FIRE AND SOUND RESISTANCE OF BLOCK MASONRY

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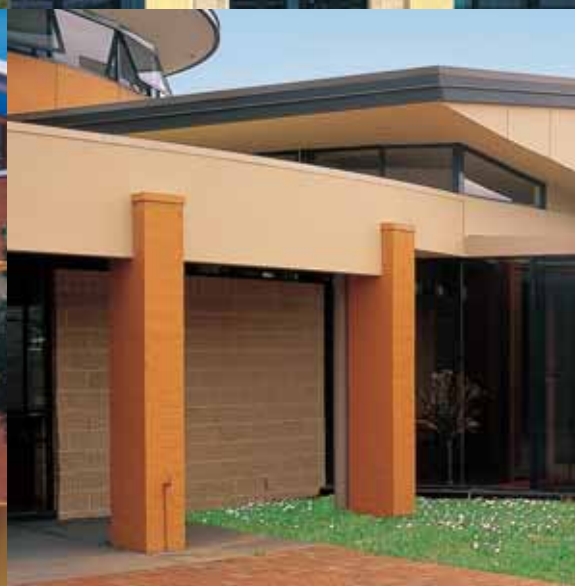

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Because of the complexity of the tables in this manual, Austral Bricks recommends working from a printed copy.

This brochure is intended as a guide for the design of walls requiring fire resistance using Besser masonry units.

The properties for units in this brochure are specific to Besser products manufactured in Victoria by Austral Bricks and do not apply to products of other manufacturers.

REQUIREMENTS OF BCA AND AS 3700

The Building Code of Australia (BCA), requires that walls be designed in accordance with Section 7 of AS 3700, SAA Masonry Code, to provide the required fire resistance in buildings. The Fire Resistance Levels (FRLs) required by the BCA for walls is summarised in Table 1.

They are given in the form of three numbers e.g., 180/120/90, which represent in turn, the required FRL (in minutes) for Structural Adequacy/Integrity/Insulation.

Reference should be made to the BCA for such matters as Compartmentation and Separation (C2), Protection of Openings (C3), Fire Fighting Equipment (E1) and Smoke Control (E2).

STRUCTURAL ADEQUACY (Ability to remain stable)

To achieve the required FRL for structural adequacy the height of the wall is limited. This limit varies according to the type of support given to the top and ends of the wall. This brochure gives the height limits for:-

(i) walls carrying a concrete floor slab;

(ii) walls carrying timber floors or roofs;

(iii) non-loadbearing walls supported at the top; all both with and without end supports;

(iv) walls with no top support;

The slenderness ratios given in Table 7.1 of the Masonry Code do not take into account any effect of applied finishes or the filling of cores with grout.

INTEGRITY (Ability to resist the passage of flames and hot gases)

Design for integrity in this brochure is based on Clause 7.5.2 of AS 3700 which deems that the FRL for integrity will be met if the wall meets that value for insulation and structural adequacy.

INSULATION (Ability to limit the passage of heat)

To achieve the required FRL for insulation a minimum “material thickness” must be provided by the wall. For solid and cored masonry units, the “material thickness” is taken as the actual thickness. The actual thickness is also used for hollow units in which all cores are filled with grout. For hollow units which are unfilled or partly filled the “material thickness” is the volume of the unit divided by its face area, commonly referred to as the “equivalent thickness”. If the wall is cement rendered on both sides, the thickness of the thinner coating up to a maximum value of 20 mm may be added to the material thickness of the wall.

CAVITY WALLS

For the design of cavity walls some specific rules are given in AS 3700. For integrity and insulation the material thickness of both leaves is added together and the cavity ignored to give the “material thickness”. However, for structural adequacy where only one leaf is loadbearing, then the FRL for structural adequacy is based on the loaded leaf alone and the non loaded leaf ignored. If both leaves are loaded or both leaves are non-load bearing then the thickness for structural adequacy is based on two-thirds of the sum of the thickness of the two leaves.

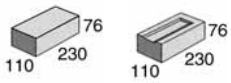
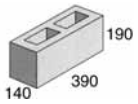
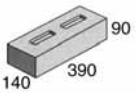
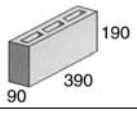
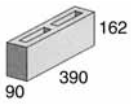
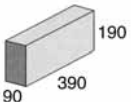
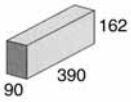
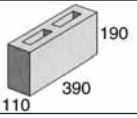
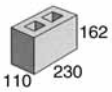
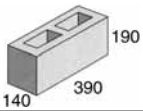
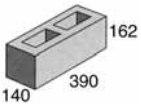
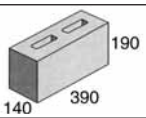
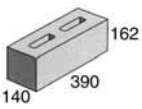
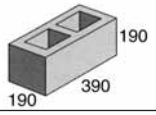
ROBUSTNESS

The height limits of walls when determined by design for robustness are in some cases less than those determined by design for fire resistance. These cases are indicated by shading in the design tables.

CONTROL JOINTS IN FIRE RESISTANT WALLS

Some guidance on control joints and suitable sealing products is provided at the end of this brochure.

TABLE 1 PROPERTIES OF BESSER MASONRY UNITS

Aggregate type	Unit code	Dimensions	Unit type	Material thickness (mm)	FRL for Insulation & Integrity (min)		Maximum slenderness ratio FRL for Structural Adequacy (min)				
					Not Grouted	Fully Grouted	60	90	120	180	240
Basalt	Brick		Solid	110	90*	NA	22.5	21	20	18	17
	15.01		Hollow	85	60	120†					
	15.83		Solid	140	120†	NA					
Scoria	10.01s		Cored	90	90	NA	25	25	25	25	16.1
	10.201s										
	10.31s		Solid								
	10.231s										
	12.801s		Cored	110	120	NA					
	Quick-Brick										
	15.01s		Hollow	85	90	120†					
	15.201s										
	15.801s		Cored	140	240	NA					
	15.301s										
	15.83s		Solid								
	20.01s		Hollow	101	120	240					

* 120 minutes with 12mm cement render on both sides
† 180 minutes with 12mm cement render on both sides
Note: The values given for the FRL for Scoria Aggregate units are based on sponsored tests carried out at NBTC on behalf of Besser Masonry Victoria and calculated in accordance with Section 7 of AS 3700.

STEP 1 – ESTABLISH REQUIREMENTS

Establish the required Fire Resistance Level (FRL) for the wall.

