MRTFC

MULTI-RESIDENTIAL
TIMBER FRAMED CONSTRUCTION

Class 1a Buildings

DESIGN & CONSTRUCTION MANUAL

National Timber Development Council

PREFACE

The deemed to satisfy provisions of the Building Code of Australia (BCA 96) describe the requirements and limitations for timber framed multi-residential buildings. These provisions allow timber framing in:-

- All Class 1 buildings
- Class 2 buildings to 3 storeys
  (4 storeys where ground storey is concrete/masonry carparking)
- Class 3 buildings to 2 storeys.

This manual outlines the BCA requirements for Class 1a buildings and associated Class 10 buildings with respect to fire separation and noise control and describes the materials, details and construction practices that are recommended to satisfy these requirements.

The information provided will enable designers, local authorities, developers and builders to achieve practical and economical solutions for Multi-Residential Timber Framed Construction (MRTFC).

A companion publication "MRTFC Design & Construction Manual – Class 2 & 3 Buildings" describes the requirements for these building classifications.

The information, opinions, advice and recommendations contained in this publication have been prepared with due care. They are offered only for the purpose of providing useful information to assist those interested in technical matters associated with the specification and use of timber and timber products.

Whilst every effort has been made to ensure that this publication is in accordance with current technology, it is not intended as an exhaustive statement of all relevant data, and as successful design and construction depends upon numerous factors outside the scope of this publication, the authors and publishers accept no responsibility for errors in, or omissions from, this publication, nor for specifications or work done or omitted to be done in reliance on this publication.

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CONTENTS

1 SCOPE

This manual contains the timber industry's recommendations for the design and construction of timber framed Class 1a attached dwellings (duplexes, townhouses, villas etc) and associated Class 10 buildings (carports etc). It provides information on materials and systems that have been developed, as well as details and building practices that are necessary to satisfy the fire resistance, and sound control requirements contained in the "deemed to satisfy" provision of the Building Code of Australia (BCA 96).

NOTE: This manual describes the requirements for Class 1a attached dwellings and associated Class 10a buildings.

NOTE: Buildings which contain separate residential units above or below one another, as well as side by side or which have common space above or below dwellings (ie. common ceiling spaces, common sub-floor space, commercial car parking etc.) are classified as Class 2 or 3. These are described in supporting publication "MRTFC Design and Construction Manual – Class 2 and 3 Buildings".

The construction details and practices included, will generally cover the majority of situations. They should, however be regarded as typical, with modifications permitted, as long as the required fire and sound performance is maintained.

NOTE: It is not intended that this manual provide an exhaustive statement of all the methods or construction details appropriate for this form of construction. Although the majority of systems available at the time of publication have been included, manufacturers will continue to develop new and alternative systems, and practices will invariably evolve which meet either the deemed to satisfy or performance requirements of the BCA.

2 ABBREVIATIONS, DEFINITIONS, TERMINOLOGY

The following abbreviations and definitions apply in the use of this manual.

BCA
Building Code of Australia 1996 - Volume 2, Class 1 and Class 10 Buildings Housing Provisions.

BUILDING SOLUTION
A solution which either:-

(a) complies with the deemed to satisfy provisions of the BCA or

(b) is an alternative solution which complies with the performance requirements.

CAULKING (FIRE GRADE SEALANT)
Fire grade material used to fill gaps at joints and intersections in fire grade linings to maintain the fire resistance level (refer also "Intumescent Sealant").

NOTE: Caulking material may also need to be flexible to allow for movement and/or waterproof for external or wet area applications.

CLASS 1
One or more buildings, which in association constitute–

(a) **Class 1a** – a single dwelling being – a detached house; or
one 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; or

(b) **Class 1b** – a boarding house, guest house, hostel or the like with a total floor area not exceeding 300 m^2 and in which not more than 12 persons would ordinarily be resident;

which is not located above or below another dwelling or another Class of building other than a private garage.

NOTE: Class 1a detached houses and Class 1b buildings (small boarding houses) have no fire resistance and sound control requirements.

CLASS 10
A non-habitable building or structure being –

(a) **Class 10a** – a non-habitable building being a private garage, carport, shed, or the like; or

(b) **Class 10b** – a structure being a fence, mast, antenna, retaining or free-standing wall, swimming pool, or the like.

DEEMED TO SATISFY PROVISIONS
Provisions contained in Section 3 of the BCA which are deemed to comply with the performance requirements.

DWELLING
A Class 1a building

FRL - FIRE RESISTANCE LEVEL
The fire resistance, expressed as a time (in minutes) that a structural member or part of a building must achieve with respect to -

(a) structural adequacy - (ie. maintain stability and adequate loadbearing capacity)

(b) integrity -(ie. resist passage of flames, smoke and hot gases)

(c) insulation - (ie. maintain a specified temperature on the surface not exposed to fire)

and expressed in that order (e.g. FRL 60/60/60 for separating walls).

NOTE: A dash, for example in 60/-/-, means there is no integrity or insulation requirement for that member or part of the building.

FIRE-SOURCE FEATURE

(a) the far boundary of a road adjoining the allotment; or

(b) a side or rear boundary of the allotment; or

(c) an external wall of another building on the allotment which is not of Class 10.

FIRE STOP
Fire grade material used to close a gap or imperfection of fit that occurs where a service passes through a fire-rated element or system.

FIRE GRADE LINING
Fire grade plasterboard or a combination of fire grade plasterboard and fibre cement used to provide the required FRL in a separating wall or external wall.

HABITABLE ROOM
A room used for normal domestic activities, and –

(a) includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room and sunroom; but

(b) 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 neither frequently nor for extended periods.

INTUMESCENT SEALANT (INTUMESCENT PUTTY)
A fire resistant material used in fire grade linings (at joints, penetrations etc) which expands when exposed to fire to fill and/or seal gaps and maintains the required fire resistance level.

MINERAL WOOL (FIRE RESISTANT)
Compressible, non-combustible, fire resistant material used to fill cavities and maintain the fire resistance or restrict the passage of smoke and gases.

NOTE: The mineral wool to be used in all applications in this manual, must be fire resistant and therefore must have a fusion temperature in excess of 1160°C. 'Rockwool' type products generally meet these requirements, whilst 'glasswool' products do not.

To maintain FRL 60/60/60 the fire resistant mineral wool must be a minimum width of 120 mm and compresses to 85% of original thickness.

MRTFC
Multi-Residential Timber Framed Construction.

NON-COMBUSTIBLE

(a) applied to a material - means not deemed *combustible* under AS 1530.1 - Combustibility Tests for Materials; and

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

PERFORMANCE REQUIREMENTS
Requirements in the BCA which state the level of performance which a building solution must meet.

RESILIENT CHANNEL/MOUNT
Proprietary support for linings designed to improve sound insulation and reduce sound transmission.

Rw
(refer "Weighted Sound Reduction Index")

SEPARATING WALL (PARTY WALL)
A wall that is common to adjoining Class 1a buildings (refer Figure 1 and Section 3.2).

NOTE: Walls that are common to or between adjoining buildings other than Class 1(a), or walls between a Class 1(a) building and another classification are referred to as common walls or fire walls (refer "MRTFC – Design & Construction Manual – Class 2 & 3 Buildings").

STC (SOUND TRANSMISSION CLASS)
The method of rating the airborne sound transmission performance of a wall or floor/ceiling element prior to 1999.

NOTE: The acoustic ratings required by the BCA (Amendment 6 - 1999) are now called the "weighted sound reduction index" with the symbol Rw*, consistent with AS/NZS 1276.1 1999.*

Test results for buildings and building elements with STC values in accordance with the 1979 version of AS 1276 remain valid (the STC value being the Rw value).

SITE
The part of the allotment of land on which a building stands or is to be erected.

NOTE: Class 1a buildings may be on their own separate allotment within a group title, community title or Torrens title subdivision (ie. where the separating wall is on the site boundary). Alternatively several Class 1a buildings may be on a single allotment, with each dwelling sold under Building Unit or Strata title.

WEIGHTED SOUND REDUCTION INDEX (Rw)
The rating of sound insulation in a building or building element as described in AS/NZS 1267.1 1999.

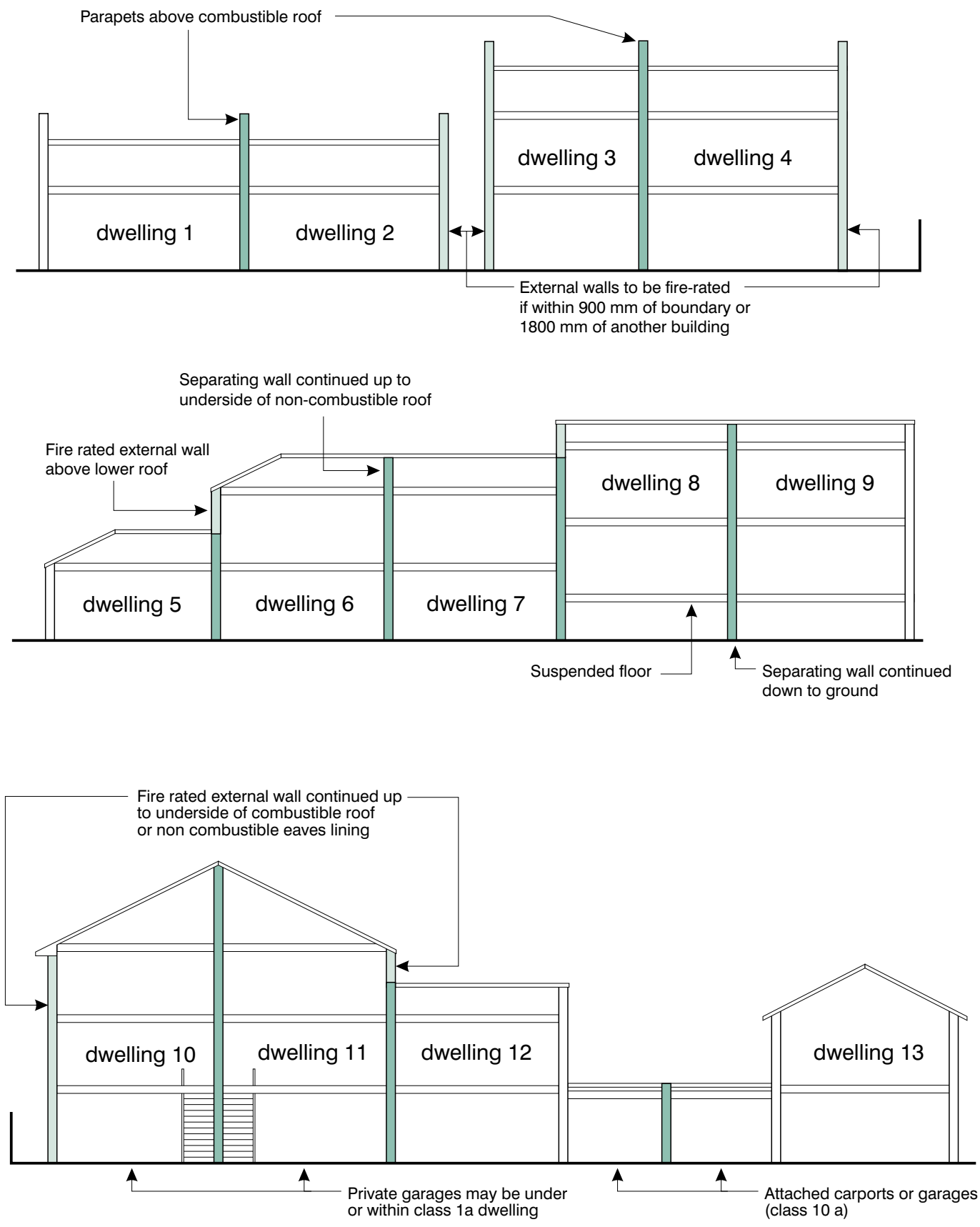


FIGURE 1 - TYPICAL CLASS 1a BUILDINGS

3 BCA REQUIREMENTS

3.1 Performance Provisions

The following summarises the BCA's objectives and performance requirements for Class 1 and 10 buildings with respect to:

a) **Structure** - withstand the combination of loads and other actions to which they may be reasonably subjected.

b) **Damp and Weatherproofing** – provide resistance to moisture from the outside and moisture rising from the ground.

c) **Fire Safety** – protect buildings from the spread of fire and provide safeguards so that occupants may safely evacuate.

d) **Health and Amenity**

i) Wet Areas not to create unhealthy or dangerous conditions

ii) Room heights to be suitable for the intended use

iii) Provide facilities for personal hygiene, laundering, food preparation and cooking

iv) Provide adequate natural and artificial light

v) Provide adequate ventilation

vi) Prevent undue sound transmission between dwellings.

e) **Safe Movement and Access**

i) Provide safe access to and within the building

ii) Restrict access (young children) to swimming pools.

A building solution must satisfy all of the performance provisions of the BCA. The building may either satisfy the "deemed to satisfy" provisions of the BCA (and as described in the manual) or be an "alternative solution" which can be shown to satisfy the performance provisions.

NOTE: For guidance on gaining approval for an alternative solution using the performance provisions of the BCA refer to MRTFC Information Bulletin No. 2.

3.2 Deemed to Satisfy Provisions

The BCA contains "deemed to satisfy provisions" that are acceptable forms of construction which comply with the performance requirements. The simplest way to obtain approval or certification for a project is to comply with the deemed to satisfy provisions.

For attached Class 1a MRTFC projects the majority of the deemed to satisfy requirements (as well as the performance provisions) are the same as the requirements for detached houses. The requirements are the same for:-

- structural design (use AS 1684-1999 'Residential Timber Framed Construction)
- damp and weatherproofing
- kitchens and wet areas
- room sizes and heights
- light and ventilation
- safe access.

The BCA requirements for attached dwellings which are in addition to or different from those for detached dwellings are:-

(a) **fire separation between dwellings** - separating walls must be of fire resisting construction. External walls must also be fire resisting if close to a boundary or another building.

(b) **sound control between dwellings** - separating walls must reduce sound transmission (noise).

NOTE: This manual contains timber framed systems, construction details and building practices which satisfy the "deemed to satisfy" fire separation and sound control requirements of the BCA.

3.3 Separating Walls

To satisfy the BCA deemed to satisfy fire and sound requirements, separating walls between Class 1a dwellings shall:-

(a) be continuous from footing (or concrete slab on ground) to underside of non-combustible roof covering or 450 mm above combustible roof. (refer Figure 1).

(b) have a fire resistance level not less than FRL 60/60/60 (-/60/60 if non-loadbearing) (refer Section 5.1)

(c) not be crossed by timber members (or other combustible building elements) other than roof battens (maximum size 75 x 50 mm).

NOTE: All intersections must be constructed so that in the event of fire, floors, ceilings, roof, internal walls etc (within the dwelling on fire) are able to collapse but leave the separating wall intact.

(d) have any void between top of wall and underside of roofing (ie. between battens) filled with solid timber, fire resistant mineral wool or other suitable fire resisting material.

(e) extend through to the outside of external walls (ie. have cavities in brick veneer external walls packed with fire resistant mineral wool, solid timber blocking or other suitable fire resisting material - (refer Figure 16).

NOTE: Cavities to be maximum 50 mm width. flashing, dpc etc to be provided to maintain weatherproofing where cavities are packed.

(f) extend through to the outside of and effectively separate voids in boxed eaves etc (refer Figure 30).

(g) have a sound transmission class of not less than:-

i) Rw 45 between habitable rooms in adjoining dwellings.

ii) Rw 45 between kitchens or wet areas in adjoining dwellings.

iii) Rw 50 (as well as resistance to impact sound) between a kitchen, bathroom, WC or laundry in one dwelling and a habitable room in an adjoining dwelling.

NOTE: The above BCA sound requirements should be regarded as minimum regulatory standards. Higher levels of sound resistance are recommended to satisfy consumer expectations.

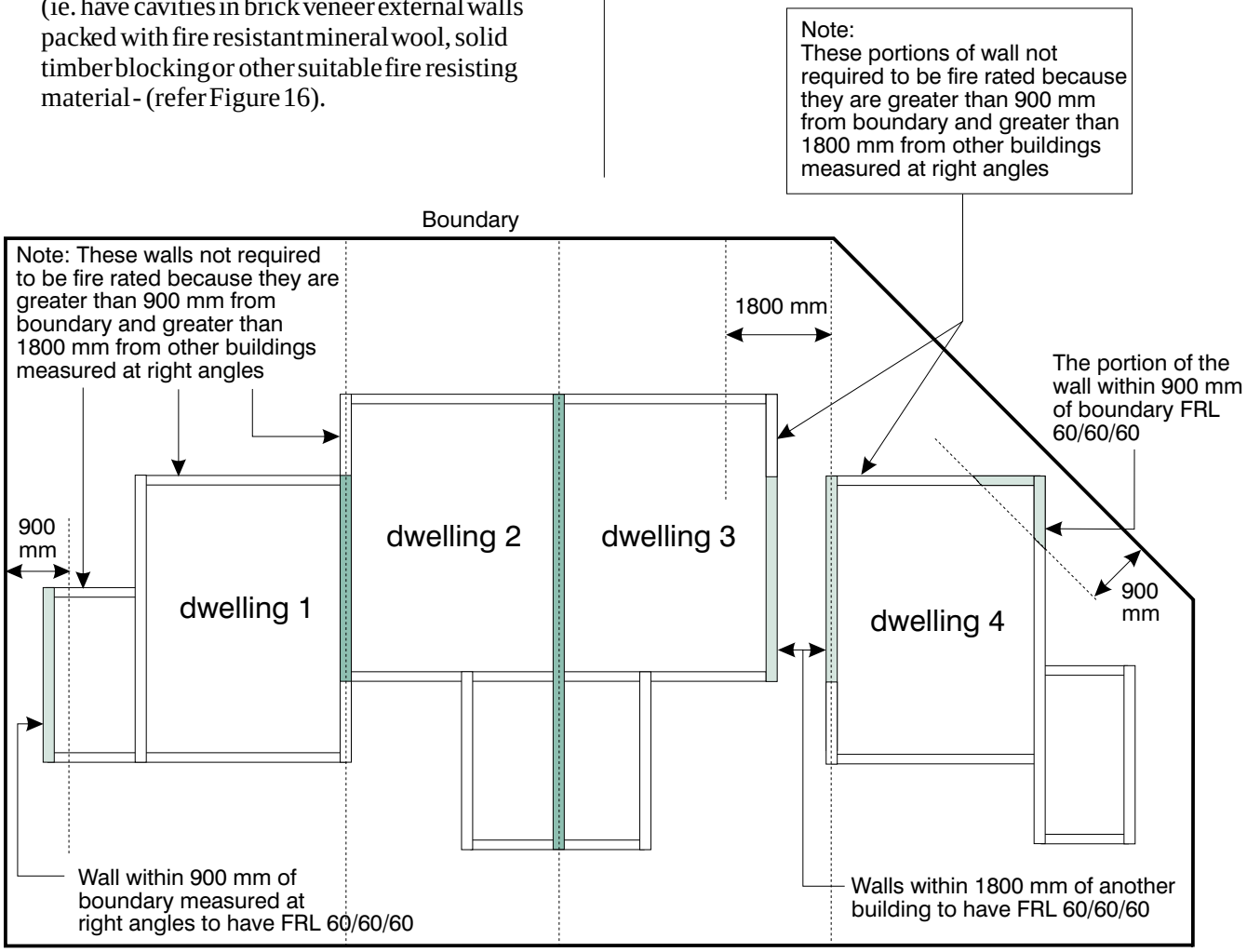


FIGURE 2 - FIRE RESISTING EXTERNAL WALLS

3.4 External Walls

In all states except South Australia, external walls in Class 1a buildings are required to be fire-resisting if less than 900 mm from rear or side boundaries or less than 1800 mm from another building. The clearances are measured at right angles (90°) to either the boundary or the external wall of another building (refer Figure 2).

NOTE: State and Local authorities throughout Australia may have planning regulations which contain different siting requirements.

The South Australian Housing Code requires: -

External walls (including those at an angle or perpendicular to the boundary) of a Class 1a building within 600 mm of the allotment boundary, or within 1200 mm of another building on the same allotment, shall be of fire-resisting construction to the underside of non-combustible roof lining or non-combustible eaves lining to resist the spread of fire from the outside except where protected by a wall of fire-resisting construction (e.g. a 'wing wall').

Fire resisting external walls must have a fire resistance level not less than FRL 60/60/60 when measured from the outside. (- /60/60 if non-loadbearing).

NOTE: Fire rated external walls in Class 1a buildings do not require fire resistance from the inside.

Fire resisting external walls must extend to the underside of a non-combustible roof covering or to a non-combustible eaves lining (refer Figure 27).

NOTE: Eaves soffit lining must be non-combustible but it is not required to be fire rated or have a fire resistance level. Normal fibre cement products are acceptable.

Openings (doors, windows etc) in fire resisting external walls must be protected.

The following are regarded as being protected:-

(a) self closing solid core doors

(b) non-openable fire windows (FRL - /60/ -) to habitable rooms.

(c) maximum 900 x 600 mm windows with steel frame and no opening sashes to non-habitable rooms. (Note: Can be permanently vented).

(d) Translucent hollow glass blocks.

3.5 Roof Lights

Roof lights, (skylights etc) which contain combustible material, may be installed in a roof which is required to have a non-combustible covering provided:-

(a) the area of the roof light is not more than 20% of the roof area

(b) the roof light is not less than 900 mm from the allotment boundary

(c) the roof light is not less than 900 mm from the vertical projection of any separating wall which extends to the underside of the roof covering

(d) the roof light is not less than 1.8 m from any roof light in another building on the allotment.

NOTE: Where any of these limitations are exceeded, the roof covering is regarded as combustible. Separating walls would therefore be required to project 450 mm above the roof.

3.6 Smoke Alarms

The BCA requires that all Class 1a buildings have automatic smoke alarms installed.

Smoke alarms must comply with AS 3786 and be connected to mains power.

Alarms shall be installed on or near the ceiling (at least one alarm per storey), located between each part of the dwelling containing bedrooms and the remainder of the dwelling.

NOTE: The intention of smoke alarms is to detect smoke before it reaches sleeping occupants, wake them, and give them time to evacuate to safety.

4 STRUCTURAL REQUIREMENTS

4.1 Timber Member Design

Timber member sizes for Class 1(a) buildings shall be determined in accordance with AS 1684 - 1999 Residential Timber Framed Construction.

In separating walls and fire rated external walls the studs and plates shall also be the size determined from AS 1684. The minimum size of studs shall be 70 x 45 mm or 90 x 35 mm studs in loadbearing separating walls. 70 x 35 mm studs can only be used in non-loadbearing separating walls.

