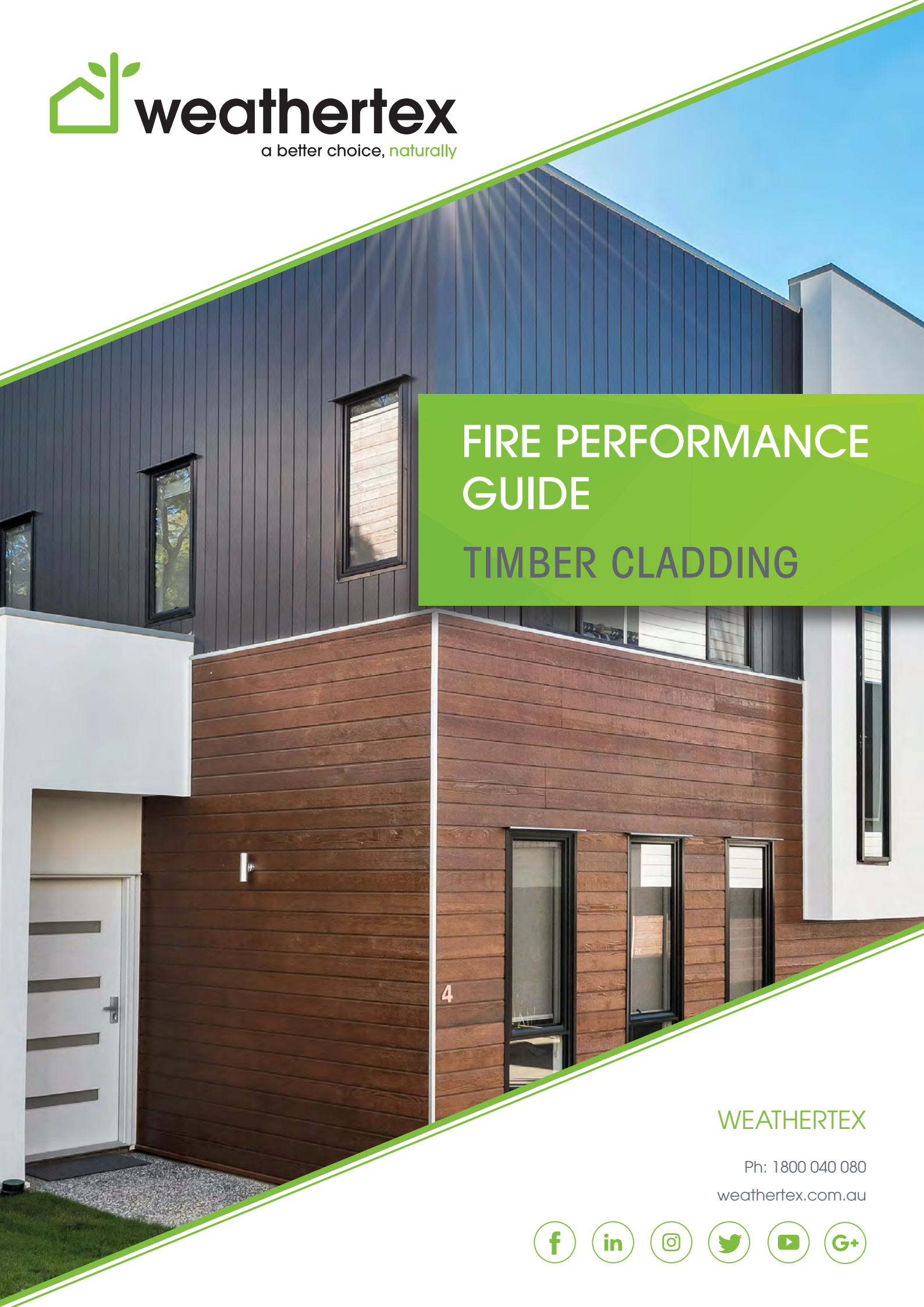
weathertex
a better choice, naturally



FIRE PERFORMANCE GUIDE

TIMBER CLADDING

WEATHERTEX

Ph: 1800 040 080

weathertex.com.au


1
2
30

Timber: A Natural and Safe Alternative

Timber cladding is an increasingly popular choice for Australian commercial and domestic buildings due to its striking natural aesthetic, durability and low environmental impact. Perhaps less widely known are the strong fire-resistant qualities of timber that make it a perfect fit for fire safety in the Australian construction industry.Timber is an age old material and its physical properties and fire performance qualities are well understood and documented.

