AUGUST 2017

AUSTRALITE

fire, acoustics & thermal technical manual

australmasonry®

CONTENTS

FIRE RESISTANCE

levels

In 2008 - 2009, a series of fire tests were done on what is now known as AustraLite masonry. When calculated to the requirements of AS3700:2011, Section 6, they were proven to achieve much higher Fire Resistance Levels (FRLs) than standard concrete masonry units:

Structural Adequacy FRL:

The Slenderness ratio (S_{rf}) of a proposed wall is calculated by the formulae in AS3700, Clause 6.3.2.2 factoring the wall's spanning height/length, thickness and which edges are restrained.

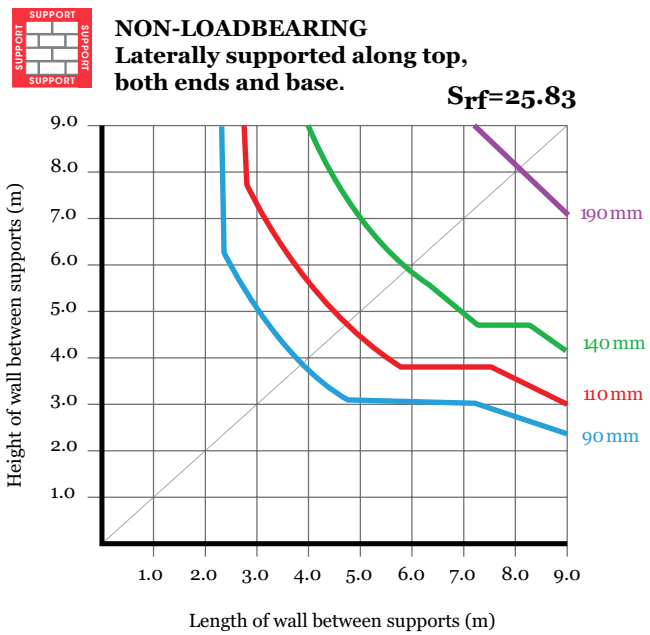
The maximum Srfs for AustraLite are:

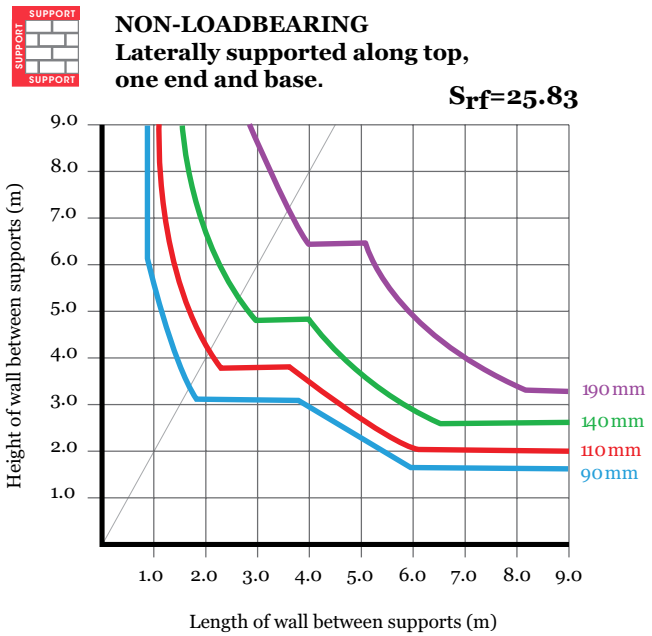
60 minutes:	22.93 Loadbearing	27.83 NON-Loadbearing
90 minutes:	21.31 Loadbearing	27.83 NON-Loadbearing
120 minutes:	20.16 Loadbearing	26.32 NON-Loadbearing
180 minutes:	18.54 Loadbearing	23.30 NON-Loadbearing
240 minutes:	17.39 Loadbearing	21.16 NON-Loadbearing

The graphs on pages 4 to 14 show the AS3700 formulae for each of these conditions.

