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Residential Care Buildings (Class 9c) Timber-based Deemed-to-Satisfy Solutions



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1 Introduction

Australia's population is ageing and demand for assisted-living accommodation is increasing. The Aged Care Financing Authority found that “an additional 74,000 new beds will be required over the coming decade to meet the needs of an ageing Australia”.

Residential Care Class 9c buildings are generally low- to mid-rise in height, which is ideally suited to timber construction. The regulatory requirements for this building classification differ from Class 2 (apartments) or 3 (hotels, etc) buildings covered under WoodSolutions Guide No 2¹ and 37R².

This Guide provides information and options to comply with the Building Code of Australia (BCA)³ using timber structural systems for Class 9c Residential Care buildings. It discusses the various BCA's Deemed-to-Satisfy (DTS) solutions available, focusing on the fire and acoustic requirements, as well as recommending timber-based design and construction solutions to meet these requirements.

2 Guide Structure

The BCA provides more than one Deemed-to-Satisfy fire solution for meeting the Performance Requirements of a Class 9c Residential Care building. Each solution affects the viability of the range of timber-based solutions.

This Guide is divided into two parts:

1. Discussion of Deemed-to-Satisfy fire and acoustic solutions – Sections 3 to 5.
2. Timber design and construction solutions that meet the variety of regulatory compliance options – Section 6.

3 Regulatory Compliance

This section discusses the BCA's Deemed-to-Satisfy Provisions³ for fire and acoustics, provides interpretation for some of these requirements and explains when they are needed. Requirements for Class 9c buildings other than fire and acoustic are not discussed within this Guide and readers should consult the BCA for other elements that make up a building design.

Words used in this guide that are in italics and in bold have a definition prescribed in the BCA. Further explanation of these terms are found in the Appendix A of this guide or the BCA.

3.1 Fire-resisting DTS Requirements Building Code of Australia (BCA)

The Building Code of Australia has three distinct fire Deemed-to-Satisfy solutions for a Class 9c residential care buildings: specifications for various internal walls and shafts; for external walls close to the property's boundaries or another building; and for floors and roofs.

Some Deemed-to-Satisfy solutions are optional; the designer needs to choose one method and stay with it. Each method will have advantages and disadvantages for the use of timber, or the type of timber system used. The three optional Deemed-to-Satisfy solutions are:

- **BCA Specification C1.1 Method:** This method follows the traditional fire-resisting methodology used for most building types, using the BCA's Specification C1.1 provisions. This method is generally applicable to low-rise Type C buildings.
- **Fire-Protected Timber Method:** This method follows the traditional Specification C1.1 provision as detailed in the first method, but utilises the concession within the specification that allows the replacement of non-combustible building elements with fire-protected timber elements. Structural timber elements that are encapsulated in a non-combustible fire-protective covering will meet this requirement. There are no limits on the Type of Construction or Rise in Storey for this method.
- **BCA Provision C2.5 Class 9c Building:** This method uses the specific provisions within the BCA for Class 9c buildings. Within this provision, there are fire-resistance requirements that are optional to the traditional Specification C1.1 method. There are no limits on the Type of Construction or Rise in Storey for this method.

These specifications vary, depending on the BCA's Type of Construction and Rise in Storey as well as additional or alternative requirements described in BCA's Provision. Some BCA Provisions allow for more than one option. Where this occurs, these options will be discussed in the relevant section of this Guide.

Section 4 discusses these requirements in relation to the building's Type of Construction. Discussion of building solutions for these requirements are found in Section 6.

The BCA has three building classifications that provide for residential care:

- *Class 3 residential care buildings intended for accommodation of the aged, children or people with disabilities who are not related to each other and the term of the stay is not specified.*
- *Class 9a residential care buildings are public health-care buildings that contain a residential care part. They are intended for aged occupants who require a high degree of care, i.e. nursing homes.*
- *Class 9c residential care buildings are buildings intended for resident care only. They are intended for persons with varying care needs, i.e. low to high care. It is also intended to allow the level of care to change as the residents' needs change over time.*

Consideration of the appropriate Class is required as construction of Class 3 or 9a buildings may restrict the profile of the residents who can be accommodated as well as affect what structural timber is the appropriate solution.

3.2 Type of Construction

The fire resistance of a building is determined by the Type of Construction (BCA Provision C1.1) and the Type of Construction is dependent on the building classification, Class 9c in this case, and the Rise in Storey. The BCA has three Types of Construction, A, B and C, where Type C has the lowest fire resistance requirement and Type A the highest. The Rise in Storey for a building is a BCA-defined term meaning the greatest number of storeys at any part of the external wall of the building (BCA Provision C1.2). Table 3.1 provides the Type of Construction for the Rise in Storey for a Class 9c building.

Table 3.1: BCA's Types of Construction Limits

Rise in Storey	Type of Construction
Single Storey	C
Two storey concession*	C
Two storey	B
Three storey and above	A

**Based on BCA's Provision C1.5*

3.2.1 Two Storey Type C buildings

The BCA Provision C1.5 allows a building with a Rise of Storey of two to be considered as a Type C construction, if it has sprinklers (BCA Specification E1.5 only) throughout, and the maximum compartment size is no larger than 3,000 m² or 18,000 m³ (see Table 3.2). Therefore, as sprinklers are always required for Class 9c building, as discussed in Section 3.3, irrespective of the Type of Construction, this concession will have considerable savings for timber construction when compared to Type B requirements.

For two-storey Class 9c buildings, the concession that allows Type C construction may have savings over solutions that meet Type B construction.

3.3 Sprinklers

The BCA Provision E1.5 (Table E1.5) requires a sprinkler system to be installed throughout the building, for any Rise in Storeys or Type of Construction.

NSW and Victoria have additional requirements for sprinklers such as Victoria requiring sprinklers to be installed in covered balconies (Victoria's Specification E1.5 Clause 2 (b)) and NSW requiring their own fire sprinkler standard⁴ to be used. If building within these regions, refer to the State variations in conjunction with this Guide.

The inclusion of sprinklers gives several concessions to the fire resistance requirements, such as Fire Hazard Properties, discussed in Section 4.5.

4 Fire Resistance Deemed-to-Satisfy Details

Fire resistance requirements for a Class 9c building vary due to Rise in Storey, various specific provisions and concessions within the BCA, state variations, location or purpose within the structure and if the building element is loadbearing or non-loadbearing or used as shafts. The following discusses each requirement.

4.1 Fire Compartments (BCA Provision Spec C1.1 Table 5)

Table 4.1 describes the maximum area or volume of a building for each Type of Construction allowed under the BCA. Compartments that are greater than the area or volume described in Table 4.1 must be divided by a fire wall so that each area or volume doesn't exceed the maximum allowed for the Type of Construction. A fire wall is a wall that divides a storey or building into fire compartments and, depending on the Type of Construction, it will have a Fire Resistance Level (see Table 4.1).

Table 4.1: Type of construction compartment size limit and the fire wall FRL requirements.

Type of Construction	Maximum Fire Compartment Size		Fire Wall Fire Resistance Level
	Area m ²	Volume m ³	
C	3,000	18,000	90/90/90
B	5,500	33,000	120/120/120
A	8,000	48,000	120/120/120

4.2 BCA Provision Clause C2.5 (b) Specific Requirements

This is a BCA Provision specifically for Class 9c buildings and must be included in all design solutions. The clause has explicit requirements for the placement of Smoke-proof Walls as well as minimum fire resistance requirements for floors and an optional internal wall solution. These requirements vary from the general fire requirements within the BCA's Specification C1.1 and because they are specific requirements they have precedence over Specification C1.1.

Where the BCA gives specific requirements such as Provision C2.5, these requirements have precedence over general requirements such as Specification C1.1.

4.2.1 Smoke-proof Walls

Smoke-proof walls (BCA Provision C2.5) must be installed so that they divide the building into areas of not more than 500 m² and separate Ancillary Use Areas.

Ancillary Use Areas are areas that contain equipment or materials that have a high potential fire hazard, including:

- a kitchen and related food preparation areas with a combined floor area of more than 30 m²
- a laundry, where items of equipment are of the type that are potential fire sources (e.g. gas-fired dryers)
- a storage room with a floor area of more than 10 m² that is used predominantly for the storage of administrative records.

Section 6.3.1 gives an example and information on timber systems and construction practices.