The Australian Building Code Board (ABCB) recognises the many applications where timber exceeds the rigorous fire safety performance requirements of the National Construction Code (NCC) for use as internal and external wall cladding.

This whitepaper will outline in detail the deemed to satisfy (DtS) solutions for timber cladding for Class 2 – 9 constructions, as outlined in NCC Volume 1 - Section C: Fire Resistance, as well as opportunities for use outside the DtS with the development of a performance solution.

How Does Timber Burn?

To understand why timber cladding is recognised for its fire resistant qualities, it is important to first understand how timber burns.

When timber is first exposed to temperatures of above 280°C, the surface layer of the wood ignites and burns. This layer rapidly turns into char becoming a thermal insulator for the solid wood that lies beneath it. The initial charring rate quickly decreases as the charcoal layer struggles for oxygen and heat energy required to continue combustion.The natural insulating qualities of timber mean that whilst temperatures at the char layer may be upwards of 280°C, there is a steep temperature gradient across the char resulting in much lower temperatures at the inner wood. This allows the inner layer of timber to retain its structural adequacy and integrity whilst also assisting with compartmentation of heat from the fire source.

Under the char layer, there is a layer of heated wood above 200°C known as the pyrolysis zone. The charring rate at the pyrolysis zone is fairly constant and is a function of density and moisture content of the timber. High density timbers have a much greater resistance to ignition and tend to have a slower charring rate. Many non-combustible materials do not retain structural strength under high heat load which results in deformation (or melting which can cause spread of flame) and eventually collapse. Steel products can drastically decline in strength under heat loads causing unpredictable and sudden failure. Moisture in masonry products can vapourise causing cracking and dangerous explosions with the potential for throwing shrapnel.

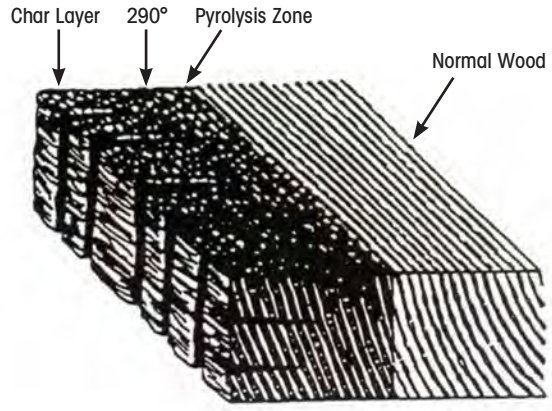


Figure 1: Shows Zones of Burning wood

Figure from Engineered Wood Panel Association of Australia

Timber, on the other hand, shows a controlled and slow decline in strength proportional to the char layer often making it a safer alternative to some non-combustible materials. Timber's predictable nature in the case of fire provides simplicity and confidence in the design of fire safety systems in any construction scenario.

Redefining our Understanding of Combustible

In the wake of incidents such as the 2017 Grenfell Tower fire in London and the public debate that has followed; the label 'combustible' in relation to external cladding has been used synonymously with dangerous and non-compliant materials. It is therefore imperative to clarify the difference between dangerous materials used in non-compliant applications (in Grenfell's case, highly ignitable aluminum composite panels used in a high rise context) and combustible cladding materials used in compliant applications (such as timber cladding in a low rise context).

The Australian Building Codes Board (ABCB) has proposed changes to its National Construction Code (NCC) which is scheduled to come into effect in 2020. These changes will only affect buildings within Class 2 and Class 3 which are more than 2 storeys and of Type A or Type B Construction. As at August 2019, the NCC has not changed. Standing concessions still apply to current builds that have been approved. No retrospective issues will arise with buildings already approved and no product will need to be removed/replaced after these changes come into effect.

Although combustible, the predictable characteristics of timber make it easy to model and design appropriate fire protection systems that underpin the application limitations of the deemed to satisfy solutions for timber cladding in the NCC.