Integrity FRL:

The **NON-Loadbearing** test (EWFA 2345.600) of a 90mm wall with S_{rf} = 25.83 achieved a 240- minute Integrity FRL. According to AS3700, Clause 6.4.3, NON-Loadbearing AustraLite masonry with t ≥ 90mm and S_{rf} ≤ 25.83 will achieve a 240-minute Integrity FRL.

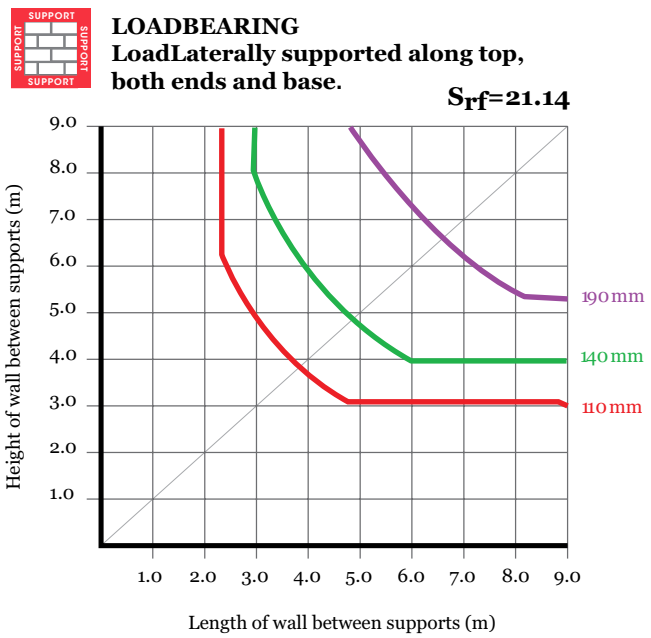


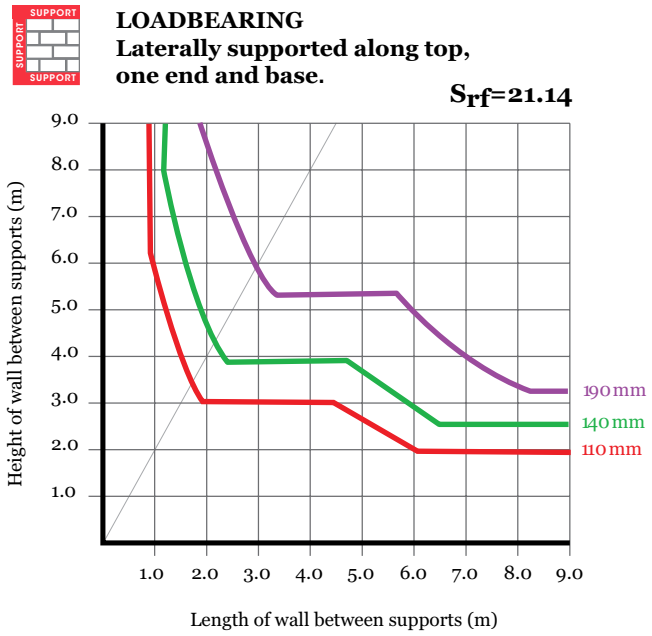


FIRE RESISTANCE LEVELS

The **Loadbearing** test (EWFA 2345.400) of 110mm AustraLite with Sr_f = 21.14 achieved a 240- minute Integrity FRL

Loadbearing AustraLite walls with t ≥ 110mm & S_{rf} ≤ 21.14 achieve a 240-minute Integrity FRL.





Loadbearing 90mm AustraLite is calculated using the deemed-to-satisfy provisions of Clause 6.4.2

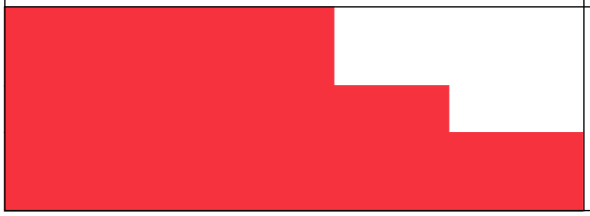
Insulation FRL:

AustraLite masonry requires material thicknesses of:

- 70mm to achieve 60 & 90-minute FRLs
- 80mm to achieve a 120-minute FRL
- 102mm to achieve a 180-minute FRL and
- 120mm to achieve a 240-minute FRL

All AustraLite masonry units have a material thickness greater than 80mm, which gives them a minimum 120-minute Insulation FRL, calculated as per AS3700:2011, Clause 6.5.4(b) (ii).

