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NEW ZEALAND STANDARD

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# TIMBER AND WOOD-BASED PRODUCTS FOR USE IN BUILDING

Superseding NZS 3602:1990

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STANDARDS NEW ZEALAND



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## NZS 3602:1995

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### COMMITTEE REPRESENTATION

This Standard was prepared by the Timber and Wood-Based Products Committee (P 3602A) for the Standards Council established under the Standards Act 1988.

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#### AMENDMENTS

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**RELATED DOCUMENTS**

Reference is made in this Standard to the following:

NEW ZEALAND STANDARDS

NZS 632:1967	Kiln-drying of timber
NZS 1158:1965	Doors
NZS 2295:1988*	Building papers (breather type)
NZS 3601:1973	Metric dimensions for timber
NZS 3603:1993	Timber structures Standard
NZS 3604:1990	Light timber frame buildings not requiring specific design
NZS 3605:1992	Timber piles and poles for use in building
NZS 3606:1987*	The manufacture of glue laminated timber
NZS 3610:1979	Profiles of mouldings and joinery
NZS 3611:1970	Exterior plywood
NZS 3612:1970	Interior plywood
NZS 3613:1970	Plywood for marine craft
NZS 3616:1978*	Finger-jointed timber
NZS 3617:1979	Profiles of weatherboards, fascia boards, and flooring
NZS 3618:1984*	Mechanical stress grading of timber
NZS 3619:1979	Timber windows
NZS 3621:1987	Standard names of commercial timbers in New Zealand
NZS 3631:1988	New Zealand timber grading rules
NZS 4211:1985	The performance of windows
NZS 7202:1986* (± BS 1204:1979)	Synthetic resin adhesives (phenolic and aminoplastic) for wood
NZS 7421:1990	Installation of solid fuel burning domestic appliances
NZS 7701:1973	Water repellent solutions for wood
NZS 7703:1985	The painting of buildings

\* To be superseded by a joint AS/NZS Standard (in preparation).



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MP 3640:1992 Minimum requirements of the NZ Timber Preservation Council Inc.

### JOINT AUSTRALIAN/NEW ZEALAND STANDARDS

AS/NZS 1859:- - - - Reconstituted wood-based panels  
Part 1(Int):1995 Particleboard  
Part 2(Int):1995 Medium density fibreboard (MDF)

AS/NZS 2269:1994 Plywood – Structural

AS/NZS 4284:1995 Testing of building facades

### AUSTRALIAN STANDARD

AS 1720:- - - - Timber structures  
(SAA Timber Structures Code)  
Part 1:1988 Design methods

### OTHER PUBLICATIONS

Bengelsdorf, M.F., American Plywood Association Report PT 80-1, Fastener Corrosion in Water-Borne Preservative Treated Wood.

Building Research Association of New Zealand (BRANZ) Report 122, Solar-Driven Moisture Transfer Through Absorbent Roofing Materials.

Building Research Association of New Zealand Technical Paper P21-1991 Supplement, A Wall Bracing Test and Evaluation Procedure.

Building Research Association of New Zealand Technical Paper P43-1984, Treated Timber Frame Foundation.

Building Industry Authority, New Zealand Building Code (NZBC) 1992.

New Zealand Timber Industry Federation (NZTIF) Timber Use Manual.

New Zealand Timber Preservation Council's Quality Assurance Scheme.

### NEW ZEALAND LEGISLATION

Building Act 1991  
Building Regulations 1992  
First Schedule, New Zealand Building Code

The users of this Standard should ensure that their copies of the above-mentioned New Zealand Standards and referenced overseas Standards are the latest revisions or include the latest amendments. Such amendments are listed in the annual Standards New Zealand Catalogue which is supplemented by lists contained in the monthly magazine *Standards* issued free of charge to committee and subscribing members of Standards New Zealand.



## **FOREWORD**

This revision of NZS 3602:1990 gives the requirements for certain timbers and wood-based products to achieve a certain life expectancy. This Standard has been prepared taking into account the relevant requirements of NZS 3604, NZS 3631 and MP 3640.

The Standard is separated into two parts. Part 1 calls up provisions related to New Zealand Building Code clause B2 "Durability" so that this Part can be cited in the Approved Document. Some provisions relating to New Zealand Building Code clauses B1, C1, E2 and E3 are also mentioned.

Part 2 sets out provisions for specifiers, manufacturers and constructors to assist in obtaining satisfactory construction and performance beyond the scope of the New Zealand Building Code (NZBC). This part of the Standard provides useful information as a link between material and construction codes.

## **REVIEW OF STANDARDS**

Suggestions for improvement of this Standard will be welcomed. They should be sent to the Chief Executive, Standards New Zealand, Private Bag 2439, Wellington 6020.

## NOTES

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## NEW ZEALAND STANDARD

# TIMBER AND WOOD-BASED PRODUCTS FOR USE IN BUILDING

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### PART 1

#### MANDATORY REQUIREMENTS FOR COMPLIANCE WITH THE DURABILITY PROVISIONS OF CLAUSE B2 OF THE NEW ZEALAND BUILDING CODE.

Other provisions of the New Zealand Building Code related to clauses B1, C1, D1, E2 and E3 are referenced.

#### 101 SCOPE

##### 101.1

This Standard gives the requirements for timber and wood-based products for particular uses in building so that they can be expected to give acceptable performance during the life of the building. To that end this Standard covers the materials themselves and also certain aspects of design and construction that are relevant to their performance in use.

##### 101.2

This Standard applies to buildings, including (but not limited to) buildings constructed to NZS 3604. Timber and wood-based products have been grouped according to their use and expected service environment. Timber and wood-based products other than those shown in tables 1, 2 and 3 are outside the scope of this Standard.

##### **C101.2**

*The use of timbers and wood-based products other than those shown in the tables will be dependent on the demonstration, or prediction, of satisfactory performance to meet the requirements of the New Zealand Building Code. Such demonstration or prediction must be to the satisfaction of the Territorial Authority.*

##### 101.3

The arrangement of Part 1 of this Standard is as follows:

##### 101.3.1 *General*

Sections 101 and 102 state the scope of this Standard and how it is to be interpreted.

##### 101.3.2 *Materials*

Sections 103 to 105 cover timber and wood-based products as materials for use in buildings.

##### 101.3.3 *Preservative treatment*

Section 106 covers preservative treatment of timber.

##### 101.3.4

Requirements for building components to achieve a 50 year durability are given in sections 106, 107, 108 and 109.

##### 101.3.5

Requirements for building components to achieve a 15 year durability are given in section 110. This section covers those building components which are generally external to the building.

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### 101.3.6

Requirements for building components to achieve a 5 year durability are given in section 111. This section covers such things as interior finishing timbers.

## 102 INTERPRETATION

### 102.1

The word "shall" identifies a mandatory requirement for compliance with this Standard. The word "should" refers to practices which are advised or recommended.

### 102.2 Commentary clauses

Clauses prefixed "C" and printed in italic type are intended as comments on the corresponding mandatory clauses. They are not to be taken as the only or complete interpretation of the corresponding clause nor should they be used for determining in any way the mandatory requirements of compliance within this Standard. The Standard can be complied with if the comment is ignored.