4.2.2 Floors

BCA's Provision C2.5 (b) (ii) requires all floors that are explicitly separating fire compartments within the building or fire compartment to have a minimum Fire Resistance Level of 60/60/60. As this requirement is 'specific' as compared to the 'general' fire resistance requirements of the BCA's Specification C1.1 Section 3, 4 and 5, the Provision C2.5 (b) (ii) must be followed.

This BCA Provision mainly affects Type B and C buildings, requiring that these floors have a Fire Resistance Level of 60/60/60. Under BCA Specification C1.1 Section 4 and 5, these floors may require no fire resistance or Fire Resistant Level of less than 60 minutes or another method such as fire protective covering or ceiling with an Incipient Spread of Fire rating.

This provision will also affect the concessions for mezzanine floors over storage areas not considered a storey, and floors above a space for the accommodation of motor vehicles or used for storage or any other ancillary purpose. These floors will also need to have a minimum Fire Resistance Level of 60/60/60.

For Type A construction, the Fire Resistance Level is 120/120/120. The BCA Specification C1.1 Clause 3.2 (a) and (b) excludes floors laid directly on the ground or above a space that is not a storey, garage, storage or other ancillary purposes. Where these floors support fire resistance construction, the BCA Specification C1.1 Clause 2.2 Fire protection for support of another part may transfer fire resistance onto these floors.

4.2.3 Internal Walls

The BCA Provision C2.5 (b) (iii) has an alternative fire resistance solution for internal walls other than those bounding lift and stair shafts. As it is an alternative solution to BCA Specification C1.1, it is discussed in more detail in Section 4.3.1.

4.3 Detailed Fire Resistance Requirements Including Options

The following specifies the fire-resisting requirements for a design to BCA Specification C1.1. It contains the fire resistance requirements needed for a Class 9c Residential Care building. For some elements, the BCA has more than one solution and, where this occurs, the options are discussed. Where there is only one solution for a building element, it implies there is only one method available.

4.3.1 Internal Walls

The fire resistance of an internal wall of a Class 9c building has more than one solution within the BCA. The following discusses the various solutions available.

BCA Specification C1.1 method

The fire resistance requirement for internal walls varies due to the Type of Construction, whether the walls are loadbearing or non-loadbearing, and the purpose of the room they bound. Table 4.2 describes the various fire resistance requirements for each wall type, construction type, and whether loadbearing or not. Internal walls that bound public corridors or lobbies, between or bounding Sole Occupancy Units (SOUs) and for shafts, except for fire-resisting lift and stair shafts (see Section 4.3.3).

Table 4.2: External Wall Fire resisting ratings

Element	Load Bearing ¹				Non-Load Bearing			
Type of Construction	Type A	Type B	Type C Double storey ²	Type C Single storey	Type A	Type B	Type C Single storey	Type C Double storey
Bounding public corridors or lobbies	120/-/-	120/-/-	60/-/-	-/-/-	-/-/-	-/-/-	-/-/-	-/-/-
Between or bounding SOUs	120/-/-	120/-/-	60/-/-	-/-/-	-/-/-	-/-/-	-/-/-	-/-/-
Shafts except fire resisting lift and stairs shafts	120/90/90	60/-/- Note 1	60/-/-	-/-/-	-/-/-	-/-/-	-/-/-	-/-/-
Other load-bearing walls	120/-/-	120/-/-	60/-/-	-/-/-	-/-/-	-/-/-	-/-/-	-/-/-

Notes:

1. Loadbearing shafts vary from Specification C1.1 Table 3.3 requirements as they may support the floor that has a fire-resistance requirement of 60/60/60.

2. If the BCA Provision concession C1.5 is used to obtained two-storey Type C construction, then the walls used to support the floor will be required to be fire resistant (60/-/-) due to the floors required to be 60/60/60 and the BCA's Specification C1.1 2.2 Support of Another Part transferring this requirement to the floor's support structure.

For Type A and B construction, the loadbearing walls must also be constructed from concrete, masonry or fire-protected timber. A way to circumvent the use of loadbearing walls within a structure is to utilise a post and beam framed or post and plate solution. Timber columns, beams and floors do not have a non-combustible requirement within the BCA. The non-combustibility requirements for floor, beams and columns may only come about when they support a loadbearing or fire resistance wall, as the BCA's Specification C1.1 Clause 2.2 Fire Protection for a Support of Another Part transfers the non-combustible requirement to the support structure.

The use of a post and beam framed or post and plate solution removes all internal loadbearing walls, and for Class 9C construction, there is no fire resistance requirement for most internal non-loadbearing walls (BCA Specification 3.1 (e) and 4.1 (f)). The exception is a fire-resisting lift and stair and service shafts where these shafts can be of fire-protected timber (discussed below), concrete, masonry or non-combustible construction to remain as a Deemed-to-Satisfy solution.

This fire-protected timber solution is only variable when the building has an effective height less than or equal to 25 m. Refer to Appendix A for more information on Fire-Protected Timber.

The use of a timber post and beam or post and plate structural system removes the need for loadbearing walls and therefore the requirements to be non-combustible or concrete and masonry. Timber columns, beams and floors have no requirement to be non-combustible unless they support an element that is required to be non-combustible.

Furthermore, there are no Fire Resistance Level requirements for all non-loadbearing walls for all Types of Construction, potentially reducing construction costs.

Internal walls Fire-Protected Timber method

For this solution, follow BCA Specification C1.1 as discussed above. For Type A and B construction, the loadbearing walls may be constructed from fire-protected timber, structural timber elements encapsulated in non-combustible insulated linings. There are limits on the extent Fire-Protected Timber can be used, such as the Rise in Storey, association construction. These limits are discussed in Appendix A.

Internal walls BCA Provision C2.5 (b) method

The BCA Provision C2.5 (b) (iii) has an alternative solution to its Specification C1.1 for the internal walls, other than those bounding lift and stair shafts. Provision C2.5 (b) (iii) requires all internal walls, other than those bounding lift and stair shafts, to have a minimum Fire Resistance Level of 60/-/-. The walls must be supported by the floor specified in BCA Provision C2.5 (b) (ii) (see Section 4.2.2). This solution states that all internal walls, other than those bounding lift and stair shafts, are to be fire-resistant, even walls that under BCA Specification C1.1 would not have any fire resistance, such as non-loadbearing walls bounding SOUs or partition walls within an SOU.

Bounding walls to lift and stair shafts must follow the BCA's Specification C1.1 requirements, discussed in Section 4.3.3.

The sub-compartmentation caused by all internal walls required to have fire resistance and the addition of smoke proof wall allows for the staged evacuation of residents from the building. The lower fire resistance allowed by BCA's Provision C2.5(b)(iii) also recognises the effectiveness of the required sprinkler systems in Class 9c buildings.

NSW variation

NSW has a variation to the BCA Provision C2.5 that changes the requirement for internal walls and these changes are summarised below.

For Type A, B and C buildings, all non-loadbearing internal walls between Sole Occupancy Units and bounding a public corridor in a residential part of the building must be lined on each side with 13 mm standard grade plasterboard or material with at least an equivalent level of fire protection. Where cavity insulation is used, the insulation is to be non-combustible. The exceptions where this does not apply are fire walls and smoke-proof walls.

These walls must extend to the underside of the floor above or a ceiling lined with 13 mm standard grade plasterboard or a non-combustible roof covering. Also, any penetrations above the door head height, construction joint, space between the top of the wall and the floor, ceiling or roof must be sealed to prevent smoke transfer.

Loadbearing internal walls for Type A and B must comply with the requirements of Specification C1.1 (see Section 4.3.1). For Type C construction, loadbearing walls between Sole Occupancy Units and bounding a public corridor in a residential part of the building must be lined and sealed as if they were non-loadbearing, as discussed above. Where there is no fire resistance required, any penetrations above the door head height, construction joint, space between the top of the wall and the floor, ceiling or roof must be sealed to prevent smoke transfer.

4.3.2 Walls Immediately Below the Roof

The BCA has a concession for internal wall immediate below the roof. It is applicable for internal walls using the BCA Specification C1.1 method and fire-protected timber method. It is not appropriate for internal walls using the BCA Provision C2.5 (b) method, as all the internal walls are required to be fire-resistant to 60/-/-.

