mbie.govt.nz](mailto:SNZPublicComments@mbie.govt.nz).

### Please read before commenting

To help you send in your comments, please read the following.

- (a) Comments are invited, preferably in electronic format, on the technical content, wording, and general arrangement of this draft.
- (b) Editorial matters (that is spelling, punctuation, grammar, numbering, references, and so on) will be corrected before final publication.
- (c) Please do not return marked-up drafts as comments.
- (d) When completing the public comment form, ensure that the number of this draft, your name and organisation (if applicable) is recorded. Please place relevant clause numbers beside each comment.
- (e) Please provide supporting reasons and suggested wording, for each comment. Where you consider that specific content is too simplistic, too complex or too detailed, provide an alternative.
- (f) If the draft is acceptable without change, an acknowledgement to this effect would be appreciated.
- (g) Normally no acknowledgement of comment is sent. All comments received by the due date will be put before the relevant development committee. Where appropriate, changes will be incorporated before the standard is formally approved.

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DZ 3602:2018

New Zealand Standard

# **Timber and wood-based products for use in building**

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Superseding NZS 3602:2003

## Committee representation

This draft was prepared under the supervision of the P3602 committee for the NZ Standards Executive established under the Standards and Accreditation Act 2015.

The committee consisted of representatives of the following organisations:

BRANZ

Certified Builders' Association of New Zealand

Frames and Truss Manufacturers' Association

Engineering New Zealand (formerly the Institution of Professional Engineers New Zealand)

Independent member co-opted by Standards New Zealand

Ministry of Business, Innovation and Employment, Building Systems Performance

New Zealand Building Industry Federation

New Zealand Farm Forestry

New Zealand Plywood Manufacturers' Association

New Zealand Timber Industry Federation

Scion

Standards New Zealand co-opted

Timber Treatment Audit Organisations

Wood Processors and Manufacturers Association of New Zealand

## Acknowledgement

Standards New Zealand gratefully acknowledges the contribution of time and expertise from all those involved in developing this standard.

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## Referenced documents

Reference is made in this document to the following:

### New Zealand standards

NZS AS 1720.1:20XX <sup>1</sup>	Timber structures Standard *in preparation
NZS 3604:1999	Timber framed buildings
NZS 3605:2001	Timber piles and poles for use in building
NZS 3610:1979	Specification for profiles of mouldings and joinery
NZS 3617:1979	Specification for profiles of weatherboards, fascia boards, and flooring
NZS 3619:1979	Specification for timber windows
NZS 3622:2004	Verification of timber properties
NZS 3631:1988	New Zealand timber grading rules
NZS 3640:2003	Chemical preservation of round and sawn timber <sup>2</sup>
NZS 7421:1990	Specification for installation of solid fuel burning domestic appliances

### Joint Australian/New Zealand standards

AS/NZS 1148:2001	Timber – Nomenclature – Australian, New Zealand and imported species
AS/NZS 1328:- - -	Glued laminated structural timber
Part 1:1998 <sup>3</sup>	Performance requirements and minimum production requirements
AS/NZS 1491:1996	Finger jointed structural timber
AS/NZS 1604:- - -	Specification for preservative treatment
Part 3:2012	Plywood
Part 4:2002	Laminated veneer lumber (LVL) ++
AS/NZS 1748:2011	Timber – Stress-graded – Product requirements for mechanically stress-graded timber
AS/NZS 1859:- - -	Reconstituted wood based panels – Specifications
Part 1:2017	Particleboard
Part 2:2017	Dry-processed fibreboard
AS/NZS 1860:- - -	Particleboard flooring
Part 1:2017	Specifications
AS/NZS 2098:- - -	Methods of test for veneer and plywood
Part 1:1996	Moisture content of veneer and plywood
Part 2:1996	Bond quality of plywood (chisel test)
Part 3:1996	Bond quality and strength of scarf joints in plywood
Part 4:1996	Measurement of dimensions for sheets of veneer and plywood
Part 5:1996	Resistance of gluelines in plywood to attack by micro-organisms
Part 6:1996	Depth of peeler checks in veneer and plywood

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<sup>1</sup> DZ NAS AS 1720.1 is currently being drafted. It is expected to supercede NZS3603. Public consultation on the draft is expected to begin in December 2017

<sup>2</sup> NZS 3640 is being revised and will be released for public comment in December 2017

<sup>3</sup> Currently under review

Part 7:1996	Density of veneer and plywood
Part 8:1996	Water absorption and thickness swelling of unpainted plywood
AS/NZS 2269:1994	Plywood – Structural
AS/NZS 2271:1999	Plywood and blockboard for exterior use
AS/NZS 2311:2000	Guide to the painting of buildings
AS/NZS 2908:- - -	Cellulose-cement products
Part 1:2000	Corrugated sheets
Part 2:2000	Flat sheet
AS/NZS 4284:1995	Testing of building facades
AS/NZS 4357:1995	Structural laminated veneer lumber
AS/NZS 4364:2010	Timber – Bond performance of structural adhesives
AS/NZS 4787:2001	Timber – Assessment of drying quality

### Other publications

Bengelsdorf, M F. 'Fastener corrosion in water-borne preservative treated wood.' *American Plywood Association Report PT 80-1* (1982).

BRANZ. *Technical Paper P21 – A wall bracing test and evaluation procedure*. Wellington: BRANZ, 2010.

New Zealand Timber Industry Federation Inc. *Timber design guide*. Wellington: New Zealand Timber Industry Federation Inc., September 2015.

### New Zealand legislation

Building Act 2004, New Zealand Building Code (NZBC) and Compliance Documents

### Websites

[www.legislation.govt.nz](http://www.legislation.govt.nz)

### Latest revisions

The users of this standard should ensure that their copies of the above-mentioned New Zealand standards are the latest revisions. Amendments to referenced New Zealand and joint Australian/New Zealand standards can be found on [www.standards.govt.nz](http://www.standards.govt.nz).

### Review of standards

Suggestions for improvement of this standard will be welcomed. They should be sent to the Manager, Standards New Zealand, PO Box 1473, Wellington 6140.

## Foreword

NZS 3602 *Timber and wood-based products for use in buildings* sets out specifications for timber and wood-based products that are required to ensure specific building components are sufficiently durable to function for a specified intended life. This standard was published in 2003 and has not been revised since.

NZS 3602 is a core resource for a wide range of people in the building industry, complementing the design and construction methods and details set out for timber-framed buildings in NZS 3604 and for other timber structures in NZS AS 1720.1<sup>4</sup>.

This revision of NZS 3602:2003 addresses requirements for preservation of timber framing that have changed since the 2003 edition. The key changes are summarised below:

- The draft standard has four sections. The provisions in section 2 are principally for components designed using the methods and details set out in NZS 3604, for timber-framed structures that do not require specific engineering design. They may also be used for components that require specific engineering design using NZS AS 1720.1. The compliance provisions for specific building components set out in section 2 and section 3 are used to ensure those components will meet the minimum performance-based requirements of New Zealand Building Code (NZBC) Clause B2 'Durability'. These sections also specify the timber grade or type of wood-based product and the NZS 3640 hazard classes that apply to specific building components.
- A new section 4 (Requirements for large format timber elements to achieve 50-year durability) is now included to cover requirements for large format timber elements specifically designed using NZS AS 1720.1 to achieve 50-year durability provision. While the standard has previously included engineered wood products, the new section now includes cross-laminated timber (CLT), large dimensional glulam, and laminated veneer lumbar (LVL).
- This revision has extended the range of situations where specific naturally durable timber species can be used. For example, uses of durability class 1 and 2 timbers have been extended for elements exposed to exterior weather conditions and dampness but not in ground contact. Furthermore, a number of new alternative species have been included in this draft, where data was available, for various end uses.
- The draft also proposes the inclusion of two new non-biocidal wood modification protection systems for sawn timber, namely Dimethylol-dihydroxy-ethylene-urea (DMDHEU) and acetylated wood, which are to be specified in NZS 3640<sup>5</sup>. These wood modification treatments are restricted to radiata pine only.
- The draft incorporates some amendments specified in NZBC Acceptable Solution B2/AS1. Other amendments to NZS 3602 are in response to changes in material design, types, and selection, to incorporate new knowledge.
- All preservative treatments by hazard class refer to NZS 3640 with the exceptions of LVL treated with an LOSP azole (referred to AS/NZS 1604.4), and plywood treated to H3.1 with LOSP azole or CCA and plywood treated with CCA to H3.2 (referred to AS/NZS 1604.3). Engineered wood products treatments are restricted to radiata pine only.
- The exceptions for the use of preservative-free (untreated) Douglas fir within Clause 3.2.2.2 of Acceptable Solution B2/AS1 are outside the scope of NZS 3602. The exceptions, which depend on NZS 3604, Acceptable Solution B2/AS1, and on other geometric and design constraints, are therefore expected to remain in B2/AS1.

NOTE – Throughout this standard, New Zealand Building Code (New Zealand Building Code) Acceptable Solutions are referred to by their number/letter assignment only (such as E2/AS1).

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<sup>4</sup> NZS AS 1720.1 is currently in development and is expected to supersede NZS 3603:1993, once it is published.

<sup>5</sup> NZS 3640:2003 is being revised and will be released for public consultation in December 2017.

# 1 General

## 1.1 Scope

### 1.1.1 Inclusions

This Standard gives the requirements for timber and wood-based products for particular uses in buildings. The requirements cover the selection of materials that can be expected to provide acceptable performance during the design life for those particular uses. It includes requirements for the selection, preservation, protection, construction and maintenance that are required to maintain that acceptable performance within the environment in which they are installed.

The chemical treatments and protection methods for sawn timber and roundwood and other wood-based products included in this standard are based on test results from laboratory and/or field study results by comparison to reference products or from a history of use in service.

### 1.1.2 Exclusions

Wood species, product types and end uses that are not listed in the tables within this standard may not comply this standard. These should be assessed as an alternative solution in accordance with the New Zealand Building Code (NZBC).

All the timber and wood products are included in this draft standard, based on testing and history of use. However Testing may not cover every possible exposure scenario for all the hazard class situations. When in doubt about the suitability of a particular treatment or protection system, seek technical advice.

Where treated timber shows evidence of decay and is being replaced, a high fungal inoculum potential may exist and have a potential negative impact on the durability of the replacement timber. This has been observed when replacing poles affected by brown rot in sandy soils. In these circumstances do not install the replacement pole in the same hole/position, or if repositioning is not possible, dig out the soil and replace with new fill material.

During construction such as when laying concrete pads or paths, If boxing timber (untreated or to lower hazard class is used) is in ground contact and left in contact with posts or building poles, the boxing timber may decay and increase the fungal inoculum potential and be risk to the long term durability of the post or pole.

#### *C1.1.2*

*The durability required by the NZBC for wood species other than those specified in this Standard will normally be established on the basis of a written opinion from an authoritative source, such as from the Building Research Association of New Zealand (BRANZ) or Scion (NZ Forest Research Institute). For structural components and components used in locations that need to have a life of 50 years or greater, the opinion will be based on biological hazard testing using the Australian Wood Preservation Committee protocols.*

## 1.2 Objectives

The objective of this standard is to provide those designing and constructing buildings with a means of specifying the timber and wood based products that will ensure that building components will comply with the requirements of NZBC Clause B2 "Durability".

## 1.3 Interpretation

For the purposes of this standard, the word 'shall' refers to requirements that are essential for compliance with the standard, while the word 'should' refers to practices that are advised or recommended.

Clauses prefixed 'C' and printed in italic type are intended as comments on the corresponding clauses. They are not to be taken as the only or complete interpretation. The standard can be complied with if the comment is ignored.

## 1.4 Definitions

For the purposes of this standard the following definitions shall apply:

<b>Acetylated wood</b>	A modification of sawn radiata pine where acetic anhydride reacts with free hydroxyl groups in wood
<b>Balcony</b>	An open deck (no roof or walls) attached to the exterior of the main structure of a building and supported by cantilevered joists
<b>Boundary joist or header joist</b>	A joist running along the outer ends of the floor joists
<b>Cross laminated timber (CLT)</b>	A composite structural panel product with three or more layers of lamella (sawn boards) where the lamella in adjacent layers are oriented perpendicular to each other. The lamella layers are always fixed together but the lamella are seldom fixed together within a layer. The minimum lamella thickness is 10 mm
<b>Deck</b>	An open floor (with no roof or walls) attached to the exterior of the main structure of a building and supported by ordinary joists
<b>Enclosed balustrade</b>	A timber-framed balustrade that is closed in on all sides
<b>Enclosed deck or balcony</b>	A timber-framed deck or balcony above an interior or exterior space, that has an impermeable upper surface and is closed in beneath that surface
<b>Engineered wood products</b>	Cross laminated timber (CLT), glued laminated timber (Glulam), laminated veneer lumber (LVL), plywood and reconstituted wood based panels
<b>Feedstock</b>	Sawn timber that is used to manufacture large format timber elements
<b>Finger jointing</b>	For the purposes of durability, finger jointed products are considered as sawn timber
<b>Flat roof</b>	A roof with its exterior surface at an angle of less than 10° to horizontal, or at a slope of less than 1 in 6
<b>Framing</b>	Timber elements that support lining, cladding, flooring, or decking or other parts of the structure, or to resist other forces applied to them
<b>Framing/Structural</b>	Timber graded for use as framing as specified in NZS 3604 or for use as structural components that require specific engineering design using NZS AS 1720.1
<b>Glued laminated timber (Glulam)</b>	A structural element formed by gluing together finger-jointed timber laminations that all have the grain parallel to the longitudinal axis
<b>Grade</b>	The established quality or use classification of timber (see NZS 3631)
<b>Ground atmosphere</b>	The atmosphere between the ground and the floor (that is, in the subfloor space)
<b>Ground contact</b>	In contact with the ground or concrete without separation by a moisture barrier