### 102.3

The full titles of reference documents cited in this Standard are given in the list of Related Documents immediately preceding the Foreword.

### 102.4

Permitted defects and warp allowances for the different grades of timber shall be as specified in NZS 3631.

### 102.5

For the purposes of this Standard, the following definitions shall apply:

**BUILDING COMPONENT** means a component or member of the appropriate timber grade in a building which is necessary for the overall structural integrity of that building.

**GRADE** means the established quality or use classification of timber.

**GROUND ATMOSPHERE** means the atmosphere between the ground and the floor (i.e. in the subfloor space).

**HEARTWOOD** or **HEART** means the inner layers of the log which, in the growing tree, have ceased to contain living cells. Heartwood is generally darker in colour than sapwood.

## 103 GENERAL

### 103.1

Building components are classified into durability ratings depending on their structural functions, their ease of access for replacement, and likelihood of detection of failure. The highest durability rating is 50 years unless the building has a specified intended life. Other building components have to last for 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 likelihood of detection of failure. The species, grade, finish, paint coating, preservative treatment and moisture content of certain timber and wood-based products to achieve these lives is given in this Standard.

### 103.2

Where paint coatings are required the quoted lives will only be achieved when the coatings are maintained in good condition.

### 103.3

This Standard only applies if all relevant design and detailing considerations necessary to control moisture to the appropriate level have been met. In service moisture contents of timber to achieve the

durability provisions of NZBC clause B2, are covered in Part 1. Moisture contents in construction to achieve satisfactory in service finishes are covered in Part 2.

#### 103.4

The visual grades with stresses assigned are:

Engineering grade, and either No. 1 Framing or Building grade, depending on species.

#### 103.5

The mechanical stress grades are F4, F6 etc. graded in accordance with NZS 3618.

#### 103.6

Basic working stresses for Australian timbers for structural use graded to the relevant Australian standards may be found in AS 1720. For other timbers, refer to NZS 3603.

#### 103.7

Sizes shall comply with NZS 3601 unless otherwise specified.

#### 103.8 Protection up to installation

##### 103.8.1

All timber and wood-based products shall be properly protected against physical damage which can reduce their durability or structural strength prior to installation.

#### 103.9 Protection after installation

##### 103.9.1

Any physical damage to timber and wood-based products which can reduce their durability and structural strength shall be made good.

##### **C103.9.1**

*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 a month, re-priming may be necessary. Refer to NZS 7703.*

#### 103.10 Fastening and fabrication

##### 103.10.1

The timber framework shall be securely fastened to resist all forces likely to be encountered during construction or during the expected life of the building. To meet these requirements fastenings and fabrications should be in accordance with the relevant sections of NZS 3604 and NZS 3603 as appropriate.

### 104 TIMBER SPECIES, GRADE, QUALITY, AND PRESERVATIVE TREATMENT

#### 104.1

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

The tables detail requirements, including the grade and preservative treatment, for the following:

Table 1 Building components, such as floors and walls which provide structural stability, to achieve a 50 year durability.

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Table 2 Building components, such as non-loadbearing elements, stair treads, weatherboards and exterior joinery, to achieve a 15 year durability.

Table 3 Building components, such as interior finishing timbers, mouldings, skirtings, architraves, shelves, panelling and decorative sarking, to achieve a 5 year durability.

### **C104.1**

*The tables include the most commonly used and generally available timbers. They do not purport to be exhaustive, nor cover all of the species that may be available from time to time. Specifiers are advised to contact local suppliers to determine species availability. Timber grades are included to comply with NZBC clause B1/VMI Paragraph 6.1 and clause B1/ASI Paragraph 4.1.*

### **104.1.1**

The use of the words "Requires treatment" in the tables 1, 2 and 3 indicates that the member, if suffixed "Yes" requires preservative treatment in accordance with MP 3640 to the Hazard Class listed. Where the word "No" is entered in the "Requires treatment" column then the particular grade and species is not required to be preservative treated for the environment stated for that part of the table. Levels of treatment are given in tables 1, 2 and 3 as well as in section 105 of this Standard.

### **104.1.2**

Grading of timber shall comply with NZS 3631 except as provided for in 110.2.5. Profiles of weatherboards, fascia boards and flooring shall comply with NZS 3617 except as provided for in 110.2.9. Profiles of exterior joinery, profiles and moulding shall comply with NZS 3610, profiles of exterior joinery shall comply with NZS 3619.

### **C104.1.2**

*The main headings for different grades of timber for specific groups of timbers are listed below for specifiers information and assistance:*

*Group I Native Softwoods:*

*Clears grade  
Premium grade  
Dressing grade  
Building grade  
No 1 cuttings grade  
No 2 cuttings grade  
Box grade*

*Group II Hardwoods: (Native, New Zealand Grown Exotic and Imported)*

*Clears grade  
Premium grade  
Dressing grade  
Engineering grade  
Building grade  
No 1 cuttings grade  
No 2 cuttings grade  
Box grade*

*Group III Exotic Softwoods: (New Zealand Grown and Imported)*

*Clears grade  
Select A grade  
Select B grade  
Dressing grade*

Merchantable grade  
 Engineering grade  
 No 1 Framing grade  
 No 2 Framing grade  
 No 1 Cuttings grade  
 No 2 Cuttings grade  
 Box grade

## 104.2 Plywood

### 104.2.1

Plywood for exterior use, exposed to ground atmosphere or for use in situations of high humidity, where dampness or condensation will occur, shall be preservative treated in accordance with 105.1 and have a weather-resistant glue line complying with one of the following:

NZS 3611, NZS 3613, or AS/NZS 2269.

#### **C104.2.1**

*Guidance as to which type of plywood should be used in any particular situation can be obtained from the Forewords of NZS 3611, NZS 3613 and AS/NZS 2269. Additional information may be obtained from the manufacturers. Plywood made to NZS 3611 and NZS 3613 may be used in accordance with the intent of those Standards.*

*Structural plywood as specified in AS/NZS 2269 is plywood adequate for service outside and primarily intended as a construction material where strength properties are the main consideration. Characteristic stresses for structural plywood are given in NZS 3603.*

### 104.2.2

When plywood is used outside, physical protection in the form of preservative treatment or preservative treatment in conjunction with paint, is necessary (refer to the tables) to ensure the required durability. Regular maintenance and replacement of the paint shall be undertaken during the life of the plywood.

### 104.2.3

Plywood conforming to NZS 3612 or AS/NZS 2269, used in interior dry situations, (i.e. protected from the weather or dampness) does not need to be treated.

#### **C104.2.3**

*Interior plywood as specified in NZS 3612 is suitable for use in interior situations where there is full protection from the weather and from high humidity. There are two grades of interior plywood, No. 1 and No. 2, based on the appearance of the face. Most plywood in New Zealand is now made to AS/NZS 2269.*

## 104.3 Particleboard and wood-based products

### 104.3.1

Although particleboard and wood-based products are shown in the tables their use is dependent on the demonstration, or prediction, that the required durability will be achieved. The acceptance of such demonstration, or prediction, is outside the scope of this Standard and shall be to the satisfaction of the Territorial Authority.