The highest FRL requirement is 240-minutes. Austral achieves this by reducing the core size of 15-01 and 20-01 blocks to give them a material thickness greater than 120mm as per AS3700, Clause 6.5.2. To distinguish these from the 120-minute rated blocks, their code numbers are 15-401 and 20-401. The Insulation FRL for each block is shown in the following bar chart.

INSULATION FRL (MINUTES) 60 90 120 180 240	**CODE NOs.**
	**10-01; 10-31; 15-01; 20-01; 15-421 & 20-421** **15-421; 15-48 & 15-91** when core-filled **11-162; 11-119; 11-76 & 12-01** **15-401 & 20-401** **20-421; 20-48; 20-91; 30-48 & 30-91** when core filled

FIRE RESISTANCE LEVELS

How to use the Structural Adequacy Charts:

The first set of graphs (pages 6 to 11) is for NON-Loadbearing masonry. The 2nd set (pages 12 to 16) is for Loadbearing masonry.

Page 17 is for partially reinforced masonry which increases the maximum S_{rf} to 36.

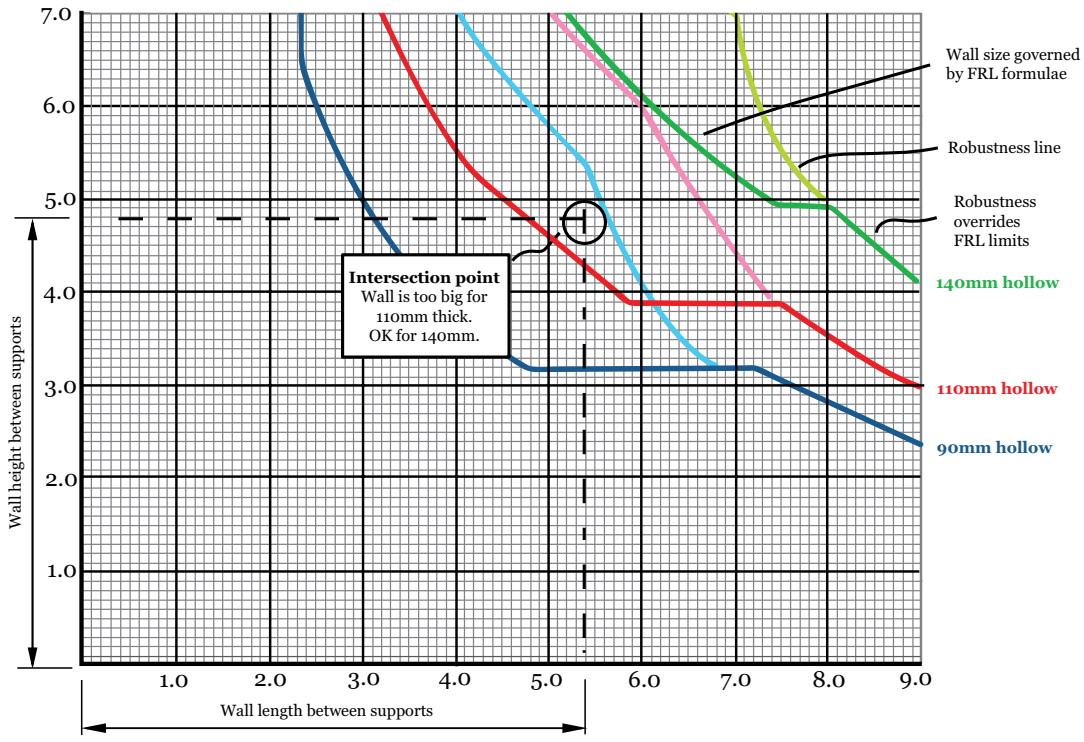
Find the appropriate page with the required FRL: 60, 90, 120, 180 or 240 minutes. Next, find the graph with the same restraint conditions as your proposed wall.