<b>Hazard class</b>	Describes an exposure and service condition where timber and wood-based products are at particular risk of biodegradation by one or more biological agents (such as fungi, insects, bacteria, or marine organisms)
<b>Heartwood or Heart</b>	The inner layers of the log that, in the growing tree, have ceased to contain living cells. Heartwood is generally darker in colour than sapwood
<b>Laminated veneer lumber (LVL)</b>	A structural product assembled from veneers laminated with adhesive, in which the grain direction of the outer veneers and most of the other veneers is parallel to the longitudinal axis. Manufactured in conformance with the requirements of AS/NZS 4357 and intended for structural applications
<b>Large format timber elements</b>	Includes LVL and Glulam elements with a cross-sectional area greater than 54,000 mm <sup>2</sup> , a thickness greater than 130 mm, or a depth greater than 600 mm. This excludes lintels and bearers in buildings within the scope of NZS 3604. All CLT elements are large format timber elements
<b>Mass timber structure</b>	A structure assembled from large format timber elements that provide part or all of the structural system. This includes structural systems such as post and beam, moment resisting frames, stressed skin panels, and panelised systems
<b>Parapet</b>	A timber-framed wall that is closed in on both faces and runs along the edge of a roof, extending above the level of the roof cladding
<b>Reconstituted wood-based panels</b>	The range of derivative wood panels that are manufactured by binding or fixing the strands, particles, and fibres, together with adhesive or other fixation methods
<b>Skillion roofing</b>	A pitched roof where the ceiling lining is parallel to and close to the roof cladding. The roof may be mono-pitch or have more than one roof plane. Some skillion roofs have rafters exposed below the ceiling
<b>Structural LVL</b>	LVL manufactured in conformance with the requirements of AS/NZS 4357 and intended for structural applications
<b>Surface treatment</b>	A chemical surface treatment applied to cross-laminated timber faces and edges
<b>Wood-based building component</b>	Any component of a building that consists of, or is made primarily from wood or wood fibres, and includes: <ul style="list-style-type: none"> <li>(a) Unsawn wood elements, such as logs, poles or posts;</li> <li>(b) Sawn timber (whether or not dressed or gauged);</li> <li>(c) Engineered wood products</li> </ul>

## 1.5 Abbreviations

Abbreviations have the following meanings:

BAE	boric acid equivalent
CCA	Copper chromium arsenic
CLT	Cross laminated timber

DMDHEU	Dimethyloldihydroxyetheleneurea
EWP	Engineered wood product
Glulam	Glue laminated timber
LOSP	Light organic solvent preservative
LVL	Laminated veneer lumber
NZBC	New Zealand Building Code
WES-TWA	Workplace Exposure Standard – Time Weighted Average

## 2 Mandatory requirements for compliance with the durability provisions of Clause B2 of the New Zealand Building Code

### 2.1 General

#### 2.1.1 Background

This revision contains some requirements for treatment of timber framing and large format timber elements that have changed since the 2003 document. The treatment of framing timber and large format timber elements shall not be seen as an alternative to or replacement for the principles of sound weathertightness design and good workmanship in building. The principle that absence of moisture should be the primary safeguard against decay still applies.

NZS 3640 is being revised at the same time as this standard and there will be amendments to the Ministry for Business, Innovation and Employment Building Performance approved documents B2/AS1 and E2/AS1 that are expected to align with this standard. This revision is in response to changes in material design, types, and selection, and as new knowledge has become available.

Specifiers are advised that:

- (a) When changes are a result of one or more previous deficiencies, there is no single course of action that will overcome all deficiencies;
- (b) Face-sealed cladding (often referred to as monolithic) facilitates the retention of moisture;
- (c) Any timber framing whether treated or not which becomes damp and remains damp will be susceptible to decay.

#### 2.1.2 Durability ratings

Wood-based building components are classified into durability ratings depending on their structural function and their ease of access, replacement, and detection of failure. The highest durability rating is for a minimum of 50 years unless the building has a specified intended life. Other wood-based building components require a durability of not less than either 5 or 15 years, unless the building has a specified intended life that is less than these, again dependent on ease of access, replacement and detection of failure. In order to meet these three levels of durability, section 2 of this standard primarily specifies the grades, moisture contents, and natural durability or chemical treatments that are required in wood-based building components made from certain wood species.

#### 2.1.3 Surface coating

Where required by this standard, surface coatings shall be an appropriate paint type or coating treatment that is applied in accordance with AS/NZS 2311, or a specialised coating system that is applied in accordance with the manufacturer's instructions. The coating shall then be maintained so the coated timber or wood-based product will achieve the durability requirements of the New Zealand Building Code.

#### **C2.1.3**

*Primer paint will deteriorate if left exposed. The top coats should therefore be applied without undue delay. If the priming is exposed for more than a month, re-priming may be necessary. Refer to AS/NZS 2311.*



#### **2.1.4**     *Moisture control*

This standard requires all the design and detailing considerations to be provided that are necessary to control moisture to the appropriate level, although it makes provision for instances where there may be an unintentional lack of moisture content control.

#### **2.1.5**     *Framing/structural grades*

Framing/Structural grades of timber shall be specified in accordance with NZS 3604 or NZS AS 1720.1 as appropriate. Other grades of timber shall be in accordance with NZS 3631 unless otherwise stated.

#### **2.1.6**     *Moisture protection and management*

##### **2.1.6.1**     *Protection*

Within the building envelop, all timber and wood-based products shall be protected prior to installation, to minimise increases in moisture content or physical damage that could reduce their durability or structural strength

##### **2.1.6.2**     *Damp-proofing*

All timber and wood-based products shall be separated from concrete or masonry with a damp-proof membrane. This is not required for timber treated to Hazard class H4 or H5, provided moisture transferred through this timber will not cause moisture-related problems in adjacent materials.

##### **2.1.7**     *Framing moisture content*

Timber with moisture content greater than 20% shall be dried to 20% or less before internal linings and finishing timber are attached to it. Any damage shall be made good or the timber replaced. Refer to E2 /AS1 for further information.

#### **2.1.8**     *Timber profiles*

##### **2.1.8.1**     *Joinery and mouldings*

Profiles of joinery and mouldings shall comply with NZS 3619 or NZS 3610 as appropriate.

##### **2.1.8.2**     *Flooring*

Profiles of flooring shall comply with NZS 3617.

##### **2.1.8.3**     *Weatherboards and fascia boards*

Profiles of weatherboards and fascia boards shall comply with NZS 3617.

##### **C2.1.8.3**

*Boards narrower than 200 mm are expected to be more stable than wider ones.*

*NZBC Verification Method E2/VM1 and AS/NZS 4284 provide NZBC compliance test methods for other weatherboard and fascia board profiles.*

## **2.2**     **Timber species, grade, quality, and preservative treatment**

### **2.2.1**     *Timber and wood-based products*

Timber and wood-based products for use in buildings shall comply with Tables 1, 2, and 3.

Large format timber elements shall comply with Table 6

The tables detail requirements, including the species, grade or type of product and any preservative treatment for the following:

- (a) Table 1: Requirements for wood-based building components to achieve 50-year durability performance;
- (b) Table 2: Requirements for wood-based building components to achieve 15-year durability performance;;

- (c) Table 3: Requirements for wood-based building components to achieve 5-year durability performance;
- (d) Table 4: Requirements for large format timber elements to achieve a 50-year durability performance.

## **2.2.2 Non-biocidal Wood products**

Dimethylol-dihydroxy-ethylene-urea (DMDHEU) and Acetylated wood is a non-biocidal modification of radiata pine as described in NZS 3640.

## **2.2.3 Plywood**

### **2.2.3.1**

Plywood shall be preservative treated in accordance with 2.3.1 when it is used in the following situations:

- (a) As exterior cladding;
- (b) Exterior use in a vertical situation where there is a life expectancy of more than 5 years, where water will not be trapped, and where debris will not be allowed to accumulate;
- (c) Other exterior uses where dampness, water accumulation, or debris accumulation could occur;
- (d) Exposed to ground atmosphere in a subfloor or crawl space situation where dampness or condensation may occur except that flooring shall be as in Table 1C;
- (e) In interior use situations where persistent dampness or condensation could occur on a long term basis; and
- (f) Behind a cladding where dampness or condensation may occur as referenced in Table 1D.

#### **C2.2.3.1**

*Guidance on which type of plywood should be used in any particular situation can be obtained from the forewords of AS/NZS 2270, AS/NZS 2271 and AS/NZS 2269. Additional information may be obtained from the manufacturers.*

*Structural plywood, as specified in AS/NZS 2269, is plywood adequate for service in exterior conditions and primarily intended as a construction material where strength properties are the main consideration. Characteristic stresses for structural plywood are given in NZS AS 1720.1.*

### **2.2.3.2**

When plywood is exposed to in-service weather, physical protection shall be provided using either preservative treatment or preservative treatment in conjunction with paint (see Tables 1, 2, and 3) to ensure the required durability. Paint shall be regularly maintained and replaced during the life of the plywood.

### **2.2.3.3**

Plywood conforming to AS/NZS 2271 or AS/NZS 2269 that is used in interior dry situations (protected from the weather, high humidity or dampness) does not need to be treated. The inside face of a drained ventilated cavity behind exterior cladding is not an interior dry situation.

## **2.2.4 Reconstituted wood-based panels**

Reconstituted wood-based panels are shown in Tables 1, 2, and 3. Manufacture shall be to the following standards AS/NZS 1860.1 for flooring, AS/NZS 1859.1 for other structural applications, and AS/NZS 1859.2 for non-structural applications. Where required, preservative treatment shall be in accordance with clause 2.3.4. Reconstituted Wood Panel manufactured to these standards that is used in interior dry situations (protected from the weather or dampness) does not need to be treated.

## **2.2.5 Engineered wood products (EWP)**

Timber used in EWP or laminated timber components shall be as per the requirements for solid timber set out in Table 1 to 3, with the exception of Table 1A, unless as otherwise specified. Where preservative treatment is required, the treatment shall be as per NZS 3640 unless otherwise specified by reference in the table.

## **C2.2.5**

*This includes the use of laminated beams and posts (not in direct ground contact). The use of engineered wood products in contact with ground is outside the scope of this standard.*

### **2.2.6 Laminated veneer lumber (LVL)**

Manufacture of laminated veneer lumber shall be in accordance with AS/NZS 4357. Chemical treatment requirements shall be as per this standard.

### **2.2.7 Glue laminated timber (Glulam)**

Materials, finishes, and workmanship of glued laminated timber shall be specified in accordance with the requirements of AS/NZS 1328. Adhesives shall comply with the 50-year durability for the given service class as per AS/NZS 4364.

### **2.2.8 Cross laminated timber (CLT)**

All CLT elements are large format timber elements. Treatment shall be to the requirements of section 4 and Table 6.

## **2.3 Preservative treatment**

### **2.3.1 General**

Timber and wood-based products that use those species of wood in Table 1, Table 2, and Table 3 and that are required to be treated shall be clearly identified in accordance with NZS 3640 except as prescribed in 2.3.2, 2.3.3 and 2.3.4.

## **C2.3.1**

*For preservative treated timber and wood products, the hazard classes of relevance to buildings are H1.1, H1.2, H3.1, H3.2, H4, and H5. Specifiers should be aware of these hazard class specifications and ensure the appropriate hazard class wood-based products are used as required in buildings. The branding requirements for timber are given in NZS 3640.*

*Framing timber can be identified as H1.2 or H1.2E depending on the treatment method given in NZS 3640.*

*Care should be taken in the handling of treated timber and disposal of sawdust and off-cuts. The chemical preservation process results in chemical deposits in the timber. The wearing of gloves is recommended to avoid the risk of transfer of chemical residues onto skin. Wear eye protection to protect eyes from wood dust. A disposable dust mask should be worn to prevent inhalation of wood dust. Workplace Exposure Standard – Time Weighted Average (WES-TWA) limits have been set for wood dust. In industrial situations, mechanical ventilation is recommended.*

*Treated wood offcut, sawdust, and other wood waste should not be burned in domestic fireplaces or burners. Toxic compounds can be released in smoke and can be concentrated in wood ash. Corrosion of metal fire grates can also be accelerated. Dispose of treated wood waste to landfill or, if available, to an approved industrial incinerator or kiln. For more information on treated timber, refer to the manufacturer's or supplier's safety data sheet.*

### **2.3.2 Plywood**

Where required, plywood shall be treated to the hazard class given in Tables 1, 2, and 3. The glue line and surface spray treatment shall be in accordance with NZS 3640. The two specific envelope treatments, for propiconazole and tebuconazole or copper chromium arsenic (CCA), shall be in accordance with AS/NZS 1604.3.

Envelope penetration patterns from AS/NZS 1604.3 shall only be applied for H3.1 using the LOSPazole (propiconazole and tebuconazole), and for H3.2 using CCA treatments noted under H3 in AS/NZS 1604.3, Table H3.1. Where these envelope treatments are used, the penetration zone, and branding, shall be to the requirements of AS/NZS 1604.3

### 2.3.3 LVL

Where required, LVL shall be treated to the hazard class given in Tables 1, 2, and 6. The glue line and surface spray treatments shall be in accordance with NZS 3640. The two specific envelope treatments, for propiconazole and tebuconazole or CCA, shall be in accordance with AS/NZS 1604.4.

Envelope penetration patterns from AS/NZS 1604.4 shall only be applied for H3.1 using the light organic solvent preservative (LOSP) azole (propiconazole and tebuconazole) noted under H3 in AS/NZS 1604.4, Table H3.1. Where this envelope treatment is used, the penetration zone and branding, shall be to the requirements of AS/NZS 1604.4

For all fixed preservatives used for H3.1 and greater, supplementary treatment shall be applied in accordance with 2.3.5

### 2.3.4 Reconstituted Wood Panel

Where required, Reconstituted Wood Panel shall be treated to the hazard class given in Tables 1, 2, and 6. Preservative treatment will be to AS/NZS 1604.2, particle treatment (AS/NZS 1604.2, Table 2.1) with azole (propiconazole and tebuconazole) retention as set out in NZ 3640 for H1.2 and H3.1. Branding and compliance shall be to the requirements of AS/NZS 1604.2.