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### 104.4 Glue laminated timber

#### 104.4.1

Tables 1 and 2 require preservative treatment of a particular species and quality of timber for a laminated timber component.

#### 104.4.2

Materials, finishes and workmanship of glue laminated timber shall be specified in accordance with the requirements of NZS 3606.

## 105 PRESERVATIVE TREATMENT

### 105.1

With the exception of those building components not requiring treatment, timber specified to be treated in tables 1, 2 and 3, shall be treated and branded in accordance with MP 3640.

#### **C105.1**


*Preservative treatment is specified to prevent degradation of timber through decay or attack by wood-boring insects. Decay can occur only in wet or damp timber. Insect attack can occur in wet, or damp timber and to a lesser extent in dry timber. Kiln dried or high temperature dried radiata pine wood is less susceptible to insect attack than untreated sapwood of many native species. Thus it may be used as an alternative to traditional use of H1 treated material installed wet (see table 1C).*

*For treated timber, Hazard Class specifications of relevance to building construction are H1, H3, H4 and H5. Specifiers should be familiar with their provisions, and nominate in their job specifications the Hazard Class specifications required for all building components. Branding requirements are stated in section 6 of MP 3640. Also see New Zealand Timber Industry Federation Timber Use Manual for more information.*

*Care should be taken in the disposal of waste pieces of treated timber. Treated timber offcuts should not be burned in domestic fireplaces because this produces toxic air pollution, concentrates toxic wastes in ashes and accelerates corrosion of metal fireplaces.*

### 105.2

Timber treated at plants participating in the Timber Preservation Council's Woodmark scheme carries

the Woodmark symbol . For the purposes of this Standard, the Woodmark symbol is accepted as automatic proof that the branded Hazard Class has been achieved. Where timber treatment will be undertaken at a plant not a participant in the Timber Preservation Council Woodmark scheme, then the Territorial Authority shall satisfy itself that the plant is operating to at least equal standards.

### 105.3

Treated timber shall be properly cared for before use to avoid exposure to a hazard situation for which it has not been treated and therefore against which it has not been protected.

#### **C105.3**

*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.*

*For example, H1 and H3 timbers should be stored out of contact with the ground. Timbers treated with leachable preservatives should also be protected from prolonged exposure to the weather before use and afterwards by adherence to recommended maintenance procedures.*

**105.4**

The life of metal fixings and components, including protective coating systems, when in contact with preservative treated timbers, shall satisfy the durability provisions of clause B2 of the NZBC.

Where the structural integrity of the building is dependent on a fastening and that fastening has a limited life, then the life of the fastening shall be the specified intended life of the building.

**C105.4**

*Timber treatments may affect the life of fasteners and evidence, or opinions predicting, satisfactory performance may need to be supplied to the Territorial Authority. Hot dipped galvanized nails, wire dogs, bolts and sheet fixings in contact with CCA treated timber in damp conditions can have an expected life of less than 15 years. Unprotected electroplate galvanized fixings will have considerably less life than hot dipped galvanized steel fixings. Additional proprietary coatings offer extended life to galvanized steel fixings, but their durability must be established in accordance with B2/VM1. Galvanized structural components incorporating a sacrificial thickness of metal for the life of the fitting are also acceptable. Type 304 or 316 stainless steel nails, wire dogs, bolts and sheet steel fixings offer a longer life than galvanized steel.*

*Specifiers may elect to specify a higher standard than that required by NZBC for other purposes. Where galvanized steel or aluminium components are used in conditions of dampness with timber that has been treated with preservatives containing copper, special precautions in accordance with the component manufacturer's instructions will be necessary to avoid corrosion.*

**105.5**

Radiata pine framing members that have been kiln dried at 74 °C or above, to 18 % moisture content or less and have been planer gauged do not require preservative treatment, provided they are not exposed to ground atmosphere or in any position where the timber moisture content will exceed 18 %.

**C105.5**

*In timber complying with the conditions in 105.5 attack from the common New Zealand household borer (Anobium), will be at an acceptably low level to comply with the strength properties and durability required by the NZBC. Care needs to be exercised in the use of untreated framing members adjacent to external absorbent claddings on walls and roofs that are susceptible to solar driven moisture transfer mechanisms which can cause high humidity in framing cavities. Cladding manufacturers recommendations to prevent solar-driven moisture transfer through their absorbent cladding materials from entering framing cavities should be followed. Adequate prevention of moisture being conducted from the subfloor into the wall cavity should be implemented.*

*It should be noted that kiln dried gauged untreated radiata pine framing timbers be protected from getting wet or moisture pick up from the ground or concrete prior to installation in the structure. (Refer 109.4.3). The building should be closed in to protect the untreated timber from the weather and dampness within one months exposure to the weather during construction.*

*The minimum wood temperature of 74 °C is the minimum temperature for export quarantine requirements. These requirements are intended to sterilize the timber. High temperature drying i.e. at temperatures above 100 °C is preferable because it not only sterilizes the wood but induces other changes thought to make the wood less susceptible to attack.*

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### 106 REQUIREMENTS FOR BUILDING COMPONENTS IN CONTACT WITH THE GROUND, TO ACHIEVE A 50 YEAR DURABILITY (see table 1A)

#### 106.1

Table 1A lists the species, grade, moisture content and preservative treatment required for building components in contact with the ground.

##### **C106.1**

*Research by the New Zealand Forest Research Institute on CCA treated radiata pine house and building foundations indicates a very long life, possibly in excess of 80 years providing the timber is correctly treated.*

#### 106.2

Round or square timber house piles and poles for use in buildings shall be in accordance with NZS 3605. Cut ends or notches or similar, in poles and posts made after treatment shall not be put into the ground, nor closer than 300 mm from the ground and shall be protected from the weather. Any cut or bored surfaces shall have *in situ* treatment according to MP 3640. Poles and posts shall have been held at least 3 weeks after treatment, before use. Connecting metal fasteners shall be fixed after the timber has dried.

##### **C106.2**

*Guidance on suitable timber preservative treatment preparations can be obtained from the New Zealand Timber Preservation Council in Wellington or the Forest Research Institute in Rotorua.*

#### 106.3

Plywood used for treated frame foundations (all weather wood foundations) shall be treated to the requirements of Hazard Class H5.

##### **C106.3**

*BRANZ Technical Paper P43:1984 Treated Timber Frame Foundation provides details on the construction of treated timber foundations. Stainless steel nails and staples are recommended for use in this type of construction (refer to American Plywood Association's Report PT 80-1 Fastener Corrosion in Water-Borne Preservative Treated Wood). The life expectancy of other types of fixings is considerably less than stainless steel and may not provide a 50 year durability performance.*

#### 106.4

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

##### **C106.4**

*Crib walls are engineering designed retaining structures. Proprietary crib wall retaining wall systems, and design procedures, height limitations and construction methods for building such walls are available. Generally the wall's components are manufactured from timber which has a grade equivalent to No. 1 framing.*

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**107 REQUIREMENTS FOR BUILDING COMPONENTS EXPOSED TO EXTERIOR WEATHER CONDITIONS AND DAMPNESS, TO ACHIEVE A 50 YEAR DURABILITY (see table 1B)****107.1**

Table 1B lists the species, grade, moisture content and preservative treatment required for building components exposed to exterior weather conditions and dampness.

