



Fire and acoustically rated walls

Application guide

External cladding

Internal lining



James Hardie
A smarter way to build

AUSTRALIA SEPTEMBER 2015

1 INTRODUCTION

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1.1 APPLICATION

This manual provides information for designers of James Hardie fire and acoustically rated walls, framed from timber or steel, for use in residential and commercial construction such as:

- Separating walls in multi-residential construction
- Separating walls in office buildings
- External walls required to be fire resistant
- Bathroom linings
- Hospital corridor walls subject to trolley impact
- Wall linings in transit areas and schools
- Walls in security type buildings

These fire and acoustically rated walls can be used to meet a wide range of performance specifications and service requirements to suit most applications:

- For **internal** partition walls, Villaboard® lining is the main component used. In addition, it can be used for bracing from the time of erection.
- For **external** cladding applications, a range of James Hardie building products are available for fire and acoustically rated construction.

Villaboard lining provides advantages when acoustic performance is needed from fire and acoustically rated walling systems. The dense sheet reduces sound transmission producing insulated walls that are slimmer than other traditional walling materials. These thinner walls have advantages in hotels, motels and similar accommodation venues where increased floor area is a bonus.

An added benefit is that James Hardie building products are resistant to damage from moisture, rotting, cracking, fire and termites when installed and maintained as specified.

This manual is intended to assist designers in selecting a suitable construction type, whereas general construction details are given in the James Hardie 'Construction of fire and acoustically rated walls Technical Specification'. That literature provides details of framing installation, layout of sheeting, fasteners, placement of acoustic infill, control joints, corners, decorative finishes, service penetrations and more.

Make sure your information is up to date. When specifying or installing James Hardie products, ensure that you have the current manual. Additional installation information, warranties and warnings are available at www.jameshardie.com.au or Ask James Hardie™ on 13 11 03.

1.2 RESIDENTIAL AND COMMERCIAL APPLICATIONS

In residential and commercial applications, the James Hardie systems are principally for constructing:

- Separating walls between two occupancies, required to be both fire resistant and acoustically insulated. Refer to Section 5.
- External walls, required to be fire resistant, see Section 6.

The Building Code of Australia (BCA) permits the use of lightweight framed walls in all Class 1 Buildings and in Class 2 and 3 Buildings under conditions outlined in this manual. However, this manual is not a substitute for the BCA. All relevant requirements of the BCA and other regulations must be complied with. The information provided in the manual regarding Class 1 to Class 3 Buildings includes the specific use of James Hardie fibre cement products.

Generally the same principles and details apply to a Class 10a non-habitable building such as a carport, private garage, shed and the like where it touches the other class of building under consideration.

1.3 DEEMED-TO-SATISFY BCA PROVISIONS

In the lead up to the May 2004 revision to the BCA, it became clear that occupiers of multi-residential properties are generally concerned about the amount of noise they experience. In quality residential construction, residents expect to hear almost no noise from the adjoining occupancy. To achieve this, it is necessary to design and construct separating walls with superior sound insulating properties.

The previous edition of this manual dated May 2000 referred to the James Hardie preferred system that was trialled using a program of laboratory and field testing in order to combine the required levels of fire resistance with the high level of sound reduction demanded. This system now forms the basis for the Deemed-to-Satisfy provision in the BCA.

The basic discontinuous system (see Figure 1) consists of two separate timber frames, lined with Villaboard lining and fire resistant plasterboard to achieve specific fire ratings. For further details refer to the dual frame systems in Section 5.

The wall must be completely covered by the base sheet, without interruption, to ensure the acoustic integrity of the system.

Using two separate frames further reduces impact sound transmission. Depending on the thickness of the Villaboard lining and fire resistant plasterboard used, the James Hardie systems can achieve the following loadbearing and non loadbearing fire ratings:

- Timber framing: FRL of 60/60/60 or 90/90/90
- Steel framing: FRL of -/60/60, 60/60/60, -/90/90, 90/90/90, -/120/120 or 120/120/120

To achieve the required fire and acoustic performance, the separating wall must be installed in strict accordance with the James Hardie **'Construction of fire and acoustically rated wall Technical Specification'** for these walls.

Refer to Section 3.4 for fibre cement deemed-to-satisfy solutions.

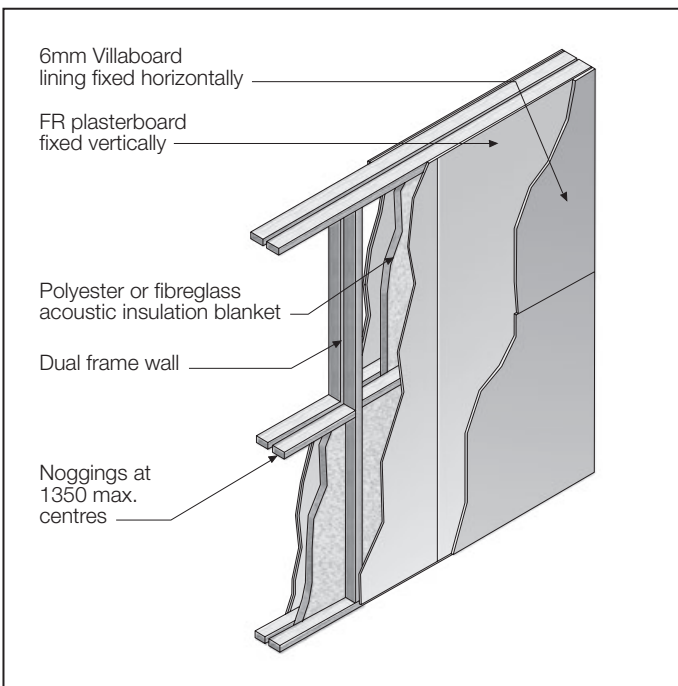


FIGURE 1 BASIC DETAILS OF THE JAMES HARDIE DISCONTINUOUS WALL SYSTEM

NOTE

The order of the linings is interchangeable.

1.4 BUILDING CODE OF AUSTRALIA

The BCA is the national regulatory instrument for building construction and it includes requirements for the design and construction of lightweight walling systems.

The performance based criteria allows suppliers to test and prove that the systems they recommend will satisfy the requirements set out in the BCA.

The BCA specifies minimum requirements for fire resistance, acoustic ratings and impact sound insulation for internal walls in all applicable classes of buildings.

The information in this manual regarding the minimum requirements of the BCA may be used as a guide to, but not as a substitute for, the BCA. The BCA is subject to regular amendments and individual designs may therefore vary from BCA requirements.

In selecting the right system for your application, you should determine the minimum requirements of the BCA to ensure that once the system has been selected and built, it satisfies those requirements. Ensure that you have the latest amendments of the BCA.

In some of these applications, however, the design level of acoustic insulation does not always come from the BCA and instead may be specified in the design brief or contract documents.

1.5 REFERENCED DOCUMENTS AND FURTHER INFORMATION

The following documents are referred to in this manual:

- The Building Code of Australia (BCA).
- AS 1191 - Method for laboratory measurements of airborne sound transmission loss of building partitions.
- AS 1530.4 - Fire resistance tests of elements of building construction.
- AS 1684 - National Timber Framing Code.
- Multi Residential Timber Framed Construction (MRTFC) Design and Construction Manuals for Class 1 Buildings/Class 2 and Class 3 Buildings.

For further information on timber-framed construction refer to the following publications:

- AS 1684 – Residential timber-framed construction
- AS 1720 – Timber structures
- MRTFC Manuals published by the Timber Development Council or, contact the National Timber Association in each state or territory.

For further information on steel-framed construction refer to AS/NZS 4600 – Cold Formed Steel Structures, or contact Metal Building Systems or Rondo Building Services.

For further information on James Hardie Building Products visit our website and download the latest James Hardie manuals at www.jameshardie.com.au, or Ask James Hardie™ on 13 11 03.

2 FIRE RESISTANCE

2.1 GENERAL

The BCA specifies required levels of fire resistance for walls that separate one occupancy from another. These required levels are expressed as the Fire Resistance Level (FRL) of the wall in minutes. In the event of a fire, the fire walls provide occupants in the adjoining occupancy with sufficient time to escape safely, by ensuring the wall maintains sufficient structural adequacy, integrity and insulation.

If the BCA, for example, requires a wall to achieve an FRL of 60/60/60 or -/60/60 (ie structural adequacy/integrity/insulation) the wall will have the following characteristics:

- The first figure 60 describes the wall's structural adequacy and indicates in minutes the period after which failure might occur as the wall system under test collapses under load. A dash here indicates that there is no requirement for structural adequacy (this is typical for non-load bearing systems).
- The second figure 60 describes the wall's integrity and indicates in minutes the period after which failure might occur as the wall system under test develops cracks or openings through which hot gases or flames can pass.
- The third figure 60 describes the wall's insulation and indicates in minutes the period after which failure might occur in the wall system under test, when
 - The average temperature of the unexposed surface of the test specimen increases by more than 140°C above the initial temperature, or
 - The temperature at any point on the unexposed surface increases by more than 180°C above the initial temperature.

2.2 WALL TYPE CONSTRUCTION

2.2.1 Separating walls

A fire rated separating wall, is required by the BCA to have a specified fire resistance level (FRL) as follows:

- Separating walls in Class 1 Buildings must have a fire resistance level (FRL) of 60/60/60.
- Separating walls in Class 2 and 3 Buildings must have an FRL of 90/90/90.

(Refer to the BCA Specification C1.1, Tables 3 and 4 and Clauses 3.10 and 4.3 for concessions on internal wall FRL requirements).

The BCA permits the use of timber framed residential construction for walls required to be fire rated within the following limits:

- All Class 1 Buildings.
- Class 2 Buildings to 3 storeys (4 storeys when the ground storey is for car parking and is of masonry or concrete construction).
- Class 3 Buildings to two storeys where access to two exits is provided or where each sole occupancy has its own direct access to a road or open space.

2.2.2 External walls

The BCA Part 3.7.1 'Fire' requires that the external walls of Class 1 Buildings that are within 900mm of an allotment boundary (other than the boundary adjoining a public road or other public space) or external walls that are within 1.8m of another building on the same allotment (other than an appurtenant Class 10 Building or a detached part of the same Class 1 Building), shall have a FRL of 60/60/60.

Where Class 2 and 3 Buildings are of Type C construction within 1.5m from any fire source feature to which they are exposed, the external walls are required to have a FRL of 90/90/90. Refer to the BCA Specification C1.1 Clause 5 for further details.

Further details covering fire resistant construction for Class 2 and 3 Buildings can be found in the Multi Residential Timber Framed Construction (MRTFC) Manuals published by the Timber Development Council.

NOTE

The above information may be used as a guide to, but not as a substitute for, the BCA. The BCA is subject to regular amendments and individual design may result in variation to the BCA requirements.

2.3 FIRE TESTING

The fire resistance level (FRL) test reports and Letters of Opinion quoted in this manual have been certified by the CSIRO Division of Building Construction and Engineering and the Building Research Association of New Zealand (BRANZ).