### 2.3.5 Supplementary treatments

#### 2.3.5.1 General

The cutting, machining/shaping or notching of treated timber, could expose less well-treated inner zones. This includes heartwood where the protection could only be an envelope. For H3.1 and above, supplementary treatment to these cut surfaces is a requirement to protect the integrity of the preservative treatment. This protection, however, shall not be expected to be as effective as the original treatment.

#### 2.3.5.2 Copper naphthenate

Copper naphthenate at equivalent to at least elemental copper 15 g/L shall be applied by brush or roller as two coats to surfaces. Allow the first coat to dry before applying the second coat.

This treatment is a surface treatment. It is suitable for hazard class H3.1 and higher.

##### **C2.3.5.2**

*Copper naphthenate is formulated as a concentrate in a hydrocarbon solvent. The treatment solution is a bright green colour. Concentrates are diluted with white spirit before application*

#### 2.3.5.3 Zinc naphthenate

Zinc naphthenate at equivalent to at least elemental zinc 25 g/L shall be applied by brush or roller as two coats to surfaces. Allow the first coat to dry before applying the second coat.

This treatment is a surface treatment. It is suitable where a non-colourless treatment is required and for hazard class H3.1 and higher.

##### **C2.3.5.3**

*Zinc naphthenate is formulated as a concentrate in a hydrocarbon solvent. The treatment solution is colourless when applied. Concentrates are diluted with white spirit before application.*

#### 2.3.5.4 Boron

A supplementary boron treatment for H3.1 timber is suitable provided a protective paint coating is also applied afterwards to the cut end or notch.

A boron in glycol formulation at equivalent to elemental boron 52 g/L shall be applied by brush or roller as two coats to surfaces.

#### **C2.3.5.4**

*Allow the first coat to dry before applying the second coat. The treatment can be applied to dry or damp timber. The presence of some moisture in timber enhances diffusion and will increase the depth of penetration.*

*Formulations may be colourless or include a red dye.*

#### **2.3.6 Handling and storage**

Treated timber shall be handled and stored before use to avoid exposing it to a hazard situation that it has not been treated for and therefore against which it has not been protected. H1.1, H1.2, and H3.1 timber shall be stored undercover and out of contact with the ground. H3.2 timbers should be stored out of contact with the ground.

#### **2.3.7 Fixings and fastenings**

Preservative treated timber and other wood products may affect the durability of metal fastenings and other building components, including protective coating systems, building wraps, sealants and adhesives. Building components in contact with preservative-treated timber shall be of compatible materials or separated by a protective system so the minimum durability performance requirements of the timber or building component are not compromised by the other material. Components of metal fixings or fastenings shall also be of compatible metals.

Fixings or fastenings in contact with timber treated with copper-based timber preservatives shall be, as a minimum, hot-dipped galvanised steel. Fixings or fastenings in contact with acetylated wood shall be stainless steel with a minimum grade of 304.

#### **C2.3.7**

*Timber treatments could affect the life of fixings or fasteners and evidence or opinions predicting satisfactory performance may be required by the Building Consent Authority. The expected life of hot-dipped galvanised steel fixings or fastenings that are in contact with damp copper-based preservative treated timber can be less than 50 years and in some cases less than 15 years. In particular, steel fixings or fastenings in contact with timber treated with preservatives that result in a high level of residual copper salts, such as copper azole (CuAz) and alkaline copper quaternary (ACQ) will require special consideration when used in damp conditions as the risk of corrosion is substantially higher than when using timber treated with copper chrome arsenate (CCA) preservative to the same hazard class. In those situations, the use of type 304 stainless steel should be considered. Refer to NZS 3604 and the National Association of Steel Framed Housing.*

*The life of unprotected electroplate galvanised fixings can be considerably less than hot-dipped galvanised fixings. Additional proprietary coatings can extend their life, but their durability performance must be established in accordance with B2/VM1. The life of galvanised structural components can be extended by incorporating a sacrificial thickness of metal or by increasing the thickness of the increased weight of galvanising.*

*NZS 3604 provides a compliant solution for steel fixings and fastenings in connection with preservative-treated timber and E2/AS1 provides material compatibility tables for given minimum durability periods. These documents can be referred to where appropriate. Specifiers may elect to specify a higher standard than that required by the New Zealand Building Code for other purposes; however, the material compatibility requirements of this clause will still apply.*

### **2.4 Wood-based building components in contact with the ground, to achieve a 50-year durability**

#### **2.4.1 Requirements for wood-based components in contact with ground**

Table 1A lists the species or type, grade, in-service moisture range, and preservative treatment required for wood-based building components in contact with the ground.

#### **2.4.2 Round or square timber house piles and poles**

Round or square timber house piles and poles for use in buildings shall be in accordance with NZS 3605. Any cut or bored surfaces shall have in situ treatment according to clause 2.3. Cut ends, notches and holes in poles and piles that are made after treatment shall not be put into the ground, or be closer than the distances specified in NZS 3604 to the ground, and shall be protected from the weather.

#### **C2.4.2**

*In ground contact situations, the presence of untreated timber or wood residues (such as bark mulch) adjacent to or in contact with H4 or H5 treated timber piles and poles can adversely affect the lifespan of these products.*

#### **2.4.3 Crib walling**

Crib walling shall be constructed of treated timber as required by Table 1A.

#### **C2.4.3**

*Crib walls are normally engineered retaining structures. Proprietary design procedures, height limitations and construction methods are available for building crib retaining walls. Components for these walls are normally manufactured from timber that has a grade equivalent to No. 1 Framing as specified in NZS 3631.*

### **2.5 Wood-based building components exposed to exterior weather conditions and dampness, to achieve a 50-year durability**

#### **2.5.1 Requirements for wood-based components exposed to weather and dampness**

Table 1B lists the species or type, grade, in-service moisture range, and preservative treatment required for wood-based building components that are exposed to exterior weather conditions and dampness but are not in contact with the ground.

#### **2.5.2 Exterior cladding used as bracing**

Plywood cladding used as a bracing element that is performance rated in accordance with the BRANZ P21 test procedure shall be protected by the manufacturer's specified exterior paint systems, which shall be regularly maintained. Detailing near doors and other fittings shall prevent collection of debris that could damage the plywood surface. Battens and other items attached to the surface shall have capillary breaks and surfaces that encourage drainage of water and shedding of debris.

#### **2.5.3 Adhesives**

Adhesives for timber or wood-based products that are used in exterior or exposed situations shall meet the minimum durability requirements for a life of 50 years based on *in situ* exposure. Adhesives for glued laminated timber shall comply with the requirements of AS/NZS 4364 for service class 2 or 3 as applicable.

### **2.6 Wood-based building components protected from the weather but exposed to ground atmosphere, to achieve a 50-year durability**

#### **2.6.1 Requirements for wood-based components protected from weather but exposed to ground atmosphere**

Table 1C lists the species or type, grade, moisture content in-service moisture range and preservative treatment required for wood-based building components that are protected from the weather but exposed to ground atmosphere.

#### **C2.6.1**

*The care and proper handling of timber after treatment and prior to use (and in service where the relevant Hazard Class contains recommendations relating to necessary or desirable maintenance procedures) can have a bearing on its durability in service.*

#### **2.6.2 Moisture control and subfloor areas**

Moisture shall be controlled in subfloor spaces beneath timber and wood-based flooring. Control measures shall be maintained in an effective condition throughout the life of the building. All subfloor spaces shall be ventilated.



### **C2.6.2**

*Subfloor ventilation is vital for the moisture content of reconstituted wood products such as particleboard floors to remain less than 18% moisture content as required by E2/AS1. Cross ventilation can be achieved by providing appropriate openings around the subfloor space in accordance with NZS 3604 or using alternative measures as described in E2/AS1.*

*A vapour barrier such as polythene is recommended to cover the ground, especially when ventilation is not available on all four sides of a building subfloor space. The durability of subfloor framing is directly related to the amount of ventilation of the subfloor area. If the ventilation is decreased, the moisture content and risk of degradation of the timber structure are likely to increase along with a reduction to the life of the structure.*

### **2.6.3 Sheet bracing**

#### **2.6.3.1**

Plywood sheet bracing in subfloor areas shall be treated as shown in Table 1C.

Edges of plywood sheets branded with an E that are cut, machined, or bored need supplementary treatment as specified in 2.3.

#### **2.6.3.2**

Fibre boards complying with AS/NZS 2908 shall be suitable for bracing when rated by the BRANZ P21 test procedure, provided that the surface treatment, coatings, and details are appropriate to the exposure level and can be demonstrated to achieve at least a 50-year durability as required by the New Zealand Building Code Clause B2.

### **C2.6.3.2**

*The manufacturers of some fibre boards specify they are required to remain dry in service.*

## **2.7 Wood-based building components not exposed to weather or ground atmosphere but with a risk of moisture content conducive to decay, to achieve a 50-year durability**

### **2.7.1 Requirements for wood-based building components with a risk of moisture content conducive to decay**

Table 1D lists the species or type, grade, in-service moisture range and preservative treatment required for wood-based building components that are not directly exposed to the weather but are at risk of a raised moisture content that would be conducive to decay.

### **2.7.2 End-uses with a risk of elevated moisture content**

This section applies to at least the following risk situations:

- (a) Elements supporting or within enclosed decks or balconies (see Figure 1):
  - (i) Elements within enclosed decks or balconies with a risk of decay
  - (ii) Element supporting enclosed decks or balconies with a risk of decay, such as walls supporting decks
  - (iii) Elements supporting enclosed cantilevered decks having increased risk of failure due to there being single points of support;
- (b) Timber-framed elements exposed to exterior weather conditions on both faces such as parapets and balustrades, or exterior boxed beams, boxed columns, or boxed chimneys;
- (c) Timber-framed elements exposed to exterior weather conditions on one face, but where the penetration of moisture during the life of the building is likely and detection of elevated moisture levels is difficult such as:
  - (i) Elements within enclosed flat roofs or skillion roofs
  - (ii) Sarking and framing not protected from solar driven moisture, for example through absorbent roofing materials such as shingles
  - (iii) Valley boards and boards supporting flashings or box gutters to roof penetrations and upstands to roof decks

- (iv) Sheet material providing wall bracing to external walls
- (v) Battens used behind cladding to form a cavity
- (vi) Framing and other elements in exterior walls including boundary joists.
- (d) Other timber-framed elements
  - (i) All roof trusses, roof framing, ceiling and eaves framing, and sarking excluding that on enclosed skillion and flat roofs, or that are not protected from solar-driven moisture e.g. through absorbent roofing materials. All mid-floor framing elements and associated ceiling framing but excluding boundary joists;
  - (ii) Internal walls;

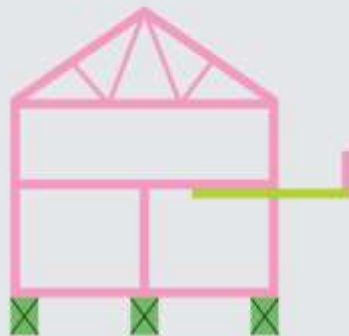
### **2.7.3**     *Timber battens or Batten in drained ventilated cavities*

Timber battens are used behind some claddings to form a drained ventilated cavity. Treatment of these battens must be carried out in final shape and cross section to the level required in Table 1D. Refer to E2/AS1 for examples of claddings that are required to have a drained ventilated cavity.



## For Timber Framing With:

**Cantilevered enclosed balcony and balustrade**



 **H1.2**

 **H3.2**

**Enclosed balcony and balustrade with living space below**



 **H5**

**Enclosed balcony and balustrade open below**



H5 post if in contact with the ground or concrete.

Figure 1 Example of treatment requirements for timber-framed buildings

## **2.8 Wood-based building components protected from the weather and in dry conditions and not exposed to ground atmosphere, to achieve a 50-year durability**

### **2.8.1 Requirements for wood-based components in protected dry conditions**

Table 1E lists the species or type, grade, in-service moisture range and preservative treatment required for wood-based building components protected from the weather and in dry conditions and not exposed to ground atmosphere.

### **2.8.2 Scope**

Section 2.8 applies to situations where there are dry conditions or a low risk of moisture content conducive to decay and applies to the following risk situations:

- (a) Sheet materials providing bracing to internal walls;
- (b) Interior flooring;
- (c) Unlined buildings that are not used for purposes involving high humidity or moisture (such as saunas, spa pools, or some agricultural purposes where there is elevated moisture content conducive to decay).

#### **C2.8.2**

*It is recommended that ground surrounding unlined buildings including garages and agricultural and industrial buildings, should be contoured so as to direct surface water away from the building floor so that the bottom plate is not at risk of prolonged elevated moisture content.*

### **2.8.3 Protection of interior flooring**

#### **2.8.3.1**

Floor coverings in 'wet areas' such as laundries, bathrooms, kitchens, and toilets shall have an impervious coating. Where maintenance of an impervious coating cannot be assured in wet areas, plywood, reconstituted wood products, and sawn timber flooring shall be treated to a minimum H1.2. Where flooring itself is the primary support structure, this shall be treated to a minimum H3.2.

#### **C2.8.3.1**

*Considerable undetected water damage to particleboard and surrounding wall floor framing can occur under baths used as a shower and under certain types of shower trays. Methods of protection are available in E3/AS1.*

#### **2.8.3.2**

Other floor coverings such as linoleum, tiles, and so on, and durable coatings such as specialised finishes shall be maintained to ensure the timber, particleboard, plywood, or wood-based products' surface is protected from moisture penetration and entrapment.

#### **2.8.3.3**

Steam vents from clothes driers shall not exit into the subfloor area, roof spaces, walls, or floor cavities and all floor drains shall be piped to the outside of the building.

#### **2.8.3.4**

Flooring at exterior doors and full-height windows shall be protected by incorporating sill and head flashings to prevent leakage and consequent moisture damage to particleboard, plywood, or wood-based flooring.