**107.1.1**

Exterior supporting structures, such as poles, posts and timber framing supporting floors, exposed to the weather shall be of timber species which will accept preservation treatment. These timber members shall be treated to the provisions of MP 3640 for their appropriate end use and carry the relevant Hazard Class H Branding.

**107.2 Exterior bracing**

Plywood cladding used as a bracing element, performance rated in accordance with the BRANZ P21 test procedure, shall be protected by manufacturers specified exterior paint systems which are to be regularly maintained. Detailing near doors and other fittings shall avoid the collection of detritus which 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 detritus.

**107.3 Adhesives****107.3.1**

Adhesive for timber or wood-based products used in exterior or exposed situations shall be type WBP of NZS 7202. The above requirements apply to adhesives used in finger-joints to NZS 3616. Adhesives for glue laminated timber shall be specified in accordance with NZS 3606.

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### 108 REQUIREMENTS FOR BUILDING COMPONENTS PROTECTED FROM THE WEATHER BUT EXPOSED TO GROUND ATMOSPHERE, TO ACHIEVE A 50 YEAR DURABILITY (see table 1C)

#### 108.1

Table 1C lists the species, grade, moisture content and preservative treatment required for building components protected from the weather but exposed to ground atmosphere.

#### 108.2

The durability of suspended timber and wood-based products floors is dependent on the subfloor space being ventilated throughout the life of the building to the provisions of NZS 3604 or Acceptable Solution E2/AS1. Subfloor air space shall continue to receive the ventilation to the provisions of NZS 3604 or Acceptable Solution E2/AS1.

##### **C108.2**

*Subfloor ventilation is vital in maintaining the moisture content of reconstituted wood products such as particleboard floors to a level less than 18 % moisture content required by the NZBC Acceptable Solution E2/AS1. Cross ventilation can be achieved by the appropriate openings around the subfloor space or alternative measures as described in Acceptable Solution E2/AS1. The durability assessment of subfloor framing is related directly to the amount of ventilation of the subfloor area. If the ventilation is decreased then the moisture content of the timber structure is likely to increase thereby increasing the risk of attack and hence reducing the life of the structure.*

#### 108.3

Vapour barriers required by E2/AS1 to control moisture content in subfloor areas shall be maintained in an effective condition throughout the life of the building.

#### 108.4 Sheet bracing

##### 108.4.1

Plywood used as bracing shall be treated as shown in table 1C to achieve a 50 year durability.

##### 108.4.2

Cement bonded fibre boards 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 required by the NZBC clause B2.

##### **C108.4.2**

*Some cement bonded fibre boards are specified by manufacturers as required to remain dry in service.*

## 109 REQUIREMENTS FOR BUILDING COMPONENTS PROTECTED FROM THE WEATHER AND IN DRY CONDITIONS AND NOT EXPOSED TO GROUND ATMOSPHERE, TO ACHIEVE A 50 YEAR DURABILITY (see table 1D)

### 109.1

Table 1D lists the species, grade, moisture content and preservative treatment required for building components protected from the weather and in dry conditions and not exposed to ground atmosphere.

#### **C109.1**

*This section deals with all members above subfloor areas that are not exposed to ground atmosphere from the ground or where it can be controlled so that the long term in situ equilibrium moisture content of timber elements will not exceed 18 % moisture content. This includes building components above ground that are either completely covered by a vapour barrier or on a concrete floor at ground level.*

### 109.2 Damp proofing

#### 109.2.1

All timber and wood-based products in contact with wet or damp concrete or with concrete or masonry that is exposed to the exterior shall be protected with bituminous damp-proof course or other suitable impervious material overlapping the timber by at least 6 mm. This is not required for timber treated to H4 or H5 provided however that the transfer of moisture through this timber will not cause moisture related problems in adjacent building components or wall cavities.

#### **C109.2.1**

*Timber treated to H4 or H5 used on damp concrete without a damp-proof course should not be totally enclosed to allow for moisture to disperse freely. Stud framing attached to such wall plates should be H4 or H5 treated timber.*

### 109.3 Plywoods, particleboard and wood-based products

#### 109.3.1

Plywoods, particleboards and wood-based products used in interior situations, protected from weather or dampness do not need to be treated.

### 109.4 Protection of interior flooring

#### 109.4.1

Plywood and particleboard and other wood-based products floors which are to remain uncovered in non-wet areas shall be finished with a hardwearing durable coating such as a solvent evaporation or air moisture curing polyurethane.

#### 109.4.2

Floor coverings in "wet areas" such as laundries, bathrooms and toilets shall be as set out in Acceptable Solution E3/AS1 Paragraph 3.1.2. Air moisture curing polyurethane coatings in kitchens are acceptable. All coverings and coatings in wet areas and kitchens shall be maintained to ensure water cannot penetrate to the floor. Where maintenance of an impervious coating cannot be assured in wet areas H3 treated plywood or timber that has been treated to H3 shall be used.

#### 109.4.3

Other floor coverings such as carpet, lino, tiles etc. and durable coatings such as specialised finishes shall be maintained to ensure the timber, particleboard, plywood or wood-based products surface is protected.



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### 109.4.4

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.

### 109.4.5

Flashings shall be incorporated in the door sills, head and jambs of all exterior joinery to prevent leakage and consequent moisture damage to particleboard, plywood or wood-based flooring.

### 109.4.6

Flooring shall be protected from localised heat sources, such as free standing heating appliances, space heaters, hot air ducts and pipes containing steam in accordance with to NZS 7421 for Installation of solid fuel burning domestic appliances and NZBC Acceptable Solution B1/AS3 Paragraph 2.2 and Acceptable Solution C1/AS1 Paragraphs 1.3 and 1.4.

### 109.4.7

Openings in flooring shall not be used as a means of temporary drainage during washing as this will result in damage to the flooring around the hole.

## 109.5 Finger-jointing

### 109.5.1

Finger-jointed timber shall comply with the requirements of NZS 3616.

## 109.6 Adhesives

### 109.6.1

Adhesives for timber or wood-based products used for load bearing applications in dry interior situations shall comply with NZS 7202. The above requirements apply to adhesive used in finger-joints. Adhesives for glue laminated timber shall be specified in accordance with NZS 3606.

## 109.7 Condensation and solar-driven moisture control

### 109.7.1

All timber and wood-based products shall be so built into the structure that due allowance is made for the control of condensation so as to control decay, corrosion, mildew, distortion, and disfigurement. Reference shall be made to condensation and solar driven moisture control and ventilation in clause 109.7.2.

### 109.7.2

Constructions shall comply with Acceptable Solution E2/AS1 and E3/AS1.