Finally, plot the intersection of your wall's height and length on the appropriate graph.

The thickness required is represented by those lines clear of the intersection point.

Note: All masonry must be designed for Robustness (AS3700, Part 4.6). In some cases, the **Robustness** requirement overrides the FRL limits.

Where this occurs, the pale Robustness graph-line changes to the darker colour of the FRL line. Some walls, particularly those without ends restrained, are governed by other loads (e.g. Vertical, Bending, Robustness, Earthquake etc.) Please check this and any other loads with your engineer).

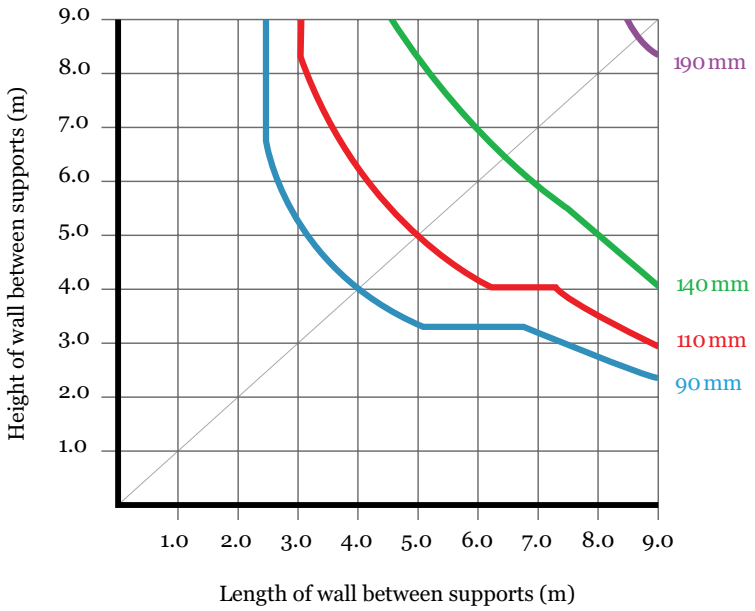


FIRE RESISTANCE LEVELS

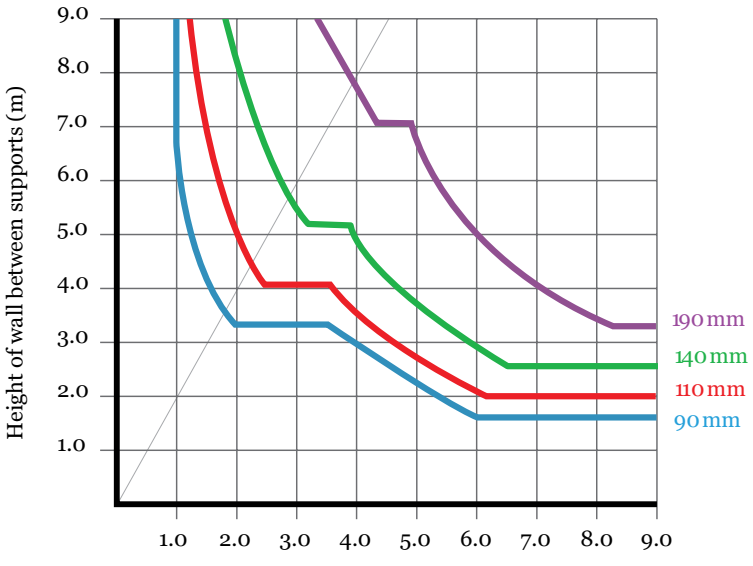
Structural Adequacy FRLs

60 & 90-Minute Structural Adequacy FRLs (S_{rf} = 27.8) NB: Integrity (S_{rf}25.8 governs)

NON-LOADBEARING
Laterally supported along top, both ends and base.