#### **2.8.3.5**

Flooring shall be protected from localised heat sources. The methods of providing protection are outside the scope of this standard.

### **C2.8.3.5**

*Methods of protecting flooring from fixed appliances that use controlled combustion and from luminaries such as down lights are available in Acceptable Solutions B1/AS3 and C/AS1.*

#### **2.8.4**     *Finger jointing*

Finger-jointed timber shall comply with the requirements of AS/NZS 1491, AS 5068, AS 5069, or AS/NZS 8008.

#### **2.8.5**     *Solar driven moisture control and condensation*

##### **2.8.5.1**

All timber and wood-based products shall be either protected from the effects of condensation and moisture or be treated to the appropriate hazard class. See Tables 1, 2 and 3.

##### **2.8.5.2**

Construction shall comply with New Zealand Building Code Clauses E2 and E3.

### **2.9**     **Wood-based building components with a 15-year durability**

#### **2.9.1**     *Requirements for wood-based components in exposed conditions*

Table 2A lists the species or type, grade, in-service moisture content and preservative treatment required for wood-based building components exposed to exterior weather conditions and dampness. Table 2B lists the requirements for wood-based building components protected from the weather and dampness.

### **C2.9.1**

*Wood-based building components that are moderately difficult to access or replace and for which failure would go undetected during normal use of the building, are required to have a minimum durability of 15 years. Included in this category are framing for non-loadbearing walls, weatherboards, exterior joinery, stair components and balustrades depending on the details of construction and hence the degree of difficulty to replace. Hidden fixings of the external envelope that are difficult to replace or inspect need to have a minimum durability of 50 years.*

#### **2.9.2**     *Weatherboards and exterior finishing timbers*

##### **2.9.2.1**

Unless covered by 2.9.2.5, weatherboards and exterior finishing timbers required to have paint protection shall be primed on all faces (including cut ends) prior to fixing.

### **C2.9.2.1**

*Primer paint will deteriorate if left exposed. The top coats should therefore be applied without undue delay. If the priming is exposed for more than one month, re-priming could be necessary (refer to AS/NZS 2311).*

*Application of a water repellent will improve the stability of painted timber, but is not a substitute for priming.*

*Water can readily penetrate through the end grain of a timber element and lead to timber decay, even when the element is covered by other wood-based building components, such as mitred weatherboards.*

##### **2.9.2.2**

Weatherboards that are protected by a well-maintained three-coat alkyd or 100% acrylic paint in accordance with AS/NZS 2311 shall, if requiring treatment, be treated to at least H3.1 in accordance with Table 2A.

### 2.9.2.3

Grading requirements additional to those set out in NZS 3631 are as follows:

- (a) All holes, resin, and bark pockets shall be excluded;
- (b) Knot size shall not exceed 50 mm, or 25 mm width for spike knots.

#### **C2.9.2.3**

*Dressing grade plus the additional requirements set out above is the lowest grade regarded as suitable in these locations. Where appearance is of major concern, the specification of superior grades should be considered.*

### 2.9.2.4

The selection of paints or water repellents for knots and other resinous areas shall be obtained from AS/NZS 2311.

### 2.9.2.5

For 'no finish' or 'stained finish' condition, only the heartwood of the following species are permitted: redwood, cypress, western red cedar, Japanese cedar, totara, and beech (silver, red, and hard), and sawn H3.2-treated radiata pine.

Profiles of weatherboards and fascia boards shall comply with NZS 3617

#### **C2.9.2.5**

*Boards narrower than 200 mm can be expected to be more stable than wider ones.*

*NZBC Verification Method E2/VM1 and AS/NZS 4284 provide NZBC compliance test methods for other weatherboard and fascia board profiles.*

### 2.9.2.6

The acceptability, for particular uses of profiles of weatherboards and fascia boards not complying with NZS 3617 shall be determined in accordance with New Zealand Building Code B2/VM1.

### 2.9.3 Finger-jointing

Finger-jointed timber shall comply with the requirements of AS/NZS 1491, AS/NZS 5068, and AS/NZS 5069.

### 2.9.4 Exterior window joinery and door frames

Exterior window joinery and door frames shall comply with NZS 3610 or NZS 3619.

### 2.9.5 Exterior sheet claddings

When used in exterior situations that are subjected to high humidity:

- (a) Plywood shall be manufactured in compliance to AS/NZS 2269
- (b) Reconstituted wood-based panels shall be manufactured using weather-resistant adhesives.

### 2.9.6 Exterior floors

#### 2.9.6.1

Exposed decking and verandah flooring have similar exposure hazards risks and no distinction is made between them in terms of grade, quality and treatment of timber. See Table 2A.

#### **C2.9.6.1**

*The durability of eucalyptus species and some imported timber species varies considerably. Care should be taken when considering the selection of such species and this consideration should relate to the expected risks. Balau decking has been reported to fail within 5 years and its use is therefore is not recommended. Table 2A specifies the species. Further information should be sought from SCION or BRANZ.*

### 2.9.6.2

Plywood complying with 2.2.3.1 is suitable for exterior flooring provided plywood is manufactured in compliance with AS/NZS 2269, and treated in accordance with 2.3.2. See Table 2A.

### 2.9.7 Slip resistance

Due attention shall be paid to acceptable slip resistance of all walking surfaces, both wet and dry in accordance with D1/AS1 as appropriate.

### 2.9.8 Protective surface coatings

Surface coatings shall be a paint type or surface treatment applied in accordance with AS/NZS 2311 and regularly maintained so that the building element concerned will have a minimum durability of 15 years as required by the New Zealand Building Code.

#### **C2.9.8**

*The type and colour of protective finish influences the rate and amount of moisture that will be absorbed or lost from timber. Dark coloured finishes on exterior cladding can result in high surface temperatures and the moisture content of the cladding can fall to well below that expected of similar cladding with a light coloured finish and cause resin bleeding, excessive shrinkage, checking, and failure of the finishing material. (Refer also to the New Zealand Timber Industry Federation Timber Design Guide).*

## **2.10 Wood-based building components to achieve a 5-year durability**

### 2.10.1 Requirements for wood-based components in protected dry conditions

Table 3 lists the species or type, grade, in-service moisture range, and preservative treatment required for non-structural components that are protected from the weather.

#### **C2.10.1**

*Wood-based building components that are easy to access and replace and their failure is easy to detect are required by the New Zealand Building Code to have a minimum durability of 5 years. Included in this category are interior finishing timbers and mouldings.*

### 2.10.2 Finishing timber and timber linings

Finishing timber and timber linings exposed in any position where condensation or dampness will normally occur, for example in spa rooms, bathrooms, and laundries, shall be protected against decay by appropriate protection such as preservative treatment, or painting.

### 2.10.3 Finger-jointing

Finger-jointed timber shall comply with the requirements of AS/NZS 1491, AS 5068, AS 5069 or AS/NZS 8008.

### 2.10.4 Surface coatings

Surface coatings shall be paint type or surface treatment to maintain a 5-year durability of the element and be applied in accordance with AS/NZS 2311.

### 2.10.5 Plywood, particleboard, fibreboard, and wood-based products

Purpose-made grades of plywood, particleboard, and fibreboards are suitable for most uses to achieve a minimum durability of 5 years in dry conditions.

#### **C2.10.5**

*Particular care is required in the choice of material in any position where condensation and dampness may occur.*

## 2.11 Alternative timber species

### 2.11.1 Requirements for alternative species

Alternative species shall only be those with the botanical names specified in List 1.

#### List 1 – Botanical names for alternative species

Common name	Species name
Alpine ash	Eucalyptus delegatensis
Blackbutt	Eucalyptus pilularis
Blackwood	Acacia melanoxylon
Brownbarrel	Eucalyptus fastigata
European oak	Quercus robor
Hard beech	Fuscospora truncata
Japanese cedar or sugi	Cryptomeria japonica
Kwila	Intsia bijuga or Intsia palembanica
Larch	Larix decidua
Lawson's cypress	Chamaecyparis lawsoniana
Leyland cypress	Cupressocyparis leylandii
Totara	Podocarpus totara
Tallowwood	Eucalyptus microcorys
Macrocarpa	Cupressus macrocarpa
Matai	Prumnopitys taxifolia
Mexican cypress	Cupressus lusitanica
Mountain ash	Eucalyptus regnans
Mountain beech	Fuscospora cliffortioides
Messmate	Eucalyptus obliqua
Redwood	Sequoia sempervirens
Red beech	Fuscospora fusca
Rimu	Dacrycarpus cupressinum
Shining gum	Eucalyptus Nitens
Sydney blue gum	Eucalyptus saligna
Southern mahogany	Eucalyptus botryoides
Silver beech	Lophozonia menziesii
Tawa	Beilschmiedia tawa or B. taraire
Western red cedar	Thuja plicata
White stringybark	Eucalyptus globoidea
Yellow stringybark	Eucalyptus muelleriana
Vitex	Vitex cofassus

Alternative species that require preservative treatment shall be treated and branded in accordance with the requirements of NZS 3640, with the additional requirement that the brand on the finished product shall also include the common or species name.

Alternative species with the sapwood removed shall be branded in accordance with Section 2.11.2.

#### **C2.11.1**

*Species with the common names that are listed in this document are restricted and specified by their botanical names. Their use may be limited by aspects such as dimensional stability, strength, stiffness or fastener spacing and strength that are outside the scope of this standard.*

*A quality assurance system is needed to identify the species and ensure the finished products are correctly branded.*

*Timber for export will normally be treated and branded or identified in accordance with the requirements of the importing country.*

*Sapwood is normally removed at the time the log is sawn. Sapwood may not be easily distinguishable from heartwood by the time that the finished product leaves the sawmill.*

#### **2.11.2 Branding and identification of alternative species containing only heartwood**

Alternative species of timber products that only contain heartwood shall be branded after all cutting and machining using permanent ink, an imprint, incision or a burn brand that is either applied directly to the timber product or a plastic tag affixed to the timber product. The branding shall include both the common or species name specified in Table 1 and the word 'Heartwood'.

#### **C2.11.2**

*The branding may include any logo for the manufacturer and/or Quality Assurance audit organisation, or to meet requirements for other specifications or the user.*

### **2.12 Use of Table 1, Table 2, Table 3 and Table 6**

#### **2.12.1**

Tables 1 to 3 are arranged in order of descending expected service life. Table 1 specifies the use of timber where a minimum durability of 50 years is required, Table 2 specifies where a minimum durability of 15 years is required, and Table 3 specifies where a minimum durability of 5 years is required. Table 6 specifies the requirements of large format timber elements where a minimum durability of 50 years is required.

#### **2.12.2 Flow chart to guide use of Tables**

In order to determine which table to consult, follow the flow chart in Figure 2.

#### **2.12.3 Alternate Solutions**

The use of different timbers or timber treatments to those listed in Table 1 may still comply with the New Zealand Building Code in particular applications. Where the use of a different timber or timber treatment is proposed, this would be an alternative solution and evidence shall be provided to the Building Consent Authority or Building Certifier that the intended use will meet the New Zealand Building Code requirements. For example, if imported hardwood is to be used to surface a deck, evidence is required that the timber would be durable for a minimum of 15 years in the expected exposure conditions.

#### **2.12.4 Preservative treatment**

Throughout the tables, the treatment level specified to NZS 3640 is the minimum; timber treated to a higher level satisfies the minimum requirements except for hazard class H3.1 that shall not be substituted for H1.2 unless specified in NZS 3640.

Laminated Veneer Lumber H3.1 treated to the requirements of clause 2.3.3 may be used where H1.2 treated LVL is specified in Table 1.