#### **C109.7.2**

*(a) Constructions involving timber and wood-based products must make due allowance for the control of condensation to limit to a reasonable degree decay, corrosion, mildew, distortion, and disfigurement.*

*(b) The notes for guidance below cover only the most general considerations, and for the specific treatment of particular cases reference should be made to more detailed publications; guidance on these may be obtained from the Building Research Association of New Zealand (Private Bag 50908, Porirua), or other appropriate sources.*





- (c) *Condensation occurs upon cold faces, that is, upon surfaces whose temperature falls below the dew point of the air adjacent to them. Cold faces may occur in cavities or in rooms. The appropriate precautions to control condensation in cavities include the use of breather-type building paper or alternative products complying with the water vapour transmission requirements of NZS 2295 and the use of vapour checks.*
- (d) *Breather-type building paper should be fixed to the external face of roof framing and exterior wall framing immediately beneath roofing or roof sheathing (in the case of built up or membrane roofs) and immediately behind wall cladding so as to limit the entry of wind into building cavities, to act as a secondary barrier to wind-driven rain, and to absorb temporary condensation in wall and roof cavities. Adequate laps should be provided to adjacent sheets, and care should be taken to prevent the building paper from being torn.*
- (e) *Vapour checks (barriers) are sometimes installed in structures. When a vapour check is installed, it should always be placed on the warmer side of the floor, wall, or roof behind the linings. Wherever a vapour check is installed insulation is also necessary to avoid the risk of condensation occurring on the vapour barrier.*
- (f) *Prefabricated panel construction requires special consideration with regard to condensation both on faces and within the thickness of the panel.*
- (g) *Ventilation of roof spaces which are sarked to accept bitumen base tiles is recommended by North American tile manufacturers. Their recommendation should be considered in the installation of their product used in New Zealand. Due attention should be given to controlling or eliminating condensation caused by solar-driven moisture transfer through absorbent roofing and wall claddings, into timber frame building cavities. For more information refer to BRANZ Report 122 Solar-driven moisture transfer through absorbent roofing materials. It appears that while solar heating of wetted absorbent claddings evaporates some of the surface moisture into the exterior air, it also drives a significant portion of it through the back of the absorbent cladding and into the wall or roof cavity. This problem has been observed in "skillion" or "cathedral" roofs where it has been reported to cause wetted ceiling insulation, wetted ceilings and water dripping out of the eaves of roofs. Similar problems have been observed in external wall cavities clad with absorbent materials. Recommendations, by manufacturers of absorbent cladding materials, to eliminate or control solar-driven condensation should be followed with the proviso that their recommendations will provide the timber structure with the appropriate durability performance required by this Standard. Permeable building papers are unlikely to greatly impede the transfer of moisture from solar-driven moisture.*

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### 110 REQUIREMENTS FOR BUILDING COMPONENTS WITH A 15 YEAR DURABILITY (see table 2)

#### 110.1

Table 2A lists the species, grade, moisture content and preservative treatment required for building components exposed to exterior weather conditions and dampness and table 2B lists the requirements for building components protected from the weather and dampness.

##### **C110.1**

*Building components which have moderate ease of access, are not difficult to replace and for which failure is not difficult to detect are required to have a durability of 15 years. Included in this category are the frames of non-loadbearing walls, weatherboards, exterior joinery, verandah flooring, unroofed decking, stair components and balustrades depending on the details of construction and hence the degree of difficulty to replace. Hidden fixings of the external envelope which are difficult to replace or inspect need a 50 year durability.*

#### 110.2 Weatherboards and exterior finishing timbers

##### 110.2.1

Unless covered by 110.2.7, weatherboards and exterior finishing timbers shall be primed in accordance with NZS 7703, either before delivery or immediately after the block stack is opened up on site. All surfaces and joints of exterior finishing timbers shall be primed with the exception of those building components which are treated to H3.

##### **C110.2.1**

*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 may be necessary (refer to NZS 7703). Water repellent application will improve the stability of painted timber but it must still be primed.*

##### 110.2.2

Unless covered by 110.2.7 the end grain of all species exposed to the weather shall be protected by paint in accordance with NZS 7703. Particular attention shall be given to sealing the end grain of weatherboards. Knots shall be considered as for end grain.

##### **C110.2.2**

*Water penetration of timber through end grain can readily occur and can cause timber decay even when covered by other building components, i.e. as in mitred weatherboards. Water repellent application will improve the stability of painted timber but it must still be primed.*

##### 110.2.3

Horizontal weatherboards which are protected by a well maintained three coat alkyd or 100 % acrylic paint in accordance with NZS 7703 shall, if requiring treatment, be treated to H1 in accordance with table 2A.

##### 110.2.4

Vertical or diagonally placed weatherboards requiring treatment, whether or not protected by a paint system in accordance with NZS 7703, shall be treated to H3 in accordance with table 2A.

##### 110.2.5

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

- (a) All holes, resin and bark pockets excluded;

(b) Knot size shall not exceed 50 mm; or 25 mm width for spike knots.

**C110.2.5**

*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.*

**110.2.6**

The selection of paints or water repellents for knots and other resinous areas shall be obtained from NZS 7703.

**110.2.7**

For "no finish" or "stained finish" condition only the following species are permitted; redwood, cypress, western red cedar and sawn H3 treated pinus species.

**110.2.8**

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

**C110.2.8**

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

**110.2.9**

The acceptability, for particular uses of profiles of weatherboards and fascia boards not complying with NZS 3617 shall be determined in accordance with NZBC B2/VM1 or by tests carried out to AS/NZS 4284.

**110.2.10**

Non-ferrous, type 304 stainless steel or galvanized fastenings shall be used with redwood, western red cedar, erima, or other acidic species and for CCA treated pine. Aluminium fasteners shall not be used with CCA treated pine.

**110.3 Finger-jointing****110.3.1**

Finger-jointed timber shall comply with the requirements of NZS 3616.

**110.4 Exterior window joinery and door frames****110.4.1**

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

**110.4.2**

The acceptability of exterior joinery shall be determined by testing in accordance with NZS 4211 or AS/NZS 4284.

**C110.4.2**

*Exterior windows designed to NZS 3610 may comply with durability requirements of clause B2 of the New Zealand Building Code but will not necessarily obtain the performance required for the higher wind zone ratings in NZS 4211.*

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### 110.5 Exterior claddings

#### 110.5.1

Plywood for exterior use or for use in situations of high humidity shall have a weather-resistant glue line and comply with one of the following:

NZS 3611, NZS 3613 or AS/NZS 2269.

### 110.6 Doors

#### 110.6.1

Doors shall comply with NZS 1158.

### 110.7 Exterior floors

#### 110.7.1

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

##### **C110.7.1**

*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 hazard. Balau decking has been reported to fail within 5 years and therefore is not recommended in this Standard. Some guidance on species is given in table 2A. Further information should be sought from the Forest Research Institute, Building Research Association of New Zealand or the Timber Preservation Council Inc.*

#### 110.7.2

Plywoods complying with 104.2.1 are suitable for exterior flooring, provided the appropriate grades and treatments are used. Refer table 2A and MP 3640.

