External Timber Cladding & Bushfire-prone Areas

Regulatory & Design Considerations

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External Cladding

Clad in recycled Ironbark and Tallowwood

Library at the Docks by Clare Design & Lend Lease

Winner Public Building & Sustainability 2014 Australian Timber Design Awards
Dandenong Mental Health Facility
Bates Smart (in collaboration with Irwin Alsop Group)

2014

Winner 2014
Australian Timber Design Awards
Blackbutt cladding
Shou Sugi Ban

Noordparksbar, a cafeteria in a public park north of Amsterdam, Designed by Bureau SLA and Overtreders W.
Photo courtesy of Shinji Otani, and ArchDaily
Class 1 Buildings
(e.g. detached houses)
Grooved

Vertical Fixing Method Plan View:
Prevailing weather direction of boards for vertical fixing method

Stainless steel screw as appropriate or Hot Dipped Galvanized ring shank nail as appropriate
(See NCC Vol 1: 3.5.3.2 Timber Cladding).

Min Gap as per Manufacturers recommendations

Horizontal fixed boards to have lapping on the downwards side as pictured

Vertical Fixing Method Plan View:
Prevailing weather direction of boards for vertical fixing method

Stainless steel screw as appropriate or Hot Dipped Galvanized ring shank nail as appropriate
(See NCC Vol 1: 3.5.3.2 Timber Cladding).
Screw countersunk below timber surface to allow for overlap board.

Min Gap as per Manufacturers recommendations

Horizontal fixed boards to have lapped boards with rebate groove facing on the downwards side as pictured.
Weatherboard
Board & Batten

Typical Radial BE Board & Batten combinations:
75mm (Face board) x 100mm (Backer board)

80 50 80
55 100 55

Stainless steel
Galvanized pin
(See Radial Ti)
3.5.4.2 Timber wall cladding

Timber wall cladding must be installed as follows:

(a) Splayed timber weatherboards must be fixed in accordance with Figure 3.5.4.1 and with a lap not less than—
   (i) 30 mm for hardwood, Cypress and treated pine; and
   (ii) 20 mm for Western Red Cedar; and
   (iii) 25 mm for Baltic Pine.
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   (iii) 25 mm for Baltic Pine.

(b) Profiled timber boards must be—
   (i) fixed in a horizontal, vertical or diagonal direction with the overlap and groove closely fitted, where provided; and
   (ii) with tongue and groove profile, fixed with tongue edge up, where they are fixed in a horizontal or diagonal direction; and
   (iii) where fixed in a vertical or diagonal direction, provided with a vapour permeable sarking complying with AS/NZS 4200.1. See Figure 3.5.4.2 installed behind boards with—
      (A) each adjoining sheet or roll being—
         (aa) overlapped not less than 150 mm; or
         (bb) taped together; and
      (B) sarking fixed to supporting members at not more

Figure 3.5.4.2 Fixing of vertical wall cladding

Note to Figure 3.5.4.2: For fixing of diagonal wall cladding, equivalent fixing details apply.
External walls are required to achieve a fire resistance level (FRL) of 60/60/60 when constructed within 900 mm of an allotment boundary or 1800 mm from another building.
Fire rated external walls must –
• commence at the footings or ground slab, except where the external wall commences above a separating wall,
• have an FRL of not less than 60/60/60 when tested from the outside,
• extend to the underside of a non-combustible roof covering or non-combustible eaves lining,
• have openings in walls: – protected by non-openable fire window or other construction with an FRL of not less than \(-/60/-\) – protected by self-closing solid core doors not less than 35 mm thick.

35 mm thick.
Can be achieved with the use of moisture-resistant fire grade plasterboard and external timber cladding.

One layer of 16 mm moisture resistant fire grade plasterboard provides a FRL of 60/60/60.

Plasterboard/fire protective-grade board manufacturers have their own tested systems.
Australian Timber Design Awards

Sydney Design Group (2009)
Hazelwood Beach House

Matt Gibson Architecture (2011)
Kooyong Residence

Casey Brown Architects (2013)
Jamberoo House

Craig Steere Architects (2013)
Cedar House
Low-rise Residential Buildings

NCC Volume Two Provisions

Building Code of Australia 2019
NCC 2019 Compliance Pathway

Class 2 (apartment) Buildings

Low-rise (three and four-storey) timber construction systems have been permitted since:

• BCA 1990, Amdt 7 (1994) followed by an amendment

- Type of Construction – Clause C1.1

<table>
<thead>
<tr>
<th>Rise in storeys</th>
<th>Class 2, 3 or 9 building</th>
<th>Class 5, 6, 7 or 8 building</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 or more</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>1</td>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>