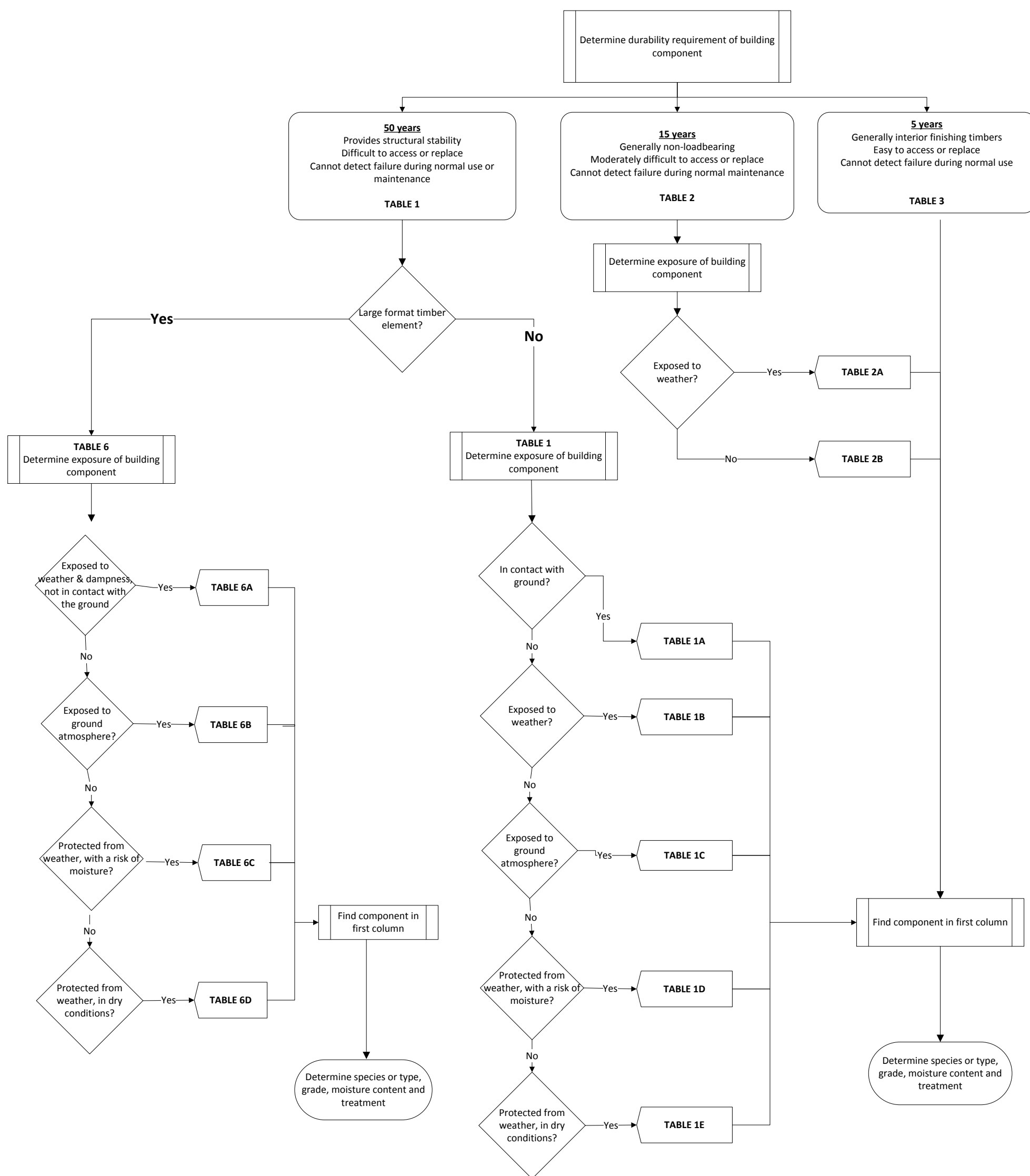


Figure 2 Flow chart guiding the use of Tables 1, 2, 3 and 6



**Table 1 – Requirements for wood-based building components to achieve a 50-year durability performance**

Ref No.	Wood-based building components	Species or type <sup>(1)</sup>	Grade or Standard ref.	Level of treatment <sup>(2)</sup> and Hazard Class <sup>(3)</sup>	See clause/ section
A – Elements in contact with the ground (see section 2.4)					
1A.1	Building piles	Radiata pine	NZS 3605	H5	2.4.2
1A.2	Crib walling		NZS 3631	H5	C2.4.3
1A.3	Sawn poles		NZS 3605	H5	–
1A.4	House poles		NZS 3605	H5	2.4.2
1A.5	Retaining walls – uprights		NZS 3605	H5	–
1A.6	Retaining walls – horizontal elements			H4	–
B – Elements exposed to exterior weather conditions and dampness but not in ground contact (see section 2.5)					
1B.1	Posts, bearers, beams, floor joists, rafters, guardrails, stair stringers	Radiata pine	Framing/structural	H3.2	–
		Alternative species <sup>(4)</sup>	Framing/structural heartwood	None	
1B.2	Cladding as wall bracing	Plywood <sup>(5)</sup>	AS/NZS 2269	H3.1 (5)	2.5.2
1B.3	Cladding as wall bracing	Plywood	AS/NZS 2269	H3.2	2.5.2
C – Elements protected from the weather but exposed to ground atmosphere (see section 2.6)					
1C.1	Jackstuds, subfloor braces, bearers, wall plates, floor joists to the subfloor, blocking, subfloor wall studs, wallings and battens, wall studs and nogs, diagonal boards	Radiata pine	Framing/structural	H1.2	2.6
		Douglas fir	Framing/structural	H1.2	
		Alternative species <sup>(4)(6)(7)</sup>	Framing/structural	H1.2	
		Alternative species <sup>(4)(6)</sup>	Framing/structural heartwood	None	
		LVL	AS/NZS 4357	None	
1C.2	Plywood sheet bracing	Plywood Radiata pine	AS/NZS 2269	H1.2	2.6.3.1

1C.3	Internal flooring and suspended ground floors	Plywood <sup>(8)</sup> LVL	AS/NZS 2269 AS/NZS 4357	None	2.6.2
		Particleboard and other wood-based products <sup>(8)</sup>	AS/NZS 1860.1	None	2.2.4 2.6.2
		Radiata pine	Dressing	H1.2	2.6.2
		Douglas fir	Dressing	H1.2	
		Alternative species <sup>(4)</sup> (6)(7)(9)(10)	Dressing	H1.2	
		Alternative species <sup>(4)</sup> (6)(9)	Dressing heartwood	None	

**Notes to Table 1A to 1C**

- (1) Wood-based building components made from wood species other than those listed may also achieve the required durability but there is not enough data on their durability to permit their inclusion in this Standard. Refer to 1.1
- (2) NZS 3640 specifies the treatment requirements. The exceptions outside 3640 are listed in clauses 2.3.2 and 2.3.3 and 2.3.4
- (3) Throughout Table 1 Treatment for service at a higher hazard class number usually satisfies biological protection requirements for service at a lower hazard class number, except in the case of some H3.1 and H3.2 treatments as specified in NZS 3640
- (4) Alternative species are: Beech (Hard Mountain, Red,) Totara, European oak, Eucalyptus species (E. pilularis, E. muelleriana, E. globoidea, E. microcorys, E. saligna, E. botryoides), Refer to List 1.
- (5) H3.1 LOSP treated items exposed to the exterior must be painted to achieve a 50-year durability and the paint maintained.
- (6) Alternative species are: Larch, Cupressus macrocarpa (macrocarpa), Mexican cypress, Lawson's cypress, Leyland cypress. Refer to List 1.
- (7) Alternative species are Eucalyptus species (E. delegatensis, E. fastigata, E. obliqua, E. regnans). Refer to List 1.
- (8) In wet areas where maintenance of an impervious coating cannot be assured plywood or timber flooring that has been treated to a minimum of H1.2 shall be used. (Refer to 2.8.3.1).
- (9) Alternative species are Matai, Rimu, Silver Beech, Tasmanian Blackwood, Refer to List 1.
- (10) Alternative species is Tawa. Refer to List 1.

Ref No.	Wood-based building components	Species or type <sup>(1)</sup>	Grade or Standard ref.	Level of treatment <sup>(2)</sup> and Hazard Class <sup>(3)</sup>	See clause/ section
<b>D – Elements protected from the weather but with a risk of moisture penetration conducive to decay (see section 2.7)</b>					
Roof elements (in or associated with)					
1D.1	Sarking and framing not protected from solar driven moisture through absorbent claddings materials <sup>(4)</sup>	Plywood and Reconstituted Wood Panel	AS/NZS 2269 AS/NZS 1859.1	H1.2	2.2.3/ 2.2.4
		Radiata pine	Framing/structural	H1.2	2.7.2
		Douglas fir	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)(7)</sup>	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)</sup>	Framing/structural heartwood	None	
		LVL	AS/NZS 4357	H1.2	
1D.2	Enclosed flat roof framing and associated supporting elements	Radiata pine	Framing/structural	H1.2	1.4
		Douglas fir	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)(7)</sup>	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)</sup>	Framing/structural heartwood	None	
		LVL	AS/NZS 4357	H1.2	
1D.3	Enclosed skillion roof framing and associated elements	Radiata pine	Framing/structural	H1.2	1.4 2.7.2
		Douglas fir	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)(7)</sup>	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)</sup>	Framing/structural heartwood	None	
		LVL	AS/NZS 4357	H1.2	
1D.4	Valley boards and boards supporting flashings or box gutters, and flashings to roof penetrations and upstands to roof decks <sup>(7)</sup>	Radiata pine	Merchantable	H1.2	2.7.2
		Plywood	AS/NZS 2269	H1.2	
		Douglas fir	Merchantable	H1.2	
		Alternative species <sup>(5)(6)(7)</sup>	Merchantable	H1.2	
		Alternative species <sup>(5)(6)</sup>	Merchantable heartwood	None	
		LVL	AS/NZS 4357	H1.2	

Wall elements (in or associated with)					
1D.5	Framing and other elements within or beneath a parapet	Radiata pine	Framing/structural	H1.2	2.7.2
		Douglas fir	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)(7)</sup>	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)</sup>	Framing/structural heartwood	None	
		LVL	AS/NZS 4357	H1.2	
1D.6	Framing and other elements within enclosed decks or balconies <sup>(8)</sup>	Radiata pine	Framing/structural	H1.2	2.7.2
		Douglas fir	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)(7)</sup>	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)</sup>	Framing/structural heartwood	None	
		LVL	AS/NZS 4357	H1.2	
1D.7	Cantilevered enclosed deck joists and associated framing including joist trimmers, nogs, and blocking <sup>(11)</sup>	Radiata pine	Framing/structural	H3.2	2.7.2
		Alternative species <sup>(10)</sup>	Framing/structural heartwood	None	
1D.8	Framing and other elements supporting enclosed decks (including enclosed cantilevered decks) or balconies	Radiata pine	Framing/structural	H1.2	2.7.2
		Douglas fir	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)(7)</sup>	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)</sup>	Framing/structural heartwood	None	
		LVL	AS/NZS 4357	H1.2	
1D.9	Sheet materials providing wall bracing and/or rigid air barriers when fixed to either face or exterior wall framing	Plywood	AS/NZS 2296	H1.2	2.2.3

1D.10	Battens used behind cladding to form a cavity	Radiata pine	Merchantable	H3.1	2.7.2
		Plywood	AS/NZS 2269	H3.1	
		Alternative species <sup>(5)</sup>	Merchantable heartwood	None	
		LVL	AS/NZS 4357	H3.1	
1D.11	Structural battens used behind cladding	Radiata pine	Framing/structural	H3.2	
		Alternative species <sup>(10)</sup>	Framing/structural heartwood	None	
		Plywood	Framing/structural	H3.2	
1D.12	All other exterior wall framing and other elements including exterior and boundary joists <sup>(9)(11)</sup>	Radiata pine	Framing/structural	H1.2	2.7.2
		Douglas fir	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)(7)</sup>	Framing/structural	H1.2	
		Alternative species <sup>(5)(6)</sup>	Framing/structural heartwood	None	
		LVL	AS/NZS 4357	H1.2	

#### Notes to Table 1D

- (1) Wood-based building components made from wood species other than those listed may also achieve the required durability but there is not enough data on their durability to permit their inclusion in this Standard. Refer to 1.1.
- (2) NZS 3640 specifies the treatment requirements. The exceptions outside 3640 are listed in clauses 2.3.2 and 2.3.3 and 2.3.4
- (3) Throughout table 1, treatment for service at a higher hazard class number usually satisfies biological protection requirements for service at a lower hazard class number, except in the case of some H3.1 and H3.2 treatments as specified in NZS 3640.
- (4) Timber shakes and shingles, and similar absorbent claddings, absorb moisture that can be driven into frame cavities by evaporation. Unless the cavities are adequately drained and ventilated, continuing condensation caused by solar driven transfer increases the moisture content in the cavities and timber framing requiring a higher level of timber treatment to resist decay.
- (5) Alternative species are: Beech (Hard, Mountain, Red), Totara, European oak Eucalyptus species (E. pilularis, E. muelleriana, E. globoidea, E. microcorys, E. saligna, E. botryoides), Cupressus macrocarpa (macrocarpa), Mexican cypress, Lawson's cypress, Leyland cypress. Refer to List 1.
- (6) Alternative species is Larch. Refer to List 1.
- (7) Alternative species are Eucalyptus species (E. delegatensis E. fastigata, E. obliqua, E. regnans). Refer to List 1.
- (8) Any metal flashing shall be separated from timber treated to H3.2 using building wrap.
- (9) Such as joists, lintels, wall plate and studs, together with parapets, enclosed balustrades, boxed columns and chimneys.
- (10) Alternative species are Totara, Eucalyptus species (E. pilularis, E. muelleriana, E. globoidea, E. saligna, E. botryoides), Beech (Red, Mountain, Hard), and European Oak. Refer to List 1
- (11) Exposed ends of joists shall be protected by a boundary joist.

Ref No.	Wood-based building components	Species or type <sup>(1)</sup>	Grade or Standard ref.	Level of treatment <sup>(2)</sup> and Hazard Class <sup>(3)</sup>	See clause/ section
<b>E – Elements not exposed to weather or ground atmosphere and in dry conditions (see section 2.8)</b>					
1E.1	All roof trusses, including gable end trusses, roof, ceiling and eaves framing, purlins and battens	Radiata pine	Framing/structural	H1.2	2.7.2
		Douglas fir	Framing/structural	H1.2	
		Alternative species <sup>(4)(5)</sup>	Framing/structural	H1.2	
1E.2	All midfloor framing excluding boundary joists, but including ceiling, framing, ceiling battens and double top plates	Alternative species <sup>(5)</sup>	Framing/structural heartwood	None	2.2.7
		LVL	AS/NZS 4357	None	
1E.3	Wall framing and roof framing (including trusses) protected from the weather, in unlined and unoccupied farm buildings and out buildings that are not excluded by 2.8.2(c)	Radiata pine	Framing/structural	None	2.8.2
		Douglas fir	Framing/structural		
		Alternative species <sup>(4)(5)</sup>	Framing/structural		
		LVL	AS/NZS 4357	None	
1E.4	Internal walls	Radiata pine	Framing/structural	H1.2	2.8.2
		Douglas fir	Framing/structural	H1.2	
		Alternative species <sup>(4)(5)</sup>	Framing/structural	H1.2	
		Alternative species <sup>(5)</sup>	Framing/structural heartwood	None	2.2.6
		LVL	AS/NZS 4357	None	
1E.5	Internal wall bracing excluding wall bracing described in 1D.9	Plywood	AS/NZS 2269	None <sup>(7)</sup>	2.2.3.3
		Particleboard and wood-based products <sup>(6)</sup>	AS/NZS 1859.1	None <sup>(7)</sup>	2.2.4
1E.6	Interior Flooring	Plywood	AS/NZS 2269	None <sup>(7)</sup>	2.8.3.1
		Particleboard and wood-based products <sup>(6)</sup>	AS/NZS 1860.1	None <sup>(7)</sup>	
		Pinus species Douglas fir	Dressing	H1.2 <sup>(7)</sup>	

		Alternative species <sup>(8)</sup>	Dressing	H1.1 <sup>(7)</sup>	
		Alternative species <sup>(8)</sup>	Dressing heartwood	None <sup>(7)</sup>	
		Alternative species <sup>(9)</sup>	Dressing	None	

#### Notes to Table 1E

- (1) Wood-based building components made from wood species other than those listed may also achieve the required durability but there is not enough data on their durability to permit their inclusion in this Standard. Refer to 1.1.
- (2) NZS 3640 specifies the treatment requirements. The exceptions outside 3640 are listed in clauses 2.3.2 and 2.3.3 and 2.3.4
- (3) Throughout Table 1, treatment for service for a higher hazard class number usually satisfies biological protection requirements for service at a lower hazard class number, except in the case of some H3.1 and H3.2 treatments, as specified in NZS 3640.
- (4) Alternative species are: Eucalyptus species (E. delegatensis, E. regnans, E. fastigata, E. obliqua).
- (5) Alternative species are: Beech species (Hard, Mountain, Red), Totara, European oak, Eucalyptus species (E. pilularis, E. muelleriana, E. globoidea, E. microcorys, E. saligna, E. botryoides), Larch, Cupressus macrocarpa (macrocarpa), Mexican cypress, Leyland Cypress, Lawson's cypress,. Refer to List 1.
- (6) Wood-based panels must have a proven durability performance against dampness.
- (7) In wet areas where maintenance of an impervious coating cannot be assured plywood, particle board or timber flooring that has been treated to a minimum of H1.2 shall be used. (Refer to 2.8.3.1).
- (8) Alternative species are: Matai, Rimu, Tawa, Eucalyptus species (E. microcorys, E. botryoides, E. saligna, E. fastigata, E. nitens, E. obliqua), European oak, Tasmanian blackwood. Refer to List 1.
- (9) Alternative species are: Beech (Hard, Mountain, Red, Silver), Totara, Eucalyptus species (E. pilularis, E. muelleriana, E. globoidea, E. delegatensis, E. regnans), Cupressus macrocarpa (macrocarpa), Mexican cypress, Leyland cypress, Lawson's cypress. Refer to List 1.