The DtS solutions and verification methods defined in the NCC allow for timber cladding, such as Weathertex hardboard cladding products, to be used as part of an internal or external wall or ceiling across all construction classes. The following sections will step through the NCC requirements for wall cladding and present compliant applications for timber cladding in closer detail.

Navigating the NCC

A Performance Based Code

"The NCC is a performance based code containing all Performance Requirements for the construction of buildings. It is built around a hierarchy of guidance and code compliance levels, with the Performance Requirements being the minimum level that buildings and building elements must meet.

The Performance Requirements are also supported by General Requirements, which cover other aspects of applying the NCC including its interpretation, reference documents, the acceptance of design and construction (including related evidence of suitability / documentation) and the classification of buildings within the NCC.

The key to the performance based NCC is that there is no obligation to adopt any particular material, component, design factor or construction method. This provides for a choice of compliance pathways. The Performance Requirements can be met using either a Performance Solution (Alternative Solution) or using a Deemed-to-Satisfy (DTS) Solution."

*Referenced from the Australian Building Codes Board (ABCB) Website

Fire Performance Requirements

Section C of NCC – Volume 1 refers to Fire Resistance and contains the Performance Requirements and Deemed to Satisfy Provisions for for Class 2 to 9 constructions.
The performance requirements for fire resistance are centered on several key objectives:

- Maintaining structural stability during a fire
- Avoiding the spread of fire
- Protecting the building from the spread of fire and smoke to allow sufficient time for evacuation in an emergency
- Maintain tenable conditions during occupant evacuation
- Protection of service equipment and hazardous substances
- Protection of emergency equipment
- Maintaining fire resistance performance at penetrations, joints and attachments
- Access to the building for emergency vehicles & personnel

Additionally, Section 2.3 of NCC – Volume 2 refers to Fire Safety and contains the Performance Requirements for Class 1 and 10 constructions. The Deemed to Satisfy (or Acceptable Construction) Provisions for wall cladding are contained in Section 3.5 and are not covered by this guide.

Due to the lower complexity of Class 1 & 10 constructions, the fire performance requirements and objectives are correspondingly simplified:

- Protection from the spread of fire
- Fire detection and early warning
- Protection from heating appliances
- Resistance to bushfires

In all cases, the Builder/Designer/Architect may choose to follow the DtS provisions provided in the NCC to achieve compliance to the relevant performance requirements. Where the design application does not fit with standard DtS solutions, a Performance Solution must be developed in collaboration with the project stakeholders (i.e. architect, engineer, surveyor, local fire authorities, etc).

Class 2-9 Construction

NCC Volume 1: Section C - Fire Resistance provides the following DtS subsections:

Subsections C2 and C3 focus on application design and not material selection and will not be discussed further in this document. The deemed to satisfy provisions of C1 which are relevant to material selection for internal and external wall and ceiling linings are tabulated below.

C1.1 **Type of Construction**	This section allocates a Fire Construction Type (A, B or C) to the building. Refer to 'C1.1 and C1.5 Type of Construction Required' section below. Specification C1.1 defines non-combustibility requirements according to these construction types. Refer to 'Specification C1.1 Non-combustibility Requirements' section below including concessions for combustible products. Specification C1.1 also lists Fire Resistance Level (FRL) requirements of the components. Refer to 'Specification C1.1 Fire Resistance of Building Elements' section below.
C1.5 **Two Storey Construction**	For buildings of class 2,3 and 9c only - the construction can be classified as Type C Fire Construction Type if it satisfies the conditions listed in the 'C1.1 and C1.5 Type of Construction Required' section below.
C1.10 **Fire Hazard Properties**	This section specifies the material property requirements for the floor coverings, ceiling linings, internal wall linings and external wall cladding. Specification C1.10 details the material testing requirements depending on if a sprinkler system is installed or not. Refer to 'C1.10 Fire Hazard Properties' section below.
Part G5 **Bushfire Areas**	References AS 3959 which designates the requirements for each Bushfire Attack Level (BAL). Refer to 'Part G5 Bushfire Areas' section below.