The stud spacing in separating walls and fire rated external walls shall not be greater than 600 mm.

Timber species shall have an average dry density of not less than 450 kg/m^3.

(Note: Normal softwood, cypress and hardwood framing material meets this requirement).

4.2 Noggings

Noggings shall be provided in all loadbearing walls at a maximum spacing of 1350 mm. Noggings may be staggered (by up to the nogging depth).

NOTE: To achieve satisfactory sound performance in double stud and staggered stud walls, noggings between studs supporting linings to one dwelling must be kept clear of studs and nogging supporting the linings to the adjoining dwelling (refer Figures 9 and 19).

4.3 Notches, Cuts, Holes

Wherever possible, notches, cuts and holes should be avoided in structural members within fire rated walls. Where these cannot be avoided, sizes and spacings shall be limited to those in AS 1684 - 1999.

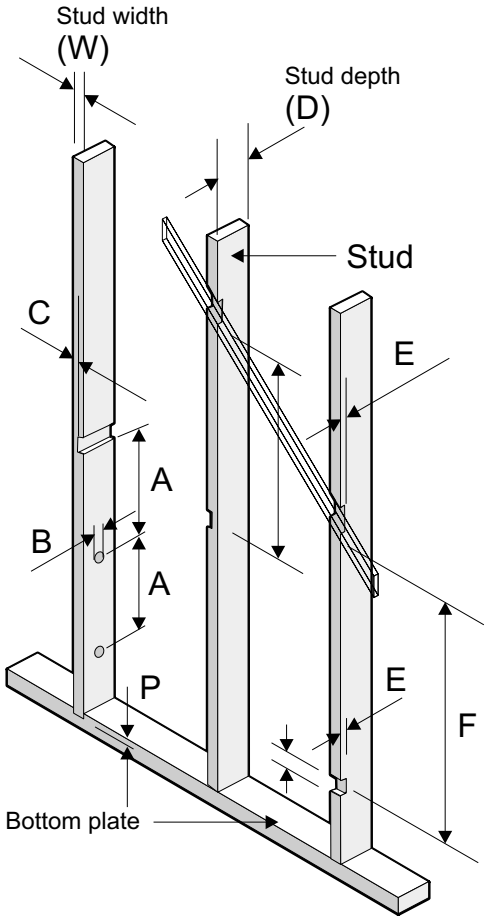


FIGURE 3 - CUTS, NOTCHES AND HOLES.

TABLE A CUTS, HOLES AND NOTCHES IN STUDS AND PLATES

DESCRIPTION		LIMITS
A	Distance between holes and/or notches in stud breadth	Minimum 3 x D
H	Hole (studs and plates)	Maximum 25 mm in wide face only
C	Notch into stud breadth	Maximum 10 mm
E	Notch into stud depth	• Maximum 20 mm at every fifth stud • Maximum 20 mm for diagonal bracing • Up to 25 mm for installation of bath • Not permitted where studs are designed as "not notched"
F	Distance between notches in stud depth	Minimum 12 x B
P	Trenches in plates	3 mm maximum

5 FIRE SEPARATION

5.1 Fire Resistance Level

Separation walls between Class 1 attached dwellings, must be constructed to limit the spread of fire and allow the occupants to safely evacuate. The level of fire resistance required by the BCA is for the separating wall to remain structurally intact and not allow the passage of flame, heat, smoke and hot gases for a period of at least 1 hour. This fire resistance level is expressed as FRL 60/60/60 (or FRL - /60/60 for non-loadbearing).

Where Class 1 buildings are within 900 mm of a side or rear boundary, or closer than 1800 mm to another building (In South Australia, within 600 mm of boundary or within 1200 mm of another building), external walls also require a fire resistance level of FRL 60/60/60 (or - /60/60 for non-loadbearing). The FRL for an external wall only requires to be measured from the outside.

To achieve the fire resistance level in timber framed walls, fire grade linings are fixed to studs with all joints, intersections and penetrations sealed.

Lining manufacturers (in association with the timber industry) have developed various systems which have been tested and certified by recognised testing authorities (CSIRO or BRANZ). FRL 60/60/60 separating walls have either a single layer of 16 mm thick fire grade plasterboard each side, or a layer of 13 mm fire grade plasterboard plus a layer of 6 mm fibre cement to both sides. (Manufacturer's recommendations for fixing sheets must be strictly adhered to).

To ensure the fire resistance is maintained at joints, intersections and penetrations, the various building practices and details contained in this publication should be followed (refer Section 7).

5.2 Solid Timber at Intersections

Many of the construction details in this manual incorporate additional solid timber (blocking or extra studs, joists, etc.) in lieu of the fire grade lining to protect the timber frame and maintain the fire resistance level at intersections etc. This system has been developed to simplify and speed up the construction process by allowing all framing to be completed and roof installed before fixing plasterboard linings.

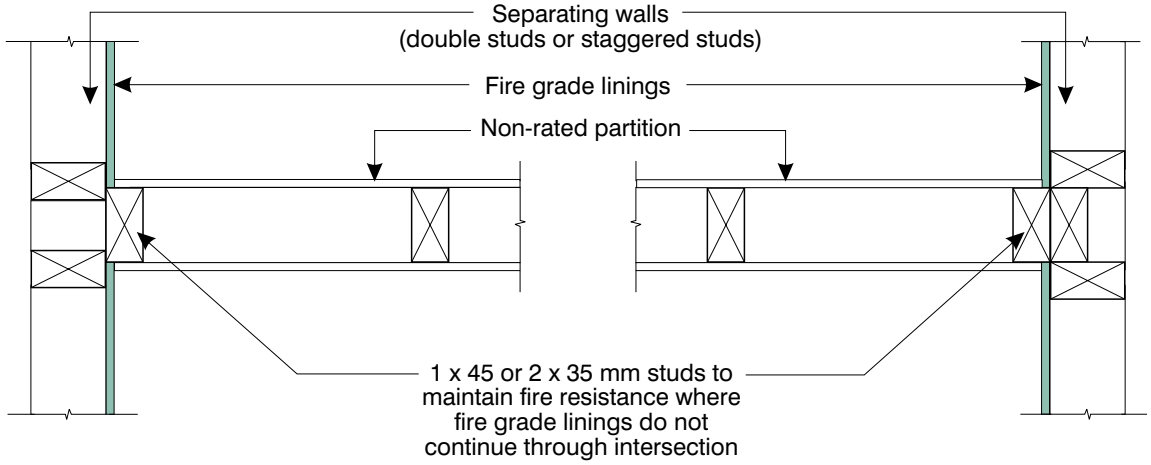
NOTE: When timber burns, it chars relatively slowly from the outside at a predictable rate. This allows additional, sacrificial timber to be used in lieu of fire grade lining, to protect structural members.

To maintain FRL 60/60/60 at intersections a minimum of 45 mm thickness of solid timber (minimum average dry density of 450 kg/m^3) is required. This is in addition to any structural member within the fire rated wall.

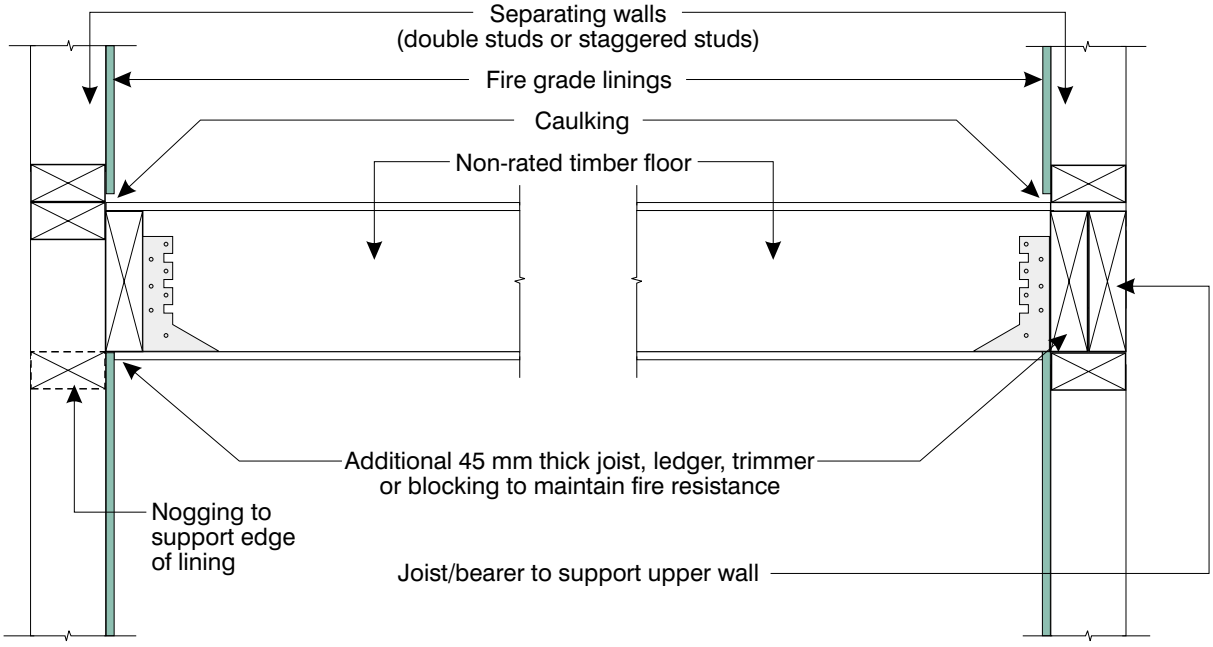
NOTE: The timber used to maintain the FRL cannot carry out a structural function within the separating wall. It can however be used to support non-rated floors or partitions. No additional fixing is required (for ledgers etc.) other than required to support loads.

Figure 4 shows typical junctions where 45 mm thickness solid timber is used in lieu of fire grade lining.

NOTE: Any timber grade and species (hardwood, softwood, LVL) commonly used for framing has an average dry density in excess of 450 kg/m^3 and can be used for blocking.



4(a) - Typical intersections between separating wall and internal partition



4(b) - Typical intersections between separating wall and timber floor

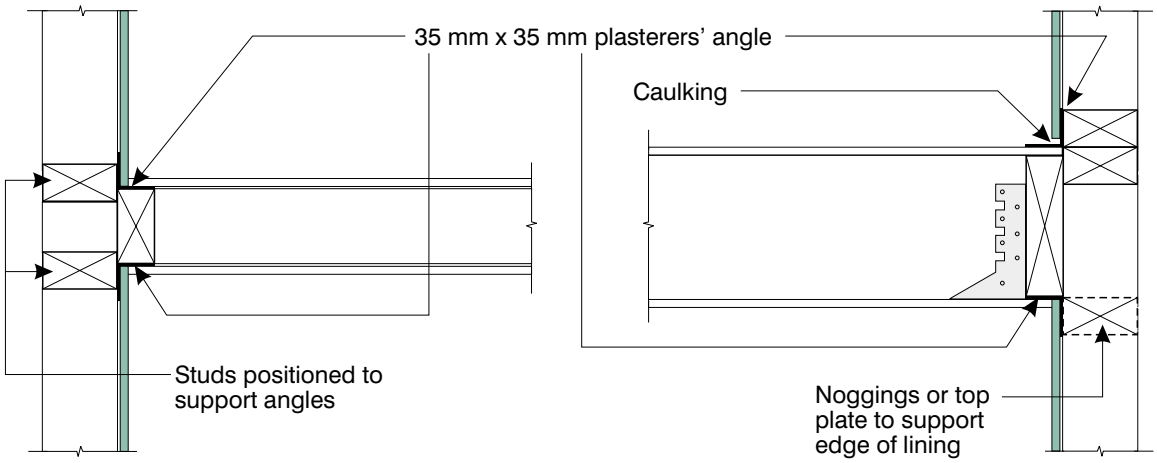
FIGURE 4 - TYPICAL JUNCTIONS WITH ADDITIONAL SOLID TIMBER

5.3 Strengthened Joints

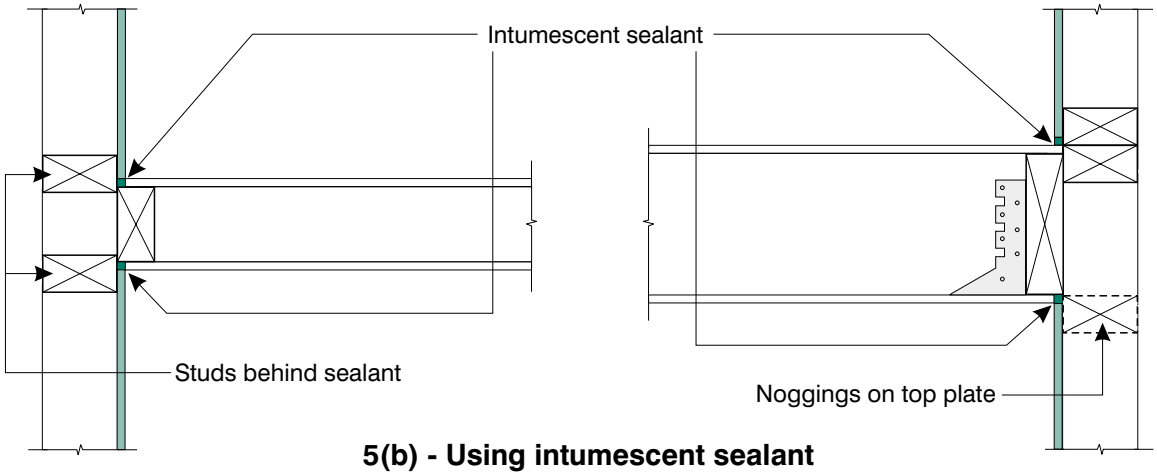
Where the intersection between the fire grade linings is strengthened by either:-

- 35 x 35 mm plasterer's angle
- intumescent sealer or
- fibre cement lining continued through joint

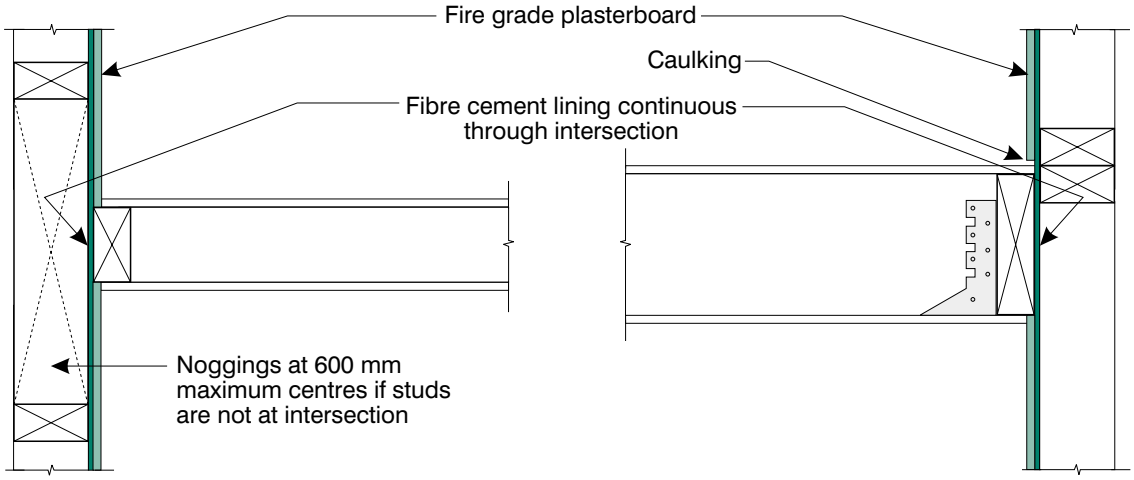
Then the thickness of solid timber to maintain FRL 60/60/60 can be reduced to 35 mm. Figure 5 shows typical intersections which have been strengthened and allow the use the reduced timber thickness.



5(a) - Using 35 x 35 mm Plasterer's angles



5(b) - Using intumescent sealant



5(c) - Using continuous fibre cement lining

FIGURE 5 - STRENGTHENED JOINTS

6 SOUND CONTROL

6.1 Weighted Sound Reduction Index (Rw)

The BCA requires the weighted Sound Reduction Index (Rw) and the resistance to impact in separating walls as shown in Table B.

TABLE B BCA REQUIREMENTS Rw AND SOUND IMPACT LEVELS FOR SEPARATING WALLS

LOCATION	IMPACT SOUND RESISTANCE	Rw LEVEL
SEPARATING WALLS (a) Between a bathroom, sanitary compartment, laundry or kitchen in one Class 1 building and a habitable room (other than a kitchen) in an adjoining Class 1 building.	Required	50
(b) All other separating walls.	Not Required	45
SOIL AND WASTE PIPES A waste pipe or other penetration that serves or passes through a separating wall between houses – (a) If the adjacent room is a habitable room (other than a kitchen); or	Not Required	45
(b) if the room is a kitchen or any other room.	Not Required	30

NOTE: The BCA requirements for sound control between dwellings listed above should only be regarded as the absolute minimum to meet statutory requirements. It is recommended that a minimum of Rw 50 be provided and resistance to impact sound be considered in all separating walls. Rw 50 with impact resistance is considered necessary to reduce airborne and structure borne noise to an acceptable level.

Test results for buildings or building elements with STC values in accordance with the 1979 version of AS 1276 remain valid. The STC value is the same as the Rw value.

COMMENTARY:

There are two types of sounds which need to be controlled. These are from airborne sources such as speech, musical instruments and loudspeakers and the other being impact sources, such as footsteps and the moving of furniture.

Sound transmission can be reduced by:-

- **Increasing Mass**

  Increasing mass can be achieved by increasing lining thickness or density or using more layers of linings.

- **Using Cavity Construction (Isolating wall surfaces)**

  One of the most effective ways of reducing sound transmission (airborne and impact) is to isolate the wall surfaces of adjoining dwellings. This is achieved through the use of double stud or staggered stud wall.

- **Using Absorptive Material**

  Filling the cavity with absorptive insulation material (cellulose fibre, glass fibre or mineral wool) can reduce airborne transmission substantially, especially when the cavity is large.

- **Avoiding Rigid Connections**

  Rigid connections between adjoining dwellings can transmit sound energy. Where connections are required for structure stability etc., resislient connectors should be used.

- **Sealing/Caulking Voids**

  Sound leaks can easily occur at the periphery of walls and floors, or where a hole is made for electricity or plumbing services. To reduce sound leaks, all gaps in a wall or floor must be thoroughly caulked, or sealed.

- **Building Layout**

  One of the simplest means of controlling noise is to distance noise sources from sensitive receiving areas. Laundries, service shafts, stairs and other noisy areas in buildings should be located as far as possible from sensitive living or sleeping areas. Placing relatively quiet areas such as bedrooms or lounge rooms next to each other also helps to minimise the noise reduction required for occupant satisfaction. Care is required in locating the windows to ensure they do not face noisy areas and that there is adequate separation between windows in adjoining dwellings.

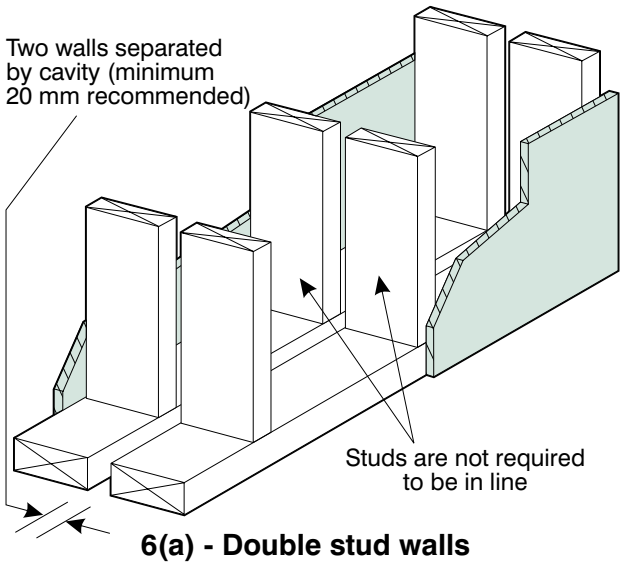
6.2 Wall Framing Options

For separating walls between dwellings it is recommended that double stud or staggered stud systems be used (refer Figure 6). These are the only systems which provide adequate resistance to impact sound as well as airborne sound.

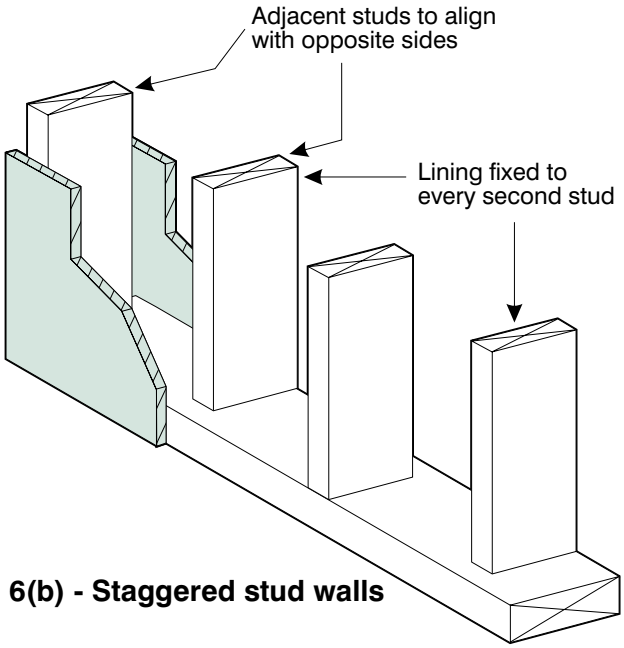
Single stud walls should only be used in situations where sound control is not critical, such as in spaces, below sub-floors or between garages.

Where suspended floors in adjoining units are at different levels, it is recommended that only double stud wall systems be used (refer Figure 13). Satisfactory impact sound resistance cannot be achieved with staggered stud walls or single stud walls (even with resilient channels) where floors are non-aligned.

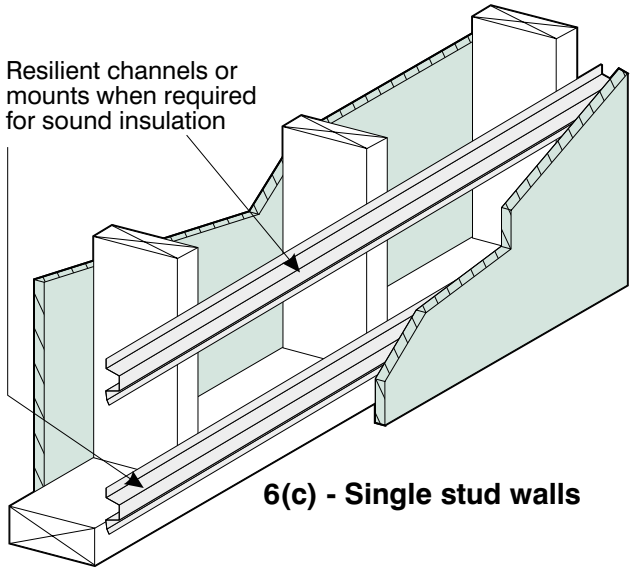
Note: The various wall systems and fire grade lining options are summarised in tables C, D and E. Linings to be fixed in accordance with manufacturers recommendations and as outlined in Section 8.