For Type A construction (BCA Specification C1.1 3.7) that have an effective height of less than 25 m and the roof has no fire resistant requirements, the internal walls immediately below the roof, other than fire wall and shafts, may be reduced to:

- with Rise in Storeys exceeding 3: FRL 60/60/60
- with Rise in Storeys not exceeding 3: no FRL.

For Type B construction, BCA Specification C1.1 4.1 (g) provides a concession for internal walls, other than fire walls and shaft walls, removing the need for these walls to be fire-resistant.

4.3.3 Fire-resisting Lift and Stair Shafts

Stair Shafts

All stairways that are essential to exit the building must be fire-isolated (BCA Provision D1.3 (b)).

For a Type A and B buildings, the shaft walls are required to be:

- loadbearing: 120/120/120
- non-loadbearing: -/120/120.

In addition, loadbearing shaft walls must be constructed from concrete, masonry or fire-protected timber.

For Type C buildings, only if a stair is required, i.e. when the two storeys concession is used and if the stair is a required exit, the shaft wall is to be fire rated to 60/60/60 (BCA Specification C1.1. Table 5).

The stairway and landings contained in the fire-resistant shaft must be constructed from non-combustible materials or meet the BCA concession for timber stairways (BCA Provision D2.25). It must also be designed so that if there is a local failure, it will not cause structural damage or impair the fire-resistance of the shaft (BCA Provision D2.2).

The BCA's timber stairways concession (BCA Provision D2.25) requires the stairs to be constructed from the following:

- have the timber finished thickness of not less than 44 mm
- have an average density of not less than 800 kg/m³ at a moisture content of 12%
- the building is protected throughout by a sprinkler system (other than an FPAA101D system) complying with Specification E1.5 that extends to within the fire-isolated enclosure
- fire protection being provided to the underside of stair flights and landings using one layer of 13 mm fire-protective grade plasterboard.

Lift Shafts (BCA Provision C2.10 b)

A lift shaft in the residential area of a Class 9c building must have a shaft with a Fire Resistance Level of:

- Type A and B construction: 120/120/120
- Type C construction: 60/60/60.

4.3.4 External Walls

The fire resistance of external walls depends on the distance from a fire-source feature (another building or boundary), the building's Type of Construction, and whether they are loadbearing or not. Table 4.3 lists numerous Fire Resistance Levels for various distances from a fire-source feature and if the wall is loadbearing or non-loadbearing.

BCA Provision C2.5 does not have any special or concessional requirements for external walls and relies on the requirements contained within BCA Specification C1.1.

Type C construction has a concession that allows the external walls to be fire rated from the outside direction only (BCA Specification C1.1 Clause 5.1 b).

Table 4.3: External Wall Fire resisting ratings

Distance to fire source feature	Load Bearing			Non-Load Bearing		
	Type A	Type B	Type C	Type A	Type B	Type C
<1.5 m	120/120/120	120/120/120	90/90/90	-/120/120	-/120/120	-/90/90
1.5 m to <3 m	120/90/90	120/90/60	60/60/60	-/90/90	-/90/60	-/60/60
3 m to <9 m	120/60/30	120/30/30	-/-/-	-/-/-	-/-/-	-/-/-
9 m to <18 m	120/60/30	120/30/-	-/-/-	-/-/-	-/-/-	-/-/-
18 m plus	120/60/30	-/-/-	-/-/-	-/-/-	-/-/-	-/-/-

For Type A and B buildings, BCA Provision C1.9 (a) requires all components that make up the external wall, including the cladding, to be constructed from non-combustible materials. The BCA Provision C1.13 concession allows any component required to be non-combustible to be substituted by fire-protected timber, refer to Appendix A.

Another way to remove the non-combustible requirement for a Type B buildings is to convert the building classification to Type C, by using the concession given in the BCA Provision C1.5. This concession has no non-combustibility requirements for external walls.

For Type C buildings, the BCA has no non-combustibility requirements for external walls, and where a wall is required to be fire-resisting, only have the Fire Resistance Level from the outside.

Vertical separation of openings in external walls (BCA Provision C2.6)

For Type A buildings there is an additional requirement in external walls. Any window or other opening in that wall that is above another opening in the storey below will require protection from the spread of fire via the facade (BCA Provision C2.6 (a)). However, as the building is required to be fully sprinkled, this requirement is removed by BCA Provision C2.6 (b) (iii).

There are no requirements for separation of opening in a Type B and C buildings.

4.3.5 Columns

The BCA has provisions for both internal and external columns, in and around a building. The requirements vary depending on the Type of Construction and location within the building.

Internal columns, except top most floor

Internal columns, except for the topmost floor, used within a Type A and B buildings are required to have fire resistance in accordance with Table 4.4. For Type C buildings, there is no fire-resistance, except where two-storey Type C buildings are used. In this case, they may support a fire-resistance floor and will inherit fire-resistance from the floor, due to BCA's Specification C1.1 Clause 2.2 Fire Protection for a Support of Another Part (see Table 4.4).

Table 4.4: Fire Resistant Levels for internal columns.

	Type A	Type B	Type C Double-storey ¹	Type C Single storey
Internal Column	120/-/-	120/-/-	60/-/-	-/-/-

Note:

1. If the BCA concession C1.5 is used to obtain two-storey Type C construction, then any columns used to support the floor will be required to be fire resistant (60/-/-) due to the floors required to be 60/60/60 and the BCA's Specification C1.1 2.2 Support of Another Part transferring this requirement to the floor's support structure.

Columns on the top storey (storey under roof) Type A

For Type A construction with an effective height of not more than 25 m and with a roof that is not fire-resistant (see Section 4.4.5 on methods to remove fire resistance requirements), internal columns may have a reduction in Fire Resistance Level to:

- with Rise in Storeys not exceeding 3: -/-/-
- with Rise in Storeys exceeding 3: 60/60/60.

For Type B buildings, the storey immediately below the roof does not need to have a Fire Resistance Level, refer BCA Specification 4.1 (g).

For Type C buildings, there are no Fire Resistance Level required

Internal columns may have a higher Fire Resistance Level than the floor or roof that they may support. This is because there is no concession or exemption for their Fire Resistance Level, unlike for walls and floors. One way to bypass this is to replace columns with a loadbearing walls.

External columns

The fire resistance of columns on the outside of the building varies with the Type of Construction and the distance from the fire source feature. See Table 3.6 for Fire Resistance Levels as per Type of Construction and the distance from fire source feature. For Type A, B and C non-loadbearing external columns, there is no fire-resistance requirements.

Table 3.6: Fire Resistant Levels for external columns.

Distance to fire source feature	Loadbearing		
	Type A	Type B	Type C
<1.5 m	120/-/-	120/-/-	90/-/-
1.5 m to <3 m	120/-/-	120/-/-	60/-/-
3 m to <18 m	120/-/-	120/-/-	-/-/-
18 m plus	-/-/-	-/-/-	-/-/-

4.3.6 Internal Beams and Trusses

For Type A buildings, beams or trusses must have a Fire Resistance Level of 120/-/-, except for when they are included in a roof that is not required to be fire-rated (see Section 4.4.5).

For Type B and C buildings, there are no direct fire resistance requirements for beams and trusses, except where they are incorporated within a fire-resisting building element.

For all Type of Construction, a beam or truss may be required to have a fire-resistance by virtue of BCA's Specification C1.1 Clause 2.2 Support of Another Part. This requirement transfers the fire-resistance requirements of the elements it supports onto the beam or truss.

4.3.7 Roofs

Fire-resistance requirements vary with the Type of Construction, but in all cases a requirement or a concession can be employed to remove the need to fire rate the roof at all.

For Type A buildings, roofs do not need to be fire-resistant as a complying sprinkler is used throughout the building (BCA Specification C1.1. Clause 3.5). For Type B and C buildings, there are no fire-resistant requirements for roofs.

Although roofs are not required to be fire-resistant, Support of Another Part (BCA Specification C1.1 Clause 2.2) may infer that the roof or elements within the roof may need fire resistance as they could provide lateral support to the external walls. The BCA contains a concession (BCA Specification C1.1. Clause 2.2 (b) (iii)) that excludes roofs from this requirement.

4.3.8 Balconies and Verandahs

The BCA contains a concession (BCA Specification C1.1 Clause 2.5 (f)) for balconies and verandahs that remove any need to provide fire-resistant requirements. For Type A buildings, balconies and verandahs must not form part of the only path of travel to a required exit. They must also be no more than a rise of two storeys above the lowest storey, and any supporting columns are to be non-combustible or built from fire-protected timber (refer Appendix A).