#### 110.7.3

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

### 110.8 Surface coatings

#### 110.8.1

Surface coatings shall be a paint type or surface treatment applied in accordance with NZS 7703, regularly maintained so that the building element concerned will have a durability of 15 years.

##### **C110.8.1**

*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 resulting in excessive shrinkage, checking and failure of the finishing material. (See also the New Zealand Timber Industry Federation Timber Use Manual).*

### 110.9 Condensation control

#### 110.9.1

Ensure that condensation control as required in 109.7 is provided with the installation of all exterior claddings.

## 111 REQUIREMENTS FOR BUILDING COMPONENTS TO ACHIEVE A 5 YEAR DURABILITY (see table 3)

### 111.1

Table 3 lists the species, grade, moisture content and preservative treatment required for non-structural components protected from the weather.

#### **C111.1**

*Building components which are easy to access and replace and where failure is easy to detect are required by the New Zealand Building Code to have a durability of 5 years. Included in this category are interior finishing timbers and mouldings.*

### 111.2 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, laundries, window reveals and sill boards (especially around metal windows) shall be protected against decay by appropriate protection such as preservative treatment, painting etc.

### 111.3 Finger-jointing

#### 111.3.1

Finger-jointed timber shall comply with the requirements of NZS 3616.

### 111.4 Surface coatings

#### 111.4.1

Surface coatings shall be the paint type or surface treatment to maintain a 5 year durability of the element and be applied in accordance with NZS 7703.

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

#### 111.5.1

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

#### **C111.5.1**

*Particular care is required in the choice of material in any position where condensation and dampness may occur. Plywood used in interior situations, protected from the weather or dampness does not need to be treated.*

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**Table 1 – Building components requiring a 50 year durability performance<sup>(1)</sup>**

Building components	Species	Grade or standard ref.	In situ moisture range %	Requires treatment	Level of treatment to MP 3640	See clause reference	
<b>A Members in contact with the ground</b> (see section 106)							
Building piles	Pinus species	NZS 3605	Not limited	Yes	H5	104.2 105.1 106.3	
Plywood and treated timber frame Foundations	Treatable species (Refer to NZTPC Timber Preservation Quality Manual)	BRANZ P43		Yes	H5		
Crib walling, sawn Poles,house Poles,retaining walls		NZS 3605		Yes Yes Yes	H4A or H5B H5B H5		
<b>B Members exposed to exterior weather conditions and dampness</b> (see section 107)							
Laminated beams	Pinus species			Yes	H3 or H4 <sup>(2)</sup>	104.4 107 105.1	
Posts sawn Bearers Beams Floor joists Rafters Guardrails Stair components	Pinus radiata	No.1 Framing	Not limited	Yes No Yes No Yes No	H3 H3 H3		
Posts in the ground Poles in the ground	Pinus species	NZS 3605	Not limited	Yes Yes	H5 H5		
Cladding as wall bracing	Plywood	AS/NZS 2269	20 % or less	Yes	H3		107.2
	Wood-based products <sup>(3)</sup>		18 % or less	Yes			
Sarking and framing not protected from solar driven moisture through absorbent cladding materials exposed to the weather	Plywood Radiata pine	AS/NZS 2269 No. 1 Framing	24 % or less	Yes Yes	H3 H3	105.1 109.7	
NOTE –							
(1) This table lists the species, grade, and preservative treatment appropriate to the building components listed in the left hand column of that section of the table.							
(2) Laminated timber beams may be treated up to H4 after manufacture.							
(3) Wood-based products must have a proven durability performance against dampness.							



Table 1 (continued) – Building components requiring a 50 year durability performance<sup>(1)</sup>

Building components	Species	Grade or standard ref.	In situ moisture range %	Requires treatment	Level of treatment to MP 3640	See clause reference
<b>C Members protected from the weather but exposed to ground atmosphere (see section 108)</b>						
Jackstuds	Radiata pine	No.1 Framing		Yes	H1	
Subfloor braces	Corsican pine	No.1 Framing		Yes	H1	
Bearers	Douglas fir	No.1 Framing		No		
Wall plates	Larch	No.1 Framing		No		
Floor joists to the subfloor, blocking etc.	Cypress species <sup>(2)</sup>	No.1 Framing	24 % or less	No		105.1
Subfloor wall studs	Rimu	Building sapwood		Yes	H1	108
Walings and battens	Rimu	Building heart		No		
Wall studs and noggs	Matai	Building sapwood		Yes	H1	
Diagonal boards	Matai	Building heart		No		
Plywood bracing	Pinus species	AS/NZS 2269	18 % or less	Yes	H1	108.4
Interior flooring	Plywood	AS/NZS 2269	18 % or less	No <sup>(4)</sup>		
	Particleboard and other wood-based products <sup>(3)</sup>		18 % or less	No <sup>(4)</sup>		104.3 108.2 108.3
	Pinus species Cypress species <sup>(2)</sup> Cypress species <sup>(2)</sup> Matai Matai Rimu Rimu Eucalyptus species Tawa	Dressing Dressing sapwood Dressing heart Dressing sapwood Dressing heart Dressing sapwood Dressing heart Dressing Dressing	18 % or less	Yes Yes No Yes No Yes No No Yes	H1 H1  H1 H1	105.1 205.14
<p>NOTE –</p> <p>(1) This table lists the species, grade, and preservative treatment appropriate to the building components listed in the left hand column of that section of the table.</p> <p>(2) Cypress species include Cupressus macrocarpa (macrocarpa), C. lustianica (Mexican cypress) and Chamacyparis lawsoniana (Lawson's cypress). Refer to NZS 3621.</p> <p>(3) Wood-based products must have a proven durability performance against dampness.</p> <p>(4) In wet areas where the maintenance of impervious coverings is in question, H3 treated timber or plywood shall be used.</p>						





Table 2 – Building components requiring a 15 year durability performance<sup>(1)</sup>