C1.1 and C 1.5 Type of Construction Required

The construction "Type" is determined by the class of building (see ABCB website for class descriptions) and the rise in storeys above and including the ground level. Type A is the most fire-resistant and Type C is the least. The minimum Type of construction is determined using Table C1.1:

TABLE C1.1	BUILDING CLASS	
RISE IN STOREYS	2,3,9	5,6,7,8
4 or more	A	A
3	A	B
2	B*	C
3	C	C

*As per C1.5, a two storey Class 2, 3, or 9c construction may be classified Type C if:

(A) it is a Class 2 or 3 building or a mixture of these classes and each sole-occupancy unit has:

1. access to at least 2 exits; or
2. its own direct access to a road or open space; or

(B) it is a Class 9c building protected throughout with a sprinkler system complying with Specification E1.5 and complies with the maximum compartment size specified in Table C2.2 for Type C construction.

Specification C1.1 - Non-combustibility Requirements

In the most recent cases of wall cladding product non-compliances such as the 2017 London Grenfell Tower and 2014 Melbourne Docklands Lacrosse Apartments; the suitability of combustible cladding for high-rise construction has been scrutinized.

In Australia, the National Construction Code requires, for Type A and B construction, that all external and common walls to be non-combustible (as determined by AS 1530.1).

Type C construction does not carry this requirement and combustible cladding may be used for external walls and still comply with the performance requirements of NCC Section C.

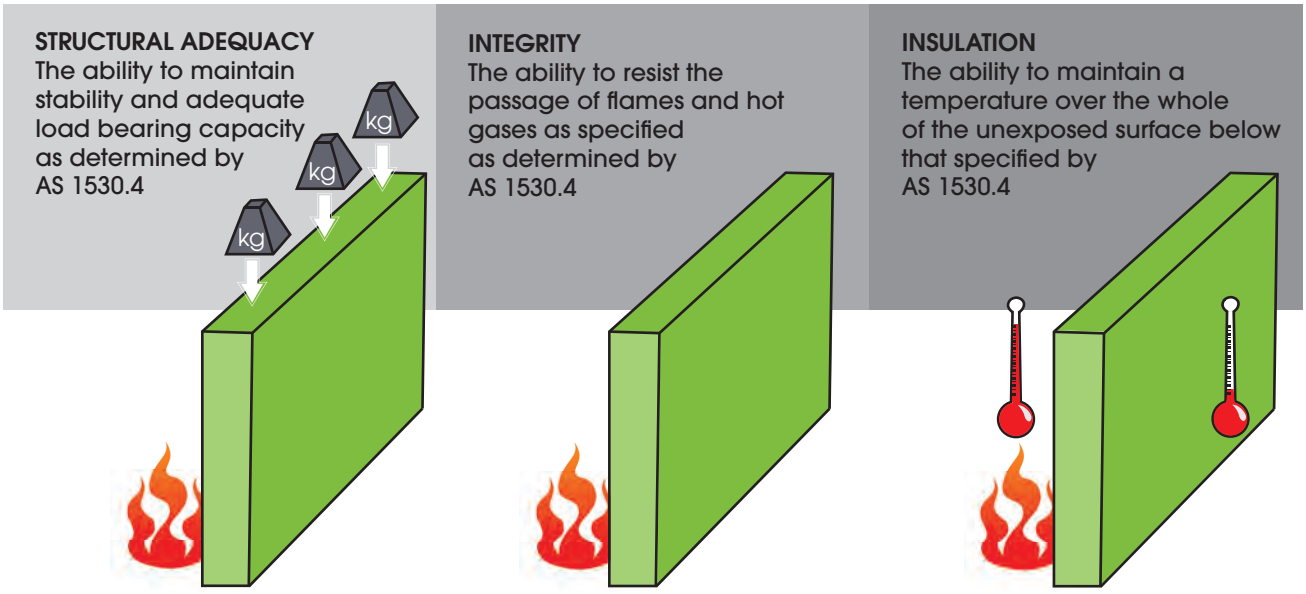
Additionally, Specification C1.1 lists concessions which allow combustible external wall cladding for Type A and B low rise construction in Class 2 and 3 buildings. Refer to the two concessions below (directly referenced from NCC 2016 Amendment 1 – Volume 1).

Fire Resistance of Building Elements

Specification C1.1 Fire Resistance of Building Elements

In addition to identifying the applications where combustible cladding may be used, Speciifcation C1.1 lists the minimum Fire Resistance Level (FRL) for several building elements (including internal and external walls).