Where the required FRL does not include a value for structural adequacy e.g., -/60/30, Clause 7.5 of AS 3700 requires that the wall have a FRL of -/60/30, the wall must be designed for 60/60/30.

Table 2 provides a summary of the BCA requirements.

STEP 2 – CHECK FRL FOR INTEGRITY AND INSULATION

Establish the minimum wall type to satisfy the requirement FRL for Integrity and Insulation i.e., the last two values of the FRL. As the required FRL for Insulation is never required to be greater than the FRL for Integrity, both Insulation and Integrity are checked for the Integrity requirement e.g., for an FRL 180/120/90 both Integrity and Insulation would be checked for 120 minutes.

Table 3A provides value and integrity and insulation for single leaf walls and Table 3B for cavity walls.

STEP 3 – DESIGN WALL FOR SOUND RESISTANCE

If the wall is also required to provide sound resistance, then it will be necessary to select a wall which provides both the designated sound resistance (from Table 3C).

STEP 4 – DESIGN WALL FOR FRL FOR STRUCTURAL ADEQUACY

Check that the proportions of the wall together with the variations support conditions and/or reinforcement are such as the requirement FRL for structural adequacy is achieved.

STEP 4A

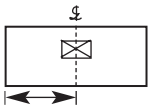
For a wall supported only at the top, check whether the permitted height exceeds the actual wall height using Table 4A for cavity walls. If the actual wall height does not exceed the permissible heights, then the chosen wall type will be satisfactory and no further steps need to be taken. If the wall is higher than the permissible height then additional supports or other means of stiffening need to be considered.

STEP 4B

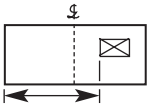
The permissible height of a wall increases when end supports are provided and the wall acts as a "panel". For walls with end supports the permissible height can be found in Table 5A for single leaf walls and Table 5B for cavity walls. If the actual wall height does not exceed the permissible heights, then the chosen wall type will be satisfactory and no further steps need to be taken. If the wall is still higher than permissible and no additional supports can be provided, then the wall will need to be either reinforced or made thicker.

For walls with openings, no design rules are available. For panels supported at both ends, a suggested method of evaluating FRL is by using an equivalent panel size of:-

(a) if the centre line of the panel intersects the opening:- the panel length.



(b) if the opening is offset to one end of the panel:- the longest length to the ends of the opening, assuming a free edge at the opening.



STEP 4C

The permissible height and length of a wall increases when either partially reinforced with vertically reinforced cores or with horizontally reinforced bond beams or in the ultimate case, when reinforced as a panel in both directions. For reinforced walls the permissible dimensions can be obtained from Tables 6A, 6B and 6C.

STEP 4D

If the permissible dimensions are still not sufficient, then choose a thicker wall and return to Step 4A.

CONTROL JOINTS IN FIRE RESISTANT WALLS

Clause C3.16 of the BCA states:-

"Construction joints, space and the like in and between building elements separating fire compartments must be suitably protected to maintain the fire resisting performance of the element concerned."

There are many companies producing a range of sealing products suitable. Three have supplied detailed technical data. They are:-

1. "Pyropanel 201FSR", a two part polyurethane fire rated sealant. "Intumex Mw" a fire prevention waterbased mastic and "Intumex S", a fire prevention silicone. These products have test reports giving integrity and insulation in excess of 120 minutes for joints up to 54mm wide. They are being distributed through major plumbing outlets, but if not locally available can be purchased by contacting Firemax in Brisbane who can arrange delivery.
2. Fire Research Pty Ltd "Fyrejoint" is a one part gunable acrylic compound. The product has been tested to give it up to four hours Fire Rating. The product is manufactured by Wormald. Sales and supplies are handled by the Brisbane office of Grinnel Corporation Supply Sales.
3. The Fire Stop System. The sealants 2000 and 790 are silicone based products. They are gunable and claim to have fire ratings for one to four hours with joints up to 30mm wide. The products are manufactured by Dow Corning and distributed through their Brisbane office.

THIS TABLE CONTINUES ON THE FOLLOWING PAGE

TABLE 2 – FRL REQUIREMENTS FOR WALLS AS

BUILDING CLASSIFICATION

CLASS 1: one or more buildings which in association constitute:

(a) Class 1a – a single dwelling being –

(i) a detached house; or

(ii) 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 300m² 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*.

CLASS 2: a building containing 2 or more sole-occupancy units each being a separate dwelling.

CLASS 3: a residential building, 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, including:

(a) a boarding-house, guest house, hostel, lodging-house or backpackers accommodation; or

(b) a residential part of an hotel or motel; or

(c) a residential part of a *school*; or

(d) accommodation for the aged, disabled or children;

(e) a residential part of a *health-care building* which accommodates members of staff.

CLASS 4: a dwelling in a building that is Class 5, 6, 7, 8 or 9 if it is the only dwelling in the building.

CLASS 5: an office building used for professional or commercial purposes, excluding buildings of Class 6, 7, 8 or 9.

CLASS OF BUILDING			NUMBER OF STOREYS (SEE NOTE 2)			
Class 1 (see spec CI:9 of BCA for Class 10a requirements)			any	-	-	-
Classes 2, 3, & 4 Part			-	1	2	3 or more
Class 5			-	-	-	-
Class 6			-	-	-	-
Class 7 (except car parks) and 8			-	-	-	-
Class 7 Car Parks			-	-	-	-
Class 9			-	-	-	-
TYPE OF CONSTRUCTION			**BCA SPEC C1.9**	**C**	**B**	**A**
EXTERNAL loadbearing walls	Distance from fire source feature (see note 1)	Less than 1.5 m	See Note 3	90/90/90	90/90/90	90/90/90
		1.5 m to less than 3 m		-/-/-	90/60/30	90/60/60
		3 m to less than 9 m			90/30/30	90/60/30
		9 m to less than 18 m			90/30/-	90/60/30
		18 m or more				90/60/30
EXTERNAL non-loadbearing walls	Distance from fire source feature (see Note 1)	Less than 1.5 m	See Note 3	90/90/90	-/90/90	-/90/90
		1.5 to less than 3 m		-/-/-	-/60/30	-/60/60
		3m or more			-/-/-	-/-/-
Common walls and fire walls (and separating walls in Class 1)			60/60/60	90/90/90	90/90/90	90/90/90
INTERNAL WALLS	Fire-resisting lift shafts	LB			90/90/90	90/90/90
		NLB				-/90/90
	Fire-resisting stair shafts	LB		60/60/60	90/90/90	90/90/90
		NLB		60/60/60	-/90/90	-/90/90
	Between or bounding sole occupancy units, bounding public corridors, public hallways and the like	LB		60/60/60	60/60/60	90/90/90
		NLB		60/60/60	-/60/60	-/60/60
	Ventilating pipe, garbage and like shafts not used for the discharge of hot products of combustion	LB				90/90/90
		NLB				-/90/90
	Other loadbearing walls				60/-/-	90/-/-

NOTE 1

FIRE-SOURCE FEATURE MEANS –

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

(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.