Fire resistance testing to determine the FRL of a wall (in the form of a specimen) has been conducted to the Australian Standard AS 1530 Part 4: 'Fire Resistance Tests of Elements of Building Construction'. The standard follows the basic principles and provisions contained in ISO-834 'Fire Resistance Tests – Elements of Building Construction'.

3 ACOUSTIC PERFORMANCE

3.1 GENERAL

The revision of the BCA in May 2004 has brought changes in some cases not only to the level of sound insulation required between the rooms of dwellings, but also the manner in which the insulation is measured. Two modes of noise transmission are considered in buildings, namely airborne sound and impact sound.

3.2 AIRBORNE SOUND

The capacity of a wall to reduce the level of airborne sound that can be transmitted through it is measured in terms of sound transmission loss. Previously the parameter STC (sound transmission class) was used to rate the performance, but our building codes have been revised to use the ISO standard, the **weighted sound reduction index**, R_w .

Certain kinds of sound, however, are more readily transmitted through insulating materials than others, for example lower frequency sounds from modern home entertainment systems with their high bass frequency output. For this reason the BCA has introduced in certain cases a spectrum adaptation factor C_{tr} to account for this phenomenon. Adopting the C_{tr} is also likely to minimise inconsistencies between laboratory test results and on-site test results. The C_{tr} is a negative number, which means that the $(R_w + C_{tr})$ value of a building element will be less than its R_w rating.

3.3 IMPACT SOUND

Impact noise occurs where a vibration sound is created by some physical contact with the floor or wall through footsteps, moving of heavy objects, or the operation of household appliances such as dishwashers, washing machines and clothes driers.

Impact sound between dwellings is accounted for by the requirement for discontinuous construction in certain walls. Discontinuous construction means a wall system having a minimum 20mm cavity between two separate frames, with no mechanical linkage between frames except at the periphery. A staggered wall stud is not deemed to be discontinuous construction.

3.4 BCA PERFORMANCE LEVELS

The BCA concerns itself, as far as acoustic insulation is concerned, only with Class 1, 2, 3 and 9c (aged care) buildings. Therefore it covers only residential type dwellings. Commercial buildings are developed on the basis of non-BCA acoustic criteria and the designer is likely to find the required performance level in the tender or contract documents or design specifications.

The BCA acoustic performance provisions for separating walls for various classes of dwellings are summarised in Table 1.

TABLE 1

BCA ACOUSTIC PERFORMANCE REQUIREMENTS FOR CLASS 1, 2, 3, AND 9C DWELLINGS			
SEPARATING WALL NO.	DISCONTINUOUS CONSTRUCTION REQUIRED	ACOUSTIC RATING REQUIRED	FIGURE 2 AND TABLE 2 REFERENCE
Between a bathroom, sanitary compartment, laundry or kitchen and a habitable room (other than a kitchen) in an adjoining Class 1* building (dwelling).	YES	$R_w + C_{tr}$ not less than 50	
Between a bathroom, sanitary compartment, laundry or kitchen in one sole-occupancy unit from a habitable room (other than a kitchen) in an adjoining Class 2† or 3‡ unit.	YES	$R_w + C_{tr}$ not less than 50	①
Between a Class 2 or 3 sole-occupancy unit and a plant room or lift shaft.	YES	R_w not less than 50	
Between a Class 2 or 3 sole-occupancy unit and a stairway, public corridor, public lobby or the like, or parts of a different classification.	NO	R_w not less than 50	②
Between sole-occupancy units in a Class 9c aged care building.	NO	R_w not less than 45	
Between a sole-occupancy unit and a bathroom, sanitary compartment (not being associated ensuite), plant room or utilities room in a Class 9c aged care building.	NO	R_w not less than 45	
Between a sole-occupancy unit and a kitchen or laundry in a Class 9c aged care building.	YES	R_w not less than 45	
In all cases different to those listed above	NO	$R_w + C_{tr}$ not less than 50	③

* Class 1 buildings are single dwellings being either a detached house or one of a group of two or more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit. Boarding houses and the like may be included into a Class 1, refer to the BCA for more information.

† Class 2 buildings contain two or more sole-occupancy units each being a separate dwelling, refer to the BCA for more information.

‡ Class 3 are residential buildings, other than a building of Class 1 or 2, which is a common place of long term or transient living for a number of unrelated persons, refer to the BCA for more information.

NOTE

Specific requirements are applicable for penetrations passing through a separating wall, refer to the BCA for details.

3.5 TESTING AND MODELLING

3.5.1 Acoustic test reports

The acoustic test reports quoted in this manual have been certified by the CSIRO Division of Building Construction and Engineering.

Acoustic measurements are made in one-third octave bands from 100 to 5000Hz. It is convenient to simply compare the performance rating of different assemblies by expressing the result as a single number, R_w .

Systems used in building construction are tested under laboratory conditions to establish their sound insulation characteristics. The method of measurement is described in AS1191 'Acoustics – method for laboratory measurement of airborne sound transmission loss of building partitions'.

3.5.2 Acoustic modelling

Based on the test results indicated above, acoustic modelling for the James Hardie wall systems was undertaken by Koikas Acoustics Pty Ltd.

3.5.3 Lab test results vs field performance

The results determined in the laboratory indicate the potential acoustic performance of a wall system when installed with a high degree of workmanship. Inevitably, values achieved in the field will be lower, depending upon the quality of workmanship during the installation, and the sound paths that can be created around the wall by other components of the building.

Measurements have shown, however, that laboratory results can be achieved in the field, where there is particularly high attention to detail in both design and installation.

3.6 BCA ACOUSTICS COMPLIANCE

3.6.1 General

Compliance with the sound insulation performance provisions of the BCA can be achieved either by construction in accordance with the Deemed-to-Satisfy Provisions or on-site testing.

Table 2 illustrates James Hardie Party Wall Solutions to Table 1 and Figure 2, in regards to Class 2 and 3 buildings only. Simply match the wall system number in Figure 2 with the acoustic solutions in Table 2. Refer to Section 5 in this manual for a comprehensive range of systems for steel and timber frames.

3.6.2 Deemed-to-Satisfy Provisions

The Deemed-to-Satisfy Provisions are acceptable construction methods that comply with the acoustic performance requirements of the BCA. Refer to Table 2 for details.

3.6.3 On-site verification testing

Compliance of walls to the BCA can be achieved by using the verification method, namely on-site testing, with performance levels as follows when tested in accordance with AS/NZS 1276.1 or ISO 717.1:

- Walls separating sole-occupancy units require a weighted standardised level of difference with spectrum adaptation term ($D_{nt,w} + C_{tr}$) not less than 45.
- Walls separating a sole-occupancy unit from a plant room, lift shaft, stairwell, public corridor, public lobby, or the like, or parts of a different classification require a weighted standardised level of difference ($D_{nt,w}$) not less than 45.

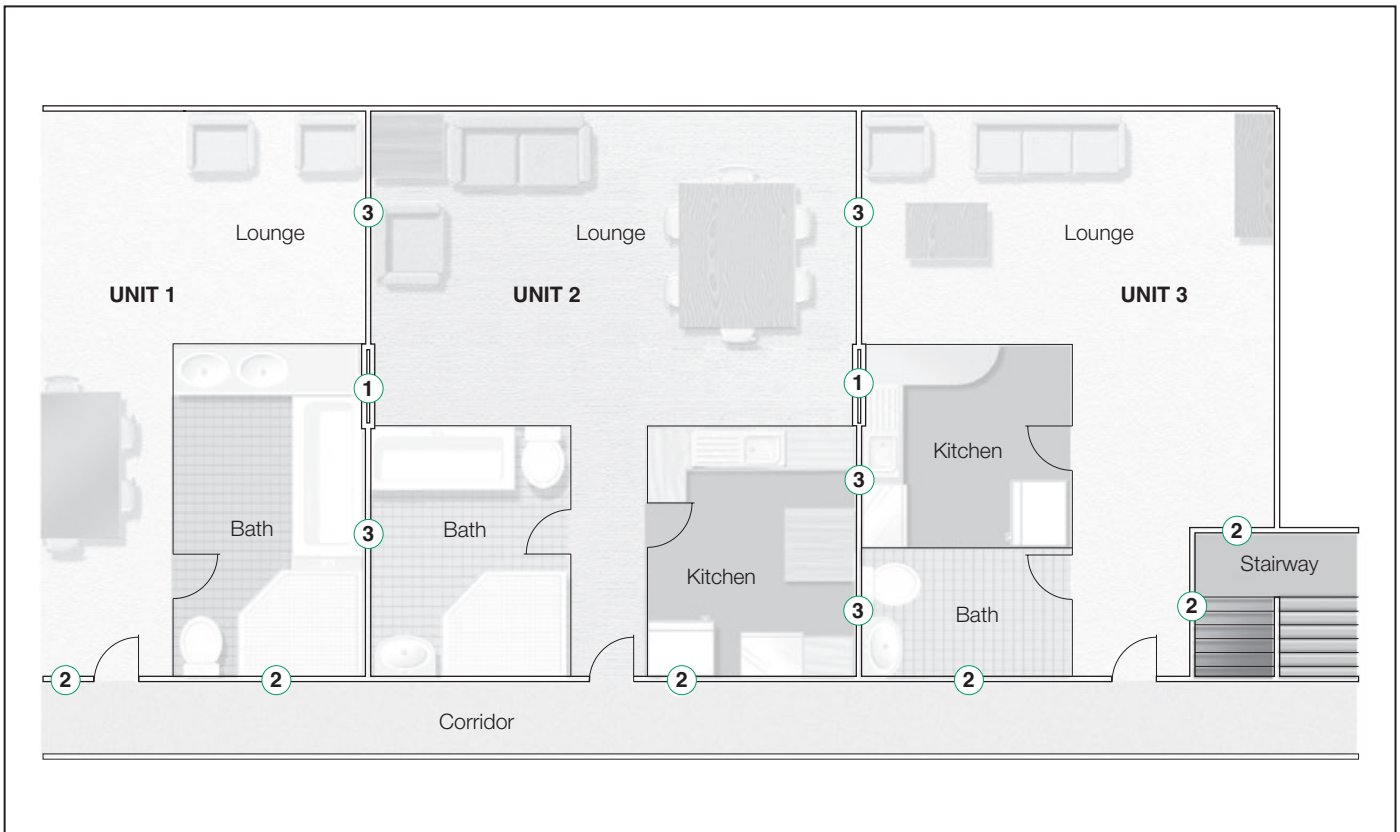
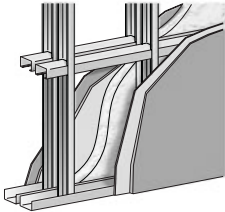
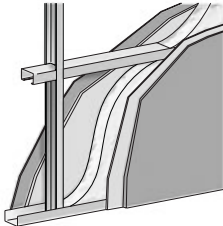