For Type A buildings three-storey or more, the balcony or verandah is required to be considered as a floor and construction should be as for a floor (see Section 4.2.2). For Type B and C buildings, balconies and verandahs must not form part of the only path of travel to a required exit, and this condition removes any fire-resisting requirements.

4.4 Fire Hazard Properties

The BCA controls the fire performance of materials used as coverings for floors, walls and ceilings. The following discusses the requirements.

4.4.1 Floor Coverings BCA Specification C1.8 Clause 3

For Residential Use Areas within a Class 9c building, the Critical Radiant Flux must not exceed 2.2 kW/m². For all other areas, except fire-isolated exits and fire control rooms, the Critical Radiant Flux must not exceed 1.2 kW/m². The Critical Radiant Flux for fire-isolated exits and fire control rooms are limited to 4.5 kW/m².

As Class 9c buildings are always sprinkled, the maximum smoke development rate of 750 per cent-minutes is not required. The BCA also allows the floor to return up the wall for a distance of 150 mm. Floor coverings turned up the wall greater than 150 mm must comply with BCA Group Number (see section 4.5.2).

Critical Radiant Flux performance of tongue and grooved timber floorboards can be found on the WoodSolutions website under the timber species section. The Critical Radiant Flux for a number of timber species is recorded with other species information. If the species contains no Critical Radiant Flux numbers, then there is no publicly available information for that species. Refer to timber product suppliers for further details.

Engineered timber flooring products such as Oriented Strand Board, particleboard, plywood and Cross Laminated Timber, etc, are proprietary, and the information must be sourced from the supplier of the product.

4.4.2 Wall and Ceiling Linings

The surface fire spread performance for wall and ceiling linings is controlled by the product's Group Number. For Class 9c buildings the allowable Group Number depends on the location of the material within the building. The Residential Use Areas are considered by the BCA as Specific Areas (BCA Notes to Table 3 Specification C1.10 Clause 4). The Group Number for wall and ceiling products in different areas within a sprinkled Class 9c building must not be less than the following (BCA Specification C1.10 Clause 4):

- Residential use areas (Specific Area) – 3
- Public corridor – 2
- Fire isolated exits and fire control rooms – 1
- Other areas (not mentioned above) – 3.

Class 9c buildings are always sprinkled so the requirement for the smoke growth rate index must not be more than 100 or the average specific extinction area is less than 250 m²/kg is not applicable (BCA Specification C1.10 4 (a)).

The performance of solid timber linings and decorative veneers on particleboard or Medium Density Fibreboard (MDF) can also be found from the Wood Solutions website under the timber species. For systems or species not found on the website, consult the product supplier.

5 Acoustics Deemed-to-Satisfy Detailed

The BCA provides requirements for residential buildings so that unnecessary sound is not transmitted between separate living spaces so as to cause illness or loss of amenity as a result of the noise.

Class 9c buildings have a lower sound attenuation requirement than Class 2 and 3 buildings, and the reason suggested by the BCA Guide⁵ is that Class 2 and 3 buildings are 'noisier' than a unit in Class 9c buildings. The BCA's Guide suggests Class 2 and 3 buildings have televisions, stereos and other activities that may not be found in a Class 9c building; therefore the level of airborne sound attenuation required in a Class 9c building is less. Unlike Class 2 and 3 buildings, the spectrum adaption terms on airborne noise (Ctr) and impact sound insulation on floors are not applied or modified the sound performance of building elements in a Class 9c building.

5.1 Sound Insulation Rating of Floors (BCA Provision F5.4 (b))

The BCA requires the floor separating in a Class 9c Sole Occupancy Units to have a Weighted Sound Reduction Index (Rw) not less than 45, and there is no direct impact noise requirement for Class 9c buildings.

5.2 Sound Insulation Rating of Walls (BCA Provision Clause F5.5 (c) and (d))

A wall in a Class 9c building that separates different Sole Occupancy Units, or a Sole Occupancy Unit from a kitchen, bathroom (not contained within the unit), sanitary compartment, laundry, plant room or utility room, must have a Weighted Sound Reduction Index (Rw) not less than 45. Further, a timber-framed wall that separates Sole Occupancy Units from a kitchen or laundry must have an impact sound insulation rating that is satisfied if the wall has two or more separate leaves, not rigidly mechanically connected. The exception of rigidly mechanically connection is at the periphery edges (BCA Provision Clause F5.3 (b) (ii)), i.e. top, bottom and side of the wall.

5.3 Sound insulation rating of internal services (BCA Provision Clause F5.6)

Ducts, soil, waste, water supply pipes or stormwater, including a duct or pipe that is located in a wall or floor cavity, must be separated from any Sole Occupancy Unit by construction with an $R_w + C_{tr}$ (airborne) not less than the following:

- adjacent room is a habitable room (other than a kitchen) – 40
- adjacent room is a kitchen or non-habitable room – 25.

5.4 Door to SOU

For Class 9c buildings, the BCA has no acoustic requirements for doors in acoustic-rated walls.

6 Design and Construction Solutions

6.1 Design Approach

There are always trade-offs in building design as key considerations are pulling design solutions in different directions. For Class 9c buildings, the significant design considerations are around occupancy, layout, acoustic, fire and structural design. For a successful design, each design issue needs to be balanced off equally with each other.

As discussed in previous sections, the BCA's Deemed-to-Satisfy solutions may give more than one method for compliance for a particular building element, an example being the three solutions for internal fire-rated walls. There are four distinct structural timber building systems, discussed in Section 6.2. For each timber building system, a BCA's Deemed-to-Satisfy solution may work better than another. The Guide, where appropriate, discusses where the various structural timber building systems may work the best with a specific BCA's Deemed-to-Satisfy solution.

6.2 Timber Building Systems

There are four distinct timber construction systems possible for use in Class 9c Residential Care timber buildings. These are lightweight timber-frames (Figure 6.1), post and beam (Figure 6.2), solid timber panels (Cross Laminated Timber (CLT) or Laminated Veneer Lumber (LVL)) (Figure 6.3) and post and plate (Figure 6.4). Refer to WoodSolutions Guide 46⁶ for more details on each timber construction system. Each timber construction system may have advantages and disadvantages when it comes to compliance for a particular building element; the Guide will discuss the merits of each in the following section.



Figure 6.1: Lightweight Timber Frame - The Green (Image: Frasers Property Australia)



Figure 6.2: Timber Post and Beam, International House, Lend Lease (Image: TDA)



Figure 6.3: CLT Forte Living, Lend Lease (Image: PlanetArk)

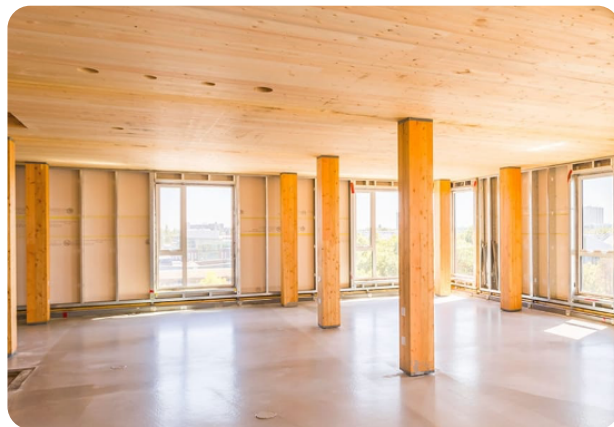


Figure 6.4: Post and Plate - Brock Commons. (Image: Brudder)

6.2.1 Internal Wall

As discussed in Section 4.3.1, the BCA provides three options for internal wall compliance: BCA Specification C1.1 method, Fire-Protected timber method and BCA Provision C2.5 (b) (iii) method (Section 4.3.1). The fundamental difference between the compliance method is the treatment of the internal walls. The BCA Provision C2.5 (b) (iii) method requires all the internal walls (loadbearing and non-loadbearing), irrespective of the Type of Construction, to be fire-resistant, but at a common rating, i.e. not less than 60/–/–. The BCA Specification C1.1 and Fire-Protected timber method do not require non-loadbearing walls to be fire rated. For the later BCA solutions, this provides an advantage as it removes any need to fire-rated internal walls, except for those bounding lift and stair shafts.