2.1 EXPOSURE TO FIRE-SOURCE FEATURES

(a) A part of a building element is exposed to a *fire-source, feature* if any of the horizontal straight lines between that part and the *fire-source feature*, or vertical projection of the feature, is not obstructed by another part of the building that –

(i) has an FRL of not less than 30/-/-; and

(ii) is neither transparent nor translucent.

(b) A part of a building element is not exposed to a *fire-source feature* if the fire-source feature is:

(i) an *external wall* of another building that stands on the allotment and the part concerned is more than 15m above the highest part of that *external wall*; or

(ii) a side or rear boundary of the allotment and the part concerned is below the level of the finished ground at every relevant part of the boundary concerned.

(c) If various distances apply for different parts of the building element –

(i) the entire element must have the FRL applicable to that part having the least distance between itself and the relevant *fire-source feature*; or

(ii) each part of the element must have the FRL applicable according to its individual distance from the *relevant fire-source feature*.

but this provision does not override or permit any exemption from Clause 2.2

NOTE 2

C 1.2 CALCULATING OF RISE IN STOREYS

(a) The rise in storeys is the greatest number of storeys at any part of the external walls of the building –

(i) above the finished ground next to that part; or

(ii) if part of the external wall is on the boundary of the allotment, above the natural ground level at the relevant part of the boundary.

THIS TABLE CONTINUED FROM THE PREVIOUS PAGE

CONTAINED IN THE BUILDING CODE OF AUSTRALIA

CLASS 6: a shop or other building for the sale of goods by retail or the supply of services direct to the public including:-

(a) an eating room, café, restaurant, milk or soft-drink bar; or

(b) a dining room, bar, shop or kiosk part of a hotel or motel; or

(c) a hairdresser's or barber's shop, public laundry, or undertaker's establishment; or

(d) market or sale room, showroom or service station.

CLASS 7: a building which is:-

(a) a *public car park*; or

(b) for storage, or display of goods or produce for sale by wholesale.

CLASS 8: a laboratory, or a building in which a handicraft or process for the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, sale or gain.

CLASS 9: a building of a public nature:-

(a) Class 9a – a *health-care* building; including those parts of the building set aside as a laboratory; or

(b) Class 9b – an *assembly building*, including a trade workshop, laboratory or the like in a primary or secondary *school*, but excluding any other parts of the building that are of another Class.

CLASS 10: a non-habitable building or structure:-

(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.

NUMBER OF STOREYS (SEE NOTE 2)								
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	1 or 2	3	4 or more	-	-	-	-
-	-	1 or 2	-	-	3	4 or more	-	-
-	-	1 or 2	-	-	-	-	3	4 or more
1 or 2	3 or more	-	-	-	-	-	-	-
-	-	1	2	3 or more	-	-	-	-
C	**B (3 STOREYS) A (4 OR MORE)**	**C**	**B**	**A**	**B**	**A**	**B**	**A**
60/60/60	60/60/60	90/90/90	120/120/120	120/120/120	180/180/180	180/180/180	240/240/240	240/240/240
	60/60/60	60/60/60	120/90/60	120/90/90	180/120/90	180/180/120	240/180/120	240/240/180
			120/30/30	120/60/30	180/90/60	180/120/90	240/90/60	240/180/90
			120/30/-	120/60/30	180/60/-	180/120/90	240/60/-	240/180/90
				120/60/30		180/120/90		240/180/90
60/60/60	-/60/60	90/90/90	-/120/120	-/120/120	-/180/180	-/180/180	-/240/240	-/240/240
	-/60/60	60/60/60	-/90/60	-/90/90	-/120/90	-/180/120	-/180/120	-240/180
		-/-/-	-/-/-	-/-/-	-/-/-	-/-/-	-/-/-	-/-/-
	120/120/120	90/90/90	120/120/120	120/120/120	180/180/180	180/180/180	240/240/240	240/240/240
	120/120/120		120/120/120	120/120/120	180/120/120	180/120/120	240/120/120	240/120/120
	-/120/120			-/120/120		-/120/120		-/120/120
	120/120/120		120/120/120	120/120/120	180/120/120	180/120/120	240/120/120	240/120/120
	-/120/120		-/120/120	-/120/120	-/120/120	-/120/120	-/120/120	-/120/120
			120/-/-	120/-/-	180/-/-	180/-/-	240/-/-	240/-/-
			-/-/-	-/-/-	-/-/-	-/-/-	-/-/-	-/-/-
				120/90/90		180/120/120		240/120/120
				-/90/90		-/120/120		-/120/120
			120/-/-	120/-/-	180/-/-	180/-/-	240/-/-	240/-/-

(b) A *storey* is not counted if –

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

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

(c) In a building of Class 7 or 8, a *storey* that has an average internal height of more than 6m is counted as –

(a) one *storey* if it is the only storey above the ground; or

(ii) 2 *storeys* in any other case.

NOTE 3

2. EXTERNAL WALLS OF CLASS 1 BUILDINGS

An *external wall* of a Class 1 building, and any openings in that wall, must comply with Clause 4 if the wall is less than –

(a) 900mm from an allotment boundary other than the boundary adjoining a road alignment or other public space; or

(b) 1.8m from another building on the same allotment other than an appurtenant Class 10 building or a detached part of the same Class 1 building.

4. CONSTRUCTION OF EXTERNAL WALLS

(a) *External walls* (including gables) referred to in Clause 2 or 5 must extend to the underside of a *non-combustible* roof covering or *non-combustible* eaves lining and must –

(i) have an FRL of not less than 60/60/60; or

(ii) have an FRL of not less than 60/60/60 when tested from the outside; or

(iii) be of masonry or masonry-veneer construction in which the external masonry veneer is not less than 90mm thick.

(b) Openings in *external walls* referred to in Clause 2 or 5 must be protected by –

(i) non-openable fire windows or other construction with an FRL of not less than -/60/-; or

(ii) *self-closing* solid core doors not less than 35mm thick.