Fire Resistance refers to the graded ability in minutes of a construction element to resist a fully developed fire, as determined by AS 1530.4, for the following criteria:



Structural stability: the ability to maintain stability and adequate load bearing capacity

Integrity: the ability to resist the passage of flames and hot gases

Insulation value: the ability to maintain a temperature over the whole of the unexposed surface

Results are expressed in minutes in the order above (e.g. 60/60/60). Note: a dash means that there is no requirement for that criterion (e.g. 90/–/– means there is no requirement for an FRL for integrity and insulation, and –/–/– means there is no requirement for an FRL).

“Timber cladding is an increasingly popular choice for Australian commercial and domestic buildings due to its striking natural aesthetic, durability and low environmental impact.”

Fire Hazard Properties

C1.10 Fire Hazard Properties

Fire hazard properties are material behavior indicators observed under specific fire test conditions.

Material Group Number is an indicator of a material's fire hazard properties where Group 1 is the highest classification and Group 4 being the poorest performing classification. The group number is used to identify where a material may be used in accordance with Specification C1.10

Internal and external wall and ceiling linings are subject to the requirements of Section 4 of Specification C1.10 and requirements for walls differ depending on if the building is protected by a sprinkler system as detailed in Table 3 of the specification.

Spec C1.10 - Table 3 Material Group Number as Determined by AS 5637.1	FIRE EXITS & CONTROL ROOM	PUBLIC CORRIDORS		SPECIFIC AREA		OTHER AREA
Building Class	Wall/Ceiling	Wall	Ceiling	Wall	Ceiling	Wall/Ceilings
Class 2 OR 3*						
Unsprinklered	1	1,2	1,2	1,2,3	1,2,3	1,2,3
Sprinklered	1	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3
*Class 3 or 9a accommodation for the aged, disabled, children and health care buildings						
Unsprinklered	1	1	1	1,2	1,2	1,2,3
Sprinklered	1	1,2	1,2	1,2,3	1,2,3	1,2,3
Class 5,6,7,8 or 9b schools						
Unsprinklered	1	1,2	1,2	1,2,3	1,2	1,2,3
Sprinklered	1	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3
Class 9b other than schools						
Unsprinklered	1	1	1	1,2	1,2	1,2,3
Sprinklered	1	1,2	1,2	1,2,3	1,2,3	1,2,3
Class 9c						
Sprinklered	1	1,2	1,2	1,2,3	1,2,3	1,2,3

Buildings not fitted with a sprinkler system complying with Specification E1.5 must also have:

1. A Smoke Growth Rate Index not more than 100; or
2. An Average Specific Extinction Area less than 250m2/kg.

Group number and average specific extinction area may be determined in accordance with AS 5637.1. Generally, most hardwood timber products achieve a Group 3 classification and timber treated with fire retardants can achieve a Group 2 classification.

Part G5 Bushfire Areas

Buildings in a designated bushfire prone area must be designed and constructed to reduce the risk of ignition from a bushfire. Appropriate material selection considers the potential for ignition caused by burning embers, radiant heat or flame generated by a bushfire and the intensity of the bushfire attack. AS 3959 provides the assessment criteria to determine the Bushfire Attack Level (BAL) requirements attributed to components of a construction. This takes into account (with local and state variations) several criteria such as ground slope, vegetation type and density.

There are 6 levels relating to the intensity of radiant heat exposure:

BAL LOW – No construction requirements
BAL 12.5 (kW/m^2) – Low
BAL 19 (kW/m^2) – Moderate
BAL 29 (kW/m^2) – High
BAL 40 (kW/m^2) – Very high
BAL FZ – Extreme

With regards to external timber cladding compliance, the following requirements apply in accordance with AS 3959 for each BAL classification. Note: the requirements in the table are in addition to 'General' construction design requirements detailed in AS 3959.