**Table 2 – Requirements for wood-based building components to achieve a 15-year durability performance**

Ref No.	Wood-based building components	Species or type <sup>(1)</sup>	Grade or Standard ref.	Level of treatment <sup>(2)</sup> and Hazard Class <sup>(3)</sup>	See clause/ section
<b>A – Elements exposed to exterior weather conditions and dampness (see section 2.9)</b>					
2A.1	Weatherboards, base battens, fascia, barge, and coverboards	Radiata pine	Dressing	H3.1	2.9.2
		Acetylated wood		H3.1	
		DMDHEU		H3.1	
		Plywood	AS/NZS 2269	H3.1	
		Alternative species <sup>(4)</sup>	Dressing heartwood	None	
2A.2	Sheet cladding not providing bracing	Plywood	AS/NZS 2269	H3.1	2.9.5 2.2.3
2A.3	Exterior joinery including window frames, sills, and slashes, exterior door frames, sills and doors, timber reveals for aluminium windows	Radiata pine	Select A	H3.1	-
		DMDHEU	Select A	H3.1	
		Acetylated wood	Select A	H3.1	
		LVL	AS/NZS 4357	H3.1	
		Alternative species <sup>(4)</sup>	Select A heartwood	None	
2A.4	Stair handrails and balustrades, (which can be easily replaced)	Radiata pine	Framing/structural	H3.2	2.9.7
		Alternative species <sup>(5)</sup>	Framing/structural heartwood	None	
2A.5	External stairs, veranda floors, unroofed decking (which can be easily replaced) with either a paint, stain, clear or no finish	Radiata pine	Merchantable	H3.2	2.9.8
		Acetylated wood (Deck board only) sapwood	Merchantable		
		DMDHEU (deck board only) sapwood	Merchantable		
		Plywood	AS/NZS 2269	H3.2	2.2.3 2.9.8
		Alternative species <sup>(5)</sup>	Merchantable heartwood	None	2.9.8



<b>B – Elements protected from the weather and dampness (see section 2.9)</b>					
2B.1	Non-load bearing framing for interior walls that do not provide bracing	Radiata pine	Framing/structural	H1.2	-
		Douglas fir	Framing/structural	H1.2	
		Alternative species <sup>(6)(7)</sup>	Framing/structural	H1.2	
		Alternative species <sup>(6)</sup>	Framing/structural heartwood	None	
		LVL	AS/NZS 4357	None	
2B.2	Stair treads, risers and handrails	Radiata pine	Select A or premium	None	-
		Douglas fir			
		Alternative species <sup>(5)(7)(8)</sup>			
		Plywood, Reconstituted Wood Panel	AS/NZS 2269 AS/NZS 1860.1		

**Notes to Table 2**

- (1) Wood-based building components made from wood species other than those listed may also achieve the required durability but there is not enough data on their durability to permit their inclusion in this Standard. Refer to 1.1.
- (2) NZS 3640 specifies the treatment requirements. The exceptions outside 3640 are listed in clauses 2.3.2 and 2.3.3 and 2.3.4.
- (3) Throughout table 2, treatment for service for a higher hazard class number usually satisfies biological protection requirements for service at a lower hazard class number, except in the case of the some H3.1 and H3.2 treatments, as specified in NZS 3640.
- (4) Alternative species are: Totara, Western red cedar, Redwood, Japanese cedar, Beech (Red, Hard, Mountain, Silver), Cupressus macrocarpa (macrocarpa), Mexican cypress, Leyland cypress and Lawson's cypress. Refer to List 1.
- (5) Alternative species are: Beech (Red, Mountain, Hard), European Oak, Totara, Eucalyptus species (E. pilularis, E. muelleriana, E. globoidea, E. microcorys, E. saligna, E. botryoides), Cupressus macrocarpa (macrocarpa), Mexican cypress, Lawson's cypress and Leyland cypress. Refer to List 1.
- (6) Alternative species are: Beech (Hard, Mountain, Red), Totara, European oak, , Eucalyptus species (E. pilularis, E. muelleriana, E. globoidea, E. microcorys, E. saligna, E. botryoides), Cupressus macrocarpa (macrocarpa), Mexican cypress, Leyland cypress, Lawson's cypress and Larch. Refer to List 1.
- (7) Alternative species are: Totara, Eucalyptus species (E. delegatensis, E. fastigata, E. obliqua, E. nitens, E. regnans). Refer to List 1.
- (8) Alternative species is European oak. Refer to List 1.

**Table 3 – Requirements for wood-based building components to achieve a 5-year durability performance**

Ref No.	Wood-based building components	Species or type (1)	Grade or Standard ref.	Preservation	See clause/ section
3.1	All interior finishing timbers, such as mouldings, skirtings, architraves, panelling, decorative sarking, shelves, any other timber component that can be easily replaced and not specified in tables 1, 2 and 3	Sawn timber	Dressing	None	2.10
		Wood based products	AS/NZS 1859		
		Reconstituted Wood Panel	AS/NZS 2269 AS/NZS 2270  AS/NZS 1859.2 AS/NZS 1859.1		

### 3 Construction provisions outside the mandatory requirements of the New Zealand Building Code

#### 3.1 Purpose

Where this specification is cited, section 3 shall be read in conjunction with other sections. The purpose of section 3 is to cover construction and contract provisions outside the mandatory requirements of the New Zealand Building Code. Such matters are important to specifiers and constructors to ensure acceptable levels of finish and construction in the building process. Section 3 also contains useful information and comments intended to assist specifiers, manufacturers and constructors.

#### **C3.1**

*The New Zealand Building Code deals with matters related to health and safety in buildings. Safety depends on the strength and durability of its structural elements throughout the life of the building. Protection against external and internal moisture relates to health and is also part of the New Zealand Building Code. Section 3 of this standard deals principally with matters related to timber moisture contents, before and after construction, and other matters necessary to achieve acceptable standards of finish.*

#### 3.2 General

#### **C3.2**

*This standard states the acceptable performance of timber for building construction purposes. Building owners, architects, lending institutions, and other interested parties are entitled to specify more exacting requirements to suit their particular interests, and users of this standard are therefore advised to ascertain the position in this regard at an early stage.*

##### 3.2.1

Framing/Structural grades of timber shall be specified as either rough sawn, gauged to width only, gauged to thickness only, or gauged to both width and thickness.

##### 3.2.2

Unless otherwise specified, all joinery and finishing timbers shall be supplied free from saw, machine, and other marks that impair the production of a smooth, even finish.

### 3.3 Plywood and laminated veneer lumber

Protection shall be applied to the manufacturer's specifications to minimise damage to faces and edges.

### 3.4 Particleboard, fibreboard, and other wood-based panel products

#### 3.4.1

The use of each particular grade of particleboard, fibreboard, and other wood-based panel products shall be in accordance with the manufacturer's printed instructions current at the time of use.

#### **C3.4.1**

*The grades of particleboard, fibreboard, and other wood-based panel products usually produced in New Zealand are as follows:*

*(a) High density;*

*(b) Medium density;*

*(c) Low density.*

*Different types of wood-based panel products are available overseas and may be imported into New Zealand.*

#### 3.4.2

The manufacturer or importer shall have established that the performance of the particleboard, wood-based products or fibreboards will meet the provisions of the New Zealand Building Code.

#### 3.4.3

Strict adherence to the manufacturer's printed instructions on such things as the use, fixing, and finishing of particleboard, wood-based products, or fibreboards shall be followed.

Note: Each manufacturer's instructions apply only to that manufacturer's product and care should therefore be taken to ensure that the printed instructions being followed are those for the manufacturer of the actual product being used.

#### **C3.4.3**

*AS/NZS 1859 contains detailed information on the fixing and use of fibreboards and on the range of textured, veneered and pre-finished boards produced.*

### 3.5 Moisture content and quality control requirements for wood-based building components protected from the weather and in dry conditions with a 50-year performance

Wood-based building components that are protected from the weather and in dry conditions, which are not subject to ground atmosphere, or not in any position where condensation or dampness will occur, shall conform to the moisture content and quality controls set out in 3.5. Their grade, quality, and level of preservative treatment shall be as listed in Table 1D and 1E.

Time of installation' is the time at or during which this standard applies and depends on the purpose to which this standard is put. The quality of the products can vary with moisture changes between the time of purchase and installation such that the products may not comply with this standard or its related documents

#### **C3.5**

*Section 3.5 deals with all protected wood-based building components above subfloor areas and above concrete floors at ground level that cover the entire floor area.*

#### 3.5.1

At the time of installation the moisture content of timbers, unless expressly stated to the contrary, shall be within the moisture content limits set out in Table 6.

**Table 4 – Allowable moisture content (%) <sup>1</sup> at time of installation or in the case of framing timber at time of enclosure**

Use category level of finish	Air-conditioned or centrally heated buildings	Intermittently heated buildings <sup>2</sup>	Unheated buildings
1 Timber to which linings are attached to achieve a level of finish 4 to 5 (refer 3.5.3)	8 – 18	12 – 18	12 – 18
2 Enclosed framing (including roof trusses) to achieve a level of finish 0 to 3 (refer 3.5.3)	12 – 18	12 – 20	12 – 20
3 Load-bearing lintels and beams	8 – 18	12 – 20	12 – 20
4 Weatherboards, exterior joinery and finishing timbers	14 – 18	14 – 18	14 – 18
5 Flooring exposed to ground atmosphere	10 – 14	12 – 16	14 – 18
6 Interior joinery and finish, furniture, corestock	8 – 12	10 – 14	12 – 16
7 Flooring not exposed to ground atmosphere	8 – 12	10 – 14	12 – 16
<p>1 Allowable ranges of moisture content are specified on the basis that 90% of pieces shall be within the specified range, the remainder shall be no more than 2% moisture content above or below the specified range. The average moisture content of the individual boards shall be within the middle third of the specified range. In special circumstances, for example flooring exposed in rooms with a large window area, the upper limits may be reduced.</p> <p>2 Buildings periodically heated by open fires, electric heaters, and so on, such as most domestic buildings.</p>			

### 3.5.2

At the time of the installation of wall linings, the moisture content of framing elements shall be such that the specified “level of finish” is maintained beyond the time of construction.

#### C3.5.3

*The standard of surface finish for many thin wall linings fixed to timber framing can be affected by framing movement due to the timber drying many months after installation of linings. This clause identifies levels of finished wall linings and recommends the maximum moisture content of wall framing at the time of installation of linings to reduce the visual surface distortions due to moisture change in frames.*

#### 3.5.3 Level of finish

The following is a scale of levels of finish for the final decoration:

Level 0	This level of finish may be useful in temporary construction or whenever the final decoration has not been determined.
Level 1	For use in plenum areas above ceilings, in attics, in areas where the assembly would generally be concealed, or in building service corridors and other areas not normally open to public view.
Level 2	For use in garages, warehouse storage or other structures where appearance is not of primary concern.
Level 3	For use in appearance areas that are to receive heavy or medium texture (spray or hand applied) finishes before final painting, or where heavy grade wall coverings are to be applied as the final decoration.

- |         |   |
|---------|---|
| Level 4 | For use where light textures or wall coverings are to be applied, or economy is of concern. Also for non-critical lighting areas where flat and low sheen paints are to be applied. |
| Level 5 | This level of finish is for use where gloss, semi-gloss, low sheen, or non-textured flat paints are specified or where critical lighting conditions occur.                          |

Refer to the manufacturer's specifications on how to achieve the recommended level of finish dictated by the type of wall decoration specified.

### 3.5.4

Where nail popping, joint peaking, and ridges formed by stud warping and twisting are undesirable on the finished surfaces within 12 months of installation of wall linings, kiln dried timber shall be used, or alternatively the timber framing shall be dried to less than 20% moisture content before wall linings are installed.

Note: Some check on the moisture content of timbers immediately prior to installation is desirable and is essential for certain critical applications. Such checks should be the responsibility of the contractor. Where dry framing is specified, checks on moisture content immediately prior to closing in are desirable.