SOME OTHER REQUIREMENTS

2.2 FIRE PROTECTION FOR A SUPPORT OF ANOTHER PART

(a) A part of a building that gives direct vertical or lateral support to another part *required* to have an FRL must

  (i) Have an FRL in respect of *structural adequacy* that is the greater of:

    (A) that *required* for the part it supports, or

    (B) that *required* for the part itself; and

  (ii) be *non-combustible* if the part it supports is *required* to be *non-combustible*.

(b) The *requirements* of (a) for a *structural member* providing lateral support do not apply in respect of roofs in Type B and C construction, roofs complying with Clause 3.5 for Type A construction, and columns complying with Clause 2.5(a) and (b).

2.3 LINTELS

A lintel must have the FRL *required* for the part of the building in which it is situated unless it does not contribute to the support of a fire door, fire *window* or fire shutter, and –

(a) it spans an opening in:

  (i) a wall of a building containing only one *storey*; or

  (ii) a *non-loadbearing* wall of a Class 2 or 3 building; or

(b) it spans an opening in masonry which is not more than 150 mm thick and –

  (i) not more than 3 m wide if the masonry is *non-loadbearing* or

  (ii) not more than 1.8 m wide if the masonry is *loadbearing* and part of a solid wall or one of the leaves of a cavity wall.

SOME CONCESSIONS

C1.5 TWO STOREY CLASS 2 OR 3 BUILDINGS

A Class 2 or 3 building, or a mixture of these Classes, having a *rise in storeys* of 2, may be of Type C construction if each *sole-occupancy unit* has –

(a) access to at least 2 *exits*; or

(b) its own direct access to a road or *open space*

C1.7 OPEN SPECTATOR STANDS AND INDOOR SPORTS STADIUMS

(a) An *open spectator stand* or indoor sports stadium may be of Type C construction and need not comply with the other provisions of this Part if it contains not more than 1 tier of seating, is of *non combustible* construction, and has only changing rooms, sanitary facilities or the like below the tiered seating.

(b) In (a) one tier of seating means numerous rows of tiered seating incorporating cross-overs but within one viewing level.

3.8 OPEN SPECTATOR STANDS AND INDOOR SPORTS STADIUM: CONCESSION (IN TYPE A CONSTRUCTION)

In an *open spectator stand* or indoor sports stadium, the following building elements need not have the FRL specified:

(a) the roof if it is non-combustible.

(b) Columns and *loadbearing* walls supporting only the roof if they are *non-combustible*.

(c) Any *non-loadbearing* part of an *external wall* less than 3m –

  (i) from any *fire source feature* to which it is exposed if it has a FRL of not less than 60/60/60 and is non-combustible; or

  (ii) from an external wall of another open spectator stand if it is non-combustible.

2.6 MEZZANINE FLOORS: CONCESSION

(a) This clause does not apply to a Class 9b building that is a spectator stand or audience viewing area accommodating more than 100 persons as calculated according to D1.13.

(b) A mezzanine and its supports need not have an FRL or be *non-combustible* provided –

  (i) the total *floor area* of all the *mezzanines* in the same room does not exceed 1/3 the floor area of the room or 200m^2, whichever is the lesser; and

  (ii) the FRL of each wall and column that supports any other part of the building within 6m of the *mezzanine* is increased by the amount listed in Table 2.6.

TABLE 2.6

Increased FRLs – Construction Surrounding Mezzanines

Level otherwise required for any FRL criterion (mins)	Increase in level to (not less than)
30	60
60	90
90	120
120	180
180	240

The increase in level applies to each FRL criterion *(structural adequacy, integrity or insulation*) relevant to the building element concerned.

ROOF AND INTERNAL WALLS ON TOP FLOOR OF TYPE A CONSTRUCTION

3.5 ROOF: CONCESSION

A roof need not comply with Table 3 if its covering is *non-combustible* and the building –

(a) has a *sprinkler system* installed throughout;

(b) has a rise in storeys of 3 or less;

(c) is of Class 2 or 3; or

(d) has an *effective height* of not more than 25 m and the ceiling immediately below the roof has a *resistance* to the *incipient spread of fire* to the roof space of not less than 60 minutes.

3.7 INTERNAL COLUMNS AND WALLS: CONCESSION

For a building with an *effective height* of not more than 25 m and having a roof without an FRL in accordance with Clause 3.5, in the *storey* immediately below that roof, internal columns other than those referred to in Clause 3.1(f) and loadbearing *internal walls* other than *fire walls* may have –

(a) in a Class 2 or 3 building: FRL 60/60/60; or

(b) in a Class 5,6,7,8 or 9 building –

  (i) with rise in storeys exceeding 3: FRL 60/60/60

  (ii) with rise in storeys not exceeding 3: no FRL

ABBREVIATIONS

FRL = Fire resistance level – as required by the BCA

CR = 12 mm cement render on both sides

CF = with all cores filled with grout (not necessarily reinforced).

TABLE 3A
SINGLE LEAF WALLS SATISFYING FRL FOR INTEGRITY & INSULATION

Block thickness (mm)	Block type and finishes				
	FRL required (minutes)				
	60	90	120	180	240
190	20.01s	20.01s	20.01s	20.01s CF	20.01s CF
140	15.801s	15.801s	15.801s	15.801s	15.801s
	15.301s	15.301s	15.301s	15.301s	15.301s
	15.83s	15.83s	15.83s	15.83s	15.83s
	15.01s	15.01s	15.01s CF	15.01s CF CR	
	15.201s	15.201s	15.201s CF	15.201s CF CR	
	15.83	15.83	15.83	15.83 CR	
	15.01	15.01 CF	15.01 CF	15.01 CF CR	
110	12.801s	12.801s	12.801s		
	Quick-Brick	Quick-Brick	Quick-Brick		
	Brick	Brick	Brick CR		
90	10.01s	10.01s			
	10.201s	10.201s			
	10.31s	10.31s			
	10.231s	10.231s			

TABLE 3B
CAVITY WALLS SATISFYING FRL UP TO 240 MINS FOR INTEGRITY & INSULATION

Wall width (mm)	Block types	
	Internal leaf	External non-loaded leaf
300	15.01s	Brick (basalt or clay)
280	15.01s	10.01s
270	Quick-Brick or 12.801s	Brick (basalt or clay)
250	Quick-Brick or 12.801s	10.01s
250	10.01s or 10.201s or 10.231s	Brick (basalt or clay)
230	10.01s or 10.201s or 10.231s	10.01s