The BCA Provision C2.5 (b) (iii) method may favour the use of timber-framed or panel construction timber systems, as these timber construction systems have many loadbearing walls, requiring fire rating. Therefore, the consequence of BCA Provision C2.5 (b) (iii) method requiring all walls to be fire-rated has fewer cost impacts, as a number of these walls already need to be fire-rated.

For the BCA Specification C1.1 method, post and beam or post and plate construction timber systems would be favoured, as these timber systems have no loadbearing walls except for those bounding lift and stair shafts. Post and beam or post and plate construction timber system allow the use of non-loadbearing non-fire-rated internal walls, which are considerably cheaper than fire-rated walls.

There is no straight forward answer for which timber structural system is superior, investigation into all is required.

6.2.2 External Walls

The BCA has only one solution for external walls being compliance to BCA Specification C1.1. This Deemed-to-Satisfy solution requires the external walls to be non-combustible for Type A and B construction, whereas for Type C construction there are no non-combustible limits. Also, in some situations, the external wall is required to be fire-rated. The fire rating depends on whether the wall is loadbearing, the Type of Construction and its distance from a fire-source feature.

Solutions for lightweight timber frames or solid timber panels building systems favour fire-protected timber solution (Appendix A). For post and beam and post and plate systems, they easily allow a non-loadbearing curtain wall system to be used. Curtain walls have no fire resistance, but there is the situation due to the distance away from a fire-source feature, or the curtain wall is protected by external wall sprinklers, there is no need to fire-rated the external wall. In these situations, the curtain wall is only required to be non-combustible.

The same non-loadbearing curtain wall solution could be employed for lightweight timber-framed or solid timber panel systems, but in many instances, these buildings systems rely on external walls to be loadbearing.

Consideration of which BCA's Deemed-to-Satisfy solution is used for the internal and external walls may dictate which structural timber system works best.

6.3 Building Solutions Details

6.3.1 Smoke-proof Wall Layout (BCA Specification C2.5)

The BCA Provision C2.5 (b) (i) requires smoke-proof walls to be placed so that the area within the smoke-proof walls is not greater than 500 m². They are also required around Ancillary Use Areas such as kitchens, laundry and storage rooms. Therefore, when considering where to place smoke proof walls, the Ancillary Use Areas should be considered first, as they are required in these locations irrespective of area limits. Once the Ancillary Use Areas smoke-proof walls are determined, the remainder of the area can be assessed to see if the area is still required to be divided further.

Other locations that smoke-proof walls can coincide with are walls required to be fire rated. As fire-rated walls generally have higher construction requirements than smoke-proof walls, they can be used to divide the area further.

Smoke-proof wall example

The example in Figure 6.5 is from the WoodSolutions Cost Plan on Aged Care, WoodSolutions Guide No 287. Refer to that Guide for more information on the building's design.

Step 1 – Assign the Ancillary Use Area wall first – the kitchen location is marked in blue within Figure 6.5. The storeroom is not included as it is less than 10 m², which is below the area required to be considered by the BCA.

Step 2 – As the total floor area is greater than 500 m², the building needs to be divided into areas no bigger than 500 m². The most logical spot is the door between the dining room and the residential area, marked in orange in Figure 6.5.

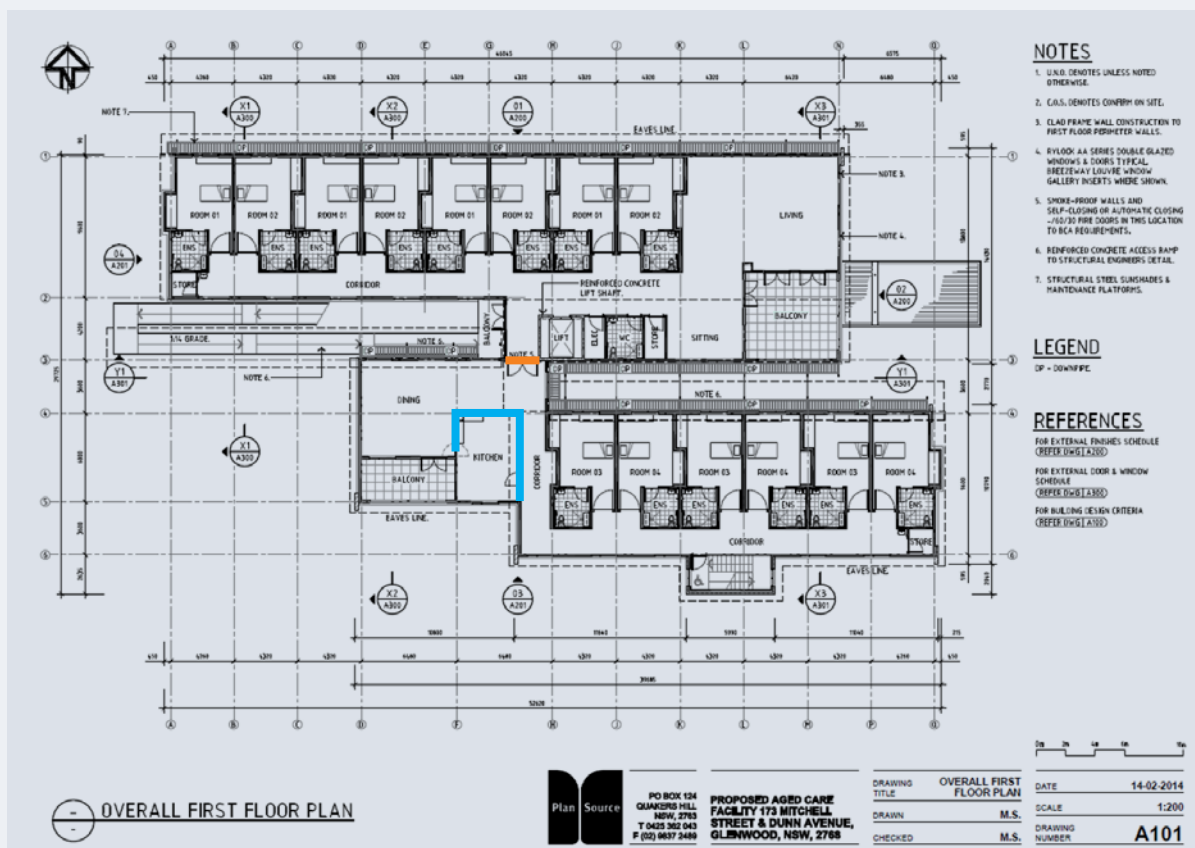


Figure 6.5: Floor plan of Residential Care facility showing Smoke-proof wall locations

The construction of a smoke-proof wall can be achieved by extending standard grade 13 mm plasterboard to the underside of the floor above or non-combustible roof covering (see Figure 6.6).