6(a) - Double stud walls



6(b) - Staggered stud walls

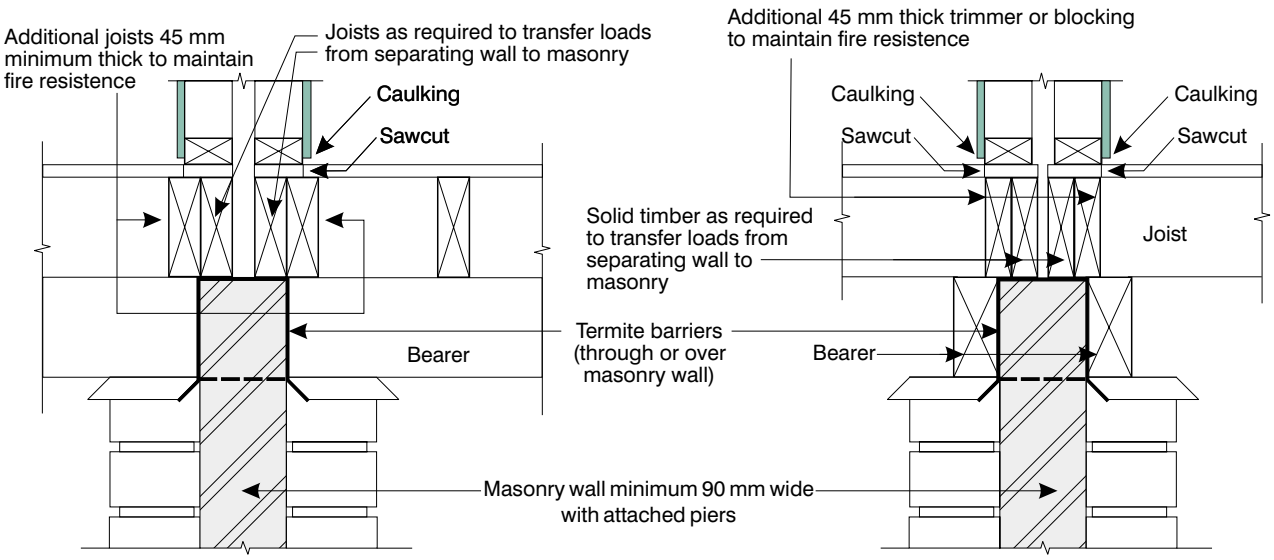


6(c) - Single stud walls

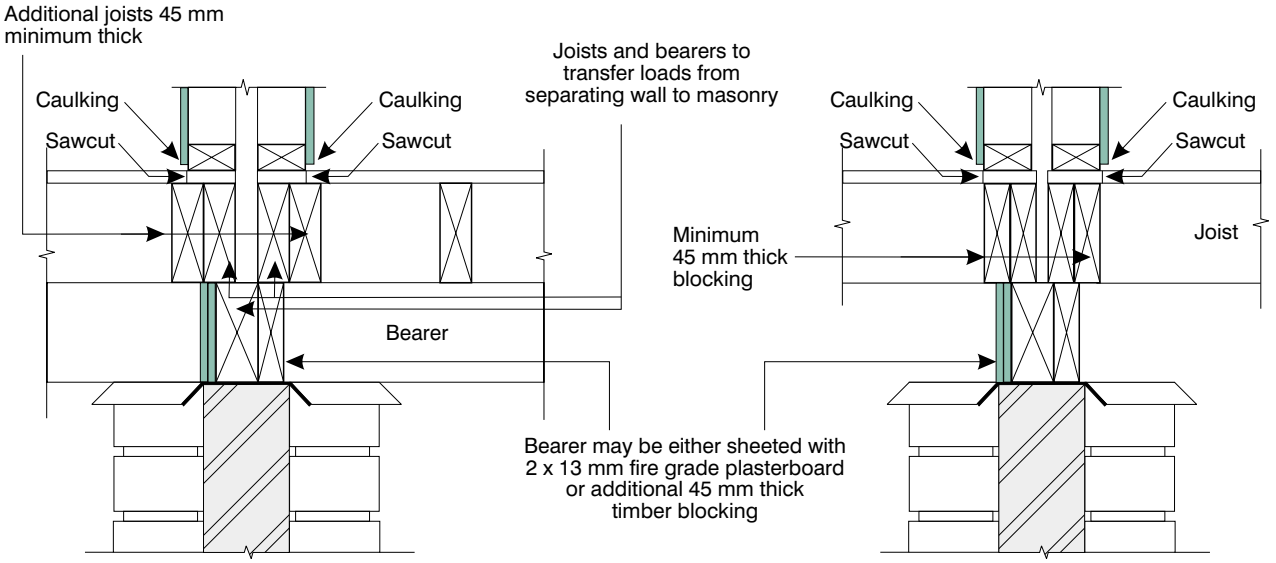
FIGURE 6 - WALL FRAMING OPTIONS

7 CONSTRUCTION DETAILS AND BUILDING PRACTICE

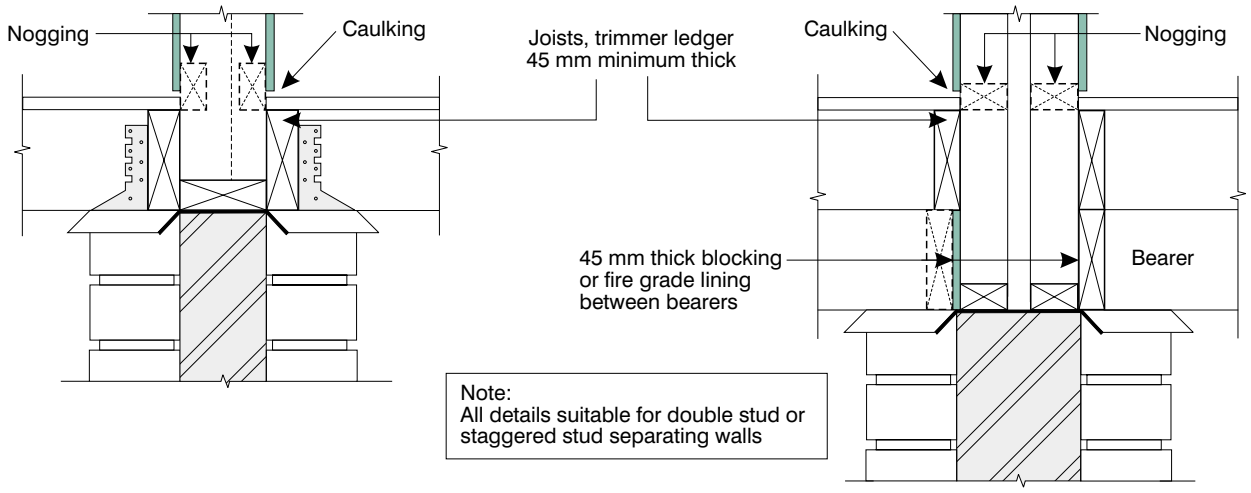
To satisfy the BCA requirements and meet consumer expectations the following details and practices should be adopted.



7(a) - Masonry wall taken up to joists



7(b) - Masonry wall taken up to bearers



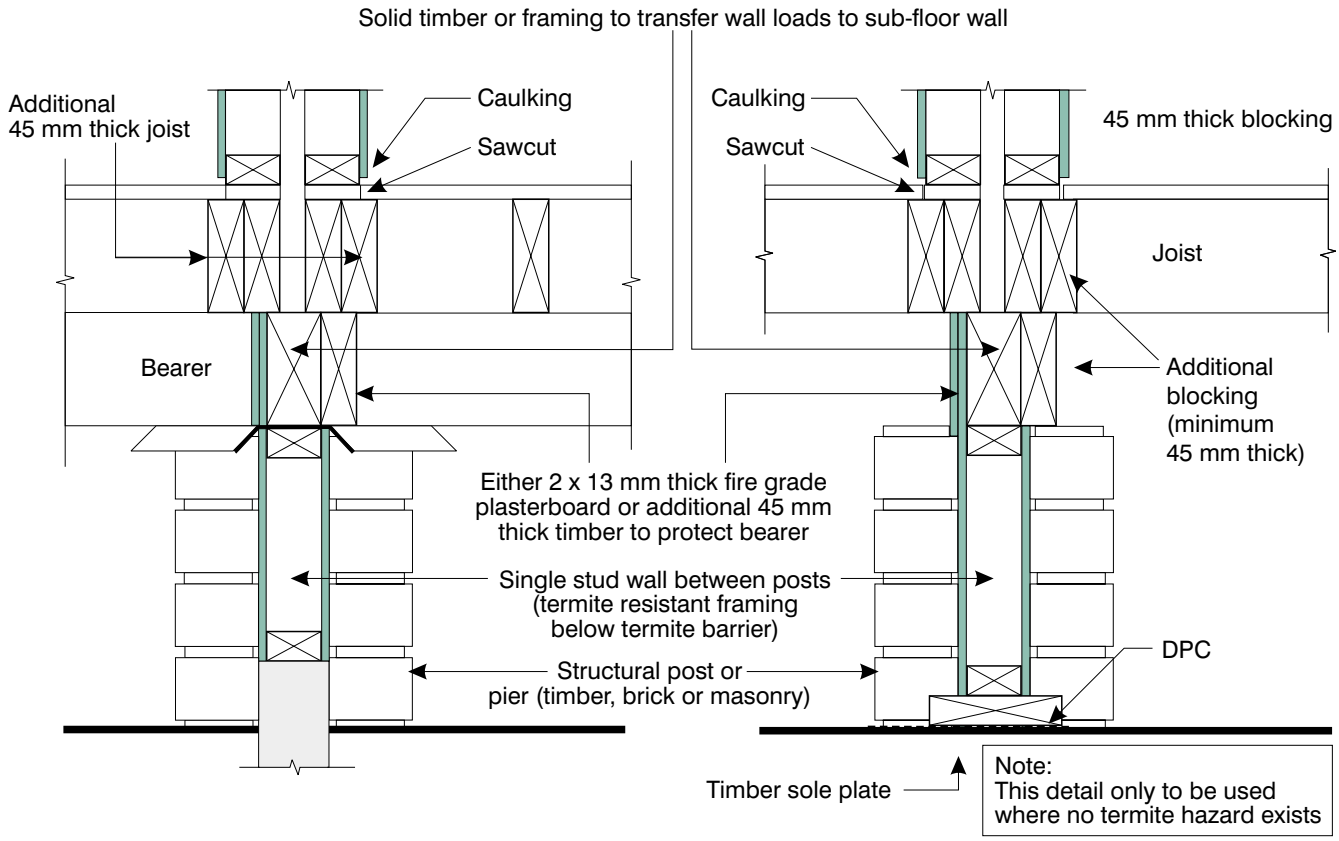
7(c) - Separating wall supported off masonry wall

FIGURE 7 - MASONRY SUB-FLOOR SEPARATING WALLS

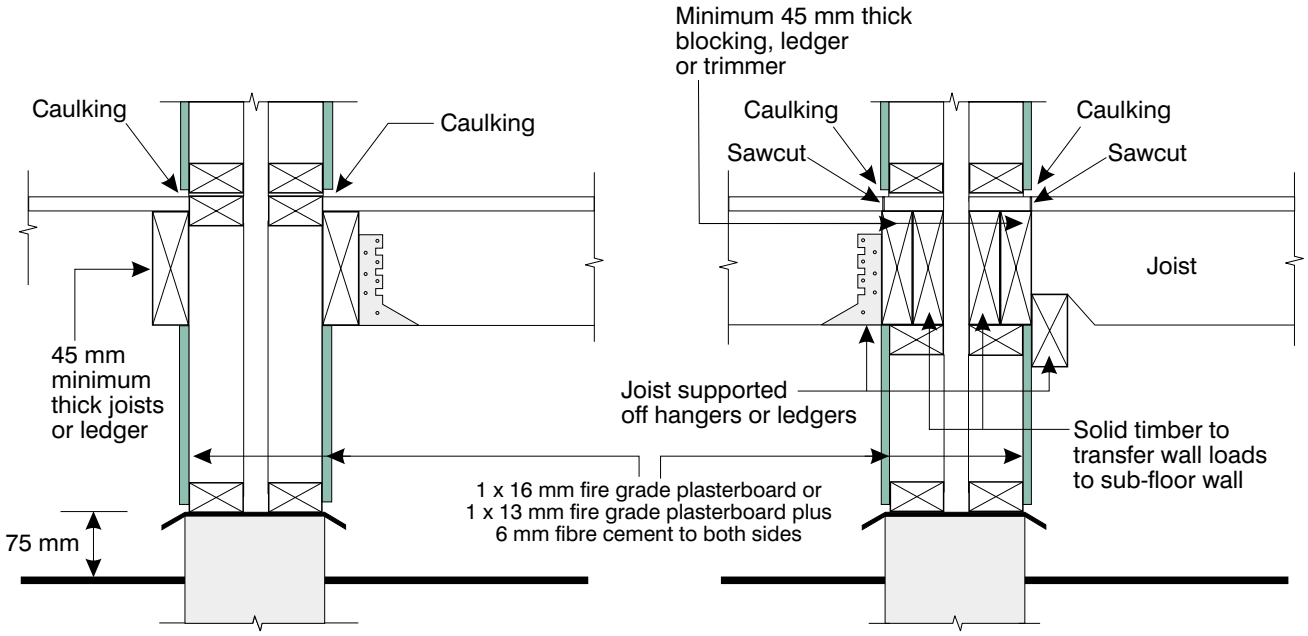
7.1 Sub-Floor Separating Walls

Separating walls must be continuous from the ground to the underside of a non-combustible roof or 450 mm above a combustible roof. Walls below suspended ground floors may be masonry (refer Figure 7) or timber framed with fire grade lining (refer Figure 8).

Timber framed sub-floor separating walls may be either loadbearing extensions of the separating wall above, or alternatively non-loadbearing infill walls between structural piers.



8(a) - Single stud wall between concrete or masonry piers



8(b) - Separating wall (double or staggered studs) supported off footing

FIGURE 8 - TIMBER FRAMED SUB-FLOOR SEPARATING WALLS

7.2 Double Stud Separating Walls

Separating walls may be constructed with two individual stud framed walls (refer Figure 9 and Table C).

NOTE: Complete isolation of the two structural frames in double stud walls provides the best airborne and impact sound resistance.

Intersections must be constructed to maintain the fire resistance level and sound performance. The following typical details show recommended building practice for double stud separating walls:-

Figure 9 - Double stud walls (typical)

Figure 10 - Two storey double stud walls

Figure 11 - Intersections between suspended floors and separating wall

Figure 12 - Bearers supported in separating wall

Figure 13 - Non-aligned floors

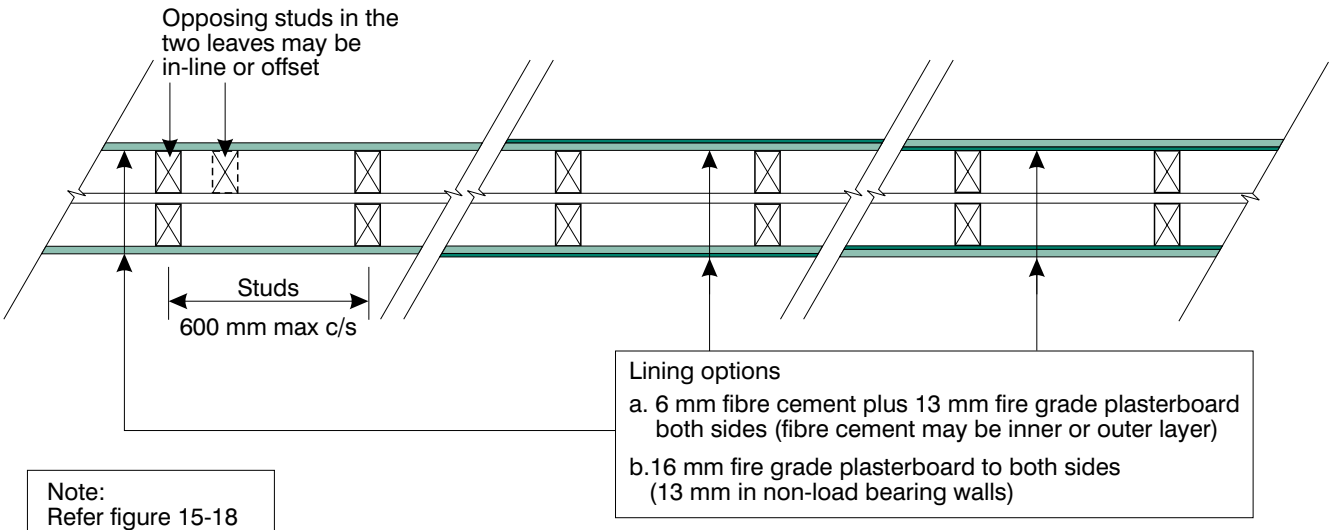
Figure 14 - Separating walls above ceilings

Figure 15 - Intersections with internal walls

Figure 16 - Intersection with brick veneer external wall

Figure 17 - Non-aligned external walls

Figure 18 - Intersection with lightweight clad external wall.



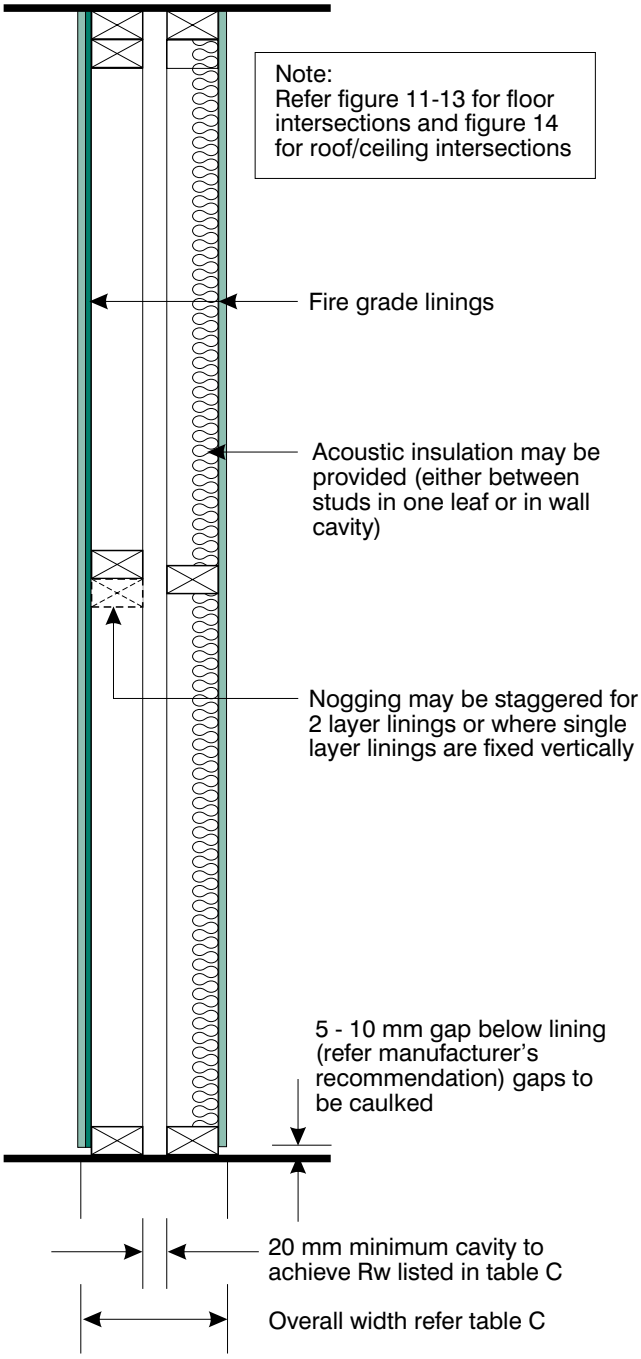
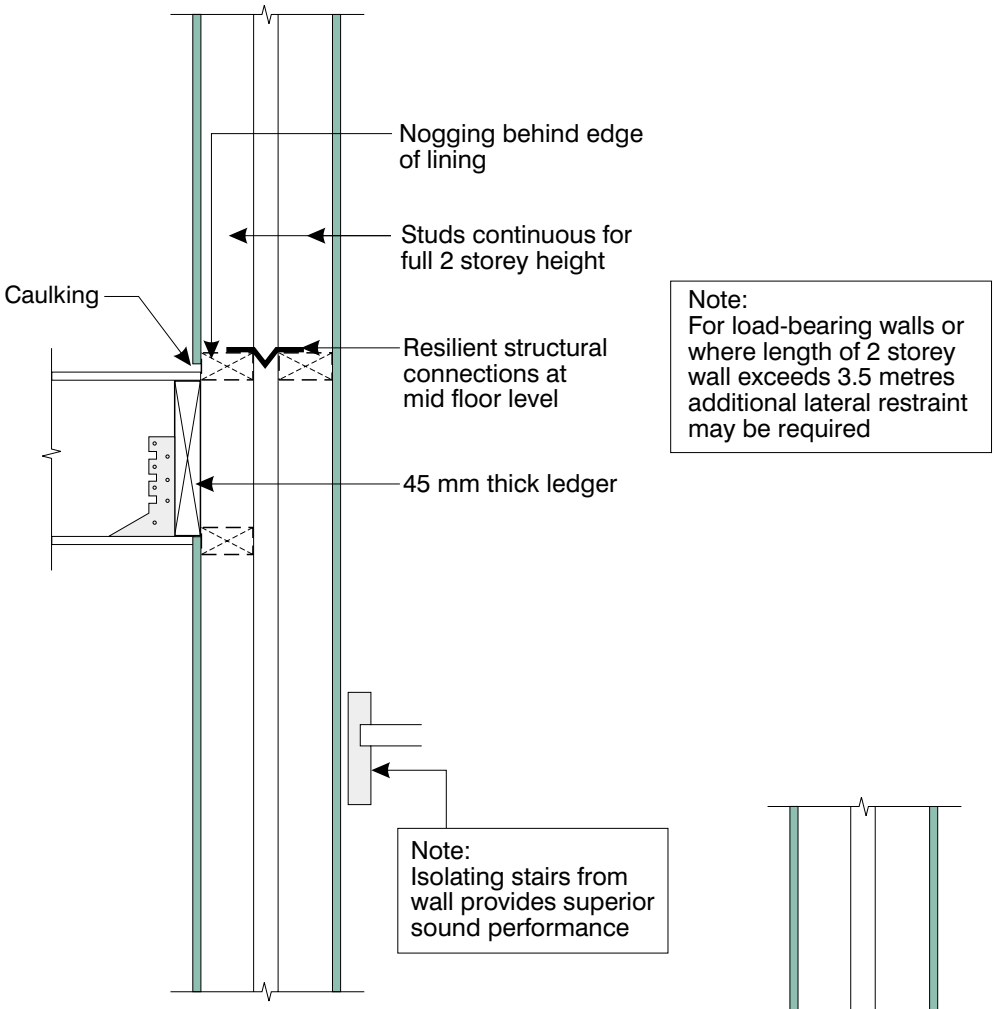