FIGURE 2 MINIMUM ACOUSTIC PERFORMANCE REQUIREMENTS FOR CLASS 2 AND 3 DWELLINGS

TABLE 2

DEEMED-TO-SATISFY ACOUSTIC ONLY PERFORMANCE PROVISIONS					
WALL SYSTEM	SYSTEM		WALL SYSTEM	SYSTEM	
	Diagram	Configuration		Diagram	Configuration
<p>①</p> <p>$R_w + C_{tr} \geq 50$</p> <p>Loadbearing (JH 234)-Timber (JH 434)-Steel</p> <p>Non-loadbearing (JH 334)-Steel</p>		<ul style="list-style-type: none"> Steel or timber dual stud frames, (Two rows of 90 x 35mm timber studs or two rows of 64mm steel studs at 600mm centres.) Refer to Section 4 for further structural considerations. 6mm Villaboard lining each side. 13mm fire resistant plasterboard each side. Wall insulation, see notes. Studs at 600mm Max. centres. 	<p>②</p> <p>$R_w \geq 50$</p> <p>Loadbearing (JH 414)-Steel</p> <p>Non-loadbearing (JH 314)-Steel</p>		<ul style="list-style-type: none"> Steel studs single frame One row of 92mm steel studs, refer to Section 4 for further structural considerations. 6mm Villaboard lining each side. 13mm fire resistant plasterboard each side. Wall insulation, see notes. Studs at 600mm Max. centres. <p>NOTES:</p> <p>1. Timber frames can not be used for this wall configuration.</p>

ON SITE VERIFICATION JAMES HARDIE PARTY WALL SOLUTIONS

<p>③ $R_w + C_{tr} \geq 50$</p> <p>Refer to Section 5 for a comprehensive range of James Hardie acoustic and fire wall systems for steel and timber frames. BCA compliance of these systems can be achieved using on-site verification testing, refer to Clause 3.6.3</p>
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NOTES ON TABLE 2

Insulation for wall system 1; 50mm thick glass wool insulation or 60mm thick polyester insulation with a density of 11kg/m³; positioned between one row of studs; **Insulation for wall systems 2;** 50mm thick glass wool insulation with a density of 11kg/m³ or 60mm thick polyester insulation with a density of 8kg/m³, positioned between studs.

3.7 ACOUSTICS IN PRACTICE

3.7.1 General

The ability of James Hardie fire and acoustically rated walls to reduce airborne sound depends on four factors:

1. Mass of the linings and their intrinsic characteristics
2. Width of the wall cavity
3. Framing configuration
4. Inclusion of a fibre blanket or batts as sound insulation into the cavity.

To achieve the performance results stated in this manual, particular care must be taken to seal between the frame and primary structure (eg at a deflection head). Any gaps in the wall system can lead to substantial losses of acoustic rating.

The systems presented in this manual provide excellent acoustic performances that range up to an R_w of 68.

3.7.2 Acoustic insulation

Acoustic performance of a wall system can be improved (ie $R_w + C_{tr}$ values increased) by installing an absorbent fill in the cavity. This is usually an acoustic grade fibreglass or polyester blanket, or batts not less than 50mm thick.

When using a blanket, take care to avoid sagging of the blanket and do not leave any gaps as the acoustic performance will be reduced. A simple method that avoids this is to drive nails into the studs. Place the nails near the edge of the stud and skew the nails to avoid contact with the other frame. Then hang the blanket on the nails.

4 STRUCTURAL CONSIDERATIONS

To achieve the values presented in this manual, use either fiberglass or polyester, with a thickness of 50mm and a density of 14kg/m³. The insulation should be an acoustic grade fiberglass or polyester fibre not less than 50mm thick, unless otherwise stated and satisfy the BCA and AS/NZS 4859.1

The small difference in the acoustic results at this R_w level between fiberglass and polyester blankets of comparable thickness and density is not of practical significance.

3.7.3 Impact sound insulation

Where the application is required to reduce impact sound, you must select a system that is either staggered or dual stud. Resilient channels can be used to reduce impact sound, however, they will not achieve isolation of the walls, which may be a BCA requirement.

3.7.4 Resilient channels

Where the wall is required to minimise the transmission of impact sounds, select a dual stud system.

Where cost is a constraint, resilient channels, fixed to the side of the wall subject to impact, may be used as an alternative.

While less effective than staggered or dual stud systems, the level of sound isolation may be adequate for applications such as between a corridor and an office space. See Figure 3.

Refer to the BCA to determine if resilient channels are an acceptable solution for your specific project.

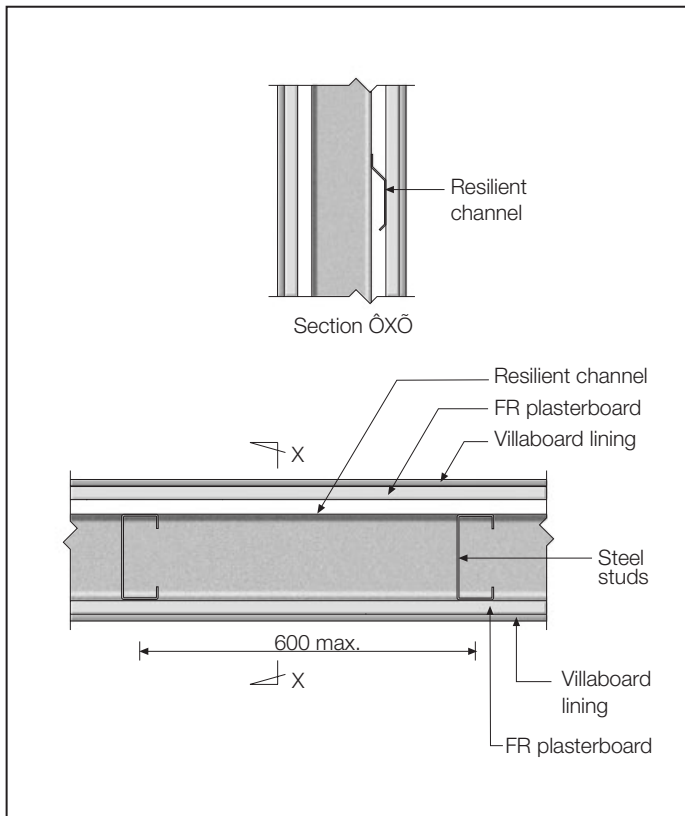


FIGURE 3 SINGLE STUD - WITH RESILIENT CHANNEL

4.1 GENERAL

To select the correct wall system from those detailed in this manual (refer to the tables in Section 5), you must first determine your performance requirements for FRL, R_w, R_w + C_m, and Impact Sound Insulation.

These sections are further divided into non-fire rated and fire-rated applications.

The fire-rated applications contain information on load bearing and non-load bearing systems.

Framing arrangements such as single, staggered and dual frames are included.

Special applications such as security panels have also been included.

NOTE

Additional performance requirements, such as abrasion, impact and moisture resistance, should also be considered.

4.2 NON-FIRE-RATED SYSTEMS

Non-fire rated wall systems are constructed using a layer of Villaboard lining applied to one or both sides of a steel or timber frame. See Figure 4. The arrangement of the frame, the thickness of the Villaboard lining and whether or not an absorbent acoustic fill is placed in the cavity depend upon the required resistance to damage by abrasion and impact and the specified sound transmission properties.

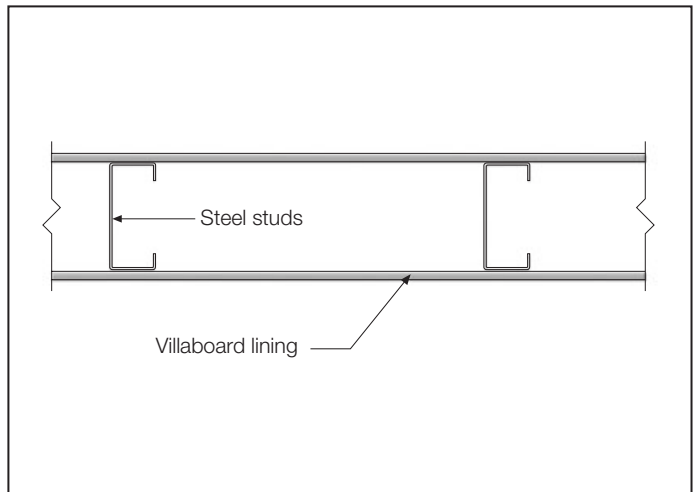


FIGURE 4 NON-FIRE RATED WALL

Additionally, in some instances the BCA does not require a wall to be fire rated but does require the wall lining to be non-combustible. Villaboard lining may be used where non-combustible construction is required in accordance with the BCA.

4.3 FIRE-RATED SYSTEMS

4.3.1 General

Fire-rated systems for an application are selected on the basis of the required Fire Resistance Levels (FRL) as set out by the BCA in addition to any acoustic requirements.

Fire-rated wall systems are constructed from lightweight framing (steel or timber) that is lined on both sides with one layer of fire resistant plasterboard and one layer of Villaboard lining.

It is relatively simple to achieve a FRL as required by the BCA. Irrespective of the frame type (ie steel or timber framing), the lining thickness of both the layer of Fire Resistant plasterboard and Villaboard lining will always be the same for the specified FRL. See Table 3 for the required lining thicknesses relative to the three standard FRLs.

TABLE 3

REQUIRED LINING THICKNESS FOR FRL		
REQUIRED FRL	LINING THICKNESS APPLIED FOR BOTH SIDES	
	Villaboard lining (mm)	Fire-resistant plasterboard (mm)
60/60/60/ - /60/60	6	13
90/90/90 - /90/90	6	16
120/120/120 - /120/120	9	16

NOTE

A 120/120/120 system is not available in timber framing.

The lining configurations shown in Table 3 will achieve the FRLs shown for single stud, staggered stud and dual stud frame systems, with or without cavity insulation.

The use of load bearing or non-load bearing systems will depend on the application.

The timber-framed systems detailed in this manual are generally used in loadbearing applications.

The steel frame systems detailed in this manual are proprietary framed systems and are generally used in non-loadbearing applications. Steel frames can be designed by a qualified structural engineer to be load bearing, provided that minimum size sections are equivalent to the systems in this manual to retain the FRLs.

4.3.2 Loadbearing Steel

The loadbearing capacities of a steel-framed wall must be determined by a qualified structural engineer in accordance with AS/NZ 4600 'Cold-formed steel structures'.

The systems described in Table 10 sustained a load of 15kN/m in relation to walls 3m high with Rondo Steel 92 x 35 x 1.15 steel studs spaced at 600mm centres with horizontal noggings at 1350.

Timber

The loadbearing capacities of the timber-framed walls must be determined in accordance with AS1684 'Residential timber-framed construction' and AS1720.1 'Timber structures'. The systems described in Table 13 sustained loads as shown in Table 4.

NOTE

In the case of Class 2 and 3 Buildings, the timber size required to meet the structural loads must be determined by a professional engineer.

TABLE 4

LOADBEARING CAPACITIES OF TIMBER-FRAMED SYSTEMS	
SYSTEM	LOADBEARING CAPACITY (kN/m)
Single stud	15
Staggered stud	20
Dual stud	20

NOTE

All tests were conducted using F5 grade timber.

The timber dimensions used in this manual refer to the usual minimum dimensions of seasoned timber. For alternative timber sizes see Table 1.3 of AS 1684.2.