Building components	Species	Grade or NZS No.	In situ moisture range %	Requires treatment	Level of treatment to MP 3640	See clause reference
<b>A Members exposed to exterior weather conditions and dampness</b> (see section 110)						
Weatherboards which are horizontal, base battens, fascia, barge and coverboards and plywood cladding all with a 3 coat paint finish	Pinus species	Dressing	18 % or less	Yes	H1	105.1 110.2.3 110.2.5
	Larch	Dressing heart		No		
	Cypress species <sup>(2)</sup>	Dressing heart		No		
	Redwood	Dressing heart		No		
Western red cedar	Dressing heart	No				
Douglas fir	Dressing heart	No				
Rimu	Dressing sapwood	Yes				
Rimu	Dressing heart	No				
Erima	Dressing	Yes				
Beech- silver,red,hard.	Dressing sapwood	Yes				
Beech- silver,red,hard.	Dressing heart	No				
	Plywood	AS/NZS 2269		Yes	H1	
	Wood-based products <sup>(3)</sup>	Exterior		Yes		
Weatherboards which are vertical or diagonal, and all weatherboards, base battens, fascia, barge and coverboards and plywood cladding with either a paint, stain, clear or no finish	Pinus species	Dressing	18 % or less	Yes	H3	110.2.4 110.2.5
	Rimu	Dressing heart		No		
	Larch	Dressing heart		No		
	Cypress species <sup>(2)</sup>	Dressing heart		No		
Redwood	Dressing	No				
Western red cedar	Dressing	No				
Douglas fir	Dressing heart	No				
Erima	Dressing	Yes				
Beech- silver,red,hard.	Dressing sapwood	Yes				
Beech- silver,red,hard.	Dressing heart	No				
	Plywood	AS/NZS 2269		Yes	H3	
	Wood-based products <sup>(3)</sup>	Exterior		Yes		
Exterior joinery which includes windows frames, sills, and sashes exterior door frames, sills and doors and external stairs, with either a paint, stain, clear or no finish	Pinus species	Select A	18 % or less	Yes	H3	105.1
	Redwood	Select A heart		No		
	Western red cedar	Select A heart		No		
	Cypress species <sup>(2)</sup>	Select A heart		No		
	Fijian kauri	Select A heart		No		
	Kauri	Premium sapwood		Yes		
	Kauri	Premium heart		No		
Matai	Premium sapwood	Yes				
Matai	Premium heart	No				
Rimu	Premium sapwood	Yes				
Rimu	Premium heart	No				
Backing to solid plaster-diagonal boards Battens to non-rigid backing	Radiata pine	No.1 Framing	24 % or less	Yes	H3 H3	105.1
	Radiata pine	No.1 Framing		Yes		
Plywood	Pinus radiata	AS/NZS 2269	24 % or less	Yes	H3	110.7.2
Verandah floors Unroofed decking (which can be easily replaced) with either a paint, stain, clear or no finish	Pinus species	Dressing	Not limited	Yes	H3	105.1
	Cypress species <sup>(2)</sup>	Dressing heart		No		
	Vitex, Kwila	Dressing heart		No		
	Rimu	Dressing sapwood		Yes		
	Eucalyptus <sup>(4)</sup>	Dressing heart		No		
	Eucalyptus <sup>(4)</sup>	Dressing sapwood		Yes		
Beech- silver,red,hard.	Dressing sapwood	Yes				
Beech- silver,red,hard.	Dressing heart	No				
	Plywood	AS/NZS 2269		Yes	H3	
	Wood-based products <sup>(3)</sup>	Exterior		Yes	H3	

NOTE –

- (1) This table lists the species, grade, and preservative treatment appropriate to the building components listed in the left hand column of that section of the table.
- (2) Cypress species include Cupressus macrocarpa (macrocarpa), C. lustianica (Mexican cypress) and Chamacyparis lawsoniana (Lawson's cypress). Refer to NZS 3621.
- (3) Wood-based products must have a proven durability performance against dampness.
- (4) Eucalyptus species include E.botryoides, E.saligna, E.globoidea, E.muellerana, E.obliqua, E. pilularis.

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**Table 2 (continued) – Building components requiring a 15 year durability performance<sup>(1)</sup>**

Building components	Species	Grade or NZS No.	In situ moisture range %	Requires treatment	Level of treatment to MP 3640	See clause reference
<b>B Members protected from the weather and dampness (see section 110)</b>						
Non-loadbearing studs in walls which are non-structural elements including nogs or dwangs which if removed would not affect the stability of the building	Radiata pine	No.2 Framing	24 % or less	Yes	H1	105.1 110
	Corsican pine	No.2 Framing		Yes	H1	
Douglas fir	No.2 Framing	No				
Larch	No.2 Framing	No				
Cypress species <sup>(2)</sup>	No.2 Framing	No				
Matai	Dressing sapwood	Yes		H1		
Matai	Dressing heart	No				
Rimu	Dressing sapwood	Yes	H1			
Rimu	Dressing heart	No				
	Kiln dried and gauged Radiata pine or Corsican pine	F4 or No.2 Framing	18 % or less	No		105.5 C105.5
Stair treads <sup>(4)</sup> Interior doors and frames Interior windows, trapdoors sarking (supporting flexible roof tiles)	Pinus species	Select A	16 % or less	No		105.1
	Douglas fir	Select A		No		
	Cypress species <sup>(2)</sup>	Select A		No		
	Yaka	Select A		No		
	Rimu	Premium		No		
	Eucalyptus species	Premium		No		
Beech- silver,red,hard.	Premium	No				
Tawa	Premium	Yes	H1			
	Plywood	AS/NZS 2269		No		
	Wood-based products <sup>(3)</sup>			No		
<p>NOTE –</p> <p>(1) This table lists the species, grade, and preservative treatment appropriate to the building components listed in the left hand column of that section of the table.</p> <p>(2) Cypress species include Cupressus macrocarpa (macrocarpa), C. lustianica (Mexican cypress) and Chamacyparis lawsoniana (Lawson's cypress). Refer to NZS 3621.</p> <p>(3) Wood-based products must have a proven durability performance against dampness.</p> <p>(4) Stairs that are readily accessible.</p>						

**Table 3 – Building components protected from the weather which require a 5 year durability performance<sup>(1)</sup>**

Building components	Species	Grade or NZS No.	<i>In situ</i> moisture range %	Requires treatment	See clause reference
Stair components other than treads (which can be easily replaced)	Pinus species	Dressing	16 % or less	No	111
	Douglas fir	Dressing		No	
	Cypress species <sup>(2)</sup>	Dressing		No	
Yaka	Dressing	No			
Rimu	Dressing	No			
Eucalyptus species	Dressing	No			
Beech- silver,red,hard.	Dressing	No			
Tawa	Dressing	No			
	Plywood	AS/NZS 2269		No	
	Wood-based products <sup>(3)</sup>			No	
All interior finishing timbers mouldings, skirtings, architraves, panelling, decorative sarking, shelves	Pinus species	Dressing	16 % or less	No	
	Douglas fir	Dressing		No	
	Cypress species <sup>(2)</sup>	Dressing		No	
Yaka	Dressing	No			
Rimu	Dressing	No			
Eucalyptus species	Dressing	No			
Beech-silver, red, hard.	Dressing	No			
Tawa	Dressing	No			
	Wood-based products <sup>(3)</sup>		16 % or less	No	
<p>NOTE –</p> <p>(1) This table lists the species, grade, and preservative treatment appropriate to the building components listed in the left hand column of that section of the table.</p> <p>(2) Cypress species include <i>Cupressus macrocarpa</i> (macrocarpa), <i>C. lusitanica</i> (Mexican cypress) and <i>Chamacyparis lawsoniana</i> (Lawson's cypress). Refer to NZS 3621.</p> <p>(3) Wood-based products must have a proven durability performance against dampness.</p>					

## NOTES

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## PART 2 CONSTRUCTION PROVISIONS BEYOND THE MANDATORY REQUIREMENTS OF THE NEW ZEALAND BUILDING CODE

### 201 PURPOSE

#### 201.1

Where this specification is cited, Part 2 shall be read in conjunction with Part 1. The purpose of Part 2 is to cover construction and contract provisions beyond 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. Part 2 also contains useful information and comments intended to assist specifiers, manufacturers and constructors.