FIGURE 9 - DOUBLE STUD WALLS (FRL 60/60/60)

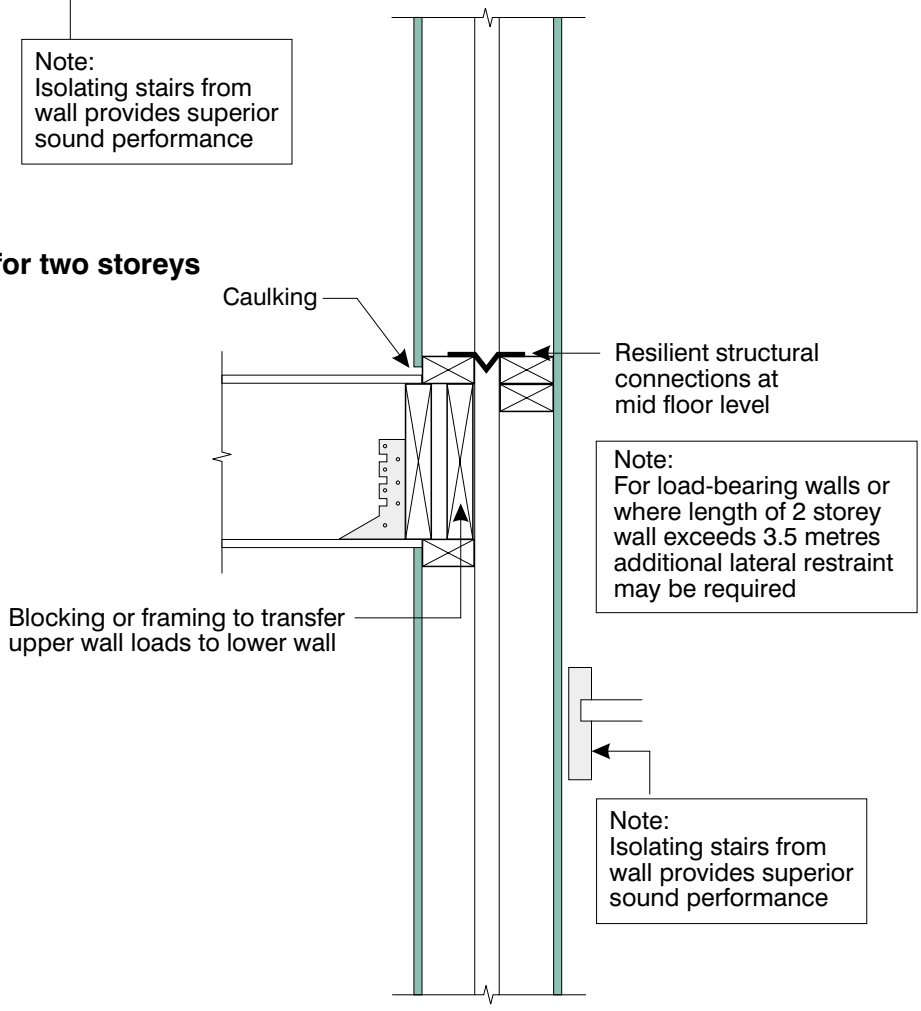
TABLE C DOUBLE STUD WALLS FRL 60/60/60

Fire Grade Linings	Studs (minimum size)	Insulation	Nominal Rw (refer notes)	Overall Width (20 mm cavity)
One layer 16 mm fire grade to plasterboard both sides. (loadbearing or non-loadbearing walls)	90 x 35 mm @ 600 mm max. centres.	50 mm	53 - 55	232 mm
		Nil	47	
	70 x 45 mm of 600 mm max. centres (See Note 3)	50 mm	50 - 52	192 mm
		Nil	46	
One layer 13 mm fire grade plasterboard to both sides. (non-loadbearing walls only)	90 x 35 mm a 600 mm max.centres	50 mm	53 - 55	226 mm
		Nil	45	
	70 x 35 mm at 600 mm max. centres	50 mm	50 -52	186 mm
		Nil	45	
6 mm fibre cement plus 13 mm fire grade plasterboard to both sides. (See Note 4)	90 x 35 mm @ 600 mm max. centres	50 mm	58 -61	238 mm
		Nil	53 - 54	
	70 x 45 mm @ 600 mm max. centres. (70 x 35 mm in non-loadbearing walls)	50 mm	57 - 59	198 mm
		Nil	51 - 52	

NOTES:
1. All of the above have “satisfactory resistance to impact sound”.
2. The nominal Rw ratings listed are based upon a 20 mm cavity between walls with acoustic insulation (where listed) 50 mm thick polyester 350 kg/m^3. Different thicknesses and types of insulation will alter Rw values. (Refer lining manufacturer for actual tested Rw values).
3. 70 x 35 mm studs are not allowed in loadbearing fire rated walls.
4. The fibre cement can be either the first layer (against the studs) or the second layer.



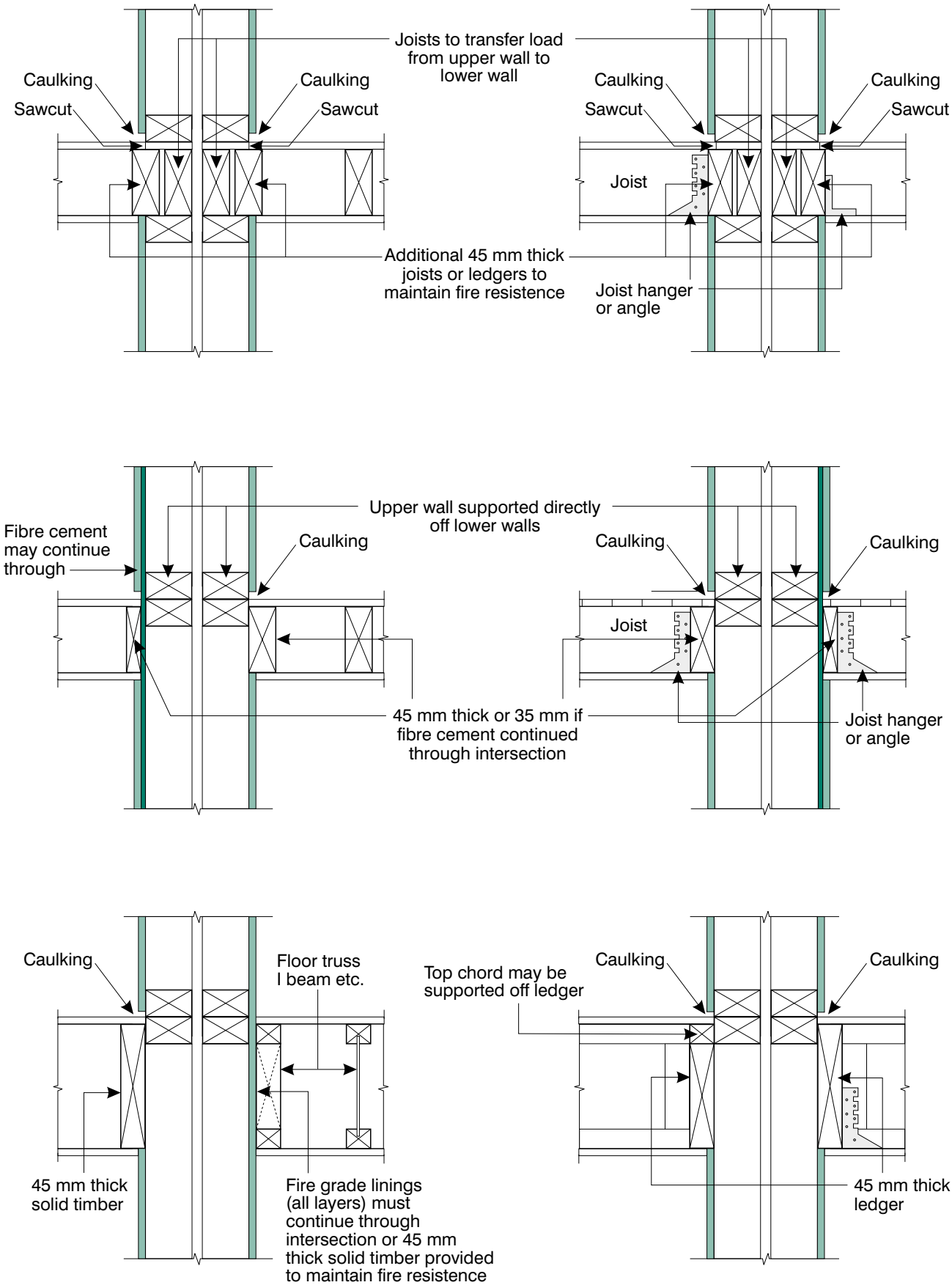
10(a) - Studs continuous for two storeys



10(b) - Upper wall supported off lower wall

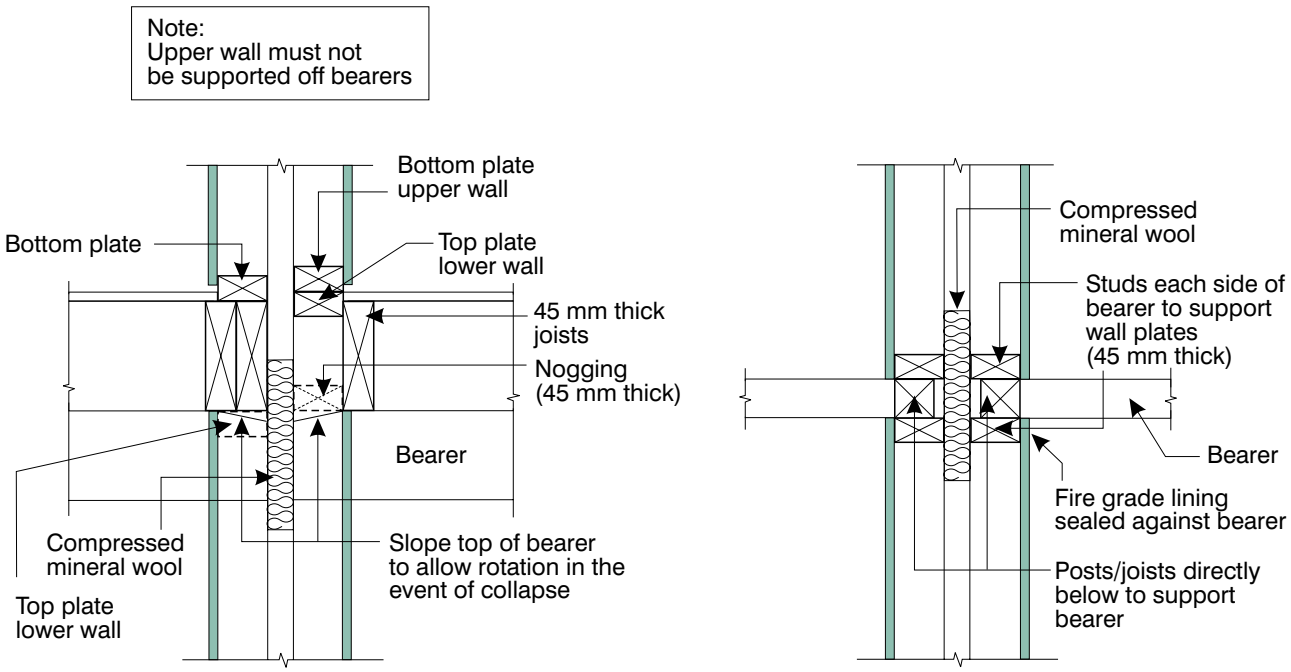
FIGURE 10 - TWO STOREY DOUBLE STUD WALLS

Note:
In all cases, floors must be able to collapse in the event of fire and leave the separating wall intact.



11(a) - Joists paralled to separating walls **11(b) - Joists perpendicular to separating walls**

FIGURE 11- INTERSECTIONS BETWEEN SUSPENDED FLOOR AND SEPARATING WALLS



12(a) - Section / Elevation **12(b) - Plan view**

FIGURE 12 - BEARERS SUPPORTED OFF SEPARATING WALL

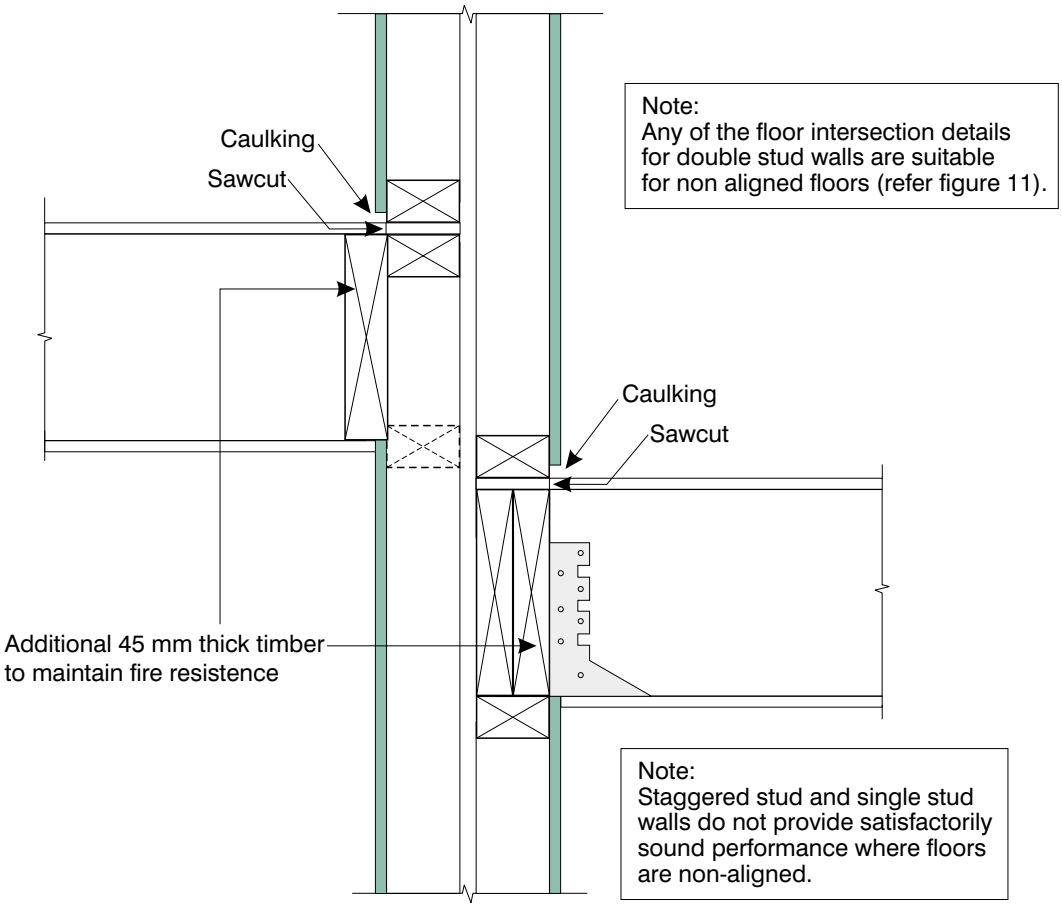


FIGURE 13 - NON-ALIGNED FLOORS

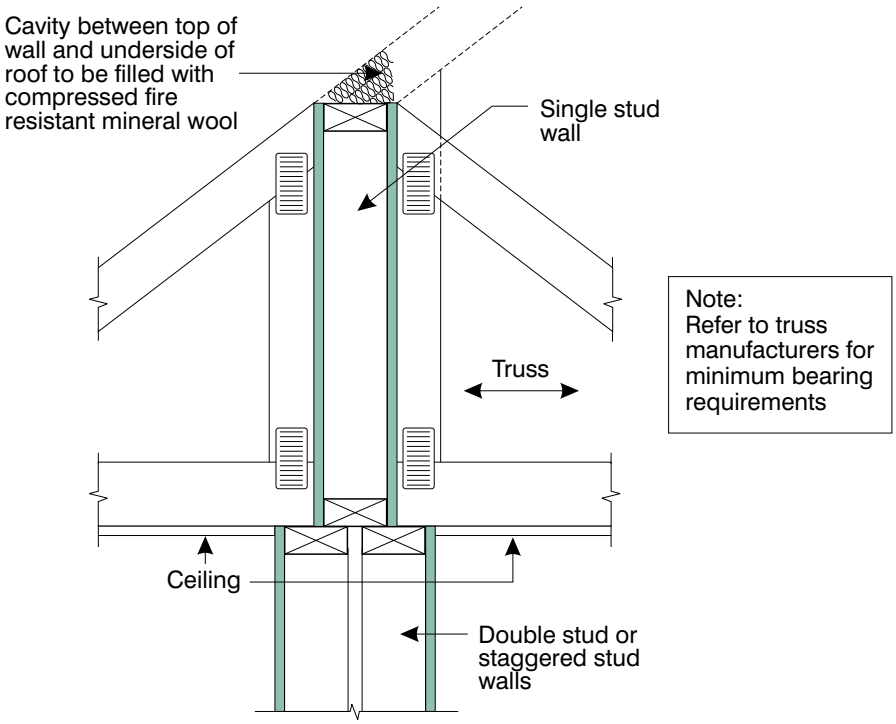
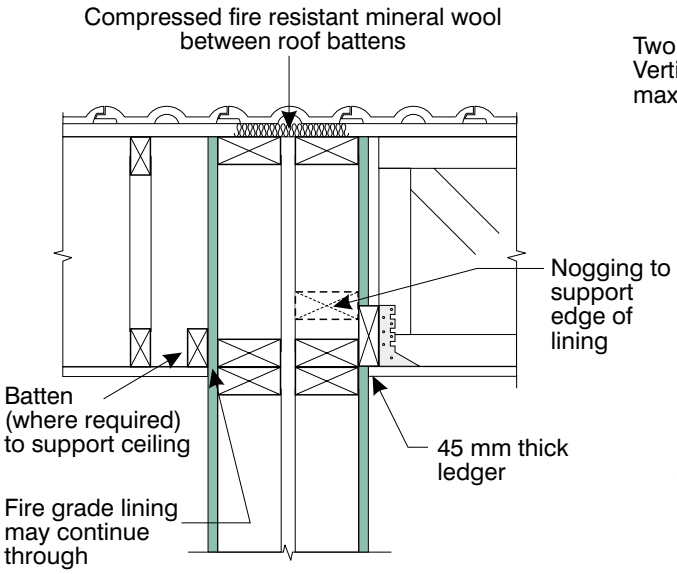


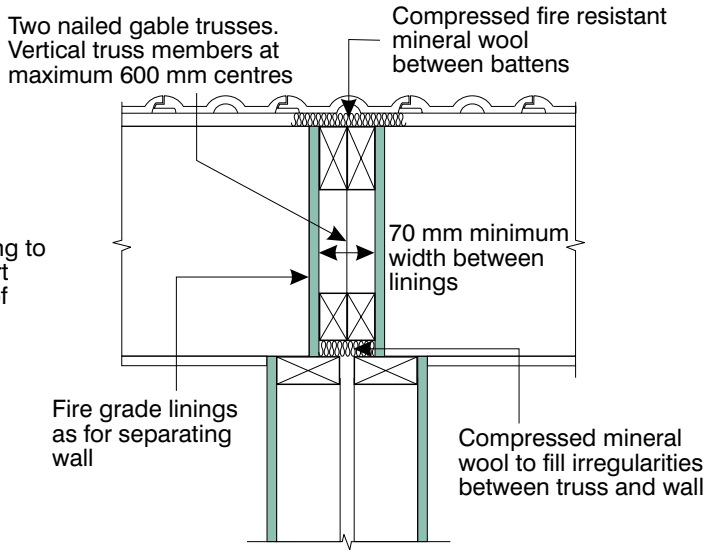
Figure 14(a) - Single stud wall

Notes:

1. Additional ledgers/battens may be required to support ceilings.
2. Top of wall cavity may need to be sealed to prevent moisture from entering cavity during construction.
3. These details are also suitable above staggered stud walls.