### 3.5.5

Where bulk insulation is used, wall framing timber shall not be totally enclosed until it is dried to within the moisture content limits set out in Table 6. Any timber that at the time of installation has degraded beyond the shape limits permitted by NZS 3631 and AS/NZS 1748 for the relevant grade shall not be installed.

### 3.5.6

The required moisture content for framing timbers shall be achieved either by drying the timber prior to use or by force drying or allowing the erected framing to dry before it is enclosed.

### 3.5.7

Any timber, including that in a pre-nailed frame that has degraded in shape beyond the limits permitted by NZS 3631 and AS/NZS 1748, prior to lining, shall be replaced.

### **C3.5.7**

*Problems resulting from the installation of timber having too high a moisture content can occur long after completion of the building. Shrinkage, distortion, checking, and mould growth can occur. Degrading of the timber can occur with changes in moisture content, which results in changes in bow, crook, cup, twist, and cross section, all of which can end up beyond the limits permitted by NZS 3631. Such dimensional changes can affect the level of finish of surfaces well after construction is completed. The long-term deflection of framing timber installed green and dried under load is greater than that of framing timber installed dry. Temporary support during drying will control deflection of beams of green timber. Installation at the specified moisture content is recommended for critical applications such as lintels, headers, ridge beams and exposed rafters (refer to NZS 3603). The pulling away of scotia and architraves and moulding from corners and re-entries can occur where the underlying top and bottom plates shrink with loss of moisture after installation. Likewise excessive movement can occur at junctions between storeys impacting on the performance of essential weathertightness details.*

### 3.5.8

#### 3.5.8.1

Timber that is specified to a moisture content shall have been dried according to recognised principles by air drying, by forced air drying, or by kiln drying complying with AS/NZS 4787.

Note: Orders for dry timber should specifically state the required moisture content range.

#### **C3.5.8.1**

*In most areas of New Zealand it is not possible to achieve these moisture contents by air drying (see also the New Zealand Timber Industry Federation Timber Design Guide).*

#### 3.5.8.2

Once timber is dry, it shall be protected from moisture pick-up until it is installed.

For monitoring of moisture content, the minimum number of samples shall be 1 per 50 pieces for oven drying and 1 per 20 pieces for moisture metering over the full range of material dried.

### 3.5.8.3

Moisture meters shall only be used for the range of 8% to 30% moisture content.

### 3.5.8.4

Any dispute concerning moisture content shall be decided by use of the oven-dry method specified in AS/NZS 4787.

### 3.5.9 *Protection up to installation*

#### 3.5.9.1

All timber and wood-based products shall be properly protected against physical damage that will affect its appearance prior to being installed.

#### 3.5.9.2

All dry timber and wood-based products, whether or not they are primed or treated with water repellent, shall be protected as follows:

- (a) At all stages after drying, the timber shall be adequately protected against rain wetting by covers or stored in the building;
- (b) In the interval between delivery and installation, dry timber shall also be adequately protected against moisture pick-up from the ground or from green concrete. Except as provided in (a), dry timber shall be kept block-stacked more than 100 mm off the ground or concrete. The block stack shall not be disturbed until immediately before use;
- (c) For wood-based products, the manufacturer's instructions for protection and conditioning shall be followed.

#### **C3.5.9.2**

*Attention to timing of delivery is important. Prolonged storage after kiln drying is bad practice. Moisture pick-up accompanied by swelling and possibly by distortion can occur if dry timber and wood-based products are stored in unfinished damp buildings, particularly in concrete structures.*

### 3.5.10

Pre-laying of strip floors, that is, laying of floors before erection of walls and roof, shall be avoided where a high quality floor is required that is free from shrinkage gaps or squeaks. The sealer or primer used as a temporary protection shall be compatible with the scheduled finish.

### 3.5.11

Any physical damage to timber and wood-based products during the currency of the contract shall be made good.

Note: In centrally heated and air-conditioned buildings, care should be taken to operate the plant so as to avoid excessively high temperatures or low humidity, particularly just after the interior finishing timbers have been installed.

#### **C3.5.11**

*Suddenly applied extreme conditions are likely to cause unsightly shrinkage, distortion, and checking of timber wood-based building components.*

### 3.5.12

Surface coatings shall be the appropriate paint type or surface treatment systems applied in accordance with AS/NZS 2311, or other specialised coating systems applied strictly to the manufacturer's instructions.

Note: Primer paint will deteriorate if left exposed. The top coats should therefore be applied without undue delay. If the priming is exposed for more than a month, re-priming could be necessary. Refer to AS/NZS 2311.

### 3.5.13

#### 3.5.13.1 *Grading requirements additional to those set out in NZS 3631*

For strip flooring, which is exposed to view, all resin, bark pockets, and spike knots that are greater than 25 mm in width shall be excluded from the species dressing grade as referred to in Table 1C.

### 3.5.13.2

For strip flooring which is to be covered by suitable floor coverings, inclusion of resin pockets, partially intergrown and tightly encased knots is acceptable.

### 3.5.14

Where timber framing is installed green or kiln dried timber is wetted and allowed to dry, those elements that are likely to deflect under their own weight shall be propped until they dry below a moisture content of 20%.

#### **C3.5.14**

*The long-term deflection of framing timber installed green or kiln dried timber that is wetted and dried under load is greater than that of framing timber installed dry. Temporary support during drying will control deflection of beams of wet timber.*

## **3.6 Moisture content and quality control requirements for wood-based building components with a 5 or 15-year durability performance**

### **3.6.1 Moisture content**

#### **3.6.1.1**

At the time of installation the moisture content of weatherboard, exterior joinery, and finishes shall be within the limits specified in Table 6.

#### **3.6.1.2**

At the time of installation of all finishing timber, interior joinery, furniture, corestock, and so on their moisture content shall be within the limits specified in Table 6.

#### **C3.6.1.2**

*Figures in Table 6 are for 90% of pieces, with the remaining pieces within  $\pm 2\%$  moisture content of the range specified.*

### **3.6.2 Fibreboards**

The use of each particular type of fibreboard shall be in accordance with the manufacturer's printed instructions and be appraised for its use in the New Zealand environment. Refer to AS/NZS 1859 for detailed information on the fixing and use of fibreboards and on the range of textured veneer and pre-finished boards produced.

Note: A range of fibreboard products are available that are made overseas. Their acceptability for particular uses may be determined on the basis of satisfactory experience with their use over a reasonable period of time, if used in New Zealand or by independent appraisal where no New Zealand performance is available.

### **3.6.3 Surface coatings**

Surface coatings shall be the appropriate paint type or surface treatment systems applied in accordance with AS/NZS 2311, or other specialised coating systems applied strictly to the manufacturer's instructions.

Note: Primer paint will deteriorate if left exposed. The top coats should therefore be applied without undue delay. If the priming is exposed for more than a month, re-priming may be necessary. Refer to AS/NZS 2311.

### **3.6.4 Protection up to installation**

#### **3.6.4.1**

All timber and wood-based products shall be properly protected against physical damage that will affect their appearance prior to being installed.

#### **3.6.4.2**

The building shall be closed in and the ground floor laid before the delivery of dry interior finishing timber, whether or not it has been primed or sealed with a water-repellent.

#### **3.6.4.3**

The area concerned shall be fully protected from the weather and from other building operations before dry interior finishing is fixed, whether or not it has been primed or sealed with a water-repellent.

### **C3.6.4.3**

*Attention to timing of delivery is important. Prolonged storage after kiln drying is bad practice. Moisture pick-up accompanied by swelling and possibly by distortion can occur if dry timber and wood-based products are stored in unfinished damp buildings, particularly in concrete structures.*

### **3.6.5**

Dry interior finishing timber and wood-based products for centrally heated or air-conditioned buildings shall be protected as follows prior to installation:

- (a) If the heating system is effectively in operation, the timber shall be fillet-stacked without wrapping inside the building for at least 1 week to enable the timber to attain a moisture content that is in equilibrium with the prevailing conditions before surface-coating and fixing;
- (b) If the heating system is not effectively in operation, the timber shall be block-stacked and fully wrapped inside the building. The wrapping shall be of non-permeable sheet material and shall cover the sides and ends as well as the top of the stack. The stack should be more than 100 mm clear of the concrete. Unless applied before delivery, a surface-coating should be applied immediately after the block stack is opened up.

Note: In heated buildings, it is very desirable for a heating system to be installed and in operation before the interior finishing timbers are installed. If this is impossible, then:

- (a) The time interval between timber installation and the turning on of the heating system should be as short as possible; and
- (b) The timber should not be installed before the interior has dried to the appropriate range listed in Table 6.

## **3.7 Protection after installation**

### **3.7.1**

Any physical damage to timber and wood-based products during building work shall be made good.

### **3.7.2**

In centrally heated and air-conditioned buildings, the contractor shall operate the plant to avoid excessively high temperatures and low humidity, particularly just after the interior finishing timbers have been installed.

### **C3.7.2**

*Extreme conditions suddenly applied are likely to cause unsightly shrinkage, distortion, and checking of timber items.*

## **3.8 Workmanship**

Work shall be in accordance with the best trade practice, and this shall be deemed to include those methods, practices and processes contained in current syllabuses for the New Zealand trade certificates in carpentry, joinery, and as per the New Zealand Timber Industry Federation Timber Design Guide. Reference should also be made to the appropriate New Zealand Standards.

## **3.9 Sawn and round timber other than building components**

### **3.9.1 Sawn and Round timber**

This section refers to those components not regarded as building components but which require treatment in order to achieve the stated durability.

### **3.9.2 Indicative treatment guidelines for non-building sawn and round timber**

Table 5 lists non-building components and associated preservative treatment hazard classes in common use for Pinus species.



**Table 5 Treatment of non-building sawn and round timber**

Typical uses	Hazard class
Boat building	H4
Bridge beams	H5
Bridge decking	H4
Cattle grids	H4
Compost bins	H4
Cooling towers	H5 or H6
Decking in contact with planter boxes or soil	H4
Drain or watercourse lining	H4
Fence battens, palings, rails and droppers	H3.2
Fruit or vegetable bins	H3.2
Garden furniture	H3.2
Gates	H3.2
Greenhouse framing	H3.2
Jetty and wharf timbers (above high water line)	H4
Jetty and wharf timbers (below high water line)	H6
Marine farms	H6
Marine piles and fendering	H6
Pergola framing	H3.2
Pergola posts	H4
Piles, freshwater	H4
Plant containers	H4
Poles, electricity transmission, telecommunication	H5
Posts, guardrail	H4
Posts, horticultural (severe sites)	H5
Posts, sawn, for domestic fencing	H4
Roof shingles	H3.2
Seed boxes	H4
Slipways, freshwater	H4
Slipways, marine (below high water line)	H6

## 4 Requirements for large format timber elements to achieve a 50-year durability

### 4.1 Scope

Mass timber structures are constructed using a combination of wood-based building components and large format timber elements. Section 4 applies only to large format timber elements. Treatment for large format timber elements shall be as per Table 6. Sections 2 and 3 may be required for other wood-based building components.

Table 66 lists the type, species, moisture content, and preservative treatment required to achieve a 50-year durability for large format timber elements. The elements themselves shall be designed to achieve a 50-year durability, as large format timber elements will always be structural due to their inherent self-weight.

Where a large format timber element is subject to humid environments such as indoor swimming pools or similar, specific design is required.

Note: The durability of the timber component is a function of design, detailing as well as preservative treatment. This standard considers preservative treatment only. In addition to the requirements of this standard, designers shall give due consideration to design and careful detailing to avoid moisture ingress (including from panel faces and edges of elements), and to avoid dirt and dust traps on wood surfaces and around connections. Trims and flashings shall be detailed with gaps that allow for air movement around connections and allow trapped moisture to freely drain

#### C4.1

*There are several degradation mechanisms which can compromise the integrity of large format timber elements including wood decay fungi, deterioration of the adhesive and deterioration of the wood-adhesive bond. Table 6 assigns the durability hazard class for the timber component.*

### 4.2 Preservative treatment

#### 4.2.1 Glulam and CLT

Large format timber elements that are Glulam and CLT, other than those covered in 4.2.2, shall have feedstock treated to the minimum requirements of NZS 3640 and comply with 4.3.1. Where Table 66 specifies a durability hazard class, all laminations within the Glulam or CLT member shall be treated to the minimum requirements of this hazard class.

Large format timber elements that are LVL shall be treated to as specify in NZS 3640 and as per clause 2.3.3.

#### 4.2.2 Supplementary treatment

When the Glulam and CLT member is installed as an interior wall or floor within the building and not in a 'wet' area, such as bathroom, toilet, or laundry, and fully protected from weather (Table 6D), the completely dimensioned and finished member shall have a supplementary surface treatment applied to all surfaces. If any part of the member extends to the outer face of the external structural support, then this member shall not be defined under Table 66D (see figure 3 and 4 below).

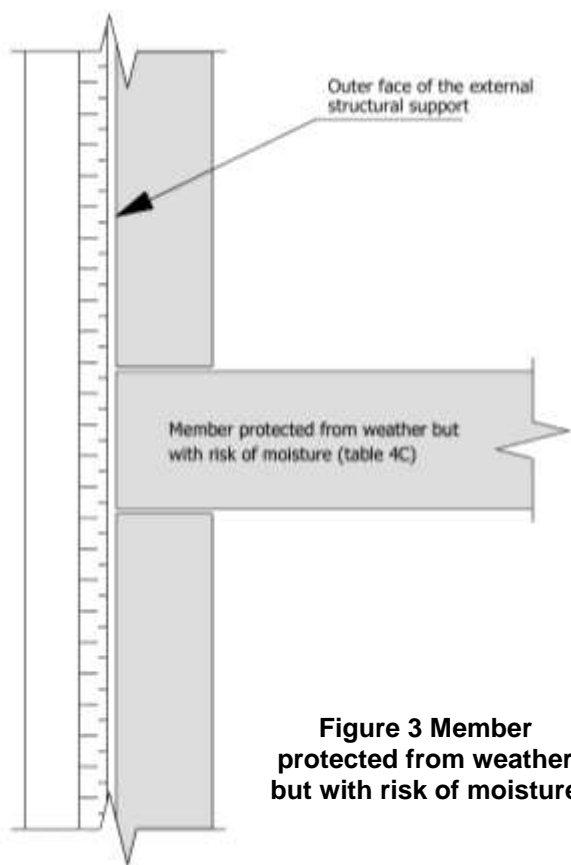
The surface treatment shall be a boron in glycol formulation which contains at least 20% boric acid equivalent (BAE) and shall be factory applied by brush or roller as two coats to all surfaces. Allow the first coat to dry before applying the second coat. There is no penetration depth requirement for a surface applied boron treatment. Alternative surface application methods shall be accepted provided they achieve a minimum retention equivalent to H1.2 as per NZS 3640.