*SA C1.1(c) and (d)*
A Class 2 or 3 building having a rise in storeys of not more than 3 need not comply with Clause 3.1(d) of Specification C1.1 and the requirements of C1.9(a), (b) and C2.6 for non-combustible material, if it is constructed using—

(i) timber framing throughout; or

(ii) non-combustible material throughout; or

(iii) a combination of (i) and (ii),

provided—

(iv) * * * * *

(v) any insulation installed in the cavity of a wall required to have an FRL is non-combustible; and

(vi) the building is fitted with an automatic smoke alarm system complying with Specification E2.2a.
Specification C1.1, Clause 3.10

(b) A Class 2 or 3 building having a **rise in storeys** of not more than 4 may have the top three **storeys** constructed in accordance with (a) provided—

(i) the **lowest storey** is used solely for the purpose of **parking motor vehicles** or for some other ancillary purpose; and

(ii) the **lowest storey** is constructed of concrete or masonry including the floor between it and the Class 2 or 3 part of the building above; and

(iii) the **lowest storey** and the **storey** above are separated by construction having an **ERL** of not less than 90/90/90 with no openings or penetrations that would reduce the **fire-resisting** performance of that construction except that a doorway in that construction may be protected by a −/60/30 **self-closing** fire door.

**Note:** NCC 2019 Table E1.5 requires all Class 2 and 3 buildings 4 storeys or more to have compliant automatic sprinklers.
3.10 Class 2 and 3 buildings: Concession

(a) A Class 2 or 3 building having a rise in storeys of not more than 3 need not comply with Clause 3.1(d) of Specification C1.1 and the requirements of C1.9(a), (b) and C2.6 for non-combustible material, if it is constructed using—

(i) timber framing throughout; or

(ii) non-combustible material throughout; or

(iii) a combination of (i) and (ii), provided—

(iv) any insulation installed in the cavity of a wall required to have an FRL is non-combustible; and

(v) the building is fitted with an automatic smoke alarm system complying with Specification E2.2a.

(b) A Class 2 or 3 building having a rise in storeys of not more than 4 may have the top three storeys constructed in accordance with (a) provided—

(i) the lowest storey is used solely for the purpose of parking motor vehicles or for some other ancillary purpose; and
“Need not comply” with Clause C1.9(a) specifies the requirements for walls; including external walls

C1.9 Non-combustible building elements

(a) In a building **required** to be of Type A or B construction, the following building elements and their components must be **non-combustible**:

(i) **External walls** and **common walls**, including all components incorporated in them including the facade covering, framing and insulation.

(ii) The flooring and floor framing of lift pits.

(iii) **Non-loadbearing internal walls** where they are **required** to be **fire-resisting**.

(b) A **shaft**, being a lift, ventilating, pipe, garbage, or similar **shaft** that is not for the discharge of hot products of combustion, that is non-**loadbearing**, must be of **non-combustible** construction in—

(i) a building **required** to be of Type A construction; and

(ii) a building **required** to be of Type B construction, subject to **C2.10**, in—
ABCB Advisory Note  *(Published 22/7/19)*

- Advisory Note published “... to assist practitioners in future decisions on design, assessment, approval/certification and installation.”
- Advises that the following components are to be non-combustible:
  - The external cladding of a framed, external wall.
**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.
ABCB Advisory Note  *(Published 22/7/19)*

Does not apply to:

- **Class 1** buildings as described in NCC Volume Two,
  *or*

- elements of **Type C** construction as described in NCC Volume One
  (e.g. apartments)

*Out of Cycle Amendment (Sept 2019)*

- Opportunity to provide comment on the proposed amendment.
Next Steps

Industry is working to develop:

− a generic timber cladding Performance Solution,
− possible CodeMark approval,
− State regulatory approval, and
− a Proposal-for-Change to amend the NCC 2022.
AS 3959-2018: Considerations

- Improving the ability of buildings in designated bushfire-prone areas to better withstand attack from bushfires
- Provide a “measure of protection” to building occupants
- Consistent with the primary focus on life safety in the National Construction Code
- After the fire front passes any residual burning of elements should be capable of being extinguished easily by occupants
- There is no guarantee that a building will survive in every occasion.
Bushfire Attack Levels & Corresponding Construction Objectives