#### **C201.1**

*The NZBC deals with matters related to health and safety in buildings. Safety is dependent on structural strength and its durability for the life of the building. Protection against external and internal moisture relates to health and is also part of the NZBC. Part 2 deals principally with matters related to timber moisture contents, before and after construction and other matters necessary to achieve acceptable standards of finish.*

#### 201.2

The arrangement of this Standard is as follows:

##### 201.2.1

Section 206 gives the installed (or pre-lined or finish) moisture content of building components, protected from the weather and in dry conditions necessary to limit movement and their aesthetic effect on lining and finishes in service for a 50 year durability.

##### 201.2.2

Section 208 gives the installed (or pre-lined or finish) moisture content of building components necessary to limit movement and their aesthetic effect on lining and finishes in service for a 15 year durability.

##### 201.2.3

Section 209 refers to workmanship and maintenance in general.

### 202 GENERAL

#### **C202**

*“Time of use” 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 goods can vary with moisture changes from the time of purchase to that in installation to the point where the goods may not comply with this Standard or its related documents.*

*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.*

#### 202.1

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



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### 202.2

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.

### 203 PLYWOOD

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

### 204 PARTICLEBOARD, FIBREBOARD AND OTHER WOOD-BASED PANEL PRODUCTS

#### 204.1

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.

##### **C204.1**

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

- (a) *Flooring grade;*
- (b) *Medium density;*
- (c) *Low density.*

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

#### 204.2

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

#### 204.3

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.

##### **C204.3**

*It should be noted that 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. Reference should be made to AS/NZS 1859 for detailed information on the fixing and use of fibreboards and on the range of textured veneered and pre-finished boards produced.*

### 205 MOISTURE CONTENT AND QUALITY CONTROL REQUIREMENTS FOR BUILDING COMPONENTS PROTECTED FROM THE WEATHER AND IN DRY CONDITIONS WITH A 50 YEAR DURABILITY PERFORMANCE

#### 205.1

Building components which 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 this section. They shall be of grade, quality and level of preservative treatment listed in table 1D.

**C205.1**

*This section deals with all protected building components above subfloor areas and concrete floors at ground level which cover the entire floor area.*

**205.2**

At the time of installation the moisture content of all finishing timbers, unless expressly stated to the contrary, shall be within the moisture content limits set out in table 4.

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

	<b>Use category level of finish</b>	<b>Air-conditioned or centrally heated buildings</b>	<b>Intermittently heated buildings<sup>(2)</sup></b>	<b>Unheated buildings</b>
1	Timber to which linings are attached to achieve a "level of finish" 3 to 5	8 – 18	14 – 18	14 – 18
2	Enclosed framing (including roof trusses) to achieve a "level of finish" 0 to 3	14 – 18	12 – 24	12 – 24
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

**NOTE –**

- (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 within a further 2 % moisture content above or below.
- (2) Buildings periodically heated by open fires, electric heaters, etc., such as most domestic buildings.

**205.3**

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

**C205.3**

*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.*

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### 205.4

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 ceiling, 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 which 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.

### 205.5

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 18 % moisture content before wall linings are installed.

#### **C205.5**

*Some check on the moisture content of finishing 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.*

### 205.6

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 4. Any timber that at the time of installation has degraded beyond the shape limits permitted by NZS 3631 for the relevant grade shall not be installed.

### 205.7

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.

### 205.8

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

**C205.8**

*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 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.*

**205.9 Drying****205.9.1**

Timber that is specified to a moisture content shall have been dried according to recognized principles by air drying, by forced air drying, or by kiln drying complying with NZS 632.

**C205.9.1**

*Orders for dry timber should specifically state the required moisture content range. It should be noted that in most areas of New Zealand it is not possible to achieve these moisture contents by air drying (see also the NZTIF Timber Use Manual).*

**205.9.2**

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

**205.9.3**

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.

**205.9.4**

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

**205.9.5**

Any dispute concerning moisture content shall be decided by use of the oven-dry method specified in NZS 632.

**205.10 Protection up to installation****205.10.1**

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

**205.10.2**

Water-repellent materials used to control the moisture content of timber products shall comply with NZS 7701.

### 205.10.3

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 with regard to protection and conditioning shall be followed.

#### **C205.10.3**

*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.*

### 205.11 Construction

#### 205.11.1

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

### 205.12 Protection after installation

#### 205.12.1

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

#### **C205.12.1**

*In centrally-heated and air-conditioned buildings care should be taken to operate the plant so as to avoid excessively high temperatures and low humidity, particularly just after the interior finishing timbers have been installed. Extreme conditions suddenly applied are likely to cause unsightly shrinkage, distortion, and checking of timber building components.*

### 205.13 Surface coatings

#### 205.13.1

Surface coatings shall be the appropriate paint type or surface treatment systems applied in accordance with NZS 7703, or other specialised coating systems applied strictly to the manufacturer's instructions.

#### **C205.13.1**

*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 a month, re-priming may be necessary. Refer to NZS 7703.*

## 205.14 Interior flooring

### 205.14.1

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, greater than 25 mm in width shall be excluded from the species dressing grade as referred to in table 1.

### 205.14.2

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

## 205.15 Structural framing

### 205.15.1

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

#### **C205.15.1**

*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.*

## 206 MOISTURE CONTENT AND QUALITY CONTROL REQUIREMENTS FOR BUILDING COMPONENTS WITH A 5 YEAR DURABILITY PERFORMANCE

### 206.1 Moisture content

#### 206.1.1

At the time of installation the moisture content of weatherboard, exterior joinery and finishes shall be within the limits specified in table 4.

#### 206.1.2

At the time of installation of all finishing timber, interior joinery, furniture and corestock etc. their moisture content shall be within the limits specified in table 4.

#### **C206.1.2**

*Note that figures in table 4 are for 90 % of pieces, with the remaining pieces within  $\pm 2$  % moisture content of the range specified.*

### 206.2 Fibreboards

#### 206.2.1

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.

#### **C206.2.1**

*Reference should be made 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. 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.*



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### 206.3 Surface coatings

#### 206.3.1

Surface coatings shall be the appropriate paint type or surface treatment systems applied in accordance with NZS 7703, or other specialised coating systems applied strictly to the manufacturer's instructions.

##### **C206.3.1**

*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 a month, re-priming may be necessary. Refer to NZS 7703.*

### 207 PROTECTION UP TO INSTALLATION

#### 207.1

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

#### 207.2

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.

#### 207.3

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.

##### **C207.3**

*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.*

#### 207.4

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 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 done before delivery, surface-coating should be done immediately the block stack is opened up.

##### **C207.4**

*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 drying out of the interior has progressed to the appropriate range listed in section 205, table 4.*



## 208 PROTECTION AFTER INSTALLATION

### 208.1

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

### 208.2

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

#### **C208.2**

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

## 209 WORKMANSHIP

### 209.1

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 NZTIF Timber Use Manual. Reference should also be made to the appropriate New Zealand Standards.

## NOTES

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