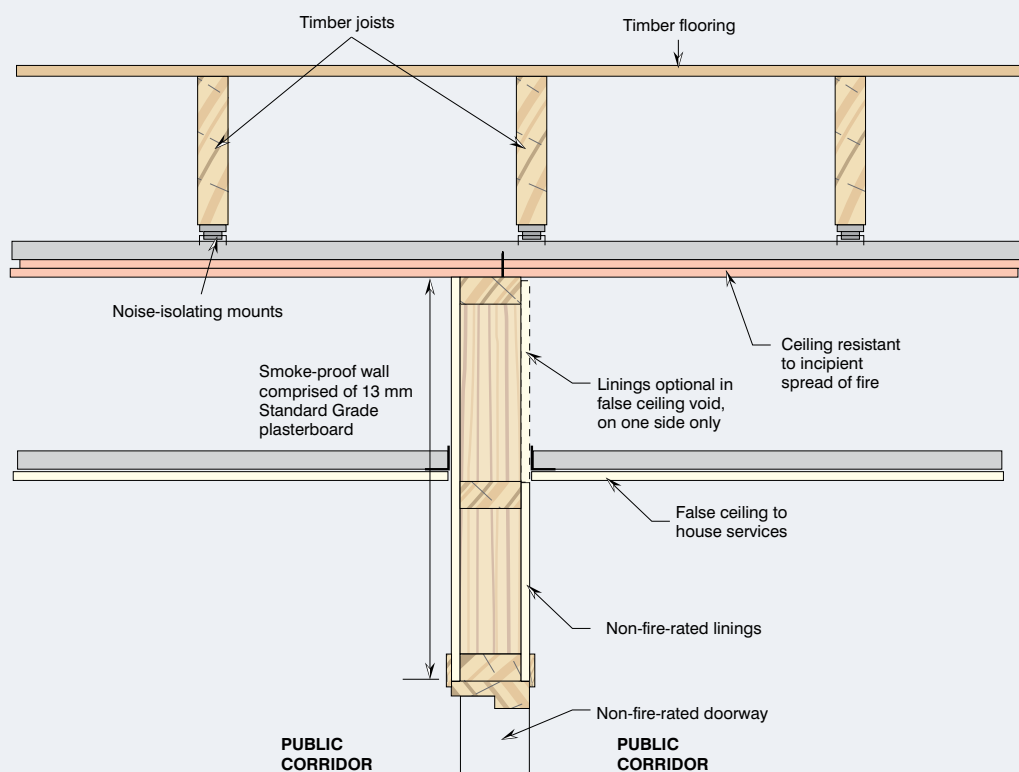


Figure 6.6: Smoke-proof Wall Construction

NSW variations

Smoke-proof walls in NSW differ from the general BCA requirements in that they are to be lined on both sides of the wall with 13 mm standard grade plasterboard and, if provided with cavity insulation, contain only non-combustible insulation. The construction joint in the wall must also be smoke sealed with intumescent putty or the like.

6.3.2 Floors

The BCA requires floors for Type B and C is to have a minimum Fire Resistance Level of 60/60/60 and for Type A, 120/120/120. Furthermore, the floor is to have sound transmission and insulation of a Weighted Sound Reduction Index (R_w) of not less than 45, when between Residential Care areas. This acoustic requirement does not include any impact noise obligation and generally speaking is much less demanding than the acoustic requirements for Class 2 or 3 buildings.

Timber-framed floors

Fundamentally, timber-framed floors (see Figure 6.7) are made up of components that aid fire resistance and acoustic performance:

1. Floor covering or topping – acoustic improvement
2. Floor joist and structural flooring – acoustic improvement and fire rating
3. Insulation – acoustic improvement
4. Ceiling – acoustic improvement and fire rating.

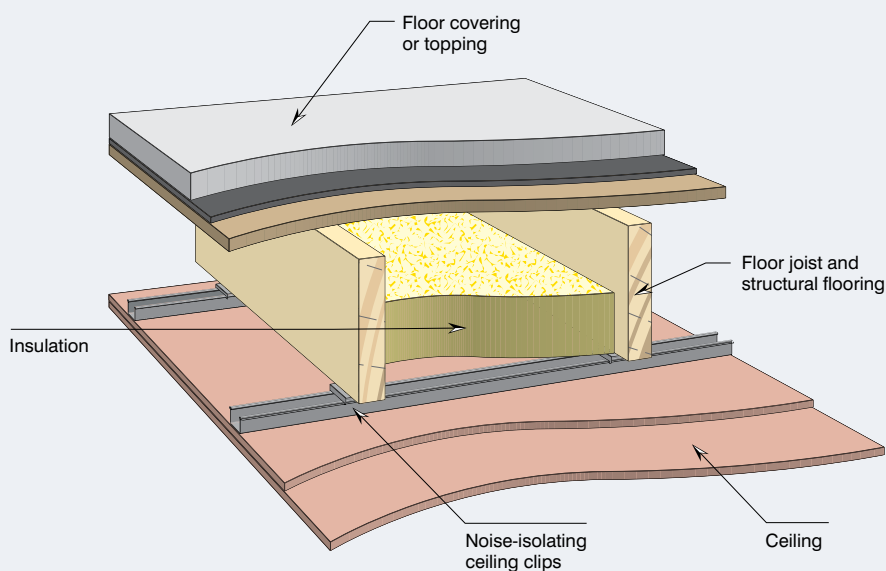


Figure 6.7: Illustration of components in a fire and acoustic rated timber-framed floor.

Changing the makeup of each component will affect the fire and acoustic performances. According to CSR's Red Book⁸, to achieve a 60/60/60 fire-resistance timber-framed floor systems requires two layers of 13 mm fire-protective plasterboard, while 120/120/120 timber-framed floor systems require three layers of 16 mm fire-protective plasterboard.

The acoustic requirement of R_w 45 can be achieved with the direct fixed two layers of 13 mm fire-protective plasterboard to the underside of the floor joist and with 90 mm glass wool insulation between the joists. Where three layers of 16 mm fire-protective plasterboard are used, no insulation is required.

Acoustic performance above BCA minimum requirements can easily be achieved by the addition of furring channels, which improve the acoustic performance by 4 dB, and resiliently mounted furring channels, which increase the acoustic performance by a further 9 dB (based on CSR's The Red Book).

There are many acoustic solutions for timber-framed floors, and the acoustic performance of framed floors is predominately dependent on the linings used for the ceiling. For further fire and acoustic information, as well as compliance evidence, refer to the relevant lining supplier.

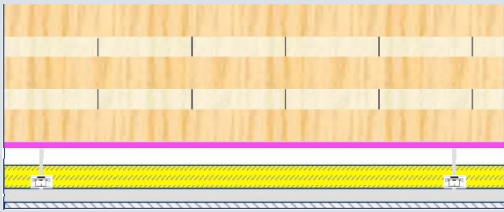
Solid Panel Floor (CLT or LVL)

The fire resistance of CLT or LVL floors varies from manufacturer to manufacturer so a direct reference to the supplier of these products for performance information is required.

For the acoustic performance of CLT, refer to WoodSolution Guide No 44⁹. Within this Guide, all the floor systems exceed the BCA minimum requirement for Class 9c residential care buildings. Refer to Table 6.1 for a compliant CLT system.

For LVL based floor systems, refer to the lining or LVL manufacture for information.

Table 6.1: CLT Acoustic Rated Floor System.

Configuration	
	140mm Cross-Laminated Timber (CLT) 16mm fire-rated plasterboard 185mm suspended ceiling with Resilient mounts 75mm glasswool insulation Lining

System	Test	Floor Covering	Lining	Thickness (mm)	R_w	$R_w + C_{tr}$	STC	$L_{n,w}$	IIC
F04-02	T1617-08	Bare CLT	1x13mm standard plasterboard	354	57 - 59	51 - 53	58 - 59	59 - 61	49 - 51
F06-01	T1617-09	Bare CLT	2x13mm standard plasterboard	367	59 - 61	53 - 55	59 - 61	57 - 58	52 - 53

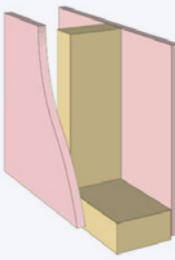
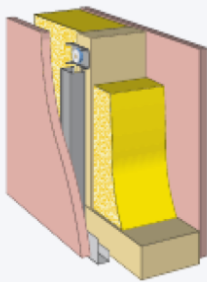
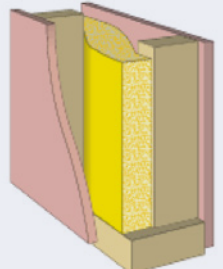
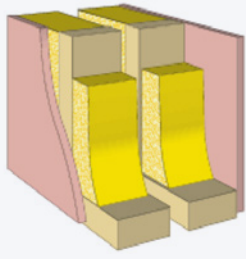
6.3.3 Internal Walls

As discussed above, the BCA gives more than one way for internal walls to comply with fire-resistant requirements. Irrespective of the pathway for achieving fire resistance, the acoustic provision for internal walls that separate different units, units from a kitchen, bathroom (not contained within the unit), sanitary compartment, laundry, plant room or utility room are all the same, requiring to have Weighted Sound Reduction Index (R_w) not less than 45. Furthermore, where the Sole Occupancy Unit's wall separates a kitchen or laundry, it must also have impact noise resistance, which can be achieved through separate leaf construction. The exception is that connections are allowed at the edge of the wall, i.e. top, bottom or end of wall length. The following discusses the timber solution for various fire compliance methods.

BCA Provision C2.5 (b) (iii) Method

This BCA provision requires all walls except the fire-resistant lift and stair shaft to have a Fire Resistance Level of 60/- / - irrespective of the application. Timber-framed walls require at least 16 mm fire-protective plasterboard applied to both sides of the studs to achieve this Fire Resistance Level. Table 6.2 has minimum complying published timber-framed systems; refer to plasterboard suppliers for evidence of fire and acoustic performance.