NON-LOADBEARING
Laterally supported along top, one end and base.

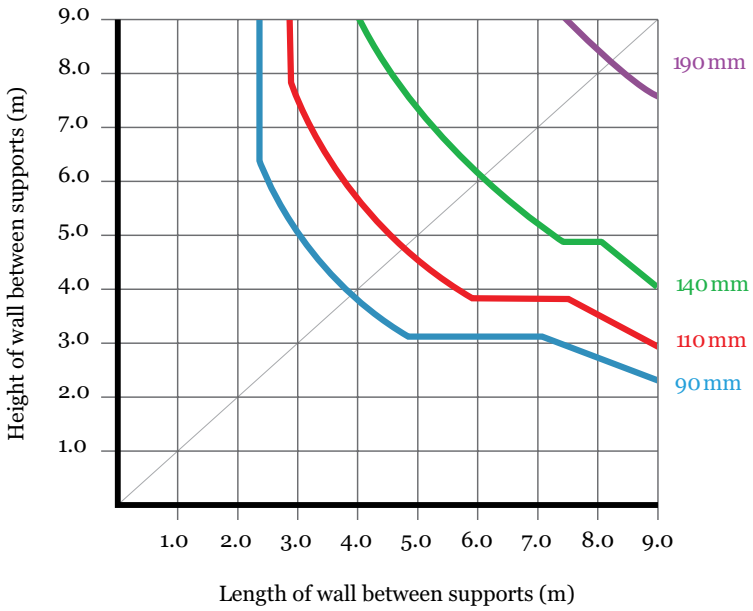


FIRE RESISTANCE LEVELS

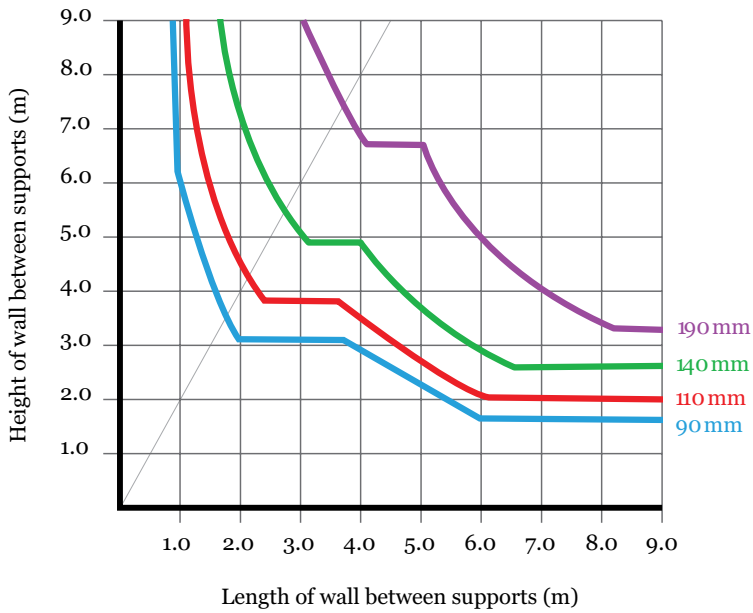
Structural Adequacy FRLs

120-Minute Structural Adequacy FRLs (S_{rf} = 26.32) *NB: Integrity (S_{rf}25.8 governs)*

NON-LOADBEARING
Laterally supported along top, both ends and base.



NON-LOADBEARING
Laterally supported along top, one end and base.