Internal wall systems

For frames up to 3m high use 70 x 45mm studs and plates, and 70 x 35mm noggings at 1350 mm maximum. 90 x 35 studs may be used instead of 70 x 45 studs. Where the height of a separating wall exceeds 3m, the stud size must be increased to meet the fire resistance requirements as shown in Table 5.

External wall systems

For frames up to 3.3m high, use 90 x 45mm studs and plates, and 90 x 45mm noggings at 1350mm maximum centres. Where the height of an external wall exceeds 3.3m, the stud size must be increased to meet fire resistance requirements as shown in Table 5.

TABLE 5

MAXIMUM WALL HEIGHT		
WALL HEIGHT (mm)	MINIMUM STUD SIZE (mm)	
	F5	F8 - F14
3300	90 x 45	90 x 45
3600	90 x 70	90 x 45
3900	90 x 70	90 x 70
4200	90 x 90	90 x 70

4.3.3 Non-loadbearing Steel

Maximum wall heights for fire rated non-loadbearing steel framed wall systems using typical fire and acoustically rated lightweight wall framing are as shown in Table 6.

TABLE 6

MAXIMUM WALL HEIGHT FOR FIRE-RATED NON-LOADBEARING STEEL-FRAMED WALLS	
HEIGHT (mm)	STUD SIZE (mm)
3000	64 x 0.55
3600	76 x 0.55
4500	92 x 0.55
6000	150 x 0.75

NOTE

Fire rated and non-fire rated walls may need to be designed to withstand wind pressures.

For further information on proprietary steel frame systems refer to the manufacturer's instructions.

When referring to manufacturer's instructions and design tables, please note that staggered and dual stud systems have Villaboard lining fixed to one side of each stud only.

Walls to a greater height and achieving an FRL of 120/120/120 can be constructed using thicker or larger steel sections. These require individual design by a qualified structural engineer.

Timber

Non-load bearing timber-framed walls must be designed and constructed in accordance with AS 1684.

4.4 FRAMING ARRANGEMENTS

4.4.1 General

Generally, there are three basic types of framing arrangements available to designers: the single, staggered and dual frame systems. All three wall systems can achieve the same FRL levels when the same lining materials are selected, but they will provide different acoustic properties.

4.4.2 Single stud frame system

The single stud frame system is a single leaf wall with lining on each side. This system has the lowest acoustic rating when compared with the other two systems and may not adequately insulate against airborne or impact sound. See Figures 5, 6 and 7 for alternative options.

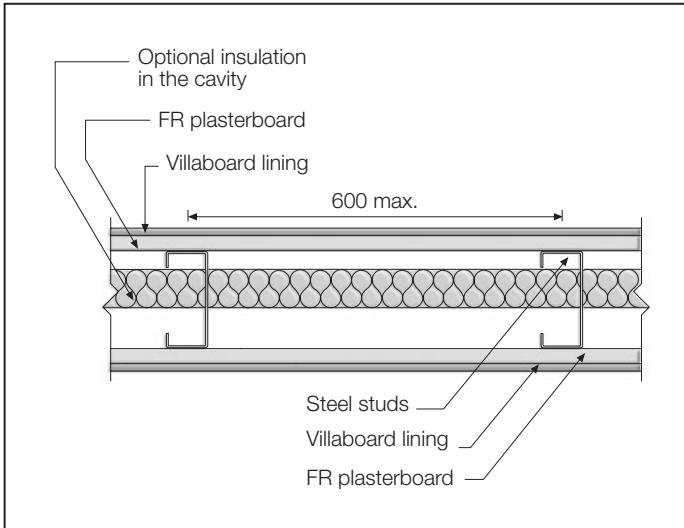


FIGURE 5 TYPICAL SINGLE STUD FRAME SYSTEM - STEEL

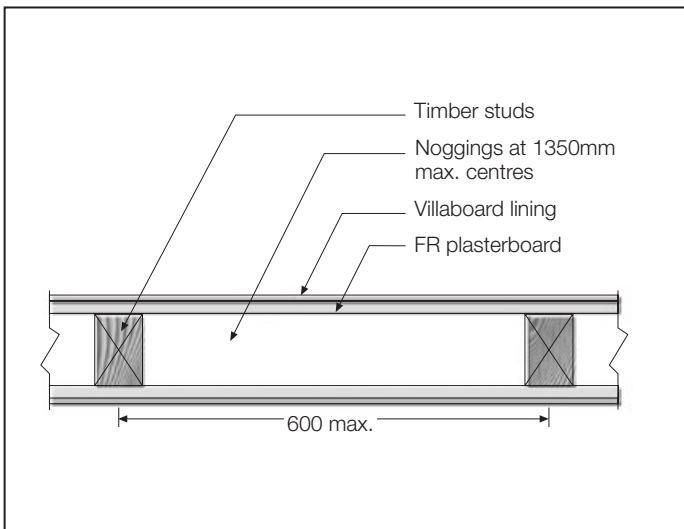


FIGURE 6 TYPICAL SINGLE STUD FRAME SYSTEM - TIMBER

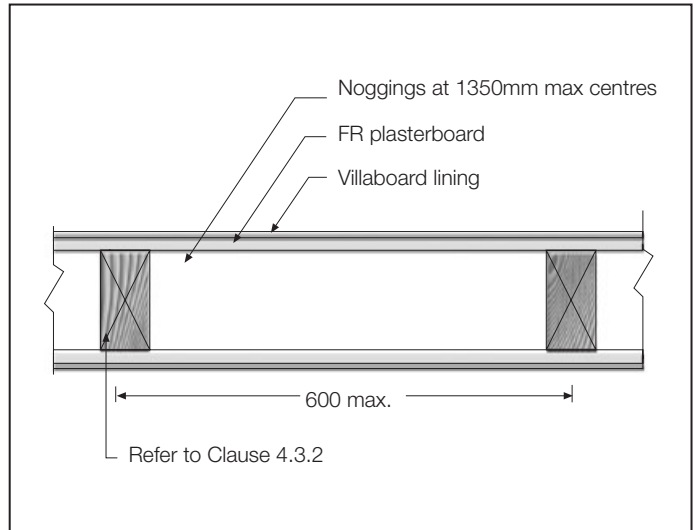


FIGURE 7 TYPICAL SINGLE STUD FRAME - LOADBEARING FRAME

4.4.3 Staggered stud frame system

The staggered stud frame system is a series of staggered studs that are fixed to the same top and bottom plate. The linings are fixed to the outside faces of the studs. This system has higher acoustic properties than the single stud framed system and will insulate against impact sound. See Figure 8.

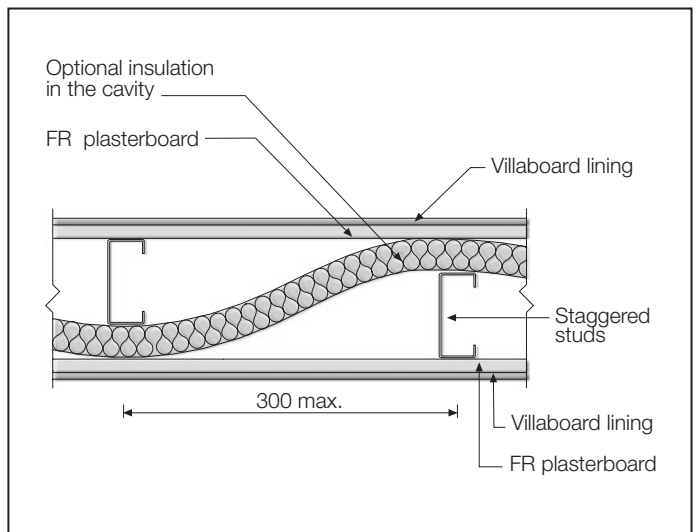


FIGURE 8 TYPICAL STAGGERED STUD FRAME SYSTEM

NOTE

This system should not be selected if services are required to run through the walls. Services require support battens that will bridge frames, reducing acoustic properties and preventing impact sound isolation.

The arrangement in Figure 9 is used as an alternative to the dual timber stud framing in areas where sound isolation is less critical. This system should not be used where floors are offset.

NOTE

Care must be taken to ensure the noggings do not bridge the cavity.

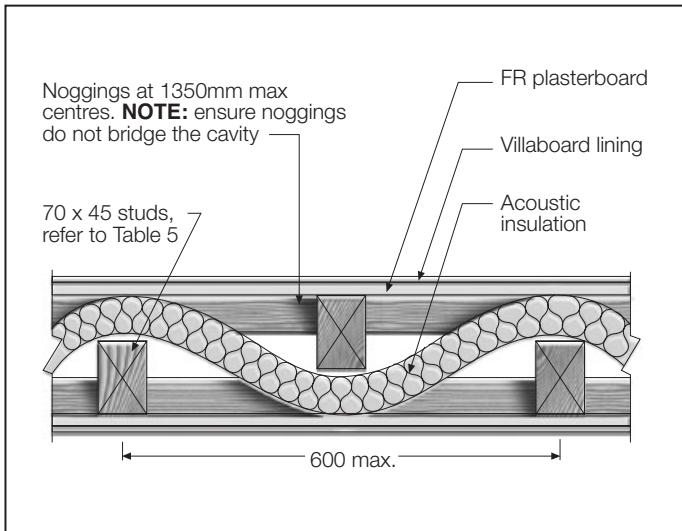


FIGURE 9 STAGGERED STUD FRAME SYSTEM (SHOWN WITH ACOUSTIC INSULATION IN THE CAVITY)

4.4.4 Dual stud frame system

The dual stud frame system uses two separate frames that are not connected. The outside face of each frame is then lined. This system will achieve the best acoustic properties and will insulate against impact sound. See Figure 10.

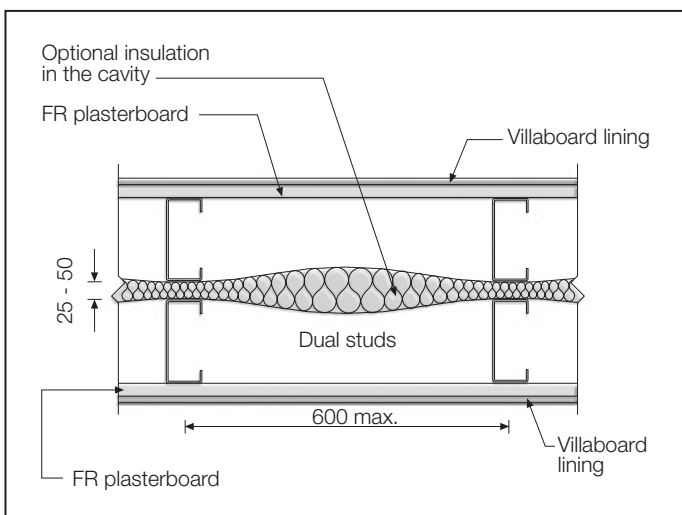


FIGURE 10 TYPICAL DUAL STUD FRAME SYSTEM

4.5 APPROVED INTERNAL LININGS

4.5.1 Fibre cement internal linings

Where fibre cement is specified for internal wall construction, only the following approved linings may be used to satisfy the FRL requirements. Where 6mm thick fibre cement is specified, only James Hardie 6mm thick or greater fibre cement products may be used. These include:

- Villaboard® lining,
- Versilux® lining (butt joined only) and
- HardieGroove® lining.