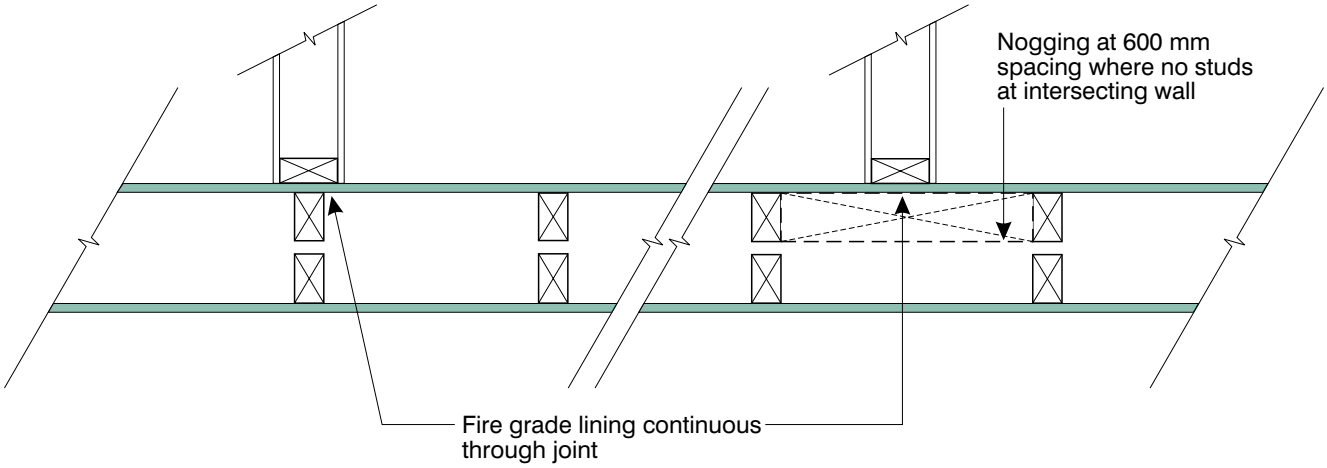


14(b) - Separating wall continued up to roof

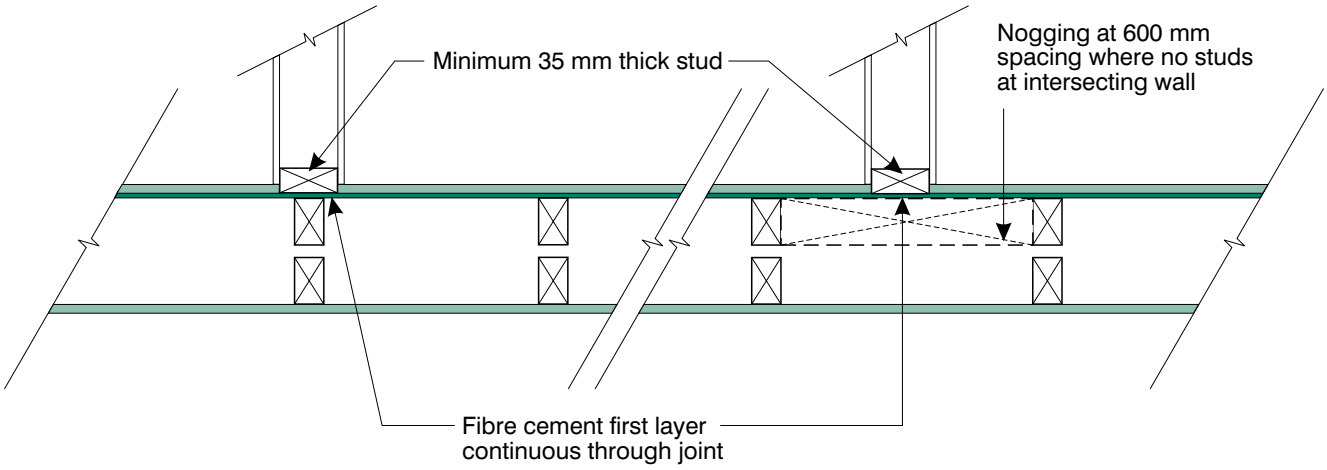


14(c) - Sheeted trusses

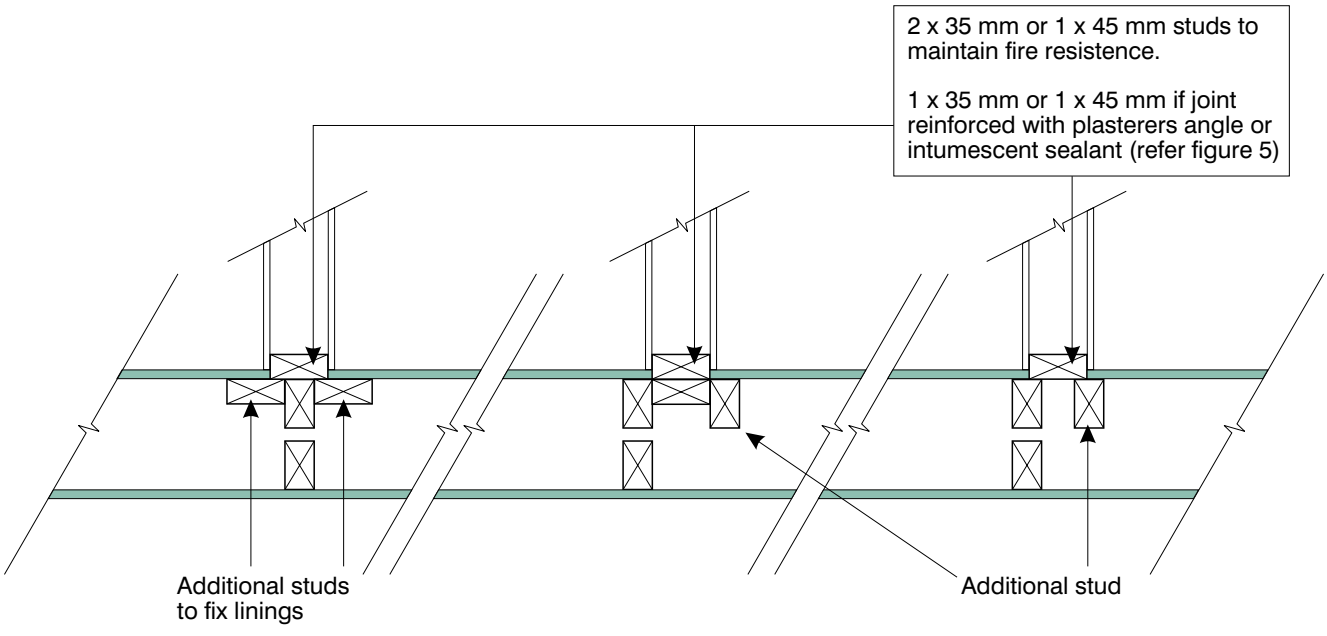
FIGURE 14 - SEPARATING WALLS ABOVE CEILINGS



15(a) - Fire grade linings continuous

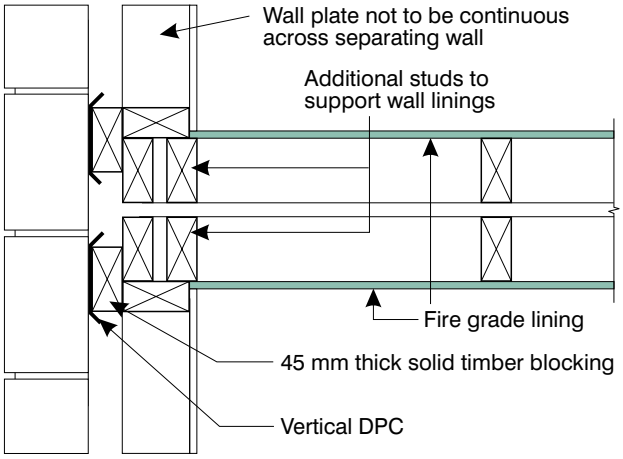


15(b) - First layer (fibre cement) continuous

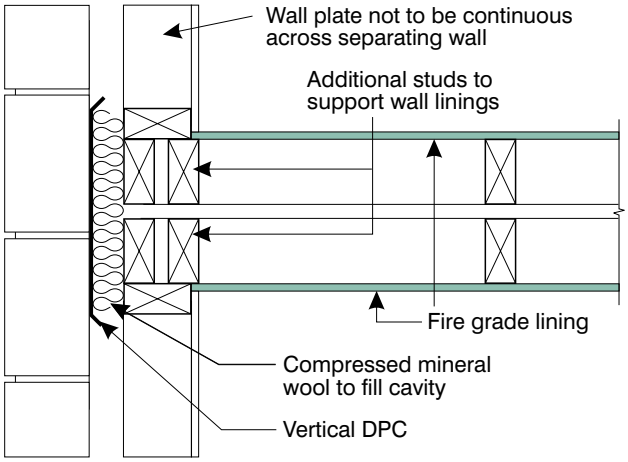


15(c) - Studs in intersecting wall used to maintain fire resistance

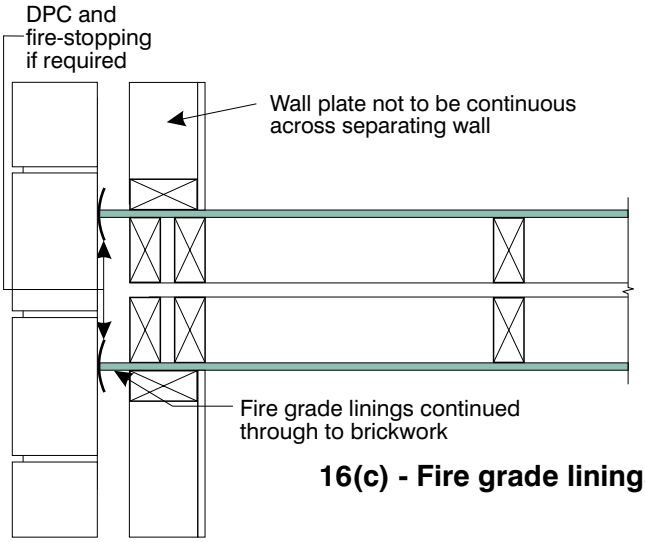
FIGURE 15 - INTERSECTIONS WITH INTERNAL WALLS



16(a) - Cavity blocked with timber



16(b) - Cavity filled with mineral wool



16(c) - Fire grade linings continued across cavity

FIGURE 16 - INTERSECTION WITH BRICK VENEER EXTERNAL WALL

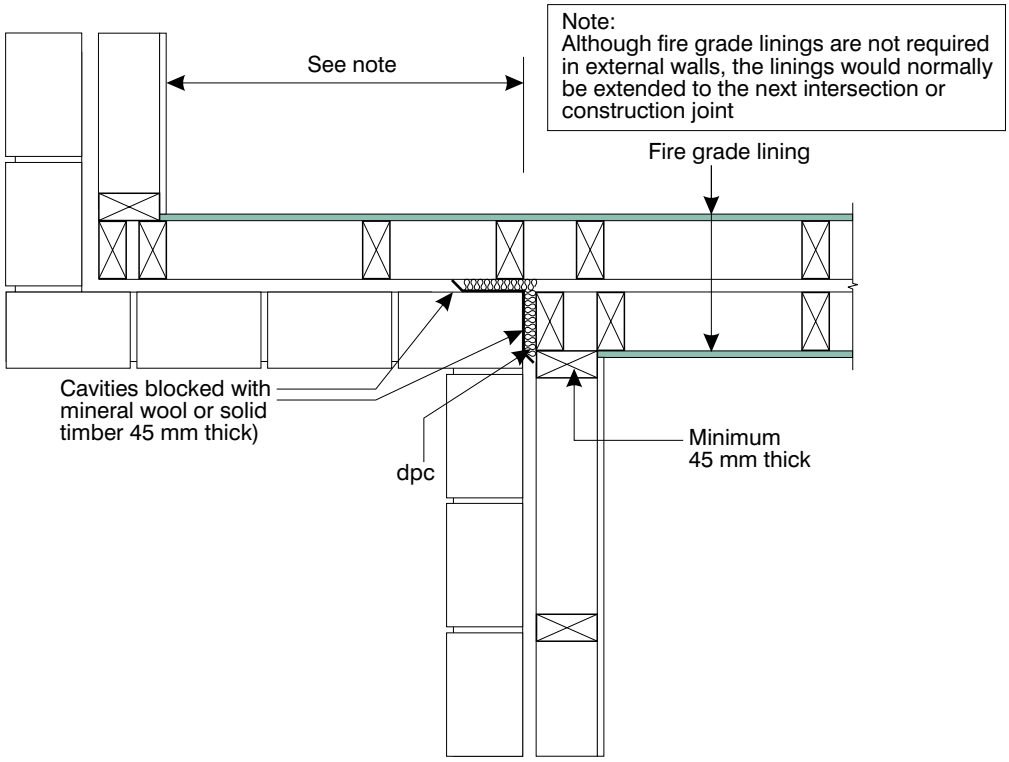
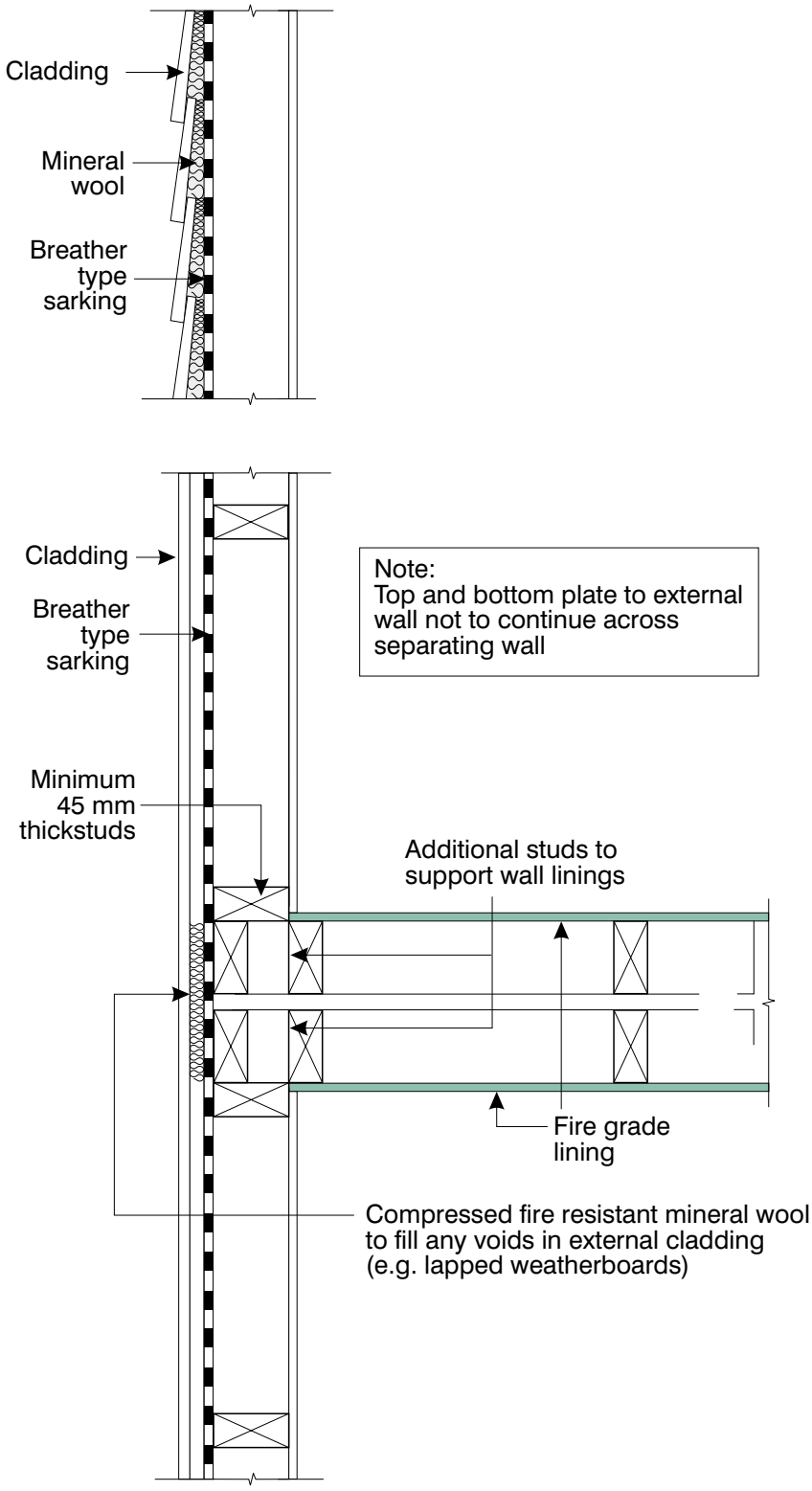


FIGURE 17 - INTERSECTION WITH NON-ALIGNED EXTERNAL WALL



18(a) - Non rated external wall

FIGURE 18 - INTERSECTION WITH LIGHTWEIGHT CLAD EXTERNAL WALL

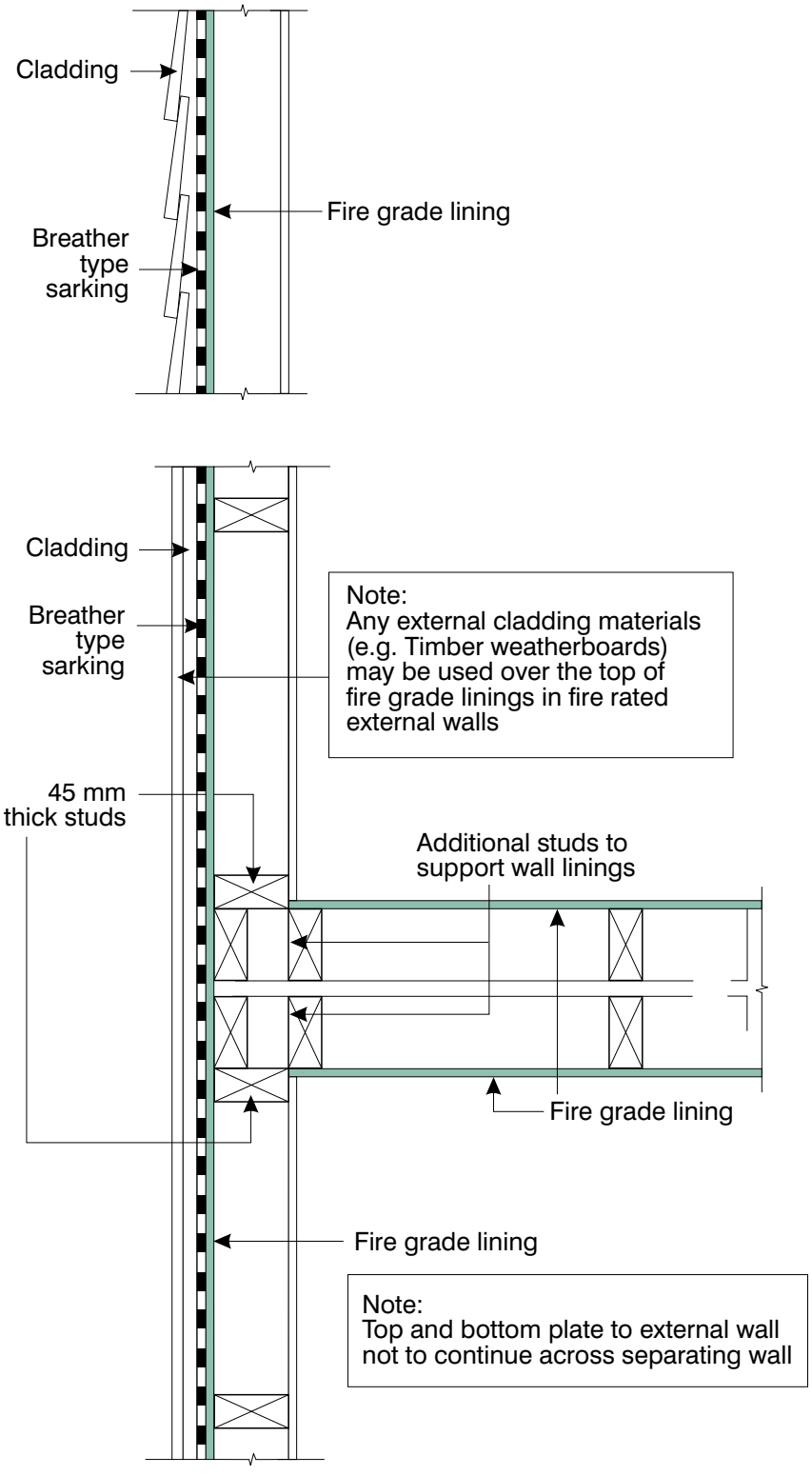


Figure 18(b) - External wall FRL 60/60/60 (measured from outside only)

7.3 Staggered Stud Separating Walls

Separating walls may be constructed using a single top and bottom plate (120 mm or 140 mm wide) with alternate studs staggered to align with opposite edges. Fire grade linings are fixed to alternate studs. (refer Figure 19 and Table D).

Isolation of the structural frame (except for plates) provides satisfactory resistance to impact sound as well as airborne sound.

NOTE: Staggered stud walls are not recommended for separating walls between units where floors are not aligned. Satisfactory sound performance cannot be achieved at floor intersections. Double stud walls are recommended for non-aligned floors.

The following typical details show recommended building practice for staggered stud separating walls to maintain fire resistance and sound performance:-

Figure 19 - Staggered stud walls (typical)

Figure 20 - Two storey staggered stud walls

Figure 21 - Intersections between suspended floors and separating walls.

Figure 22 - Bearers supported off separating wall.

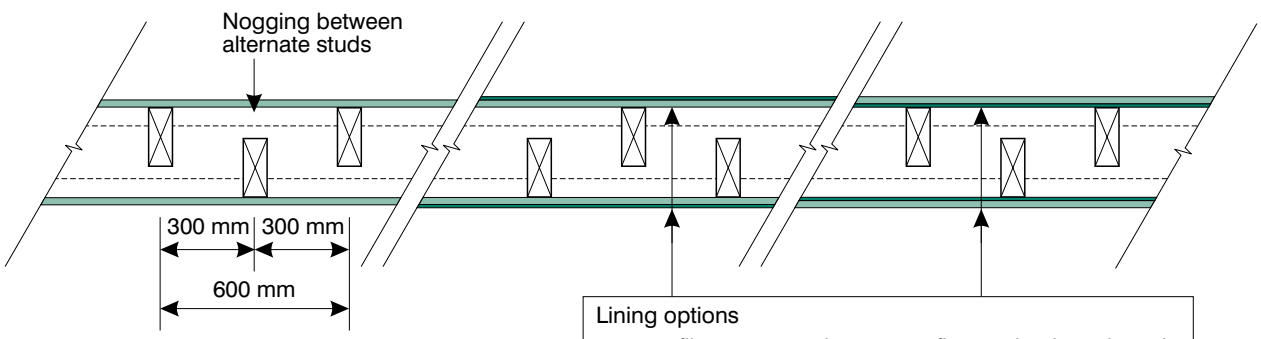
Figure 23 - Separating walls above ceilings.

Figure 24 - Intersections with internal walls

Figure 25 - Intersection with brick veneer external wall.

Figure 26 - Non-aligned external wall.

Figure 27 - Intersection with lightweight clad external wall.