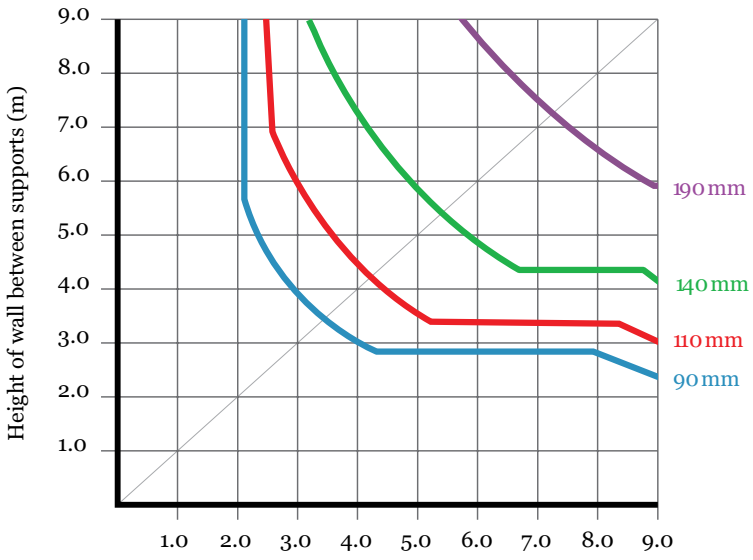


FIRE RESISTANCE LEVELS

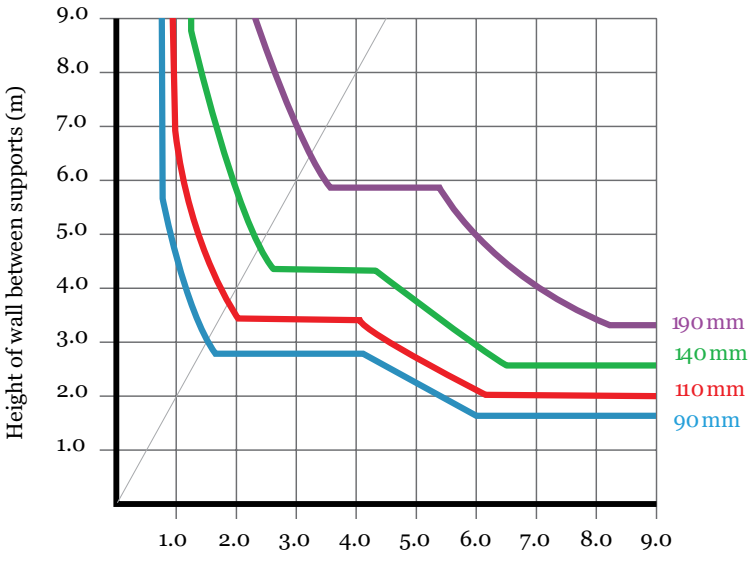
Structural Adequacy FRLs

180-Minute Structural Adequacy FRLs (S_{rf} = 23.3)

NON-LOADBEARING
Laterally supported along top, both ends and base.



NON-LOADBEARING
Laterally supported along top, both ends and base.