4.5.2 Approved FR Plasterboard

Only the following approved fire rated plasterboard linings may be used. These include:

- FireSTOP™ by Boral Plasterboard
- Gyprock Fyrchek™ by CSR Gyprock®
- Fireshield by Lafarge Plasterboard

Where water and fire rated plasterboard is specified, an equivalent fire rated plasterboard with water resistant properties must be used and approved by plasterboard manufacturer.

4.6 SPECIAL APPLICATIONS

4.6.1 External applications

For external applications, the 6mm-9mm Villaboard lining on the external face must be replaced with an equivalent or greater thickness James Hardie™ External Cladding product. For further information on fixing details please ask James Hardie™ on 13 11 03.

For ExoTec® facade panel and fixing system FRL wall systems refer to Section 7 of this manual.

4.6.2 Structural bracing

Selected James Hardie internal lining and external cladding products may be suitable to achieve a bracing capacity to the structure against lateral forces. Refer to the structural bracing application guide for design capacities and the available range of James Hardie internal lining and external cladding products used for this application. Note that to attain certain levels of bracing resistance, additional fasteners may be required.

The ExoTec facade panel and fixing system and the ComTex panels do not provide a bracing capacity when fixed on to James Hardie top hats.

4.6.3 Walls designed for impact

Villaboard lining has a harder surface than standard plasterboard, so it offers increased resistance to surface abrasion, indentation and impact. Using Villaboard lining can therefore reduce maintenance costs, particularly in areas such as hospitals, airports, schools and similar buildings subject to above average wear and tear.

For recommendations on Villaboard lining thicknesses for impact resistance see Table 7.

TABLE 7

RECOMMENDED SHEET THICKNESSES FOR IMPACT APPLICATIONS	
VILLABOARD LINING THICKNESS	APPLICATION
6mm	Normal residential service
9mm	Hospitals, schools and gymnasiums
12mm	Severe conditions such as manual arts workshops, etc.

4.6.4 Service cavities

In quality buildings, services in fire and acoustically rated walls should be avoided. While it is not difficult to maintain the fire resistance levels, the acoustic properties of the wall may be diminished. If this cannot be avoided, it is recommended that services be run through a service cavity, fixed on the face of the wall.

Where you cannot avoid putting services within the wall, you should select a dual stud frame system, and take care in the selection of framing systems and the method of installation of services. Ensure that services do not bridge wall frames as this will reduce acoustic performance and prevent impact sound isolation.

4.6.5 Security panels

Villaboard lining (typically 9mm thickness) may be used to construct walls in areas that are required to be secure. Zinalume® steel sheeting (0.55mm thickness) may be either glued to the back of the sheets or pop riveted to the frame prior to sheet fixing. This construction greatly increases resistance to impact (eg from hammer blows).

It is recommended as a lining to one or both sides of walls where security is a major issue, eg holding cells in police stations or equipment storerooms in schools. See Figure 11.

Where security needs to be higher, you can use a laminate that consists of Villaboard lining to one or both sides of a steel sheet. Details are available on request from Ask James Hardie™ on 13 11 03. Typically 0.5, 0.75, 0.95, 1.15, 1.5 or 1.95mm BMT steel sheet is bonded between 6mm or 9mm sheets of Villaboard lining. These laminates show remarkable resistance to impact penetration.

Balanced laminates that have fibre cement sheets on each side of the steel sheet must be used for external walls. For internal walls and ceilings where temperature and humidity variations are small, the single sided laminate is acceptable.

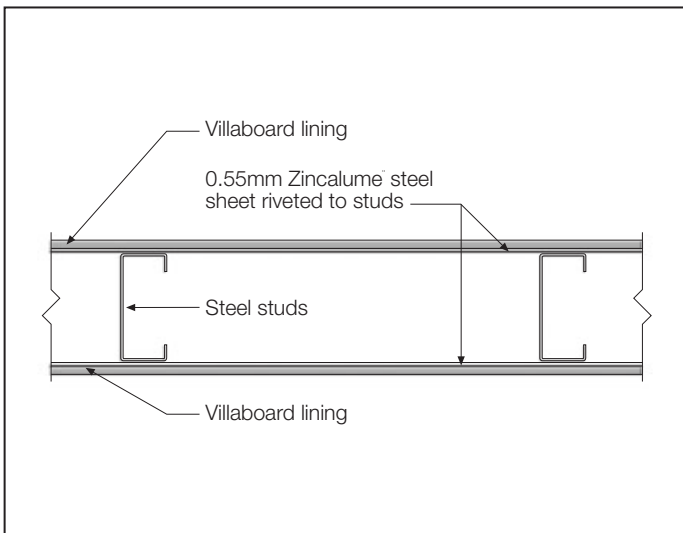


FIGURE 11 SINGLE STUDS - SECURITY WALL

For more information on suppliers of prefabricated security panels, Ask James Hardie™ on 13 11 03.

4.6.6 Smoke walls

Villaboard lining has the best possible early fire hazard properties and does not generate any smoke in a fire. For these reasons, Villaboard lining is commonly used to create *smoke walls* in hospitals.

NOTE

For more detailed product and performance information refer to the Villaboard lining Installation Manual.

4.6.7 Radiation shielding walls

Radiation shielding walls may be constructed using fire and acoustically rated lightweight walling methods by laminating a lead layer to Villaboard lining. Typically 9mm sheet is used as a substrate for lead sheet of a thickness determined by the designer to meet the radiation shielding specification.

Care in design and installation is essential to maintain the continuity of the lead sheet. Design, installation and certification should be carried out by specialists in this field.

4.7 FURTHER DESIGN REQUIREMENTS

4.7.1 Continuity

To maintain the sound isolating performance of a separating wall, it is essential to avoid designs that interrupt the continuity of the wall, or make connections between the two leaves of the dual frame (other than at the periphery). Therefore, it is advisable to avoid having power outlets on separating walls. If this is unavoidable, consider ducted skirting or the use of outlet boxes that are rated for both fire and sound isolation. Avoid running services and common plumbing in the wall as pipes and other rigid connections will transmit sound.

The continuance of the separating wall in the roof space must be fire rated but is not required to have a specific acoustic rating. Therefore, in the roof space, it is optional to continue the dual frame as shown in Figure 12, or use a single stud frame as shown in Figure 13.

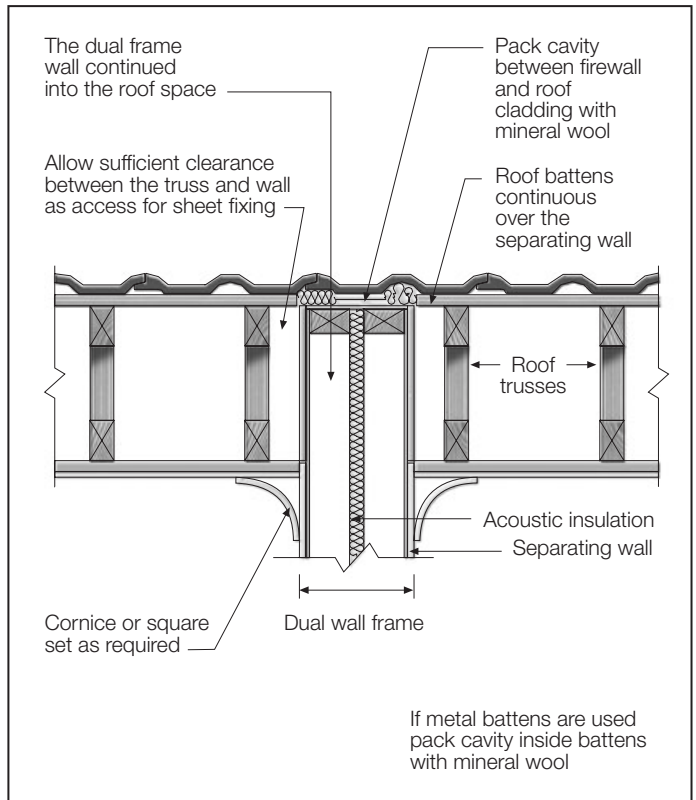


FIGURE 12 SEPARATING WALL CONTINUED INTO ROOF SPACE (ROOF TRUSSES PARALLEL TO WALL FRAME)

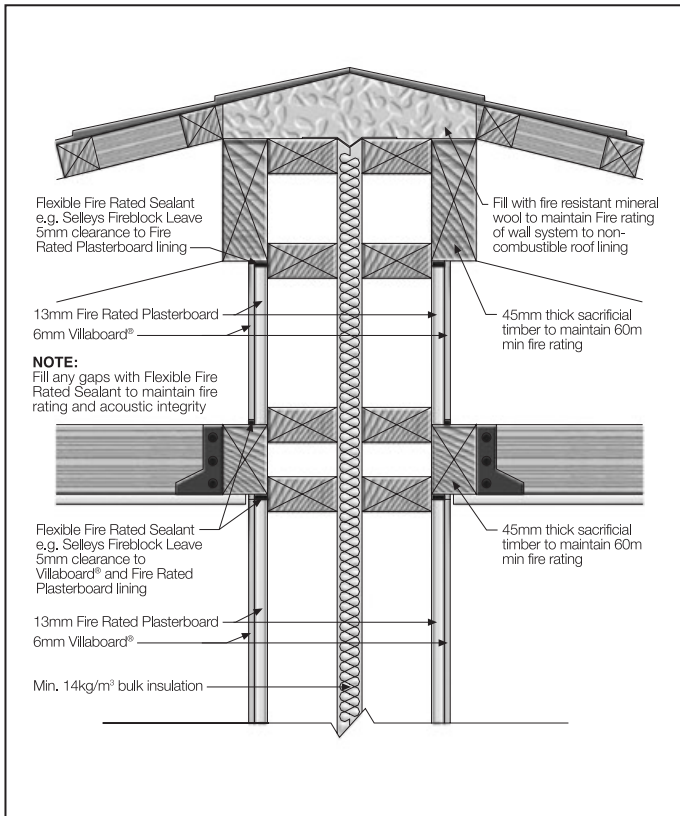


FIGURE 13 SEPARATING WALL CONTINUED INTO ROOF SPACE (ROOF TRUSSES ADJACENT TO WALL FRAME)