TABLE 3C
SOUND RESISTANCE PROPERTIES

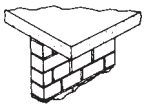
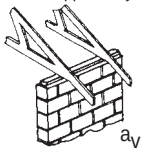
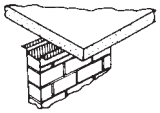
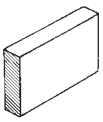
Block type & finishes	STC (Sound Transmission Class)
All cavity walls	50+ impact resistance
15.01 CF PLB1	
15.83 PLB1	
15.83	50
15.01 CF	
Brick – 15.301S, 15.801S	45

NOTES:

1. PLB1 = With 10 mm plasterboard glued or 12mm render applied on either OR both sides.
2. Sound Impact Resistance is defined in BCA Clause F5.5
3. Sound Resistance values for walls in this table, other than for brick and cavity walls are based on reports from registered testing authorities and are only applicable to Besser products manufactured by Austral Bricks. Values for brick & cavity walls are deemed-to-apply from the BCA.

PERMISSIBLE HEIGHTS FOR WALLS WITH NO END SUPPORTS

TABLE 4A – SINGLE LEAF WALLS

Wall Width (mm)	Block Types	Supporting a concrete slab which provides both lateral and rotational restraint  a_v = 0.75					Supporting a light roof or light floor which provides lateral support only  Not supporting any load but is laterally supported by some means at top  a_v = 0.85					Not supported at top  a_v = 2.00				
		Required FRL for Structural Adequacy					Required FRL for Structural Adequacy					Required FRL for Structural Adequacy				
		60	90	120	180	240	60	90	120	180	240	60	90	120	180	240
190	20.01s	6333	6333	6333	6333	4079	5588	5588	5588	5588	3599	1900	1900	1900	1900	1530
140	15.01s 15.201s 15.801s 15.301s 15.81s	4667	4667	4667	4667	3005	4118	4118	4118	4118	2652	1400	1400	1400	1400	1127
	15.01 15.83	4200	3920	3733	3360	3173	3706	3459	3294	2965	2800	1400	1400	1400	1260	1190
110	12.801s Quick-Brick	3667	3667	3667	3667	2361	3235	3235	3235	3235	2084	1100	1100	1100	1100	885
	Brick	3300	3080	2933	2640	2493	2912	2718	2588	2329	2200	1100	1100	1100	990	935
90	10.01s 10.201s 10.31s 10.231s	3000	3000	3000	3000	1932	2647	2647	2647	2647	1705	900	900	900	900	724

Values shaded are determined by robustness requirements

TABLE 4B – CAVITY WALLS

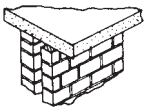
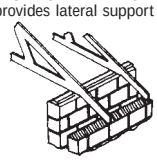
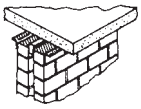
Wall width (mm)	Block Types		One leaf supporting a concrete slab which provides both lateral and rotational restraint  a_v = 0.75					Supporting a light roof or light floor which provides lateral support only  a_v = 0.85					Not supporting any load but is laterally supported by some means at top  av = 0.85				
	Internal leaf	External non-loaded leaf	Required FRL for Structural Adequacy					Required FRL for Structural Adequacy					Required FRL for Structural Adequacy				
			60	90	120	180	240	60	90	120	180	240	60	90	120	180	240
300	15.01s	Brick (basalt or clay)	4667	4667	4667	4667	3005	4118	4118	4118	4118	2652	4412	4118	3922	3529	3333
280	15.01s	10.01s	4667	4667	4667	4667	3005	4118	4118	4118	4118	2652	4510	4510	4510	4510	2904
270	Quick-Brick or 12.801s	Brick (basalt or clay)	3667	3667	3667	3667	2361	3235	3235	3235	3235	2084	3882	3624	3451	3106	2933
250	Quick-Brick or 12.801s	10.01s	3667	3667	3667	3667	2361	3235	3235	3235	3235	2084	3922	3922	3922	3922	2525
250	10.01s or 10.021s or 10.231s	Brick (Basalt or Clay)	3000	3000	3000	3000	1932	2647	2647	2647	2647	1705	3529	3294	3137	2824	2525
230	10.01s or 10.201s or 10.231s	10.01s	3000	3000	3000	3000	1932	2647	2647	2647	2647	1705	3529	3529	3529	3529	2273

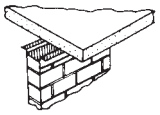
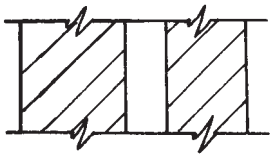
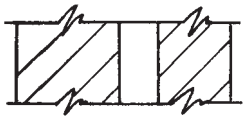
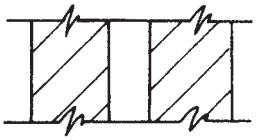
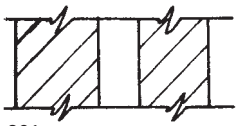
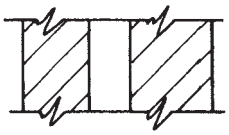
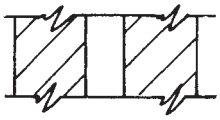
TABLE 5A - MAXIMUM PANEL SIZES OF SINGLE LEAF WALLS