Note:
Figures 23, 25, 26 & 27 for wall intersections

Lining options

a. 6mm fibre cement plus 13 mm fire grade plasterboard both sides (fibre cement may be inner or outer layer)

b. Single layer fire grade plasterboard both sides (16 mm for loadbearing walls, 13 mm for non-loadbearing walls)

Note:
Refer figures 20,21,22 & 24 for floor and ceiling intersections

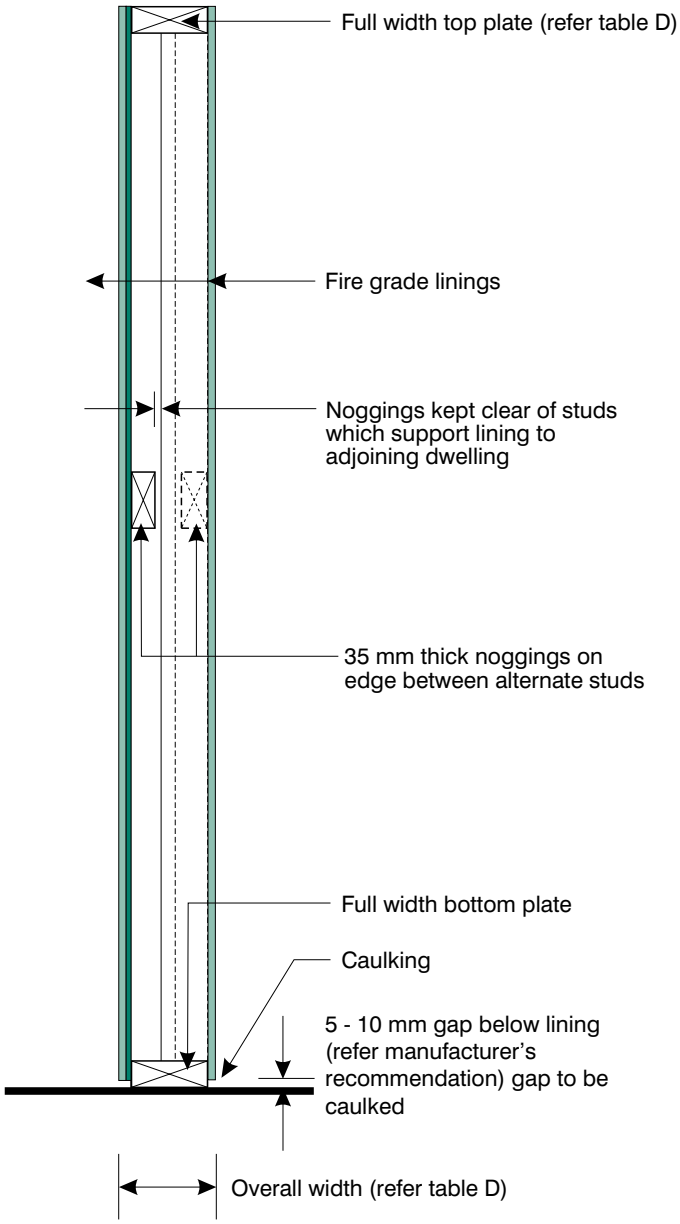


FIGURE 19 - STAGGERED STUD WALLS (FRL 60/60/60)

TABLE D STAGGERED STUD WALLS FRL 60/60/60

Fire Grade Linings	Insulation	Nominal Rw (refer notes)	Studs (minimum size)	Top and bottom plates	Overall Width
One layer 16 mm fire grade to plasterboard both sides. (loadbearing or non-loadbearing walls)	50 mm	49 - 51	90 x 35	140 x 35	172 mm
	Nil	less than 45	90 x 35	120 x 35 (see Note 2)	152 mm
		less than 45	70 x 45	120 x 35	152 mm
One layer 13 mm fire grade plasterboard to both sides.	50 mm	45 - 47	90 x 35 or 70 x 35	120 x 35	146mm
(non-loadbearing walls only)	Nil	less than 45	(see Note 4)		
6 mm fibre cement plus 13 mm fire grade plasterboard to both sides. (See Note 5)	50 mm	56 - 57	90 x 25	140 x 35	178 mm
	Nil	50		120 x 35 (see Note 2)	158 mm
	50 mm	55 - 56	70 x 45	120 x 35	158 mm
	Nil	49			

NOTES: 1. All the above have "satisfactory resistance to impact sound".

2. 120 mm wide top and bottom plates with 90 mm wide studs do not allow clearance for timber noggings. Studs in structural walls, designed in accordance with AS 1684, require solid nogging at 1350 mm max. spacing. Studs in structural walls with no nogging or metal strapping require alternative design and certification.
3. The Rw values listed are based upon 50 mm thick polyester acoustic insulation 350 kg/m^3. Different types of insulation will give different values. Refer lining manufacturers for actual tested Rw ratings.
4. 70 x 35 mm studs are not allowed in loadbearing fire rated walls.
5. Fibre cement may be either first or second layer.

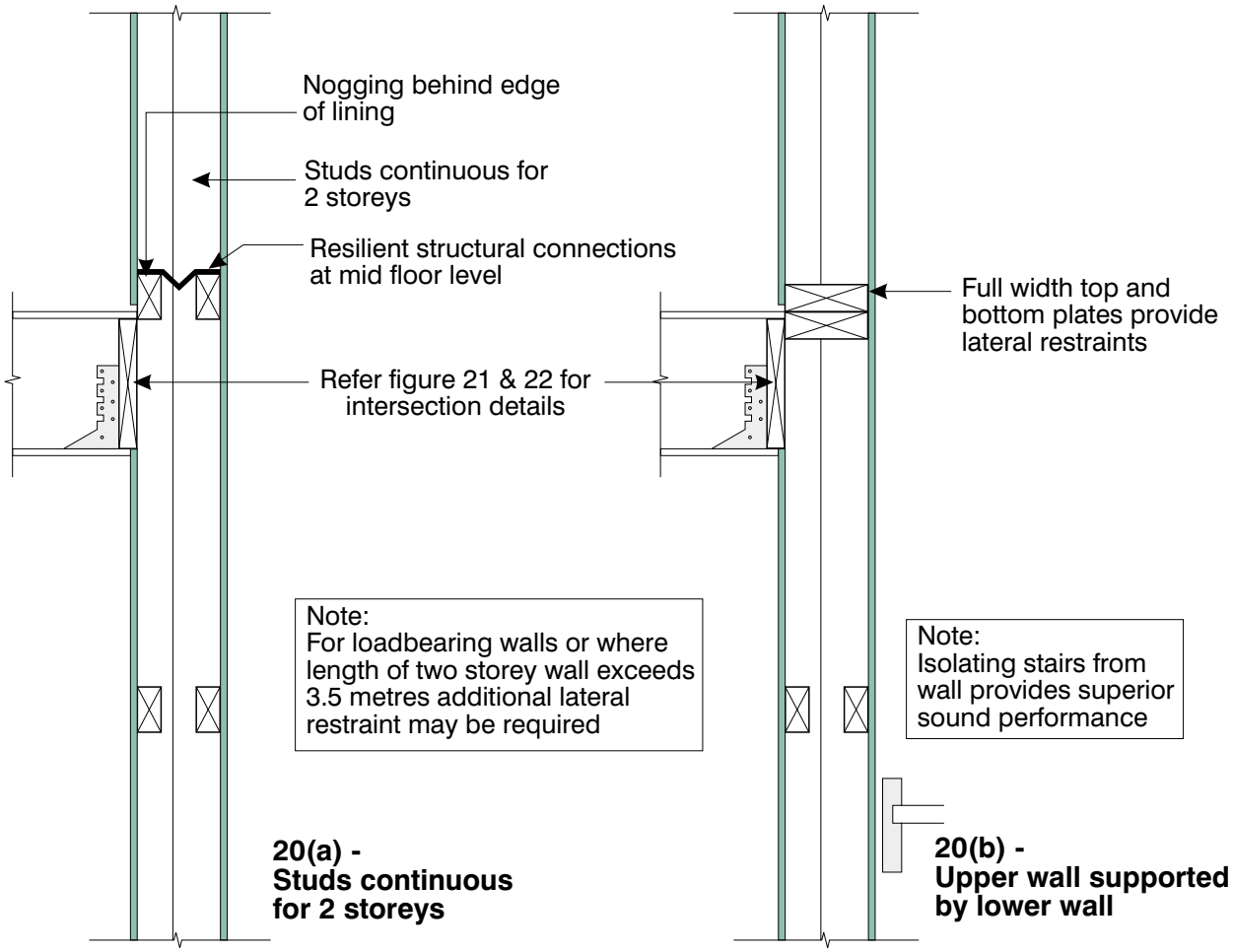
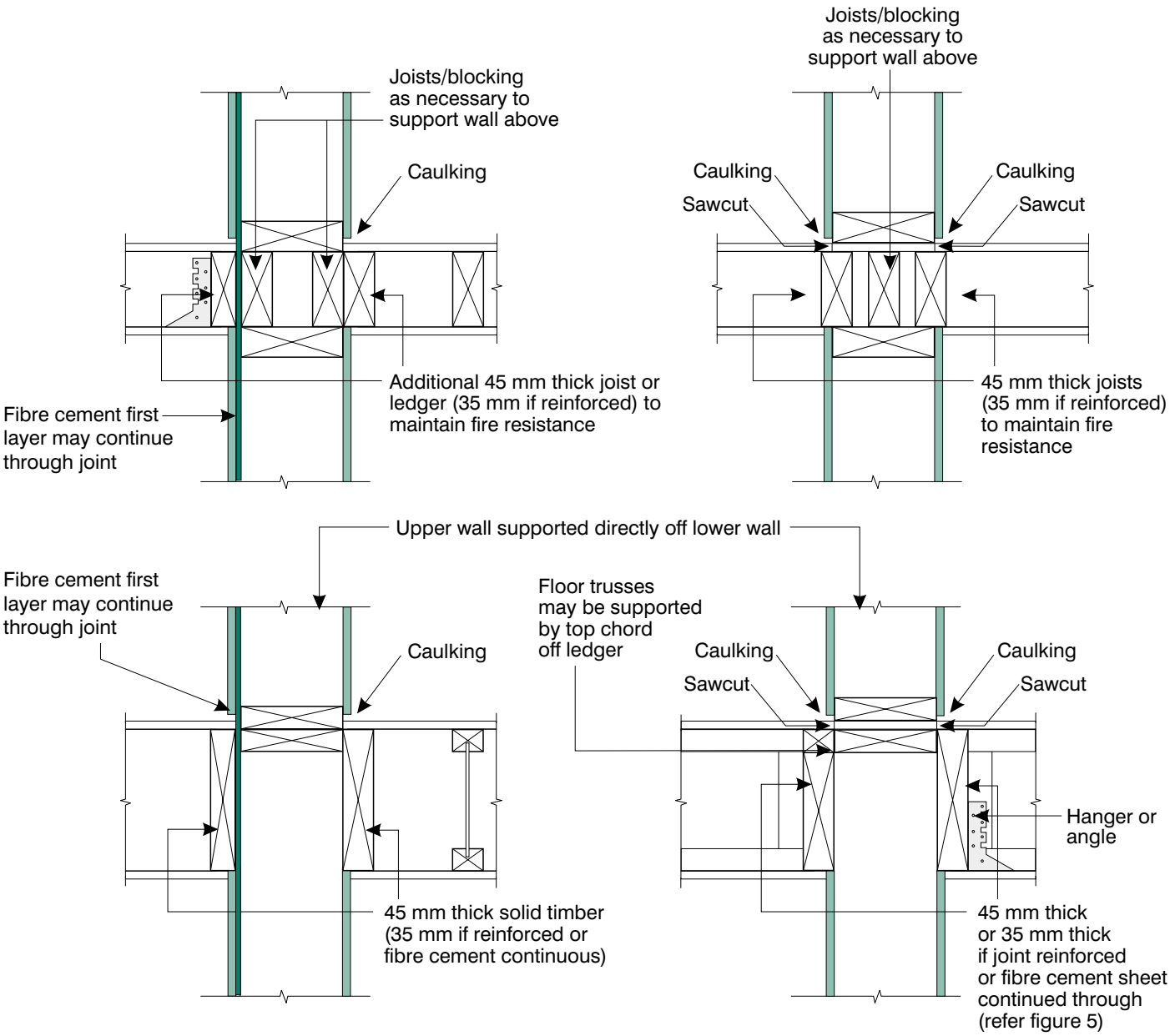


FIGURE 20 - TWO STOREY STAGGERED STUD WALLS

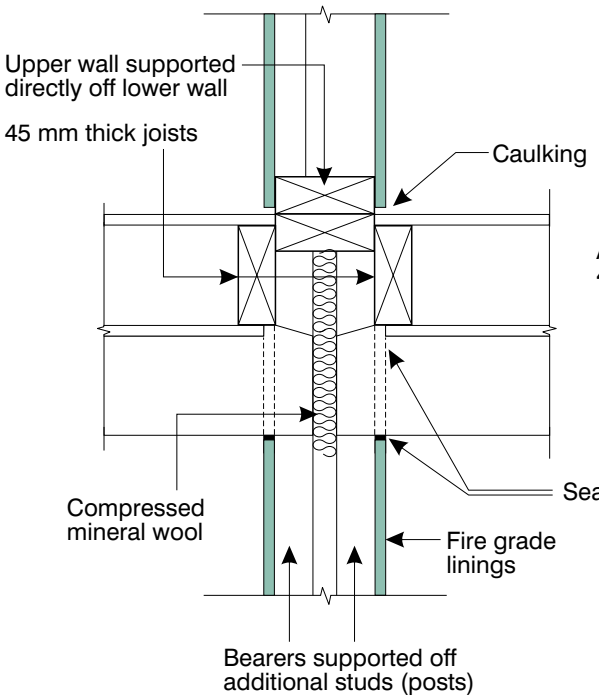


21(a) - Joists paralled to separating wall

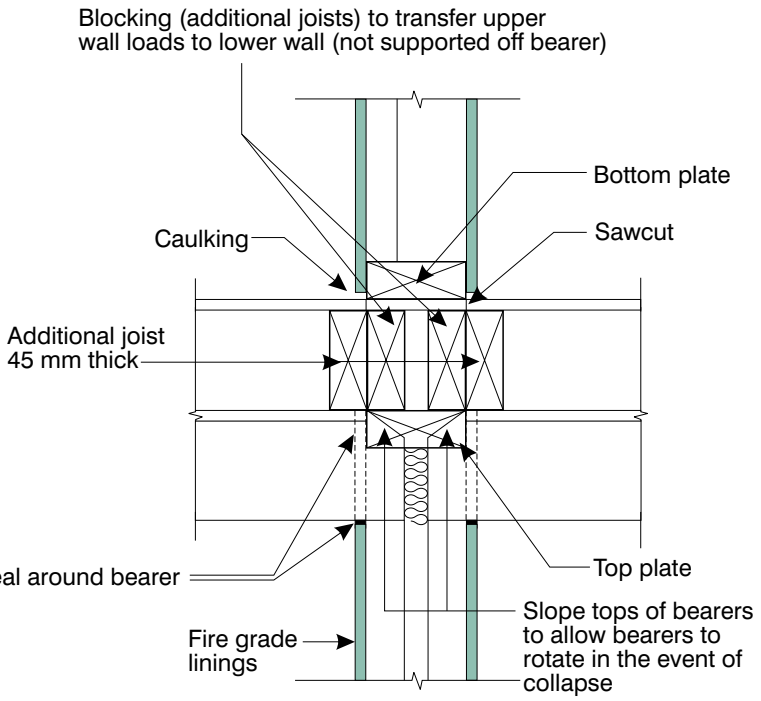
21(b) - Joists perpendicular to separating wall

Note:
Where 'I' beams or floor trusses are used, either fire grade linings (all layers) must continue through intersection or substituted with solid timber to maintain fire resistance.

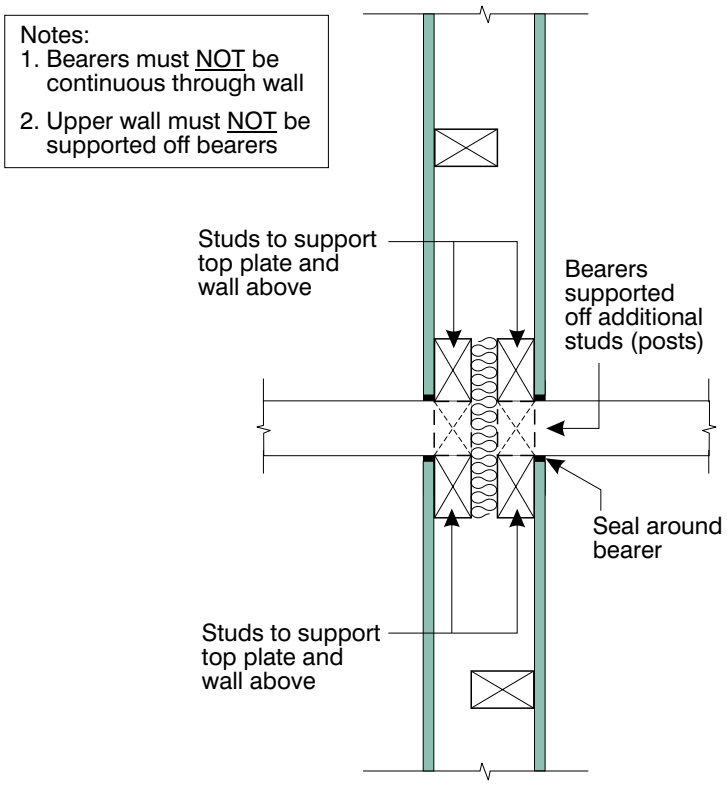
FIGURE 21 - INTERSECTIONS BETWEEN SUSPENDED FLOORS ON SEPARATING WALL



22(a) - Upper wall supported off lower wall



22(b) - Timber blocking to transfer wall loads



22(c) - Plan views

FIGURE 22 - BEARER SUPPORTED OFF STAGGERED STUD WALL

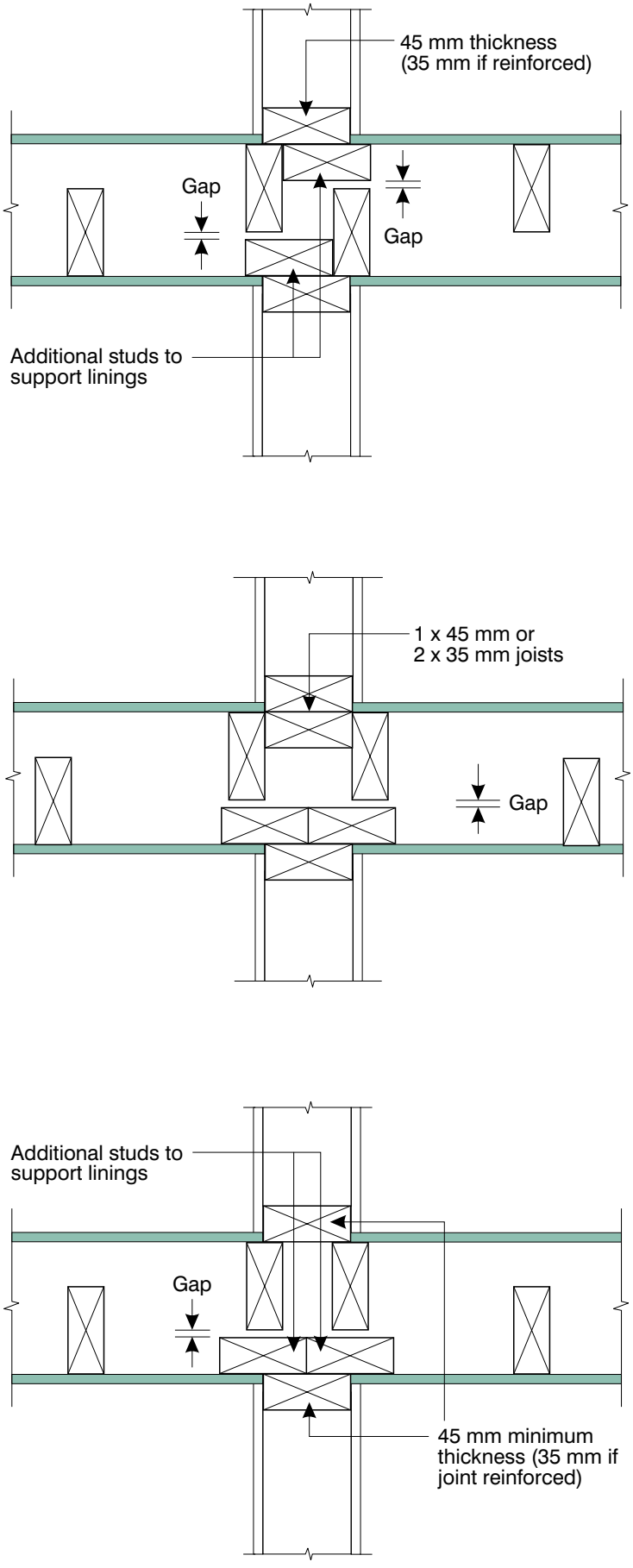
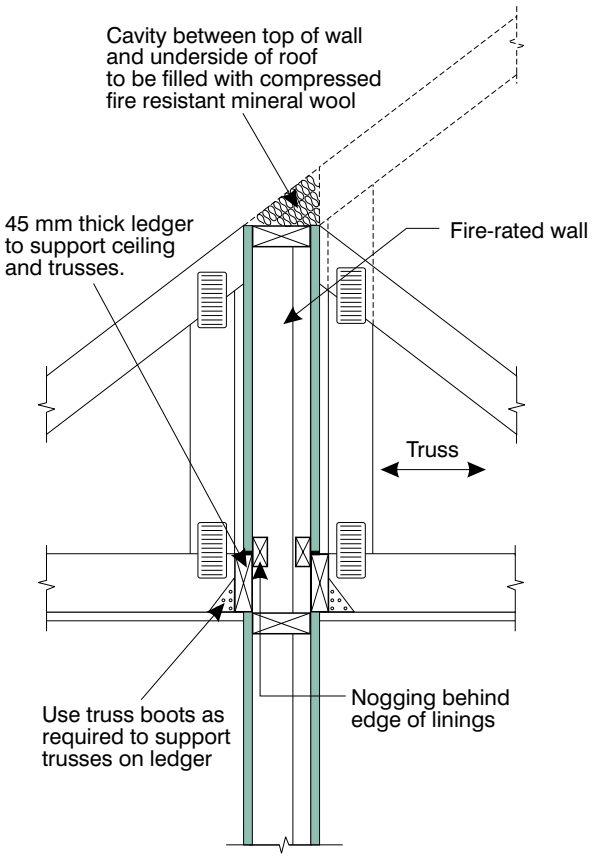


FIGURE 23 - INTERSECTION WITH INTERNAL WALLS



Note:
Single stud walls or sheeted trusses may be used in ceiling spaces above staggered stud separating walls. Refer figure 14 for typical details.