Timber Weatherboards and Architectural Panels as External Wall Cladding		
Classification	<400mm from ground, deck, roof, awning or similar	>=400mm from ground, deck, roof, awning or similar
BAL LOW	No requirements	No requirements
BAL 12.5	5.4.1 External walls shall be of (d) a timber species as specified in Appendix E	No requirements
BAL 19	6.4.1 External walls shall be of (d) a timber species as specified in Appendix E	No requirements
BAL 29	7.4.1 External walls shall be of (b)(iii) bushfire-resisting timber in Appendix F	7.4.1 External walls shall be of (b)(iii) bushfire-resisting timber in Appendix F
BAL 40	8.4.1 External walls shall be (a) made from non-combustible material or (c) a system complying with AS 1530.8.1	8.4.1 External walls shall be (a) made from non-combustible material or (c) a system complying with AS 1530.8.1
BAL FZ	9.4.1 External walls shall be (a) made from non-combustible material of 90mm minimum thickness or (b) a system complying with AS 1530.8.2 when tested from the outside	9.4.1 External walls shall be (a) made from non-combustible material of 90mm minimum thickness or (b) a system complying with AS 1530.8.2 when tested from the outside

BAL 12.5 and BAL 19 references Clause E1 of Appendix E

Timber in whole or reconstituted form with a density of 750kg/m^3 or greater at a 12% moisture content is suitable for construction where specified in Sections 5 and 6 (i.e. BAL 12.5 and BAL 19). Table E1 lists examples of suitable timber species and densities not listed in Table E1 may be found in AS 1720.2.

BAL 29 references Clause F1 of Appendix F

Bushfire-resisting timber products which have been impregnated with fire-retardants or applied with fire-retarding coatings can be deemed acceptable to withstand BAL 29 exposure when tested in accordance with AS/NZS 3837 and accelerated weathering treatment of AS 1684.2. Clause F4 lists several timber species which have been tested as compliant. Other timber products when exposed to an irradiance level of 25 kW/m^2, must achieve a maximum heat release rate of 100 kW/m^2 and an average heat release rate for 10 minutes not greater than 60 kW/m^2.

BAL 40 and BAL FZ requirements:

Generally, the requirements of BAL 40 and BAL FZ conditions are not able to be met by combustible timber cladding products.

Weathertex Ticks All the Boxes

As the winner of Architecture & Design's Most Trusted Brand 2016/17 & 2018, and ACA supplier of the year 2018, Weathertex places safety as a number one priority. Weathertex timber cladding has undergone extensive third-party testing to ensure compliance with the latest DtS requirements and verification methods.

Weathertex products are made from a reconstituted blend of Australian native hardwoods from NSW pulp wood forestry operations. The unique process steam pulps and compresses the hardwood fibre blend into a highly dense exterior grade board product. No chemical additives are required for bonding and the final product retains the natural fire resistant properties of the Australian hardwood timbers used.

While individual testing certificates are available on request, Weathertex has compiled and summarised all third party and internal quality testing results in two document available on the Weathertex Website:

1. Weathertex Certificate of Physical Properties
2. Weathertex Product Technical Statement

The following sections of this document specifically detail Weathertex compliance with the DtS provisions of Part C & G of the NCC for Weathertex weatherboard and architectural panel products.

C1.10 Weathertex & Fire Hazard Properties

Weathertex has been third party tested In accordance with AS/NZS 5637.1, as referenced by Spec C1.10. Weathertex is classified as a Group 3 material with an average specific extinction area of 38.7m2/kg. Weathertex is therefore deemed to satisfy for use as a wall and ceiling lining anywhere a Group 3 material is allowed in accordance with Table 3 of NCC specification C1.10. Please refer to table on page 9.

Part G5 Weathertex & Bushfire Areas

Weathertex has been assessed by a third party against the requirements of AS 3959 and an assessment report is available on request. Weathertex has an average product density of 1020 kg/m^3 and the manufacturing process controls the supplied timber specification to only source fire resistant timber species as listed in Appendix E of AS 3959. Weathertex meets the material physical properties required for use in BAL LOW, BAL 12.5 and BAL 19 areas.

WE COMPLY: NCC regulations and 'Deemed to Satisfy' (DtS) provisions

*For additional types of building requirements a Performance Solution is required.