Wall Width (mm)	Block Types	Loading and Top Restraint / End Supports		Supporting a concrete slab which provides both lateral and rotational restraint $a_v = 0.75$					Supporting a light roof or light floor which provides lateral support only $a_v = 0.85$				Not supporting any load but is laterally supported by some means $a_v = 0.85$	
				Maximum Wall Height (mm)					Maximum Wall Height (mm)					
		Length between supports (cross walls or columns) $a_h = 1.0$	Length from support to free end $a_h = 2.0$	Required Fire Resistance Level for Structural Adequacy (minutes)					Required Fire Resistance Level for Structural Adequacy (minutes)					
				60	90	120	180	240	60	90	120	180	240	
190	20.01s	9500	4750	6333	6333	6333	6333	4079	5588	5588	5588	5588	3599	
		9000	4500	7000	7000	7000	7000	4079	6176	6176	6176	6176	3599	
		8000	4000	8333	8333	8333	8333	4079	7353	7353	7353	7353	3599	
		7000	3500	9667	9667	9667	9667	4079	8529	8529	8529	8529	3599	
		6118	3059	10843	10843	10843	10843	4079	9567	9567	9567	9567	3599	
		6000	3000	11000	11000	11000	11000	4236	9706	9706	9706	9706	3738	
		5000	2500	12333	12333	12333	12333	5569	10882	10882	10882	10882	4914	
		4750	2375	12667	12667	12667	12667	5903	11176	11176	11176	11176	5208	
		4000	2000	NL	NL	NL	NL	6903	NL	NL	NL	NL	6091	
		3059	1530	NL	NL	NL	NL	8157	NL	NL	NL	NL	7198	
140	15.01s 15.201s 15.801s 15.301s 15.83s	7000	3500	4667	4667	4667	4667	3005	4118	4118	4118	4118	2652	
		6000	3000	6000	6000	6000	6000	3005	5294	5294	5294	5294	2652	
		5000	2500	7333	7333	7333	7333	3005	6471	6471	6471	6471	2652	
		4508	2254	7989	7989	7989	7989	3005	7049	7049	7049	7049	2652	
		4000	2000	8667	8667	8667	8667	3683	7647	7647	7647	7647	3249	
		3500	1750	9333	9333	9333	9333	4349	8235	8235	8235	8235	3838	
		2254	1127	NL	NL	NL	NL	6011	NL	NL	NL	NL	5304	
	15.01 15.83	6300	3150	4200	3920	3733	3360	3173	3706	3459	3294	2965	2800	
		5880	2940	4760	3920	3733	3360	3173	4200	3459	3294	2965	2800	
		5600	2800	5133	4293	3733	3360	3173	4529	3788	3294	2965	2800	
		5040	2520	5880	5040	4480	3360	3173	5188	4447	3953	2965	2800	
		4760	2380	6253	5413	4853	3733	3173	5518	4776	4282	3294	2800	
		4500	2250	6600	5760	5200	4080	3520	5824	5082	4588	3600	3106	
		4200	2100	7000	6160	5600	4480	3920	6176	5435	4941	3953	3459	
		3600	1800	7800	6960	6400	5280	4720	6882	6141	5647	4659	4165	
		3300	1650	8200	7360	6800	5680	5120	7235	6494	6000	5012	4518	
		3150	1575	8400	7560	7000	5880	5320	7412	6671	6176	5188	4694	
		2940	1470	NL	7840	7280	6160	5600	NL	6918	6424	5435	4941	
		2800	1400	NL	NL	7467	6347	5787	NL	NL	6588	5600	5106	
		2520	1260	NL	NL	NL	6720	6160	NL	NL	NL	5929	5435	
		2380	1190	NL	NL	NL	NL	6347	NL	NL	NL	NL	5560	
110	12.801s Quick-Brick	5500	2750	3667	3667	3667	3667	2361	3235	3235	3235	3235	2084	
		5000	2500	4333	4333	4333	4333	2361	3824	3824	3824	3824	2084	
		4000	2000	5667	5667	5667	5667	2361	5000	5000	5000	5000	2084	
		3542	1771	6277	6277	6277	6277	2361	5539	5539	5539	5539	2084	
		3000	1500	7000	7000	7000	7000	3084	6176	6176	6176	6176	2721	
		2750	1375	7333	7333	7333	7333	3417	6471	6471	6471	6471	3015	
		1771	885	NL	NL	NL	NL	4723	NL	NL	NL	NL	4167	
	Brick	4950	2475	3300	3080	2933	2640	2493	2912	2718	2588	2329	2200	
		4620	2310	3740	3080	2933	2640	2493	3300	2718	2588	2329	2200	
		4400	2200	4033	3373	2933	2640	2493	3559	2976	2588	2329	2200	
		3960	1980	4620	3960	3520	2640	2493	4076	3494	3106	2329	2200	
		3740	1870	4913	4253	3813	2933	2493	4335	3753	3365	2588	2200	
		3600	1800	5100	4440	4000	3120	2680	4500	3918	3529	2753	2365	
		3300	1650	5500	4840	4400	3520	3080	4853	4271	3882	3106	2718	
		3000	1500	5900	5240	4800	3920	3480	5206	4624	4235	3459	3071	
		2700	1350	6300	5640	5200	4320	3880	5559	4976	4588	3812	3424	
		2475	1238	6600	5940	5500	4620	4180	5824	5241	4853	4076	3688	
		2310	1155	NL	6160	5720	4840	4400	NL	5435	5047	4271	3882	
		2200	1100	NL	NL	5867	4987	4547	NL	NL	5176	4400	4012	
		1980	990	NL	NL	NL	5280	4840	NL	NL	NL	4659	4271	
		1870	935	NL	NL	NL	NL	4987	NL	NL	NL	NL	4400	
90	10.01s 10.31s 10.231s 10.201s	4500	2250	3000	3000	3000	3000	1932	2647	2647	2647	2647	1705	
		4000	2000	3667	3667	3667	3667	1932	3235	3235	3235	3235	1705	
		3000	1500	5000	5000	5000	5000	1932	4412	4412	4412	4412	1705	
		2898	1449	5136	5136	5136	5136	1932	4532	4532	4532	4532	1705	
		2250	1125	6000	6000	6000	6000	2796	5294	5294	5294	5294	2467	
		1449	724	NL	NL	NL	NL	3864	NL	NL	NL	NL	3409	

Notes:

1. When there is no end support or the length between supports is greater than shown in the table, then the height of the wall is limited to the values along the top line.
2. When the length of the wall is less than shown in the table then there is no limit (NL) to the height of the wall.
3. Linear interpolation may be used between the values given in the table.
4. Heights less than the normal 2400 mm minimum floor-to-ceiling height have been shown for completeness.