<table>
<thead>
<tr>
<th>Bushfire Attack Level (BAL)</th>
<th>Description of predicted bushfire attack and levels of exposure</th>
<th>Construction Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAL–LOW</td>
<td>There is insufficient risk to warrant specific construction requirements.</td>
<td></td>
</tr>
<tr>
<td>BAL–12.5</td>
<td>Ember attack</td>
<td>Average heat flux to cause annealed glazing to fail</td>
</tr>
<tr>
<td>BAL–19</td>
<td>Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux.</td>
<td>Screened annealed glass (screens assumed to cut radiation by 50%)</td>
</tr>
<tr>
<td>BAL–29</td>
<td>Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux.</td>
<td>Unpiloted ignition of timber (US reference – timbers ignite between 25 to 35 kW/m²)</td>
</tr>
<tr>
<td>BAL–40</td>
<td>Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux with the increased likelihood of exposure to flames.</td>
<td>Occasionally within flame (limit to knowledge available)</td>
</tr>
<tr>
<td>BAL–FZ</td>
<td>Direct exposure to flames from fire front in addition to heat flux and ember attack.</td>
<td>Building within flame (unknown territory)</td>
</tr>
</tbody>
</table>
Typical Radiant Heat Intensities & Phenomena

<table>
<thead>
<tr>
<th>kW/m²</th>
<th>Phenomena</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Pain to humans after 10 to 20 seconds</td>
</tr>
<tr>
<td>10</td>
<td><strong>Pain to humans after 3 seconds</strong></td>
</tr>
<tr>
<td>13</td>
<td>Ignition of timber after a long time (piloted)</td>
</tr>
<tr>
<td>25</td>
<td>Ignition of timber after a long time (non-piloted)</td>
</tr>
<tr>
<td>38</td>
<td>Ignition of black drill fabric after a long time</td>
</tr>
<tr>
<td></td>
<td>(non-piloted)</td>
</tr>
<tr>
<td>42</td>
<td>Ignition of cotton fabric after 5 seconds (non-piloted)</td>
</tr>
<tr>
<td>45</td>
<td>Ignition of timber in 20 seconds (non-piloted)</td>
</tr>
</tbody>
</table>

Reference: AS3959-2009 Appendix G – Table G1
• Timber can be used as usual for following applications (no restrictions) in any BAL:

• Anywhere the timber is protected from exposure to bushfire attack such as:
  – house frame
  – internal flooring
  – Internal joinery or lining
# Timber Species Options

<table>
<thead>
<tr>
<th>Bushfire-resisting timbers</th>
<th>Blackbutt, Kwila (Merbau), Red Ironbark, River Red Gum, Silvertop Ash, Spotted Gum and Turpentine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber species* from E1: density 750kg/m³ or greater include:</td>
<td>All BRTs above <em>also:</em> Balau, Brownbarrel, Box(s) [Brush, Grey, Coast Grey, Yellow], Grey Gum, Grey Ironbark, Jarrah, Kapur, Karri, Kempas, Kereuing, Manna Gum, Messmate, Mountain Grey Gum, New England Blackbutt, Southern Blue Gum, Sugar Gum, Sydney Blue Gum, Stringybark(s) [Brown, Silvertop, White, Yellow]</td>
</tr>
<tr>
<td>Timber species* from E2: density 650kg/m³ or greater include:</td>
<td>All species from E1 (above), <em>also:</em> Alpine Ash, Blackwood, Celery-top Pine, Mountain Ash, Shining Gum, Slash Pine, Southern Blue Gum, White Cypress</td>
</tr>
</tbody>
</table>

- Doors & Windows, decking, external wall cladding, subfloor: bearers, joists & supports **BAL:** LOW, 12.5, 19 & 29
- Note: Fire retardant treated timber can also be used.

- External wall cladding, decking **BAL:** LOW, 12.5, 19

- Doors & Windows **BAL:** LOW: 12.5, 19
For a timber clad wall in BAL–40 and BAL–FZ, use a wall with a Fire Resistance Level (FRL) of 30/30/30 (structural adequacy / integrity / insulation).

This can be achieved with the use of moisture resistant fire grade plasterboard and external timber cladding.

One layer of 16 mm moisture resistant fire grade plasterboard provides a FRL of 60/60/60.
BAL–FZ: Timber Roof Systems

- Fibertex 650 Rockwool oversized to compress into roof corrugations
- 75mm Anticon roofing blanket
- Corrugated steel roof sheeting 0.42mm BMT
- 45mm timber battens
- 15mm T&G plywood
- Angle 35 x 35 x 0.55mm BMT (min.)
- Timber rafter or truss
- 15mm plywood
- Angle 35 x 35 x 0.70mm BMT
- 16mm moisture resistant fire grade plasterboard
- 4.5mm fibre cement eaves lining to protect plasterboard
- Wall to meet AS3959 BAL-FZ requirements
External Timber Cladding & Bushfire-prone Areas

Regulatory & Design Considerations

Questions?

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