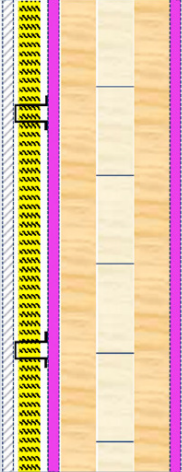
Table 6.2: Minimum Fire and Acoustic Compliant Timber-Framed Systems

Description	FRL	Acoustic Requirements	Minimum Compliant System	Graphic
Partitions not required to be acoustic rated	60/ - / -	No requirement	Single stud 16 mm fire grade plasterboard to both sides of stud - Stud size 70 x 45 mm - Acoustic rating: NA	
Wall that separates different SOU, SOU and bathroom (not contained within the unit), sanitary compartment and plant room or utilities	60/ - / -	R_w not less than 45	Single Stud with resilient mounts 16 mm fire grade plasterboard to both sides of stud - Stud size 70 x 45 mm 75 mm glasswool insulation - Acoustic rating: R_w 49	
Wall between SOU and kitchen or laundry	60/ - / -	R_w not less than 45 and two or more separate leaves without rigid mechanical connection except at the periphery.	Staggered stud 16 mm fire grade plasterboard to both sides of stud - Stud size 70 x 45 mm 75 mm glasswool insulation - Acoustic rating: R_w 49	
			Double stud 16 mm fire grade plasterboard to both sides of studs - Stud size 70 x 45 mm 75 mm glasswool insulation - Acoustic rating: R_w 57	

Note: Acoustic and Fire Rating information from CSR Red Book Fire & Acoustic Design Guide

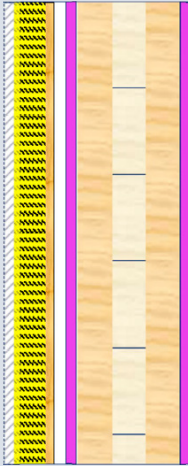
For CLT systems fire resistance requirements can be found from CLT suppliers. For acoustic information, again refer to WoodSolution Guide No 44⁹. Table 6.3 provides CLT walls that meet the acoustic performance and Table 6.4 provides CLT wall solutions that require the separation of leaves.

Table 6.3: Minimum Acoustic Compliant CLT Systems.

Configuration							
		Lining 28mm furring channel Clip or mount (min. 45mm cavity) 50mm glasswool insulation 16mm fire-rated plasterboard 90mm Cross-Laminated Timber (CLT) 16mm fire-rated plasterboard					

System	Test	Lining	Connection	Thickness (mm)	R _w	R _w + C _{tr}	STC
W05-02	T1617-94	1x13mm standard plasterboard	Adjustable clip	180	52	42	53 - 54
W06-01	T1617-37	1x13mm standard plasterboard	Resilient mount	180	51 - 52	42 - 43	53
W06-02	T1617-38	2x13mm standard plasterboard	Resilient mount	193	56	47	57 - 58

Figure 6.4: Minimum acoustic compliant CLT systems with leaves separation.

Configuration							
		Lining Stud frame 75mm glasswool insulation Gap 16mm fire-rated plasterboard 90mm Cross-Laminated Timber (CLT) 16mm fire-rated plasterboard					

System	Test	Lining	Stud Frame	Thickness (mm)	R _w	R _w + C _{tr}	STC
W02-02	T1617-88	1x13mm standard plasterboard	70mm timber stud 20mm gap	225	56	48	56 - 57
W04-02	T1617-43	1x13mm standard plasterboard	64mm steel stud 20mm gap	219	58	48 - 49	58 - 59

BCA Specification C1.1 and Fire-Protected Timber Method

For Type A and B construction, loadbearing walls that bound public corridors or lobbies between Sole Occupancy Unit are generally required to have a Fire Resistance Level of 120/-/-. For Type C construction that is two-storey in height, a Fire Resistance Level of 60/-/- is generally required on the lower storey. For non-loadbearing walls, there is no Fire Resistance Level required.

Table 6.5 has minimum complying timber framed systems a Fire Resistance Level of 120/-/-.

For a Fire Resistance Level of 60/-/- refer to Table 6.2.

Table 6.5: Minimum fire 120/ - / - compliant timber-framed systems.

Description	FRL	Acoustic Requirements	Minimum Compliant System	Graphic
Partitions not required to be acoustic rated	120/ - / -	No requirement	Single stud 2 x 16 mm fire grade plaster-board to both sides of stud - Stud size 70 x 45 mm - Acoustic rating: NA	
Wall that separates different SOU, SOU and bathroom (not contained within the unit), sanitary compartment and plant room or utilities	120/ - / -	R_w not less than 45	Single Stud 2 x 16 mm fire grade plaster-board to both sides of stud - Stud size 70 mm 75 x 45 mm glasswool insulation - Acoustic rating: R_w 46	
Wall between SOU and kitchen or laundry	120/ - / -	R_w not less than 45 and be two or more separate leaves without rigid mechanical connection except at the periphery	Staggered stud 2 x 16 mm fire grade plaster-board to both sides of studs - Stud size 70 x 45 mm - Acoustic rating: R_w 48	
			Double stud 2 x 16 mm fire grade plaster-board to both sides of studs - Stud size 70 x 45 mm - Acoustic rating: R_w 51	

Note: Acoustic and Fire Rating information from CSR Red Book Fire & Acoustic Design Guide

6.4 Fire Resistant and Acoustic Detailing

6.4.1 Lightweight Structural Timber-Framed Systems – Excluding Fire-Protected Timber Systems

Fire-resistant and acoustic rating detailing of lightweight timber-framed fire-rated systems, other than Fire-Protected Systems, are fundamentally the same irrespective of the building classifications. WoodSolutions Guide No 2¹⁰ contained information on the joining of floors to walls, walls to walls and associated cavities, penetrations, etc.

6.4.2 Solid Timber Panel Systems – CLT and LVL- excluding Fire-Protected Timber Systems

As solid panel systems solutions (CLT or LVL) are proprietary products, refer to supplying companies for information.

6.4.3 Fire-Protected Timber Lightweight Structural Timber-Framed and Solid Timber Panel Systems

Refer to WoodSolutions Guides No 37R² and 37C¹¹.

Appendix A : Fire-Protected Timber

Fire-protected timber is timber elements protected by non-combustible linings, and the timber can be either lightweight timber-framed or mass timber. The non-combustible linings differ if they are for lightweight timber-framing or mass timber, and is summarised in Table A.1.

Table A.1 Fire-Protected Timber Non-combustible linings requirements.

	Application	DTS Solution	AS1530.4 Test Method Criteria
Lightweight Timber-Framing	Loadbearing and required fire-resistant walls	2 x 13 mm fire-protective plasterboard	To achieve a Resistance to the Incipient Spread of Fire of not less than 45 minutes
Mass Timber	Inside a fire-isolated stairway or lift shaft	1 x 13 mm fire-protective plasterboard	The time allowed for fire protective covering and timber interface to exceeds 300°C – 20 minutes
	External walls within 1 m of an allotment boundary or 2 m of a building on the same allotment	2 x 13 mm fire-protective plasterboard	The time allowed for fire protective covering and timber interface to exceeds 300°C – 45 minutes
	All other applications	1 x 16 mm fire-protective plasterboard	The time allowed for fire protective covering and timber interface to exceeds 300°C – 30 minutes

Fire-protected timber has several other conditions for compliance:

- the building has an effective height of not more than 25 m; and
- the building has a sprinkler system complying with Specification E1.5 (other than an FPAA101D or FPAA101H system) throughout; and
- any insulation installed in the cavity of the timber building element required to have a Fire Resistance Level and be non-combustible; and
- cavity barriers are provided in accordance with BCA Specification C1.13.

Appendix B : Definition

Aged care building: a Class 9c building for residential accommodation of aged persons who due to varying degrees of incapacity associated with the ageing process are provided with personal care services and 24-hour staff assistance to evacuate the building during an emergency.

Ancillary Use Areas: are areas that contain equipment or materials that have a high potential fire hazard such as:

- kitchen and related food preparation areas greater than 30 m²
- laundry – where items of equipment are potential fire sources (e.g. gas-fired dryers)
- storage rooms greater than 10 m² used predominantly for the storage of administrative records.

Average Specific Extinction Area: the average specific extinction area for smoke as determined by AS/NZS 3837.

Class 9c: a residential care building.