TABLE 5B - MAXIMUM PANEL SIZES OF NON LOAD-BEARING CAVITY WALLS

Wall width (mm)	Cavity wall Block combinations	Panel length (mm)		Height to top support (mm)				
		Length between End (cross walls) or columns)	Length from Support to Free end	Not supporting any load but is laterally supported by some means at top 				
				Required FRL for Structural Adequacy (minutes)				
		a_h = 1.0	a_h=2.0	60	90	120	180	240
300	 15.01s Brick (basalt or clay)	7500	3750	4410	4110	3920	3520	3330
		7000	3500	5000	4110	3920	3520	3520
		6660	3330	5390	4510	3920	3520	3330
		6000	3000	6170	5290	4700	3520	3330
		5660	2830	6570	5680	5090	3920	3330
		3750	1875	8820	7940	7350	6170	5580
		3500	1750	NL	8230	7640	6470	5880
		3330	1665	NL	NL	7840	6660	6070
		3000	1500	NL	NL	NL	7050	6470
		2830	1415	NL	NL	NL	NL	6670
280	 15.01s + 10.01s	7660	3830	4509	4509	4509	4509	2904
		4940	2470	7717	7717	7717	7717	2904
		3830	1915	9019	9019	9019	9019	4207
		2470	1235	NL	NL	NL	NL	5805
	 Quick-Brick or 12.801s Brick (basalt or clay)	6600	3300	3882	3624	3451	3106	2933
		6160	3080	4400	3624	3451	3106	2933
		5867	2969	4745	3469	3451	3106	2933
		5280	2640	5435	4659	4141	3106	2933
		4987	2493	5780	5004	4486	3451	2933
		3300	1650	7765	6988	6471	5435	4918
		3080	1540	NL	7247	6729	5694	5176
		2933	1466	NL	NL	6902	5867	5349
		2640	1320	NL	NL	NL	6212	5694
		2493	1246	NL	NL	NL	NL	5867
	 Quick-Brick or 12.801s 10.01s	6660	3330	3920	3920	3920	3920	2525
		4292	2146	6715	6715	6715	6715	2525
		3330	1665	7840	7840	7840	7840	3658
		2146	1073	NL	NL	NL	NL	5049
250	 10.01s or 10.201s or 10.231s Brick (basalt or clay)	6000	3000	3529	3924	3137	2823	2666
		5600	2800	4000	3294	3137	2823	2666
		5333	2666	4313	3608	3137	2823	2666
		4800	2400	4940	4235	3764	2823	2666
		4533	2266	5254	4549	4078	3137	2666
		3000	1500	7059	6352	5882	4940	4470
		2800	1400	NL	6588	6117	5176	4705
		2666	1333	NL	NL	6274	5333	4862
		2400	1200	NL	NL	NL	5647	5176
		2266	1133	NL	NL	NL	NL	5333
230	 10.01s or 10.201s or 10.231s 10.01s	6000	3000	3529	3529	3529	3529	2272
		3864	1932	6042	6042	6042	6042	2272
		3000	1500	7059	7059	7059	7059	3292
		1932	966	NL	NL	NL	NL	4545

Notes:
1. When there is no end support or the length between supports is greater than shown in the table, then the height of the wall is limited to the values along the top line.
2. When the length of the wall is less than shown in the table then there is no limit (NL) to the height of the wall
3. Linear interpolation may be used between the values given in the table.
4. Heights less than the normal 2400 mm minimum floor to ceiling height have been shown for completeness.
5. For loadbearing cavity walls maximum height is the same as for the loaded leaf – see Table 5A.

VERTICALLY SPANNING

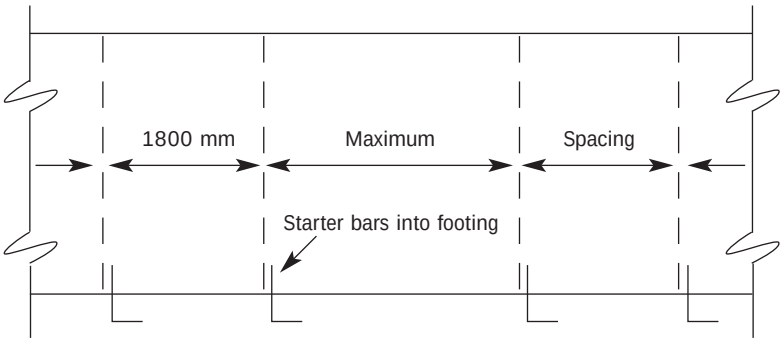
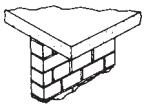
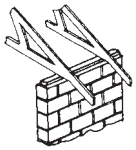
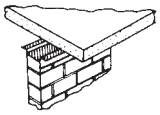
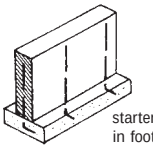


TABLE 6A – MAXIMUM HEIGHTS

Wall width (mm)	Block type	Supporting a concrete slab which provides both lateral and rotational restraint  a_v = 0.75 S_r = 27	Supporting a light roof or light floor which provides lateral support only  a_v = 0.85 S_r = 27	Not supporting any load but is laterally supported by some means  a_v = 0.85 S_r = 36	Not supported at top  a_v = 2.00 S_r = 36
190	20.01s	6840	6030	7980	3420
140	15.01s	5040	4440	5880	2520
	15.01s				

Values in this table apply to all FRLs for structural adequacy up to 240 minutes.