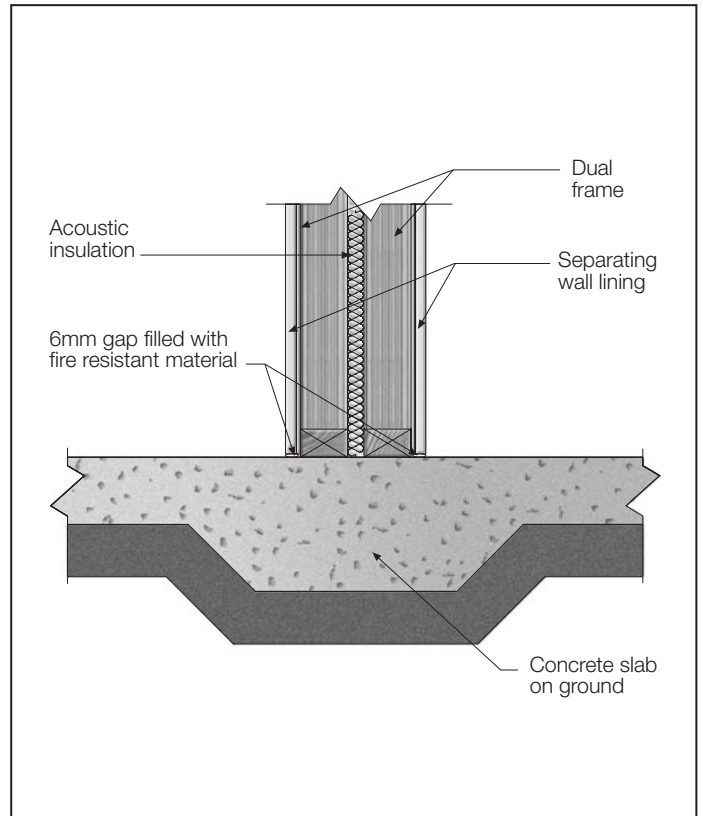


FIGURE 14 SEPARATING WALL ON A CONCRETE SLAB

4.7.2 Extent of wall

The BCA requires that for a Class 1 Building a separating wall commences at the footing or ground slab and extends,

- (a) if the building has a non-combustible roof covering, to the underside of the roof covering; OR
- (b) if the building has a combustible roof covering, to not less than 450mm above the roof covering.

In the case of **Class 2 and 3 Buildings**, designers should refer to the BCA or MRTFC Manuals for guidance.

NOTE

Where the separating wall is parallel to the trusses, as in Figure 12, the height of the separating wall at the ridge should be less than that of the trusses to allow for truss deflection under the load of the roof covering. The truss supplier will be able to advise on the design deflection.

4.7.3 Support

The frame must either be supported by a concrete slab (see Figure 14) or a masonry or concrete footing (see Figure 15).

Supporting the frame on a non-fire rated floor is not permitted.

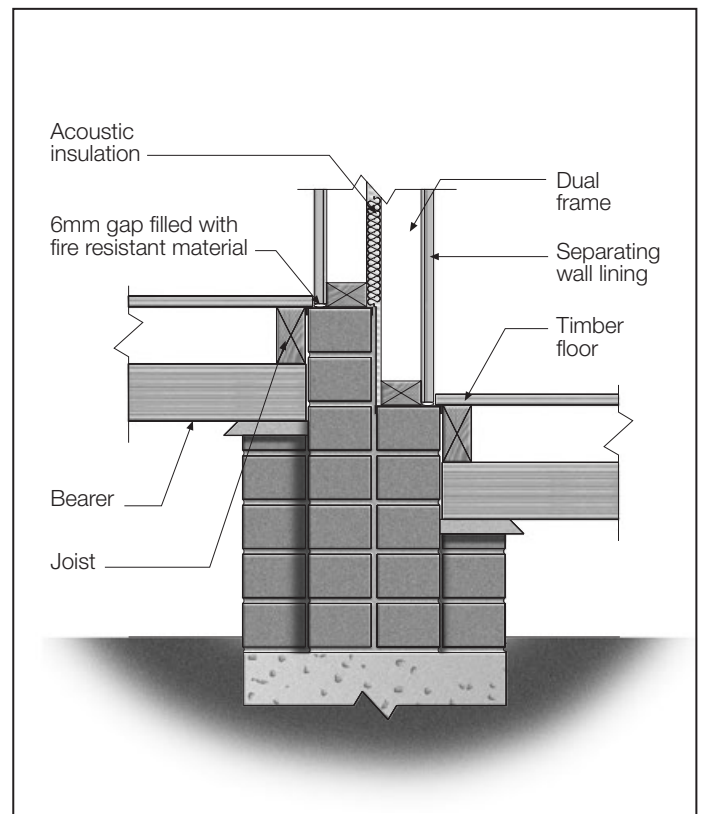


FIGURE 15 SEPARATING WALL ON BRICK FOOTINGS SHOWING DETAIL FOR A RAISED/OFFSET FLOOR

5 DESIGN INFORMATION SUMMARY/ SYSTEM SELECTION

5.1 GENERAL

The comprehensive range of James Hardie systems for steel and timber frames are summarised in Tables 8 to 13 below to make it easier to select the right system for your application.

After determining the required FRL, acoustic rating and load bearing capacity, select the James Hardie system that satisfies the minimum requirements for the application.

The systems have been divided into:

- non-fire rated systems, and
- fire rated systems

Fire rated systems have been further divided into:

- load bearing, and
- non-load bearing.

NOTES

1. For fire-rated systems, the order of the linings on a particular face of the wall may be interchanged.
2. In the detail drawings: FR plasterboard means Fire Resistant plasterboard. W & FR plasterboard means Water and Fire Resistant plasterboard.
3. Dual stud frames must be separated by 25mm min. and up to a maximum of 50mm.
4. If a fire wall system is used in a wet area application and the fire system requires fire rated plasterboard, the fire rated plasterboard lining on that side of the wall must also be water resistant

5.2 SYSTEM COMPLIANCE

All acoustic insulation ratings provided are based on modelling by Koikas Acoustics Pty Ltd. These predicted values are guidance information to assist designers in their selection of a suitable assembly type. James Hardie cannot guarantee that any such system will meet the performance requirements once tested on site. The advice of an acoustic engineer should be sought for further information in this respect.

NOTE

Refer to section 4.5 for information on approved internal linings.

TABLE 8

NON-FIRE RATED, NON-LOADBEARING WALL SYSTEMS - STEEL FRAME									
Framing arrangement	James Hardie system No.	Wall components	Stud size (mm) (t = track width)	Wall thickness (mm)	Wall mass (kg/m ²)	Acoustic performance			
						No insulation		With insulation	
						R _w	R _w +C _{tr}	R _w	R _w +C _{tr}
	JH - 611	• 6mm Villaboard lining each side • Steel studs single frame	64	76	19.9	36	30	42	33
			92	104	20.2	37	30	44	33
			150	162	21.8	38	30	47	37
	JH - 612	• 9mm Villaboard lining each side • Steel studs single frame	64	82	28.9	40	34	45	33
			92	110	29.1	41	34	49	39
			150	168	30.9	43	35	51	40
	JH - 613	• 12mm Villaboard lining each side • Steel studs single frame	64	88	37.2	43	36	51	42
			92	116	37.5	44	37	53	44
			150	174	39.1	46	38	54	47
	JH - 621	• 6mm Villaboard lining each side • Steel studs staggered frames in 92/150mm top and bottom tracks	64/92t	104	23.3	37	30	44	33
			64/150t	162	23.4	38	30	46	37
	JH - 622	• 9mm Villaboard lining each side • Steel studs staggered frames in 92/150mm top and bottom tracks	64/92t	110	31.0	41	34	49	40
			64/150t	168	31.7	43	35	50	43
	JH - 623	• 12mm Villaboard lining each side • Steel studs staggered frames in 92/150mm top and bottom tracks	64/92t	116	39.9	44	37	51	44
			64/150t	174	40.0	46	38	52	46
	JH - 631	• 6mm Villaboard lining each side • Steel studs dual frames separated 25mm	64	165	21.3	38	31	50	40
			92	221	21.9	39	32	51	42
	JH - 632	• 9mm Villaboard lining each side • Steel studs dual frames separated 25mm	64	171	30.3	43	36	57	46
			92	227	30.9	45	37	58	49
	JH - 633	• 12mm Villaboard lining each side • Steel studs dual frames separated 25mm	64	177	39.3	47	39	61	51
			92	233	39.9	49	40	62	53

TABLE 8 (CONTINUED)

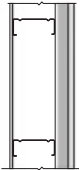
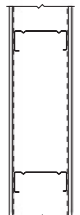
NON-FIRE RATED, NON-LOADBEARING WALL SYSTEMS - STEEL FRAME									
Framing arrangement	James Hardie system No.	Wall components	Stud size (mm) (t = track width)	Wall thickness (mm)	Wall mass (kg/m ³)	Acoustic performance			
						No insulation		With insulation	
						R _w	R _w +C _{tr}	R _w	R _w +C _{tr}
	JH - 617 Resilient channel	<ul style="list-style-type: none"> 9mm Villaboard lining one side 13mm plasterboard lining opposite side over proprietary resilient channel Steel studs single frame 	64	99	27.9	38	32	46	36
	JH - 611 Security panel	<ul style="list-style-type: none"> 6mm Villaboard lining each side 0.5mm Zinalume steel sheet each side Steel studs single frame 	64	77	22.3	40	34	48	37
	JH - 612 Security panel	<ul style="list-style-type: none"> 9mm Villaboard lining each side 0.5mm Zinalume steel sheet each side Steel studs single frame 	64	83	31.3	43	36	52	42
	JH - 613 Security panel	<ul style="list-style-type: none"> 12mm Villaboard lining each side 0.5mm Zinalume steel sheet each side Steel studs single frame 	64	89	39.6	46	38	55	45

TABLE 9

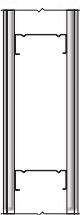
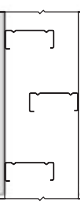
FIRE RATED, NON-LOADBEARING WALL SYSTEMS - STEEL FRAME											
Framing arrangement	James Hardie system No.	Wall components	Stud size (mm) (t = track width)	Wall thickness (mm)	Wall mass (kg/m ³)	FRL	CSIRO fire test or opinion details	Acoustic performance			
								No insulation		With insulation	
								R _w	R _w +C _{tr}	R _w	R _w +C _{tr}
	JH - 314	<ul style="list-style-type: none"> 6mm Villaboard lining each side 13mm fire resistant plasterboard each side Steel studs single frame 	64	102	41.0	-/60/60	FSV 0076	44	37	54	44
	JH - 315	<ul style="list-style-type: none"> 6mm Villaboard lining each side 16mm fire resistant plasterboard each side Steel studs single frame 	64	108	47.0	-/90/90	FCO 0395	45	39	55	46
	JH - 316	<ul style="list-style-type: none"> 9mm Villaboard lining each side 16mm fire resistant plasterboard each side Steel studs single frame 	64	114	53.9	-/120/120	FSV 0098	48	41	57	49
	JH - 324	<ul style="list-style-type: none"> 6mm Villaboard lining each side 13mm fire resistant plasterboard face layer each side Steel studs staggered frames in 92mm top and bottom tracks 	64/92t	130	43.0	-/60/60	FSV 0076 with letter of opinion FCO 0511	46	38	54	46
	JH - 325	<ul style="list-style-type: none"> 6mm Villaboard lining each side 16mm fire resistant plasterboard each side Steel studs staggered frames in 92mm top and bottom tracks 	64/92t	136	48.0	-/90/90	FCO 1519	47	40	54	48
	JH - 326	<ul style="list-style-type: none"> 9mm Villaboard lining each side 16mm fire resistant plasterboard each side Steel studs staggered frames in 92mm top and bottom tracks 	64/92t	142	56.3	-/120/120	FCO 1519	49	42	56	50