FIGURE 24 - SEPARATING WALLS ABOVE CEILINGS

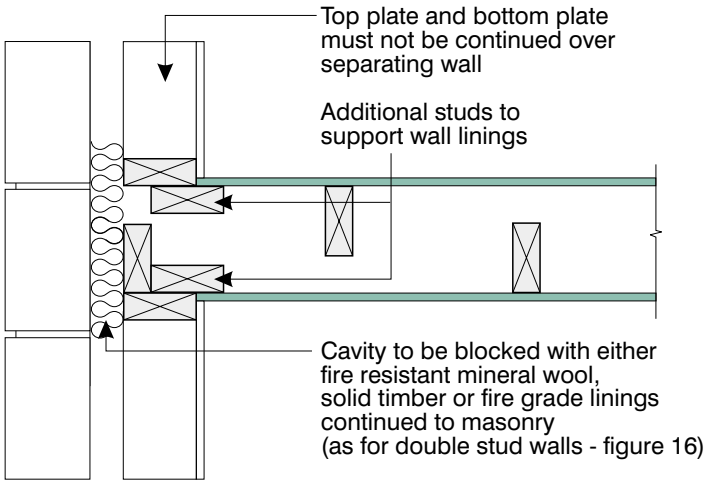


FIGURE 25 - INTERSECTION WITH EXTERNAL BRICK VENEER WALL

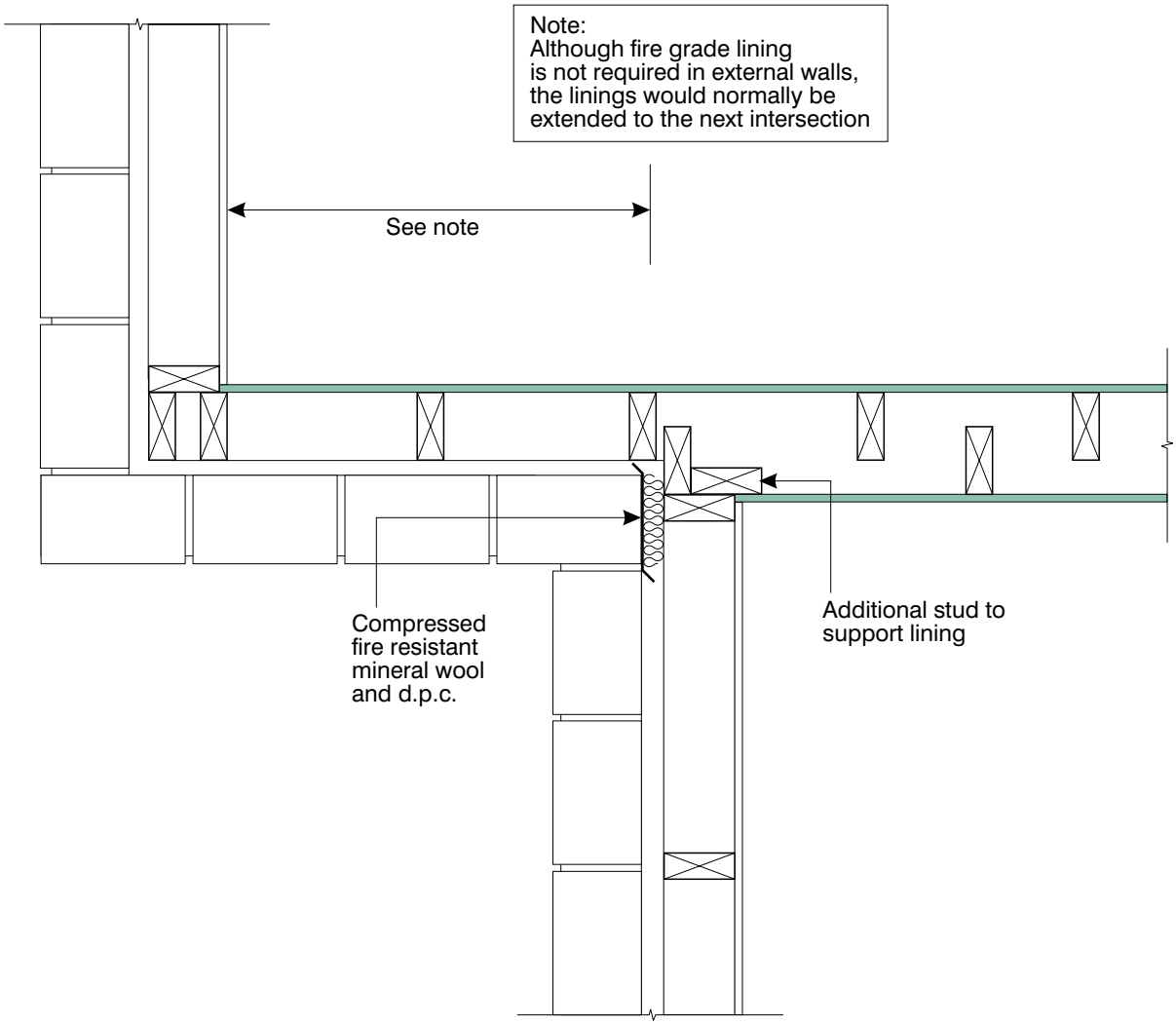


FIGURE 26 - INTERSECTION WITH NON-ALIGNED EXTERNAL WALLS

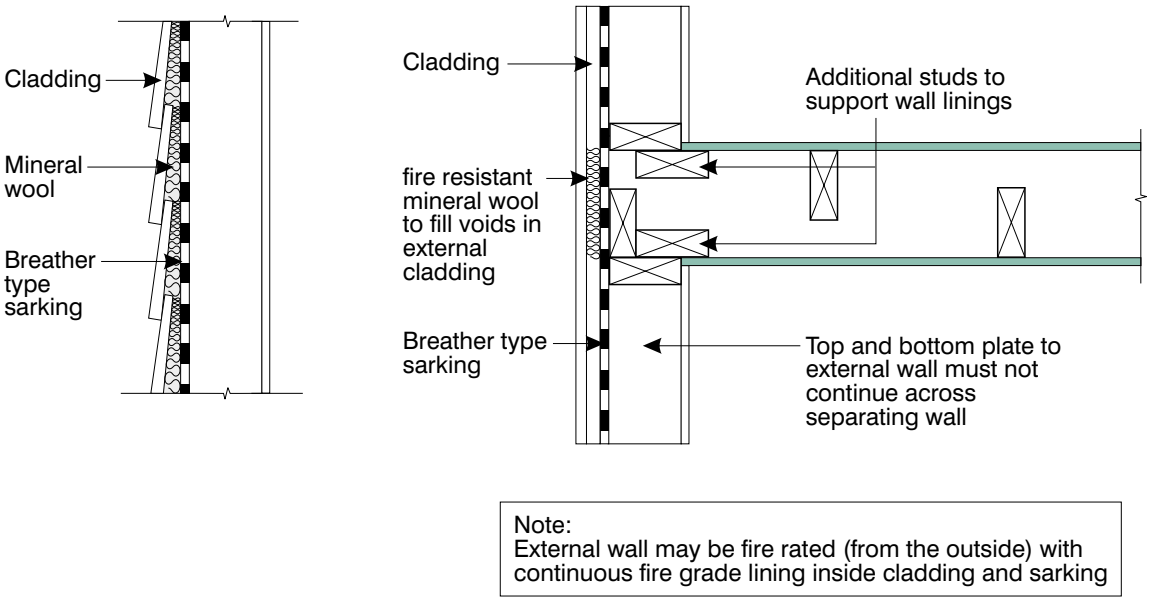


FIGURE 27 - INTERSECTION WITH LIGHTWEIGHT CLAD EXTERNAL WALLS

TABLE E SINGLE STUD WALLS FRL 60/60/60

Fire Grade Linings	Fixing	Insulation	Nominal Rw (refer notes)	Studs (minimum size)	Overall Width
One layer 16 mm fire grade to plasterboard both sides.	Resilient channels or mount to one side	50	49	90 x 35	135 mm (129 mm for 13 mm lining)
		Nil	less than 45		
(13 mm in non-loadbearing walls)	Furring channels with resilient mounted clips to one side	50	50	90 x 35	157 mm (151 mm for 13 mm lining)
		Nil	less than 45		
	Direct to studs	Nil to filled cavity	less than 45	90 x 35	122 mm (116 mm for 13 mm lining)
6 mm fibre cement plus 13 mm fire grade plasterboard to both sides.	Direct to studs	Nil	47 - 49	90 x 35	128 mm
		Nil	less than 45	70 x 45	108 mm

NOTE:
1. Lining fixed with resilient channels or mounts should face likely noise source (eg. wet areas) to provide impact sound resistance. Single stud walls with linings fixed to studs should only be used in locations where sound insulation is not critical (eg. between garages or in sub-floor or roof spaces above ceilings).
2. The nominal Rw ratings listed are based upon a 20 mm cavity between walls with acoustic insulation (where listed) 50 mm thick polyester 350 kg/m^3. Different thicknesses and types of insulation will alter Rw values. (Refer lining manufacturer for actual tested Rw values).
3. 70 x 35 mm studs are not allowed in loadbearing fire rated walls.
4. The fibre cement can be either the first layer (against the studs) or the second layer.

7.4 Single Stud Separating Walls

Where noise reduction is not required by the BCA (eg. Between Class 10 a garages or carports) or in situations where sound transmission is less critical (eg. In sub-floor and ceiling spaces), single stud framed separating walls may be used. (refer Table E).

Note: An acceptable level of sound transmission loss can only be achieved in single stud walls with the use of resilient channels or resiliently mounted furring channels. These systems however are only recommended for single storey, single room applications (e.g. wet areas) because sound performance cannot be maintained at intersections.

7.5 External Walls

External walls within 900 mm of a side or near boundary or closer than 1800 mm to another building are required to be FRL 60/60/60 (-/60/60 if non-loadbearing). (Refer Figure 2) This fire resistance level needs only to be attained from the outside.

FRL 60/60/60 external walls can be either:-

- Brick veneer (minimum 90 mm thick) bricks with any rated or non-rated internal linings.
- 2 x 13 mm fire grade plasterboard to external face covered by waterproof cladding (may be combustible material). Any rated or non-rated internal lining
- 1 x 16 mm wet area fire grade plasterboard to external face covered by waterproof cladding fixed to vertical or horizontal battens at 600 mm centres. 10 mm standard plasterboard internal lining.
- Any FRL 60/60/60 wall systems (refer Tables C, D and E) with fire grade lining to both sides, with external face covered by waterproof cladding (may be combustible material).

Fire rated wall to extend up to non-combustible roofing or non-combustible eaves lining (refer Figure 28 & 29).

NOTE: Eaves linings are required to be non-combustible but not fire rated. Fibre cement products satisfy this requirement.

Detailing of intersections between fire rated external walls and separating walls is exactly the same as for non-rated external walls. (Fire resistance of separating wall to be effectively continued through external wall and any associated cavity) (refer Figures 17, 18, 25 and 27).

NOTE: Suspended floors may be supported directly off rated or non-rated external walls. There is no requirement for floors to collapse away from external walls in the event of fire.

Separating walls must effectively extend through any void in ceilings and eaves (refer Figure 30).

Where floors are non-aligned or where a single storey dwelling adjoins a two storey dwelling, the separating wall and external wall above the lower roof shall be as shown on Figure 31. The separating wall between dwellings or between dwelling and ceiling space shall be FRL 60/60/60 from both sides. The external wall above the lower roof requires FRL 60/60/60 measured from the outside only. (- /60/60 for non-loadbearing walls).

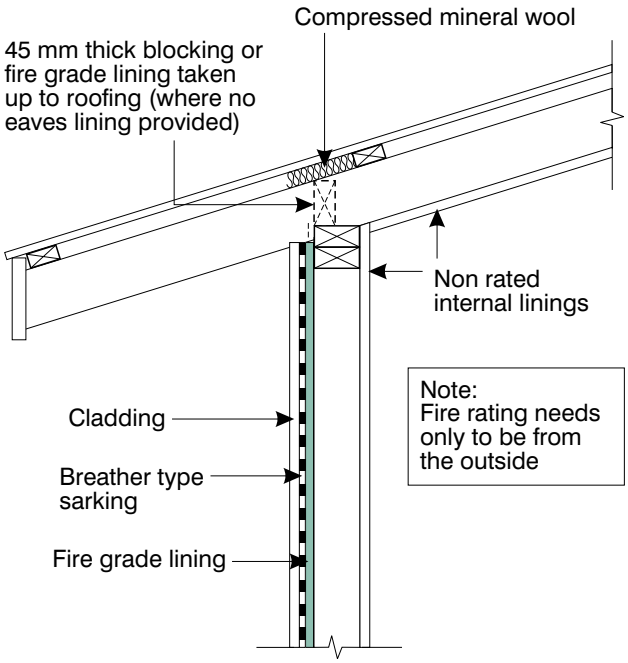


FIGURE 28 - FIRE GRADE LINING OR BLOCKING CONTINUED UP TO ROOF

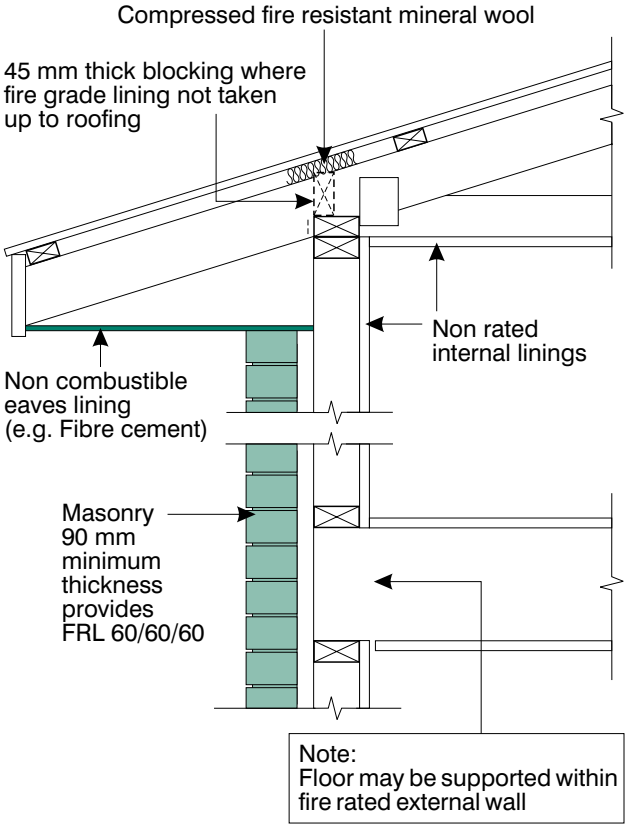


FIGURE 29 - FIRE RATED WALL (MASONRY OR FIRE GRADE LINING) TO NON-COMBUSTIBLE EAVES LINING

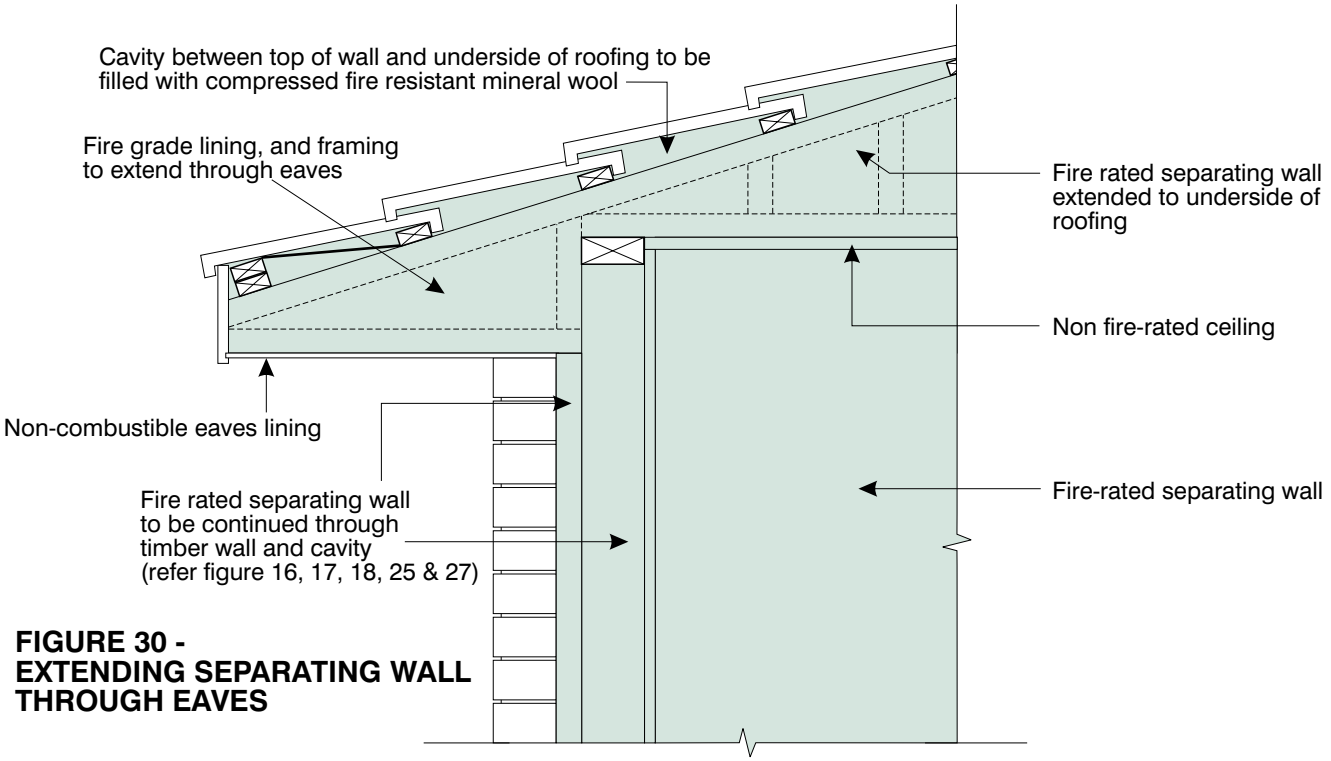


FIGURE 30 - EXTENDING SEPARATING WALL THROUGH EAVES

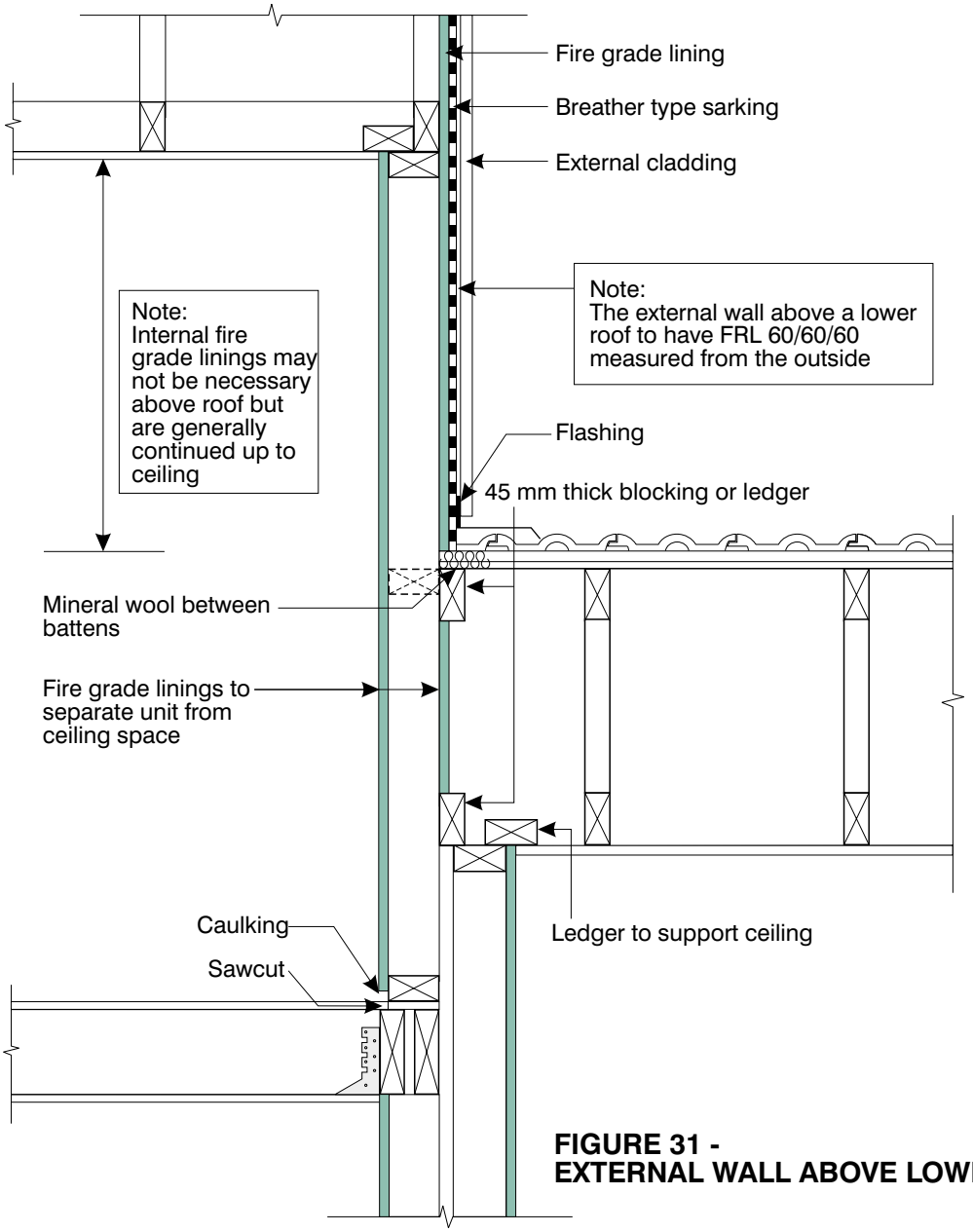


FIGURE 31 - EXTERNAL WALL ABOVE LOWER ROOF

7.6 Plumbing and Electrical Services

The installation of plumbing or electrical services in separating walls have the potential to reduce the fire resistance and sound performance. Where possible these services should not be located within fire resistant walls (ie. placed in adjoining partitions, ducts, or over the face of fire grade linings (behind battened out false wall).

NOTE: Where plumbing services are required on noise sensitive walls, it is recommended that a false wall be built in front of the fire and sound-rated wall and the plumbing be placed into this false wall.

Where services within separating walls cannot be avoided, the integrity of the wall must be maintained for both fire resistance and sound insulation. The following practices should be adopted:-

(a) All holes, gaps or other irregularities associated with penetrations through fire-rated elements must be sealed or must seal during a fire.

(b) Plumbing fittings and/or electrical outlets should preferably not be back to back (ie. penetrate only one face between two studs).

(c) Electrical outlets which are back to back, should have either fire rated boxes (with intumescent backing) or be installed with 16 mm thick fire grade plasterboard baffle extending 300 mm above and below fittings (refer Figure 32).

(d) Back to back plumbing penetrations should be separated by a 16 mm fire grade plasterboard baffle extending 300 mm above and 300 mm below penetration. 50 mm thick acoustic insulation should also be installed (refer Figure 33).

(e) Penetrations for services should be kept a minimum of 50 mm from studs.