Building Class	Description	Maximum Rise In Storeys	Conditions
1a & 1b	Single house/terrace house/town-houses/villa units/duplex/small boarding house (Torrens Title)	N/A	See Vol 2 -3.7.2.2
10	Garage/carport/sheds/shelters/pergola/fence	N/A	See Vol 2 -3.7.2.2
2	Multi-storey Apartments (Strata Title)	2	Type C Construction See NCC Vol 1 – C1.1 See NCC Vol 1 – C1.5
3	Hotel & Motel/Boarding house/hostel/student/ backpacker lodging Healthcare accommodation	2	Type C Construction See NCC Vol 1 – C1.1 See NCC Vol 1 – C1.5
5, 6, & 7	Office building/shops/café/restaurant/ bar/kiosk/showroom/carpark/warehouse storage	2	Type C Construction See NCC Vol 1 – C1.1
8	Factory/workshops/laboratory	2	Type C Construction See NCC Vol 1 – C1.1
9a & 9b	Hospitals/Health Care/School/University/Public Hall	1	Type C Construction See NCC Vol 1 – C1.1
9c	Residential Aged Care Facility	2	Type C Construction See NCC Vol 1 – C1.1 See NCC Vol 1 – C1.5
All Classes	Weathertex as Internal Wall Lining – Group 3 Material	No Limit	See Vol 1 – C1.10

C1.2 Calculation of rise in storeys

a. The rise in storeys is the sum of the greatest number of storeys above finished ground level.

b. Storey is not counted if–

   i. it is situated at the top of the building and contains only heating, ventilating or lift equipment, water tanks, or similar service units or equipment; or

   ii. it is situated partly below the finished ground level and the underside of the ceiling is not more than 1m above the average finished level of the ground at the external wall, or if the external wall is more than 12m long, the average for the 12m part where the ground is lowest.

C1.5 Two storey Class 2, 3 or 9c buildings

A building having a rise in storeys of 2 may be of Type C construction if–

a. it is a Class 2 or 3 building or a mixture of these classes and each sole-occupancy unit has–

   i. access to at least 2 exits; or

   ii. its own direct access to a road or open space; or

b. it is a Class 9c building protected throughout with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5 and complies with the maximum compartment size specified in Table C2.2 for Type C construction.

Table C2.2 Maximum Size of Fire Compartments

Classification	Type C - Construction
5, 9b or 9c	Max Floor Area – 3 000 m^2 Max Volume – 18 000 m^3
6, 7, 8 or 9a (except for patient care areas)	Max Floor Area – 2 000 m^2 Max Volume – 12 000 m^3

The Value of Innovation - Performance Solutions

With the 2019 review of the NCC by the Australian Building Code Board and relevant professional committees, there has been a focus on driving innovation and architectural design through the development of Performance Solutions for products and applications which may not fit the cookie-cutter scope of current DtS solutions.

Many applications of combustible cladding (e.g. balcony linings, attachments to concrete structures, isolated feature walls, blade walls etc.) can sensibly achieve the required fire safety performance criteria of Section C of the code with the right fire protection design. The Performance Solution report is usually prepared by an appropriately qualified fire engineer who can demonstrate the application meets the fire safety Performance Requirements for acceptance by the project's building certifier/surveyor. As a Performance Solution for the use of combustible materials will likely influence the design of other characteristics of the building, the ABCB advises that the fire engineer, building certifier/surveyor and the local firefighting authorities are involved at an early stage in the project.

Performance Solutions are a great opportunity for innovation and creativity. This compliance pathway is intended to encourage the introduction of new materials, technologies and methodologies which could achieve a new efficiency, cost-reduction or improvement in the environmental impact of construction whilst still maintaining a high performance standard. The Australian Building Codes Board has stated that the use of a performance based approach to compliance "provides practitioners with a strong degree of flexibility to determine the most appropriate means for demonstrating compliance with the relevant performance requirements."

Consequently, Weathertex Timber Weatherboards and Architectural Panels can be considered for internal and external cladding applications outside the DtS solutions provided that a Performance Solution demonstrates the building design and product application meets the relevant fire safety Performance Requirements of the NCC.

References

ABCB Website

ABCB, 2018, NCC 2019 Amendment 1, Building Code of Australia: Volume One - Class 2 to 9 Buildings. Canberra: Australian Government and States and Territories of Australia.

ABCB, 2019, Advisory note,Class 2 and 3 buildings: Concessions for use of timber framing and/or non-combustible materials.

EWPA, 2009, Fire Resistance Requirements within Australia and How To Choose The Right EWPAA Certified Product To Comply With The BCA: ewp.asn.au/library/downloads/ewpaa_fire_resistance.pdf

Last issued: November 2019

weathertex

a better choice, naturally