HORIZONTALLY SPANNING

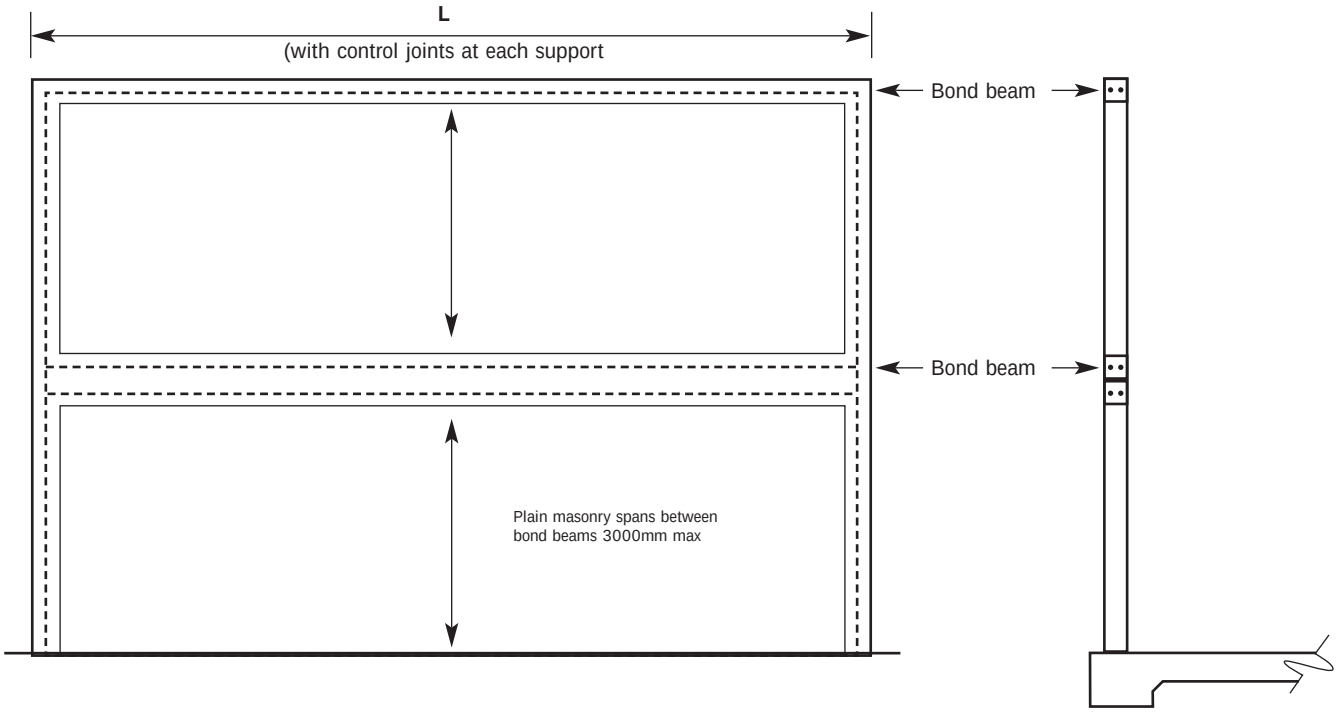


TABLE 6B – MAXIMUM LENGTHS

Wall width (mm)	Block type	Maximum length L (mm)
190	20.01s	6840
	15.01s	
140	15.01	5040

Values in this table apply to all FRLs for structural adequacy up to 240 minutes.

2-WAY SPANNING WITH TOP & END SUPPORTS

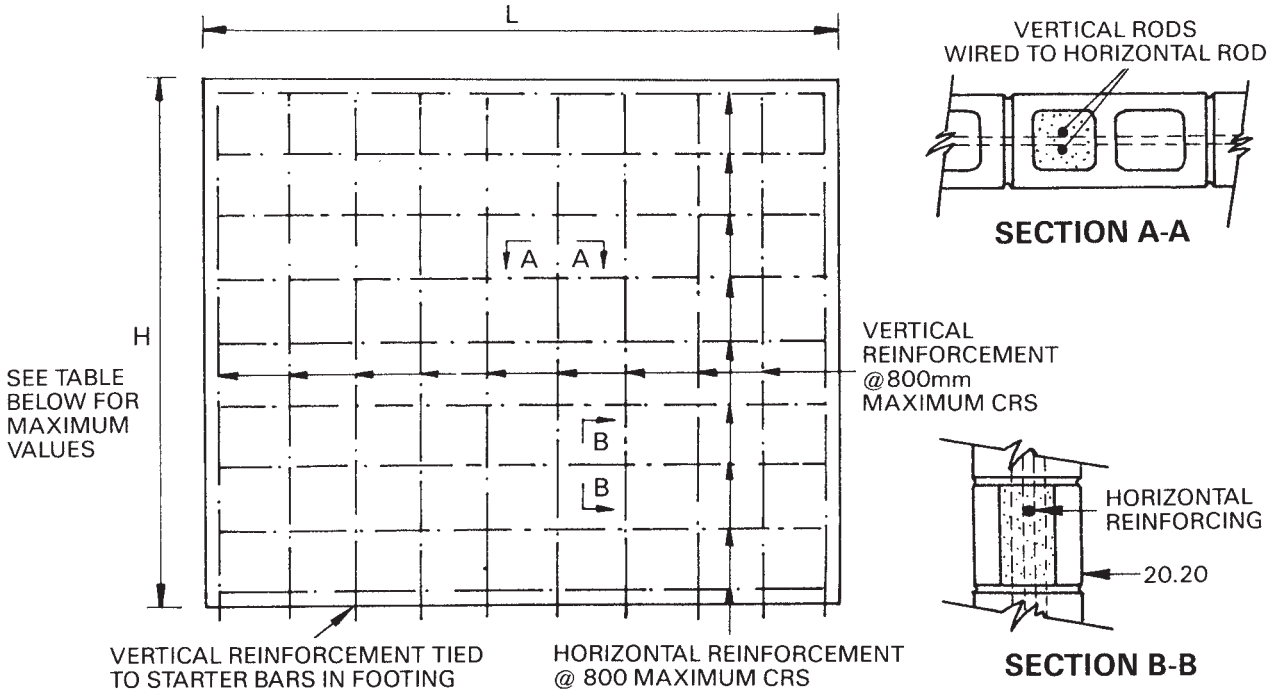


TABLE 6C – PANEL SIZE FOR REINFORCED WALLS

Wall width	Panel length (mm) L		H Height to top support (mm)			H Height (mm)
	Length between end supports	Length from support to free end	Supporting a concrete slab which provides both lateral and rotational restraint	Supporting a light roof or light floor which provides lateral support only	Not supporing any load but is laterally supported by some means	Not supported at top (cantilevered from base)
	a_h = 1.0	a_h = 2.0	a_v = 0.75 S_r = 27	a_v = 0.85 S_r = 27	a_v = 0.85 S_r = 36	a_v = 2.00 S_r = 36
190	10260	5130	6840	6035		
	5130	2565	13680	12071		
	5129	2564	NL	NL		
	13680	5320			7980	3420
	6840	2660			15960	6840
	6839	2659			NL	NL
	7560	3780	5040	4447		
	3780	1890	10080	8894		
	3779	1889	NL	NL		
140	10080	3920			5880	2520
	5040	1960			11760	5040
	5039	1959			NL	NL

Notes

1. Values in this table apply to all FRLs for structural adequacy up to 240 minutes.
2. It is recommended that reinforced panels not exceed a length of 12.0 m without a control joint.
3. When there is no end support or the length between supports is greater than shown in the table, then the height of the wall is limited to the values along the top line.
4. When the length of the wall is less than shown in the table there is no limit (NL) to the height of the wall.
5. Linear interpolation may be used between the values given in the table.
6. Values shaded are determined by robustness requirements.

VICTORIA

SCORESBY	Stud Road, Scoresby (between Ferntree Gully Road and High Street Road)
DEER PARK	972 Western Highway, Deer Park (near corner of Robinson Road & Western Highway)
GEELONG	474 - 478 La Trobe Terrace, Newtown
THOMASTOWN	140 High Street, Thomastown

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