TABLE 9 (CONTINUED)

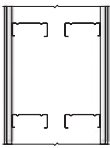
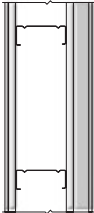
FIRE RATED, NON-LOADBEARING WALL SYSTEMS - STEEL FRAME											
Framing arrangement	James Hardie system No.	Wall component	Stud size (mm) (t = track width)	Wall thickness (mm)	Wall mass (kg/m ²)	FRL	CSIRO fire test or opinion details	Acoustic performance			
								No insulation		With insulation	
								R _w	R _w +C _{TR}	R _w	R _w +C _{TR}
	JH - 334	<ul style="list-style-type: none"> 6mm Villaboard lining each side 13mm fire resistant plasterboard each side Steel studs dual frames separated 25mm (20mm for fire test) 	64	191	44.9	-/60/60	Letter of opinion FCO 1022	49	41	64	53
	JH - 335	<ul style="list-style-type: none"> 6mm Villaboard lining each side 16mm fire resistant plasterboard each side Steel studs dual frames separated 25mm (20mm for fire test) 	64	197	46.3	-/90/90	FSV 0142 with letters of opinion FCO 0395 and FCO 1022	50	42	65	55
	JH - 336	<ul style="list-style-type: none"> 9mm Villaboard lining each side 16mm fire resistant plasterboard each side Steel studs dual frames separated 25mm (20mm for fire test) 	64	203	54.3	-/120/120	FSV 0098 with letter of opinion FCO 1022	53	44	68	59
	JH - 314 Service cavity	<ul style="list-style-type: none"> 6mm Villaboard lining each side 13mm fire resistant plasterboard each side 28mm furring channels one side, separating two lining sheets Steel studs single frame 	64	130	43.0	-/60/60	FSV 0076 with letter of opinion FCO 1020	46	38	55	47
	JH - 315 Service cavity	<ul style="list-style-type: none"> 6mm Villaboard lining each side 16mm fire resistant plasterboard each side 28mm furring channels one side, separating two lining sheets Steel studs single frame 	64	136	48.0	-/90/90	FSV 0142 with letters of opinion FCO 0395 and FCO 1020	47	40	56	48
	JH - 316 Service cavity	<ul style="list-style-type: none"> 9mm Villaboard lining each side 16mm fire resistant plasterboard each side 28mm furring channels one side, separating two lining sheets Steel studs single frame 	64	142	56.3	-/120/120	FSV 0098 with letter of opinion FCO 1020	49	42	58	51

TABLE 10

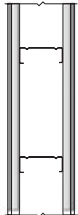
FIRE RATED, LOADBEARING WALL SYSTEMS - STEEL FRAME											
Framing arrangement	James Hardie system No.	Wall components	Stud size (mm)	Wall thickness (mm)	Wall mass (kg/m ²)	FRL	CSIRO fire test or opinion details	Acoustic performance			
								No insulation		With insulation	
								R _w	R _w +C _{TR}	R _w	R _w +C _{TR}
	JH - 414	<ul style="list-style-type: none"> 6mm Villaboard lining each side 13mm fire resistant plasterboard each side Steel studs single frame 	92	130	42.0	60/60/60	FSV 0319	46	38	55	47
	JH - 415	<ul style="list-style-type: none"> 6mm Villaboard lining each side 16mm fire resistant plasterboard each side Steel studs single frame 	92	136	44.9	90/90/90	FSV 0328	47	40	56	48
	JH - 416	<ul style="list-style-type: none"> 9mm Villaboard lining each side 16mm fire resistant plasterboard each side Steel studs single frame 	92	142	56.0	120/120/120	FSV 0328 with letter of opinion FCO 1442	49	42	58	51

TABLE 10 (CONTINUED)

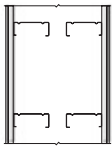
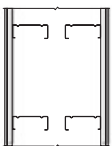
FIRE RATED, LOADBEARING WALL SYSTEMS - STEEL FRAME											
Framing arrangement	James Hardie system No.	Wall components	Stud size (mm)	Wall thickness (mm)	Wall mass (kg/m ²)	FRL	CSIRO fire test or opinion details	Acoustic performance			
								No insulation		With insulation	
								R _w	R _w +C _{tr}	R _w	R _w +C _{tr}
	JH - 434	<ul style="list-style-type: none"> 6mm Villaboard lining each side 13mm fire resistant plasterboard each side Steel studs dual frames separated 25mm (20mm for fire test) 	92	247	44.9	60/60/60	Letter of opinion FCO 1022	49	41	64	53
	JH - 436	<ul style="list-style-type: none"> 9mm Villaboard lining each side 16mm fire resistant plasterboard each side Steel studs dual frames separated 25mm (20mm for fire test) 	92	259	54.3	120/120/120	Letter of opinion FCO 1022	53	44	68	59

TABLE 11

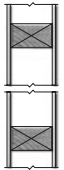
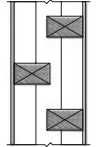
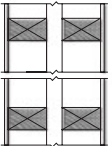
NON- FIRE RATED, NON-LOADBEARING WALL SYSTEMS - TIMBER FRAME											
Framing arrangement	James Hardie system No.	Wall components	Stud size (mm) (p = plate width)	Wall thickness (mm)	Wall mass (kg/m ²)	Acoustic performance					
						No insulation		With insulation			
						R _w	R _w +C _{tr}	R _w	R _w +C _{tr}		
	JH - 511	<ul style="list-style-type: none"> 6mm Villaboard lining each side Timber studs single frame 	70	82	17.8	36	30	41	33		
			90	102	22.0	36	30	42	33		
	JH - 512	<ul style="list-style-type: none"> 9mm Villaboard lining each side Timber studs single frame 	70	88	25.8	40	34	44	37		
			90	108	30.0	40	33	45	38		
	JH - 513	<ul style="list-style-type: none"> 12mm Villaboard lining each side Timber studs single frame 	70	94	33.8	42	35	46	40		
90			114	38.0	42	36	46	41			
	JH - 521	<ul style="list-style-type: none"> 6mm Villaboard lining each side Timber studs staggered frames in 120mm top and bottom plates 	70/120p	132	22.0	37	31	45	35		
	JH - 522	<ul style="list-style-type: none"> 9mm Villaboard lining each side Timber studs staggered frames in 120mm top and bottom plates 	70/120p	138	30.0	42	34	50	42		
	JH - 523	<ul style="list-style-type: none"> 12mm Villaboard lining each side Timber studs staggered frames in 120mm top and bottom plates 	70/120p	144	38.0	45	38	52	45		
	JH - 531	<ul style="list-style-type: none"> 6mm Villaboard lining each side Timber studs dual frames separated 25mm 	70	177	21.7	39	31	50	40		
			90	217	25.8	39	32	51	42		
	JH - 532	<ul style="list-style-type: none"> 9mm Villaboard lining each side Timber studs dual frames separated 25mm 	70	183	29.8	44	36	57	47		
			90	223	33.8	45	37	58	49		
	JH - 533	<ul style="list-style-type: none"> 12mm Villaboard lining each side Timber studs dual frames separated 25mm (20mm for fire test) 	70	189	37.8	47	39	61	52		
			90	229	41.8	49	40	62	53		

TABLE 12

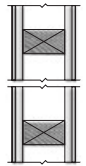
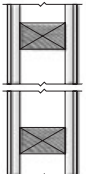
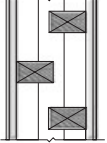
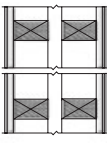
FIRE RATED, NON-LOADBEARING WALL SYSTEMS - TIMBER FRAME											
Framing arrangement	James Hardie system No.	Wall component	Stud size (mm)	Wall thickness (kg/m ²)	Wall mass	FRL	CSIRO fire test or opinion details	Acoustic performance			
								No insulation		With insulation	
								R _w	R _w +C _{tr}	R _w	R _w +C _{tr}
	JH - 114	<ul style="list-style-type: none"> • 6mm Villaboard lining each side • 13mm fire resistant plasterboard each side • Timber studs single frame 	70	108	42.8	-/60/60	Letter of opinion FCO 0726	44	37	48	42

TABLE 13

FIRE RATED, LOADBEARING WALL SYSTEMS - TIMBER FRAME											
Framing arrangement	James Hardie system No.	Wall component	Stud size (mm) (p = plate width)	Wall thickness (mm)	Wall mass (kg/m ²)	FRL	CSIRO fire test or opinion details	Acoustic performance			
								No insulation		With insulation	
								R _w	R _w +C _{tr}	R _w	R _w +C _{tr}
	JH - 214	<ul style="list-style-type: none"> • 6mm Villaboard lining each side • 13mm fire resistant plasterboard each side • Timber studs single frame 	90	128	47.0	60/60/60	FSV 0476	45	38	49	44
	JH - 215	<ul style="list-style-type: none"> • 6mm Villaboard lining each side • 16mm fire resistant plasterboard each side • Timber studs single frame 	90	134	50.0	90/90/90	FSV 0317	45	39	48	44
	JH - 224	<ul style="list-style-type: none"> • 6mm Villaboard lining each side • 13mm fire resistant plasterboard each side • Timber studs staggered frames in 120mm top and bottom plates 	70/120p	158	47.0	60/60/60	FSV 0254	47	39	54	48
	JH - 225	<ul style="list-style-type: none"> • 6mm Villaboard lining each side • 16mm fire resistant plasterboard each side • Timber studs staggered frames in 120mm top and bottom plates 	70/120p	164	52.0	90/90/90	FSV 0254 and FSV 0317 with letter of opinion FCO 1233	48	41	54	49
	JH - 234	<ul style="list-style-type: none"> • 6mm Villaboard lining each side • 13mm fire resistant plasterboard each side • Timber studs dual frames separated 25mm (20mm for fire test) 	70	203	46.7	60/60/60	FSV 0355	49	41	64	54
	JH - 235	<ul style="list-style-type: none"> • 6mm Villaboard lining each side • 16mm fire resistant plasterboard each side • Timber studs dual frames separated 25mm (20mm for fire test) 	70	209	55.0	90/90/90	FSV 0317 and FSV 0355 with letter of opinion FCO 1044	51	42	66	56

6 EXTERNAL FRL WALL CONSTRUCTION

6.1 OVERVIEW

Where the BCA requires an external wall to be fire rated in residential construction, an appropriate external wall can be created starting from the systems already detailed and adding one of James Hardie's external cladding products as well as a vapour permeable membrane.

The solutions detailed in this section are for the timber-framed systems, but the same principles may be applied to the steel-framed systems.

To maintain the superior level of sound isolation achieved by using the Deemed-to-Comply provisions described in Clause 1.3, and to minimise the effects of externally generated noise, acoustic insulation between the studs should be considered. This insulation will generally also offer thermal benefits.