Critical Radiant Flux: is a measure determined by AS ISO 9239.1 and means the critical heat flux where a piloted flame is extinguished.

Curtain Wall: a non-loadbearing external wall that is not a panel wall.

Deemed-to-Satisfy Solution: a method of satisfying the Deemed-to-Satisfy Provisions.

External wall: an outer wall of a building which is not a common wall.

Fire compartment: for Deemed-to-Satisfy Provisions – any part of a building separated from the remainder by walls and/or floors with each having an FRL not less than that required for a fire wall for that type of construction and where all openings in the separating construction are protected in accordance with the Deemed-to-Satisfy Provisions of the relevant Part.

Fire Protective Covering:

- 13 mm fire-protective grade plasterboard; or
- 12 mm cellulose cement flat sheeting complying with AS/NZS 2908.2 or ISO 8336; or
- 12 mm fibrous plaster reinforced with 13 mm x 13 mm x 0.7 mm galvanised steel wire mesh located not more than 6 mm from the exposed face; or
- other materials not less fire-protective than 13 mm fire-protective grade plasterboard, fixed in accordance with the normal trade practice for a fire-protective covering.

Fire Source Feature:

- the far boundary of a road, river, lake or the like adjoining the allotment; or
- a side or rear boundary of the allotment; or
- an external wall of another building on the allotment which is not a Class 10 building.

Fire wall: a wall with an appropriate resistance to the spread of fire that divides a storey or building into fire compartments.

Group Number: the number of one of four groups of materials used in the regulation of fire hazard properties and applied to materials used as a finish, surface, lining, or attachment to a wall or ceiling.

Habitable room: a room used for normal domestic activities, including a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom but excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes-drying room and other spaces of a specialised nature occupied infrequently or for extended periods.

Internal wall: excludes a common wall or a party wall.

Non-combustible:

(a) applied to a material — not deemed combustible as determined by AS 1530.1 — Combustibility Tests for Materials; and

(b) applied to construction or part of a building — constructed wholly of materials that are not deemed combustible.

Materials deemed not combustible under BCA Provision C1.12 include Plasterboard, perforated gypsum lath with a normal paper finish, fibrous-plaster sheet, fibre-reinforced cement sheeting and pre-finished metal sheeting having a combustible surface finish not exceeding 1 mm.

Panel Wall: a non-loadbearing external wall, in frame or similar construction that is wholly supported at each storey.

Performance Solution: a method of complying with the Performance Requirements other than by a Deemed-to-Satisfy Solution.

Public corridor: an enclosed corridor, hallway or the like which serves as a means of egress from 2 or more Sole Occupancy Units to a required exit from the storey concerned.

Sole Occupancy Unit: a room or other part of a building for occupation by one or joint owners, lessee, tenant or other occupier to the exclusion of any other owner, lessee, tenant or other occupier and includes a room or suite of associated rooms in a Class 9c building, which includes sleeping facilities and any area for the exclusive use of a resident.

Smoke Growth Rate Index: the index number for smoke used in the regulation of fire hazard properties and applied to materials used as a finish, surface, lining or attachment to a wall or ceiling.

Residential care building: a Class 3, 9a or 9c building that is a place of residence where 10% or more of persons who reside there need physical assistance in conducting their daily activities and to evacuate the building during an emergency (including any aged care building or residential aged care building) but does not include a hospital.

Resident use area: part of a Class 9c building normally used by residents and includes sole Occupancy Units, lounges, dining areas, activity rooms and the like but excludes offices, storage areas, commercial kitchens, commercial laundries and other spaces not for the use of residents.

Rise in Storeys: the greatest number of storeys calculated in accordance with BCA C1.2.

Type of Construction: A minimum Type of fire-resisting construction of a building.

Shaft: the walls and other parts of a building bounding vertical chute, duct or similar passage but not a chimney or flue.

Appendix C : References

1. WoodSolutions, Guide No 2 – Timber-framed Construction for Multi-residential Buildings Class 2 and 3 – Design and construction guide for BCA compliant sound and fire-rated construction.
2. WoodSolutions, Guide No 37R – Mid-rise Timber Buildings – Multi-residential Class 2 and 3.
3. National Construction Code, 2019 Building Code of Australia – Volume One.
4. NSW Planning and Infrastructure Fire Sprinkler Standard, 2013.
5. National Construction Code, 2019 Guide to the BCA Volume One.
6. WoodSolutions, Guide No 46, Wood Construction Systems.
7. WoodSolutions, Guide No 28, Rethinking Aged Care Construction – Consider Timber.
8. CSR Gyprock, The Red Book, Fire and Acoustic Design Guide.
9. WoodSolution Guide No 44, CLT Acoustic Performance.
10. WoodSolutions, Guide No 2, Timber-framed Construction for Multi-residential Buildings Class 2 & 3 – Design and construction guide for BCA compliant sound and fire-rated construction.
11. WoodSolutions, Guide No 37C, Mid-rise Timber Buildings Commercial and Education.

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Over 50 technical guides cover aspects ranging from design to durability, specification to detailing. Including worked drawings, they are an invaluable resource for ensuring timber-related projects comply with the National Construction Code (NCC). Download them now from WoodSolutions.com.au, the website for wood.

- 1 Timber-framed Construction for Townhouse Buildings Class 1a
- 2 Timber-framed Construction for Multi-residential Buildings Class 2 & 3
- 3 Timber-framed Construction for Commercial Buildings Class 5, 6, 9a & 9b
- 4 Building with timber in bushfire-prone areas
- 5 Timber service life design - design guide for durability
- 6 Timber-framed Construction - sacrificial timber construction joint
- 7 Plywood box beam construction for detached housing
- 8 Stairs, balustrades and handrails Class 1 Buildings - construction
- 9 Timber flooring - design guide for installation
- 10 Timber windows and doors
- 11 Timber-framed systems for external noise
- 12 Impact and assessment of moisture-affected, timber-framed construction
- 13 Finishing timber externally
- 14 Timber in Internal Design
- 15 Fire Design
- 16 Massive Timber Construction Systems: Cross-Laminated Timber (CLT)
- 17 Alternative Solution Fire Compliance, Timber Structures
- 18 Alternative Solution Fire Compliance, Facades
- 19 Alternative Solution Fire Compliance, Internal Linings
- 20 Fire Precautions During Construction of Large Buildings
- 21 Domestic Timber Deck Design
- 22 Thermal Performance in Timber-framed Buildings
- 23 Using Thermal Mass in Timber-framed Buildings
- 24 Thermal Performance for Timber-framed Residential Construction
- 25 Rethinking Construction - Consider Timber
- 26 Rethinking Office Construction - Consider Timber
- 27 Rethinking Apartment Building Construction - Consider Timber
- 28 Rethinking Aged Care Construction - Consider Timber
- 29 Rethinking Industrial Shed Construction - Consider Timber
- 30 Timber Concrete Composite Floors
- 31 Timber Cassette Floors
- 32 EXPAN Long Span Roofs - LVL Portal Frames and Trusses
- 33 EXPAN Quick Connect Moment Connection
- 34 EXPAN Timber Rivet Connection
- 35 EXPAN Floor Diaphragms in Timber Buildings
- 36 EXPAN Engineered Woods and Fabrication Specification
- 37 Mid-rise Timber Buildings (Class 2, 3 and 5 Buildings)
- 37R Mid-rise Timber Buildings, Multi-residential (Class 2 and 3)
- 37C Mid-rise Timber Buildings, Commercial and Education Class 5, 6, 7, 8 and 9b (including Class 4 parts)
- 38 Fire Safety Design of Mid-rise Timber Buildings
- 39 Robustness in Structures
- 40 Building Timber-framed Houses to Resist Wind
- 41 Timber Garden Retaining Walls Up to 1m High
- 42 Building Code of Australia Deemed to Satisfy Solutions for Timber Aged Care Buildings (Class 9c)
- 43 Reimagining Wood-based Office Fitout Systems - Design Criteria and Concepts
- 44 CLT Acoustic Performance
- 45 Code of Practice - Fire Retardant Coatings
- 46 Wood Construction Systems
- 47 Timber Bollards
- 48 Slip Resistance & Pedestrian Surfaces
- 49 Long-span Timber Floor Solutions
- 50 Mid-rise Timber Building Structural Engineering
- 51 Cost Engineering of Mid-rise Timber Buildings