Product branding shall be as per NZS 3640 and have the words 'supplementary surface treatment' as well as an identification of the manufacturer applying the treatment. Treatment formulations may be colourless or include a red or pink dye.

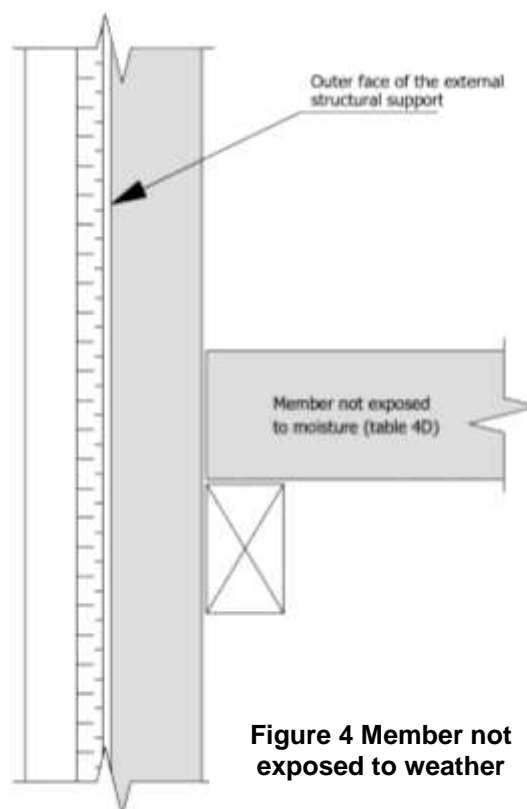
This applies only to Glulam members and three-layered CLT panels. For CLT panels which have more than three laminations, all internal laminations shall be treated to H1.2 and this shall be reflected in any product branding.

#### C4.2.2

Supplementary surface treatments can be applied to dry or damp timber. The presence of some moisture in timber enhances diffusion and will increase the depth of boron penetration. Red or pink dye added to the treatment solution is optional, but the colour does help with ensuring there is complete surface coverage. The boron in glycol formulation, if applied in accordance with 4.2.2, should achieve a similar BAE retention to the H1.2 specification but cannot be branded as H1.2.



**Figure 3 Member protected from weather but with risk of moisture**



**Figure 4 Member not exposed to weather**

#### 4.2.3 Supplementary surface treatment for exposed surfaces

For members in Table 6D which are identified with a supplementary surface treatment, where cuts or penetrations are required on site, or where damage has occurred after application of the surface treatment, all exposed surfaces shall be remediated with a suitable surface-applied treatment.

#### 4.2.4 Non-structural decorative surfaces

Where a non-structural surface layer such as a thin decorative veneer encapsulates the large format timber element, the non-structural layer does not require preservative treatment. Non-structural surface layers will be visual layers which are easy to access and replace, and installed in locations where failure is easy to detect.

Note: Elements should be properly cared for throughout delivery and erection to avoid exposure to a hazard situation for which it has not been treated (refer to NZS 3640 for hazard class definitions)

#### 4.2.5 Large format timber in wet areas

Panelised large format timber elements in wet areas e.g. bathroom, toilet or laundry, which are not supported by secondary floor joist framing and where maintenance of the impervious coating cannot be assured, shall be treated to a minimum of H3.2.

Where the large format timber element in wet areas is supported by secondary floor joist framing at a maximum of 600 mm centres, the element shall be treated to a minimum of H1.2.

In addition, in all wet areas a board underlay with sealed joints shall be applied over the large format timber element. Where the board underlay is plywood, the plywood shall be treated to a minimum of H3.1.

#### **C4.2.5**

*A board underlay with sealed joints is a precaution to provide protection against penetration of moisture and to ensure that any natural movement of timber will not affect the floor finish.*

#### **4.2.6 Feedstock lamina with different hazard class levels**

If the CLT or Glulam cross section comprises feedstock treated to different hazard class levels, the declared durability hazard class for the member shall be the treatment level with the shortest durability.

#### **4.2.7 Expanded foams**

Expanded foams with low bulk density can be susceptible to chemical reaction when in contact with damaging solvents such as acids, anhydrides, gasses, aliphatic hydrocarbons, amines, and other volatile organic substances. If expanded foams are to be used adjacent to treated timber, the supplier of the expanded foam shall approve the compatibility with the chemical preservative type.

### **4.3 Adhesives**

#### **4.3.1 Wood adhesive bond**

Adhesives for CLT and Glulam shall be appropriate for 50-year durability and tested as per AS/NZS 4364. For LVL, adhesives shall be type A bonded as per AS/NZS 2754.1 and tested in accordance with AS/NZS 2098.

#### **C4.3.1**

*Preservative treatments may affect the quality of the wood-adhesive bond.*

#### **4.3.2 Finger-joint**

Where finger-jointed feedstock forms part of the large format timber element, end joints of the feedstock shall comply with the minimum requirements of AS/NZS 1491, AS 5068, AS 5069, or AS/NZS 8008.

### **4.4 Moisture**

#### **4.4.1 Moisture management during construction**

If on-site storage is required before construction, members shall be evenly supported clear of the ground on timber gluts placed at 2 m maximum centres and securely covered to prevent direct exposure to rainfall which may deplete the preservative or cause an increased risk for the large format timber element to fungal degradation. Protective wrap shall be white or light grey to reduce the impact of UV light and to reflect heat and shall be left on the members until immediately prior to installation.

#### **4.4.2 Moisture levels**

The moisture content at the time of installing interior linings shall be no greater than 18%.

Note: Some weather exposure of large format timber elements once erected and fixed in place is acceptable and will not result in structural degradation. However, weather exposure should be limited as much as possible

#### **C4.4.2**

*Mass timber structures can be exposed to weather during construction for prolonged periods due to the size of the buildings and the large surface area of the individual elements. Good site practices to limit the effects of moisture during construction include:*

- (a) Protecting members throughout delivery and prior to installation to avoid exposure to weathering;*
- (b) Using a water-repellent sealer if the timber is exposed to weather for greater than 4 weeks. A water-repellent sealer applied to all exposed faces and edges can protect the timber from weather for up to 12 weeks. Any water-repellent sealer applied should be compatible with the final finish paint system;*
- (c) Preventing water ponding on floor or roof elements to reduce direct water absorption. Immediately following a weather event, all horizontal elements should be swept clean of ponding water;*
- (d) Protecting all exposed edges (especially end grain) to reduce direct water absorption;*

e) *Protecting timber from the effects of sunlight and other heat sources can improve dimensional stability. Exposure to the sun and other heat sources can create a moisture gradient across the element resulting in warp, twist or bow;*

f) *Propping primary structural elements throughout construction to take account of cyclic moisture movement.*

#### 4.4.3 Moisture managements for visual timber elements

Visual timber elements are common in mass timber structures. Designers shall provide specific instructions including storage, wrapping, treatment, and handling to ensure visual surfaces are protected from moisture during construction.

Note: To ensure the aesthetic properties are protected from moisture entrapment, visual grade panels and members should be given special attention when providing protection from weather. If protective wraps are used, it is recommended that the wrap be breathable and attached with stainless steel or plastic fixings to prevent rust staining. Where it is not possible to fully protect the members then some surface remedial work may be required.

#### 4.4.4 Moisture management of large format timber from ground contact, concrete or masonry

When installed, if the large format timber element is exposed to direct weather (Table 6A), the element shall be separated from the finished ground level by a minimum clearance of 100 mm.

Where elements are protected from weather, but in contact with concrete or masonry, large format timber elements shall be separated from the concrete or masonry with a damp-proof membrane. Where the members are supported on a concrete slab, the large format timber element shall be raised above the slab level by a minimum of 20 mm with a cementitious grout to prevent moisture ingress into end grain.

Crawl space to subfloors shall be as per the minimum requirements of NZS 3604.

#### 4.4.5 External wall cladding for mass timber

Cladding systems fixed to mass timber structures shall comply with the minimum requirements of NZBC Clause E2 or by testing as per AS/NZS 4284.

#### C4.4.5

*External wall cladding systems for mass timber structures (not including unlined buildings such as warehouses, factories, and so on) should provide a primary means of weather resistance against water penetration by separating the cladding system from the structural members with a drained cavity system or similar. For members located within the building's external envelope, due consideration should be given to the risk of leaks. Hygrothermal analysis can be used to identify the correct placement of vapour membranes and insulation to ensure the large format timber elements remain warm and dry.*

**Table 6 – Requirements for large format timber elements to achieve a 50-year durability performance**

Ref No.	Large format timber component	Type	Species	Level of treatment	See clause
<b>A – Members exposed to exterior weather conditions and dampness but not in ground contact</b>					
6A.1	Posts, bearers, beams outside the building's external envelope <sup>1, 2</sup>	Glulam	Pinus species	H3.2	4.3/4.4.4
6A.2	Wall bracing outside the building's external envelope <sup>1, 2</sup>	CLT, Glulam	Pinus species	H3.2	4.3/4.4.4
<b>B – Members protected from the weather but exposed to ground atmosphere</b>					
6B.1	Subfloor structure supported above ground <sup>2</sup>	Glulam	Pinus species / Douglas fir	H1.2	4.4.4
		LVL	Pinus species	H1.2	4.4.4

6B.2	Interior flooring, suspended ground floors	Glulam, CLT	Pinus species / Douglas fir	H1.2	4.4.4
		LVL	Pinus species	H1.2	4.4.4
C – Members protected from the weather but with a risk of moisture penetration conducive to decay					
6C.1	Panelised sarking not protected from solar driven moisture through absorbent cladding materials	Glulam, CLT	Pinus species / Douglas fir	H1.2	
		LVL panelised systems	Pinus species	H1.2	
6C.2	Enclosed roof members including parapets	Glulam, CLT	Pinus species / Douglas fir	H1.2	
		LVL	Pinus species	H1.2	
6C.3	Roofed over only structures including unlined feed sheds, verandahs, canopies and other predominantly open sided structures <sup>2, 3</sup>	Glulam, CLT	Pinus species / Douglas fir	H1.2	4.4.4
		LVL	Pinus species	Untreated	4.4.4
6C.4	Portal frame, post & beam structures and secondary framing forming part of the external building structure for unlined enclosed buildings with cladding systems <sup>2, 4</sup>	Glulam	Pinus species / Douglas fir	H1.2	4.4.4/4.4.5
		LVL	Pinus species	Untreated	4.4.4/4.4.5
6C.5	Panelised substrates to potential wet areas, that is, bathroom, toilet, laundry where the large format timber element is not supported by secondary joist framing	Glulam, CLT, panelised systems	Pinus species	H3.2	4.4.5
6C.6	Panelised substrates to potential wet areas, that is, bathroom, toilet, laundry where the large format timber element is supported by secondary joist framing	Glulam, CLT	Pinus species / Douglas fir	H1.2	4.4.5
		LVL panelised systems	Pinus species	H1.2	4.4.5
6C.7	Members supporting enclosed decks or balconies	Glulam, CLT	Pinus species / Douglas fir	H1.2	
		LVL	Pinus species	H1.2	
6C.8	Panelised substrates to decks, balconies, and membrane roof structures	Glulam, CLT, panelised systems	Pinus species	H3.2	
6C.9	Cantilevered enclosed deck joists	Glulam	Pinus species	H3.2	
		LVL	Pinus species	H3.1	
6C.10	Elements forming part of the external building structure including bracing walls	Glulam, CLT	Pinus species / Douglas fir	H1.2	4.4.5
		LVL	Pinus species H1.2	4.4.5	

**D – Members not exposed to weather or ground atmosphere and in dry conditions, that is, completely within the external building envelope**

6D.1	Internal portal frames, post & beams and secondary framing but excluding those in 4C.4	Glulam	Pinus species / Douglas fir	Surface treatment <sup>5</sup>	4.2.2
		LVL	Pinus species	Untreated	
6D.2	Internal flooring elements excluding those in 4B.2, 4C.5 and 4C.6	Glulam, CLT	Pinus species / Douglas fir	Surface treatment <sup>5</sup>	4.2.2
		LVL	Pinus species	Untreated	
6D.3	Internal wall framing including bracing walls but excluding those in 4C.10	Glulam, CLT	Pinus species / Douglas fir	Surface treatment <sup>5</sup>	4.2.2
		LVL	Pinus species	Untreated	

- 1 Adhesives shall comply with a 50-year durability for the given service class application as per AS/NZS 4364.
- 2 When exposed to direct weather (Table 6A), minimum clearances of 100 mm shall be maintained from the finished ground level. Where members are protected from weather and in contact with concrete or masonry, all timber shall be separated with a damp-proof membrane and the element shall be raised above the concrete slab level by a minimum clearance of 20mm.
- 3 For open sided structures, exposed ends, and sides of large format timber elements shall be capped or flashed to prevent moisture entrapment.
- 4 Where large format timber elements are used in high humidity environments like swimming pools, saunas, and so on, specific design is required.
- 5 Supplementary surface treatments shall achieve a minimum retention equivalent to H1.2 as per NZS 3640, but with no penetration requirement and shall be factory applied as detailed in 4.2.2.