6.2 FIRE SEPARATION

The BCA Part 3.7.1 'Fire' requires a FRL of 60/60/60 for external walls of Class 1 Buildings that are within 900mm of an allotment boundary (other than the boundary adjoining a public road or other public space) or external walls that are within 1.8m of another building on the same allotment (other than an appurtenant Class 10 Building or a detached part of the same Class 1 Building).

Where Class 2 and 3 Buildings are of Type C construction within 1.5m from any fire source feature to which they are exposed, the external walls are required to have a FRL of 90/90/90. Refer to the BCA Specification C1.1 Clause 5 for further details.

The above information may be used as a guide to, but not as a substitute for, the BCA.

6.3 DESIGN REQUIREMENTS

6.3.1 Vapour permeable membrane

Vapour permeable membrane must be installed in the outside linings, between the external fibre-cement layer and the water and fire resistant plasterboard.

All flashings and components must be suitable and incorporate with the vapour permeable sarking to ensure a continuous plane which drains any moisture down and out of the building.

6.3.2 External fibre cement layer

The external layer may be any of the range of James Hardie fibre cement external sheet products that are 6mm or more in thickness, or plank products that are 7.5mm or more in thickness, ie HardieTex[®] base sheet, ComTex[®] panel base sheet, HardieFlex[®] sheets, PanelClad[®] sheets, HardiePlank[®] cladding, PrimeLine[®] weatherboards or Scyon[™] Linea[™] weatherboard.

6.3.3 Wall frame Loadbearing capacity

As given in Table 4, for timber framing, the loadbearing capacity of the single stud walls is 15kN/m and for staggered or dual stud walls is 20kN/m, refer to section 4 for further information.

6.3.4 Construction details

Fire rated walls must not be supported on a non-fire rated structure. The wall must be supported on a concrete floor or masonry.

The linings must cover the entire wall on both sides, except in Class 1 Buildings, where the external fire protection need only extend to the eaves lining provided the eaves lining is non-combustible. For FRL 60/60/60 see Figure 16 and for FRL 90/90/90 see Figure 17.

6.3.5 Cold climates

In cold climates, where condensation is likely to occur, a vapour barrier may be required to protect the plasterboard on the inside face.

NOTE: Refer to section 4.11 of the Construction of Fire and Acoustically Rated Walls Technical specification for external wall construction details.

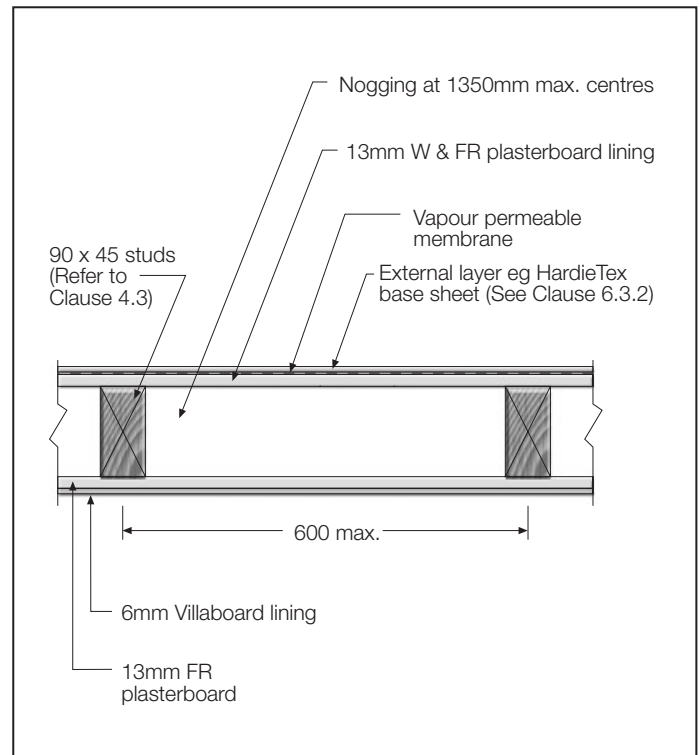


FIGURE 16 EXTERNAL WALL FRL 60/60/60

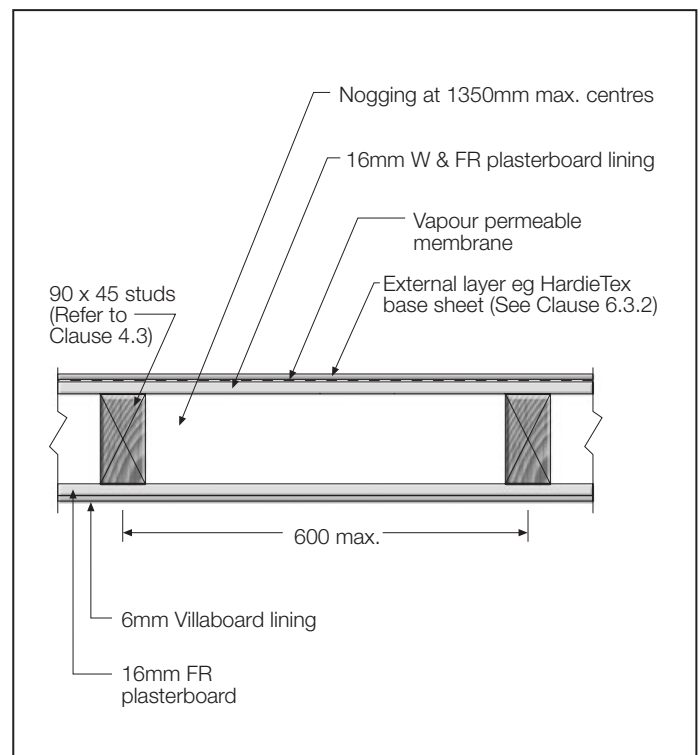


FIGURE 17 EXTERNAL WALL FRL 90/90/90

NOTE

The order of internal linings can be interchanged.

7 EXOTEC FACADE PANEL AND FIXING SYSTEM FRL EXTERNAL WALLS

7.1 OVERVIEW

The following information in Table 14 provides solutions to fire performance requirements, specified in the Building Code of Australia (BCA), when using the ExoTec facade panel and fixing system. The level of fire rating will depend on the wall configuration and materials used.

NOTES

Steel framed walls

The loadbearing capacities of a steel-framed wall must be determined by a structural engineer in accordance with codes and regulations. However, to satisfy the specified FRL for each wall system, there is a minimum metal stud size of 92 x 35 x 1.15mm at Max. 600mm centres requirement. A larger minimum metal stud size may be required, refer to Clause 4.3 for more information.

Timber framed walls

Framing and fixing must be determined by a structural engineer in accordance with the relevant codes and regulations. However, to satisfy the specified FRL for each wall system, there is a minimum 90 x 45 F5 at a maximum 600mm centres requirement. A larger minimum timber stud size may be required, refer to Clause 4.3 for more information.

TABLE 14

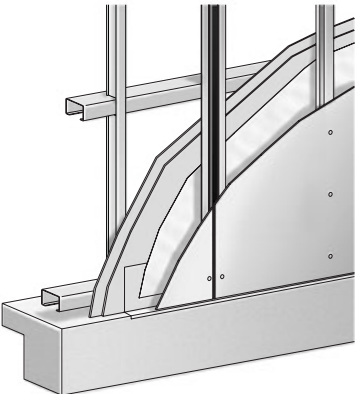
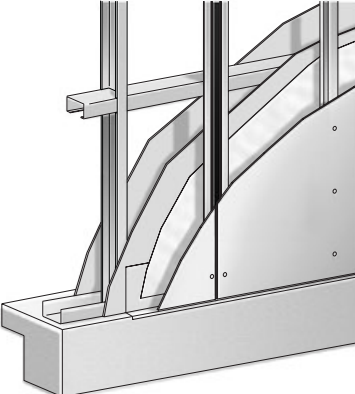
EXOTEC WALLS FOR EXOTEC FACADE PANEL AND FIXING SYSTEM FRL EXTERNAL WALLS						
Framing Arrangement	Wall components	Wall width (mm)	FRL	One way	Two way	Report/opinion
	<p>External face of wall:</p> <ul style="list-style-type: none"> 1 layer of 9mm ExoTec facade panel with fixing system. Vapour permeable membrane. 2 layers x 13mm thick fire resistant and water resistant plasterboard. <p>Internal face of wall:</p> <ul style="list-style-type: none"> Nil linings. <p>Framing: Steel Stud (Refer to 7.1)</p>	70 + wall frame width	60/60/60	✓		FCO 2371
	<p>External face of wall:</p> <ul style="list-style-type: none"> 1 layer of 9mm ExoTec facade panel with fixing system. Vapour permeable membrane. 1 layer x 13mm thick fire resistant and water resistant plasterboard. <p>Internal face of wall:</p> <ul style="list-style-type: none"> 1 layer x 13mm thick fire resistant plasterboard. <p>Framing: Steel Stud (Refer to 7.1)</p>	70 + wall frame width	60/60/60		✓	FCO 2371

TABLE 14 (CONTINUED)

EXOTEC WALLS FOR EXOTEC FACADE PANEL AND FIXING SYSTEM						
Framing Arrangement	Wall components	Wall width (mm)	FRL	One way	Two way	Report/ opinion
	<p>External face of wall:</p> <ul style="list-style-type: none"> 1 layer of 9mm ExoTec facade panel with fixing system. Vapour permeable membrane. 1 layer x 13mm thick fire resistant and water resistant plasterboard. <p>Internal face of wall:</p> <ul style="list-style-type: none"> 1 layer x 13mm thick fire resistant plasterboard. <p>Framing: Timber Stud (Refer to 7.1)</p>	70 + wall frame width	60/60/60		✓	FCO 2371
	<p>External face of wall:</p> <ul style="list-style-type: none"> 1 layer of 9mm ExoTec facade panel with fixing system. Vapour permeable membrane. 3 layers x 13mm thick fire resistant and water resistant plasterboard. <p>Internal face of wall:</p> <ul style="list-style-type: none"> Nil. <p>Framing: Steel Stud (Refer to 7.1)</p>	83 + wall frame width	90/90/90	✓		FCO 2371
	<p>External face of wall:</p> <ul style="list-style-type: none"> 1 layer of 9mm ExoTec facade panel with fixing system. Vapour permeable membrane. 2 layers x 13mm thick fire resistant and water resistant plasterboard. <p>Internal face of wall:</p> <ul style="list-style-type: none"> 1 layer x 13mm thick fire resistant plasterboard <p>Framing: Steel Stud (Refer to 7.1)</p>	83 + wall frame width	90/90/90		✓	FCO 2371
	<p>External face of wall:</p> <ul style="list-style-type: none"> 1 layer of 9mm ExoTec facade panel with fixing system. Vapour permeable membrane. 2 layers x 13mm thick fire resistant and water resistant plasterboard. <p>Internal Face of Wall:</p> <ul style="list-style-type: none"> 1 layer x 13mm thick fire resistant plasterboard. <p>Framing: Timber Stud (Refer to 7.1)</p>	83 + wall frame width	90/90/90		✓	FCO 2371

NOTES

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