(f) Pipes must not be fixed to linings.

(g) Pipes should be supported off battens between studs or kept clear of studs with resilient mounts).

(h) Baths, shower bases, sinks, basins must not be recessed into fire rated walls. Fire grade linings must be continuous behind fixtures (refer Figure 34).

NOTE: Plastic pipes and fittings generally have better sound performance than metal.

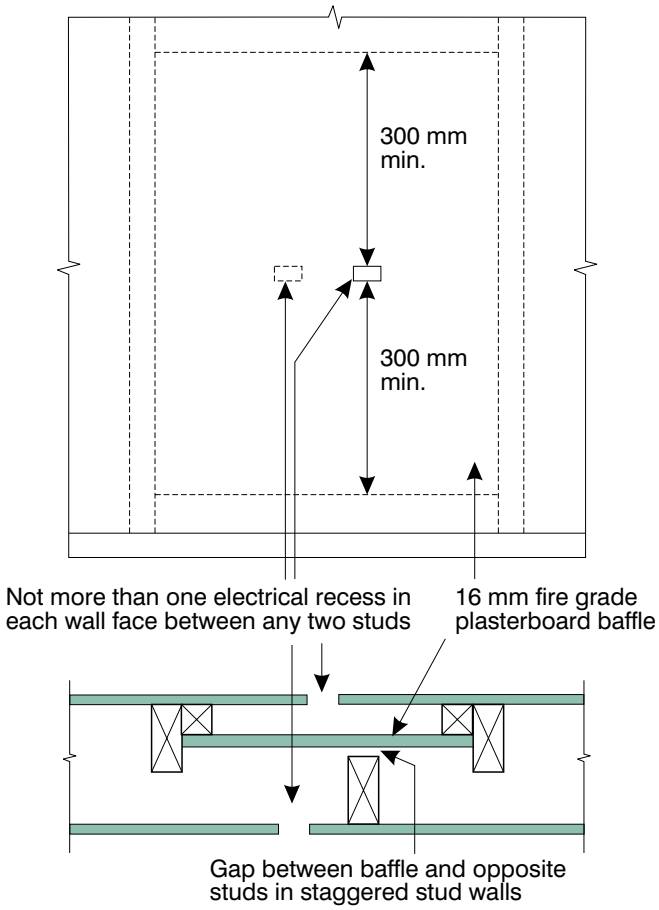
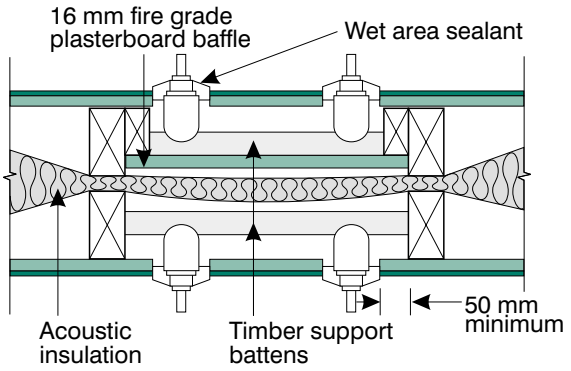


FIGURE 32 - BAFFLE BETWEEN ELECTRICAL OUTLETS OR SWITCHES



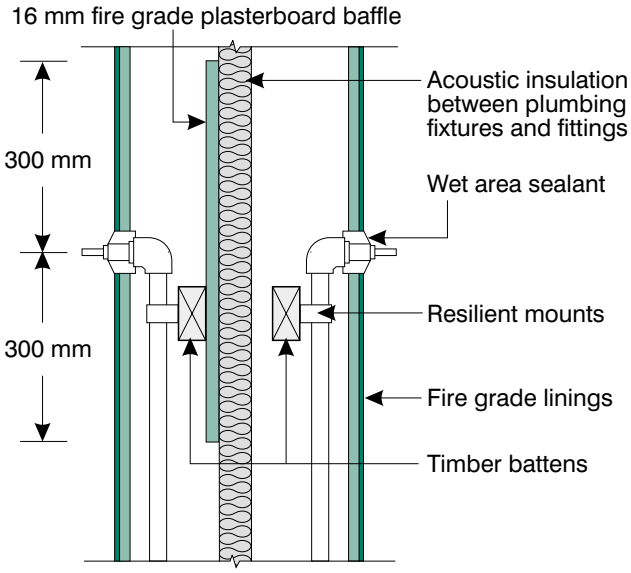
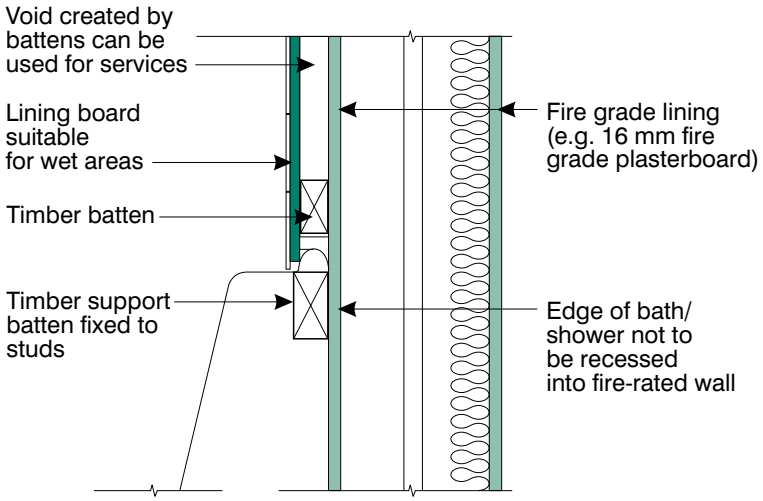
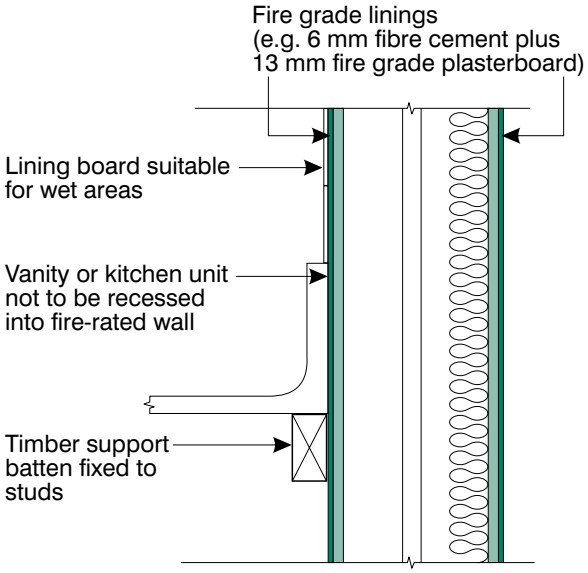


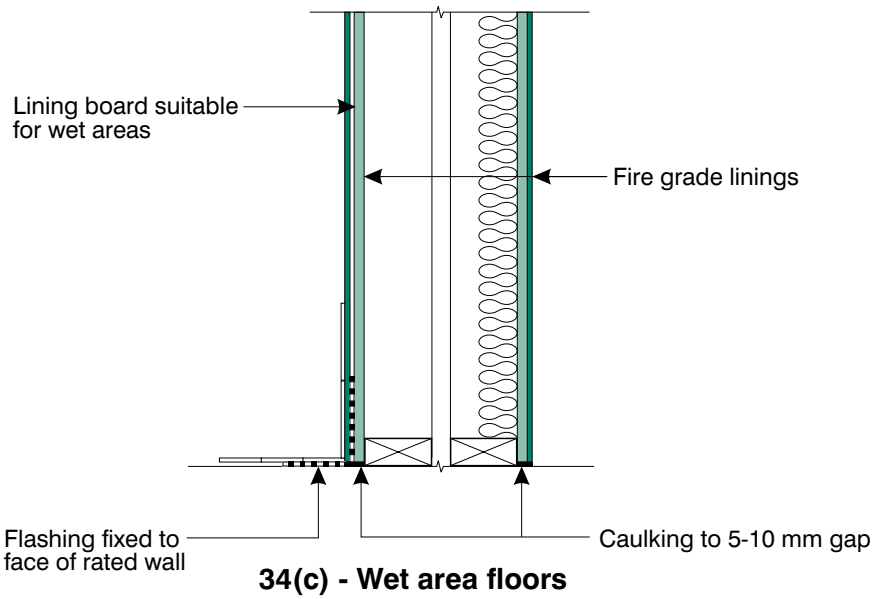
FIGURE 33 - BAFFLE AND INSULATION BETWEEN PLUMBING OUTLETS



34(a) - Edge of bath



34(b) - Vanity or kitchen bench

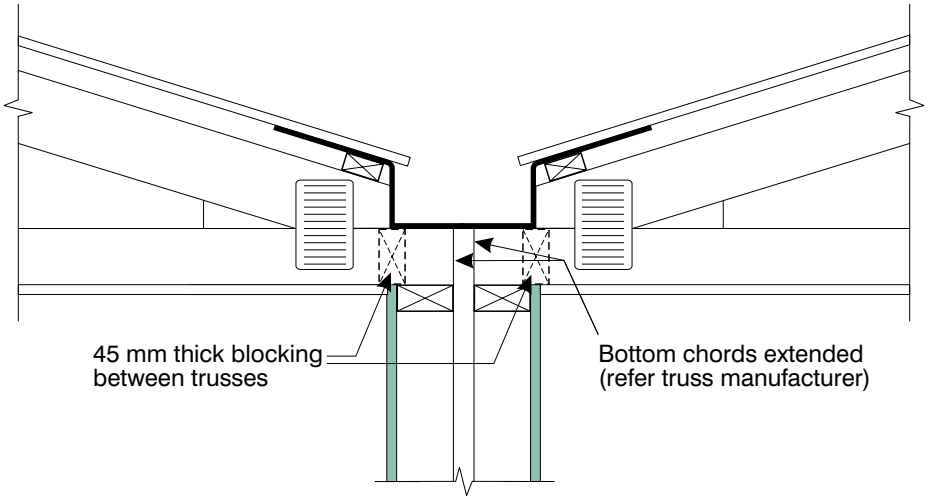


34(c) - Wet area floors

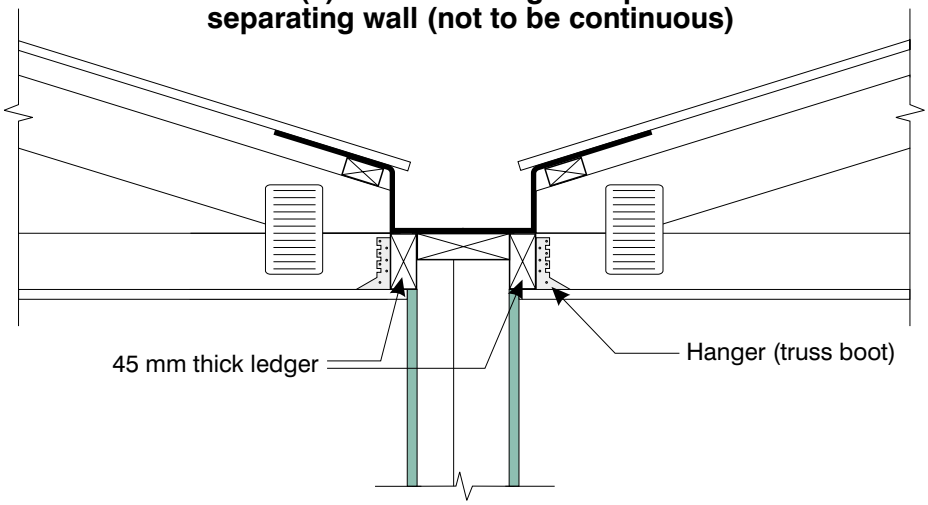
FIGURE 34 - WET AREA INSTALLATION

7.7 Boxed Gutters

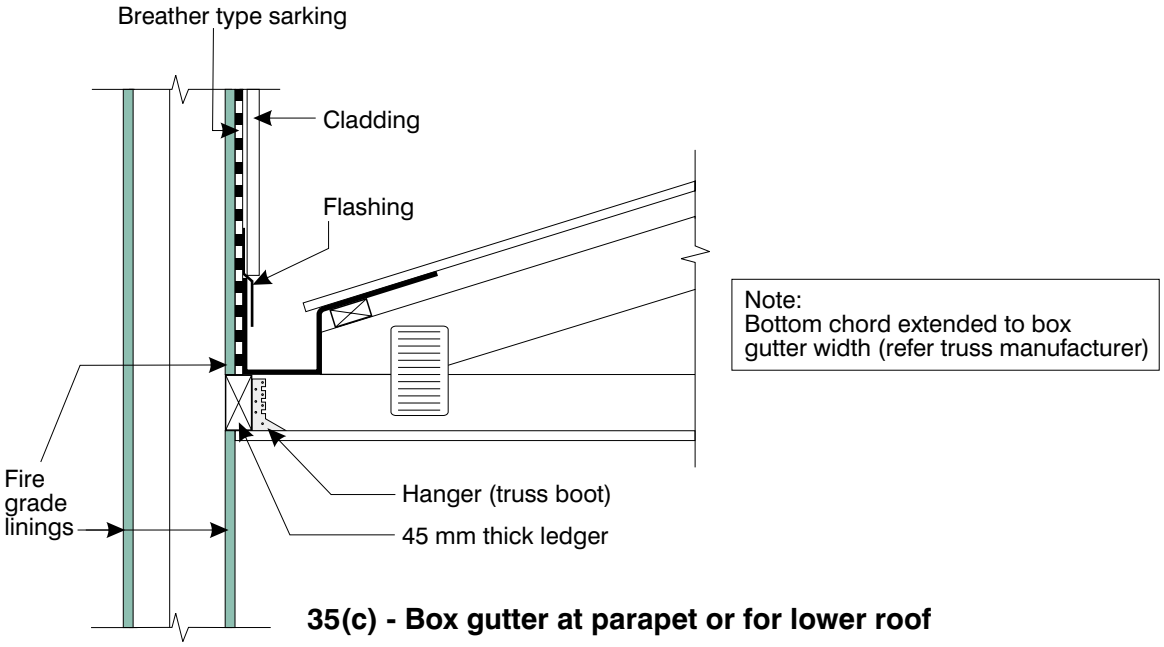
Figure 35 shows typical details for boxed gutters at separating walls.



35(a) - Roof framing on top of separating wall (not to be continuous)



35(b) - Roof framing supported off hangers and ledgers



35(c) - Box gutter at parapet or for lower roof

FIGURE 35 - BOX GUTTERS

8 FIXINGS OF LININGS

To achieve FRL 60/60/60 in separating walls the following fire grade linings and required:-

(a) **Loadbearing Walls**
- 1 x 16 mm fire grade plasterboard to both faces or
- 1 x 13 mm fire grade plasterboard plus 1 x 6 mm fibre cement to both faces (either sheet fixed first)

(b) **Non-Loadbearing Walls**
- 1 x 13 mm fire grade plasterboard to both faces (or either of the loadbearing options).

Different lining manufacturers have different requirements for nail sizes and spacings. Linings must be installed strictly in accordance with manufacturer's instructions.

Internal and external corner junctions must be arranged to provide support to both lining boards. Additional studs or noggings may be required.

All vertical butt joints shall be on studs with joints staggered. (ie. sheets on same face as well as sheets on the opposite face must not have vertical joints on the same stud).

NOTE: Staggered nogging may be used for dual layer systems, or where single layers are fixed vertically with no horizontal joints.

Where multiple layer linings are used, horizontal and vertical joints shall be staggered. Sheets can be fixed horizontally, vertically or a mixture of both. The fibre cement sheets may be either the first or second layer.

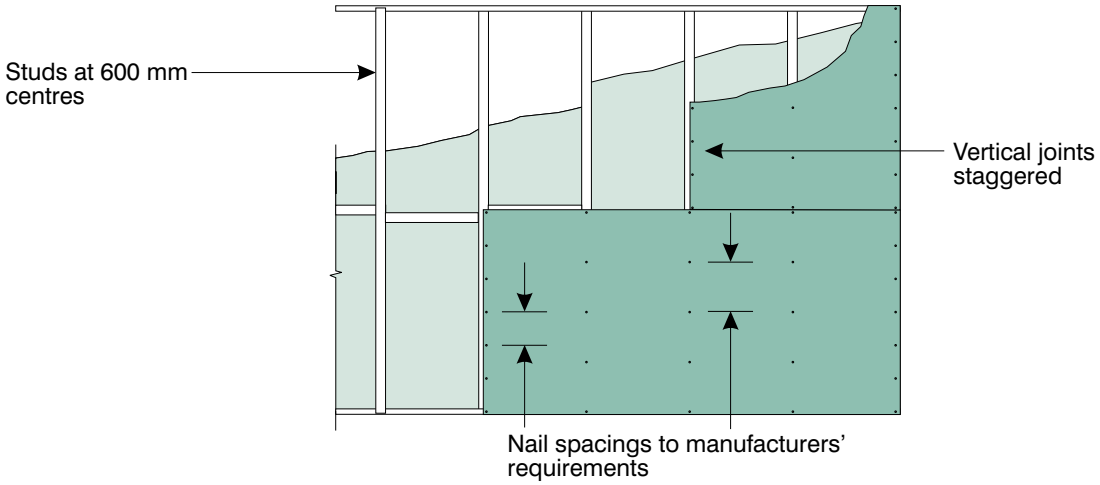
NOTE: In FRL 60/60/60 systems fibre cement sheets may be either first or second layer.

At internal wall junctions and at intersections between separating walls and ceilings, any gaps between linings shall be sealed with flexible fire resistant sealer.

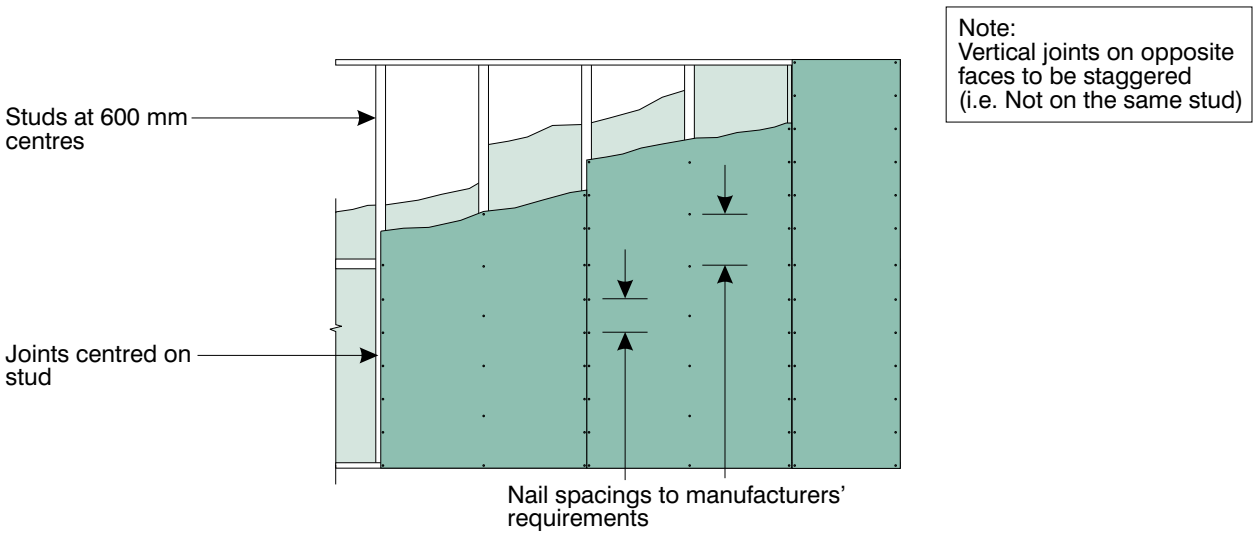
NOTE: (Refer Figure 4 for the use of timber blocking and Figure 5 for strengthening of joints with either intumescent putty, plasterer's angle or continuous linings.

A gap of between 5 and 10 mm shall be kept at the bottom of fire grade linings at floor level. Gap to be caulked with a fire resistant sealer.

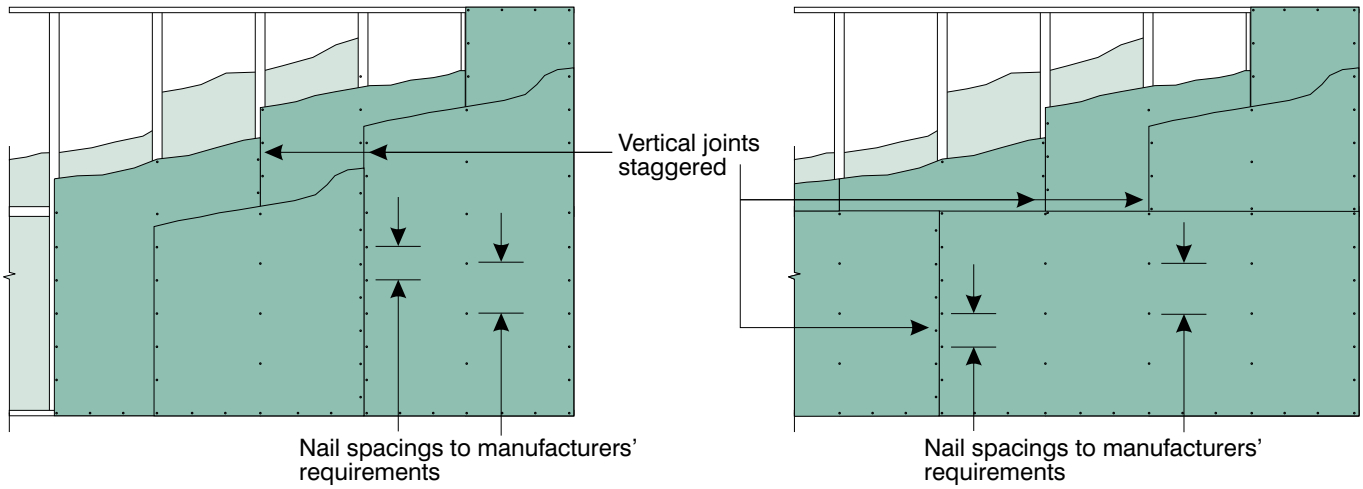
NOTE: Caulking should generally be flexible to allow for timber movement. Non-flexible caulking (eg. Vermiculite plaster) may be used to seal gaps between lining and concrete floors where seasoned framing is used.



36(a) - Single layer fire grade plasterboard fixed horizontally



36(b) - Single layer fire grade plasterboard fixed vertically



36(c) - Fibre cement in conjunction with fire grade plasterboard

FIGURE 36 - FIXING OF LININGS

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