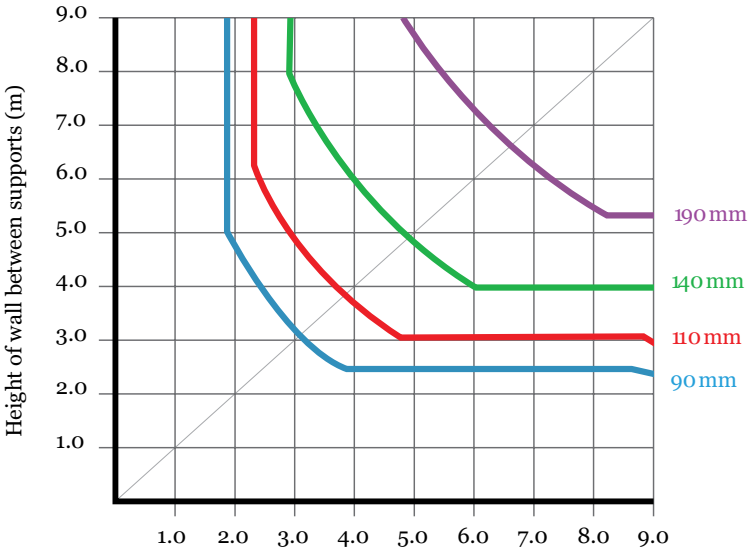


FIRE RESISTANCE LEVELS

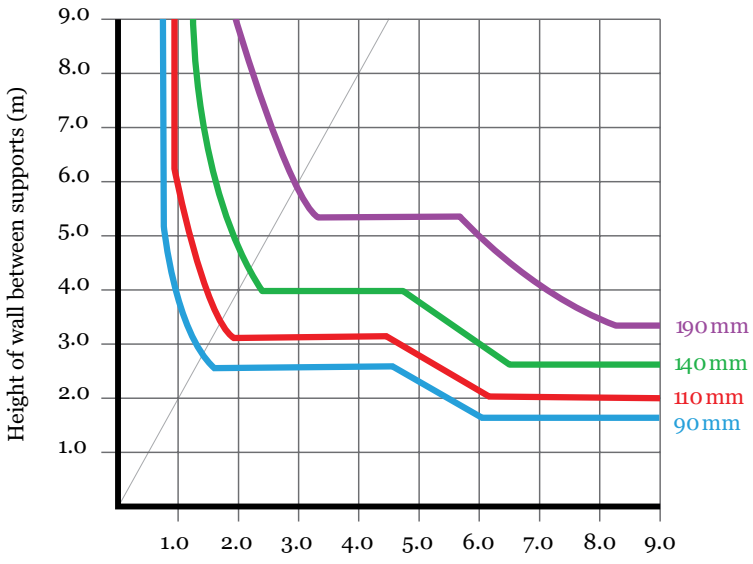
Structural Adequacy FRLs

240-Minute Structural Adequacy FRLs (S_{rf} = 21.16)

NON-LOADBEARING
Laterally supported along top, both ends and base.



NON-LOADBEARING
Laterally supported along top, one end and base.



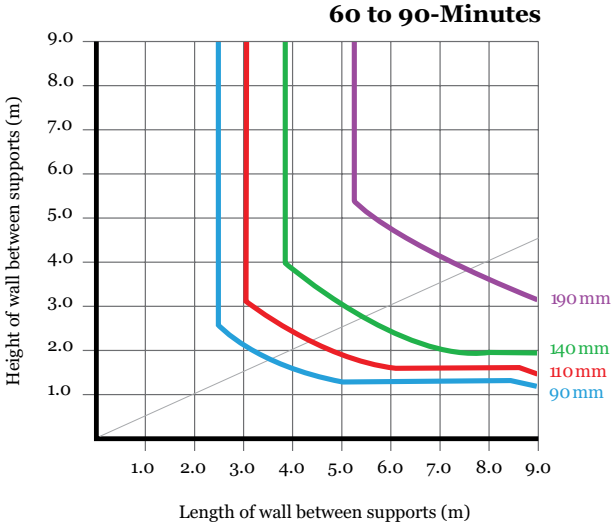
FIRE RESISTANCE LEVELS

Structural Adequacy FRLs

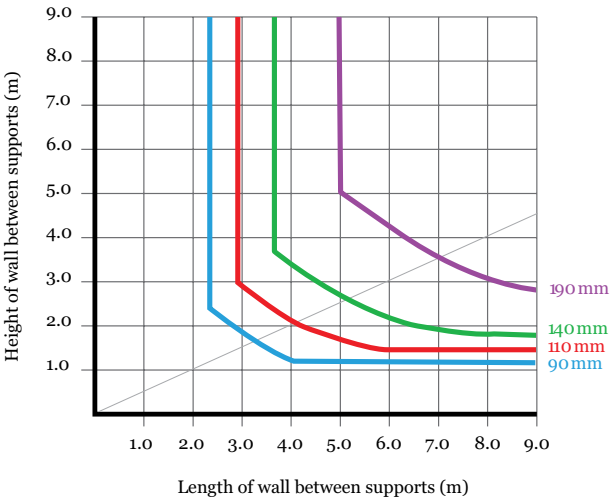
For wider spans, see PARTIALLY REINFORCED MASONRY on page 17.

Laterally supported along both ends and base.

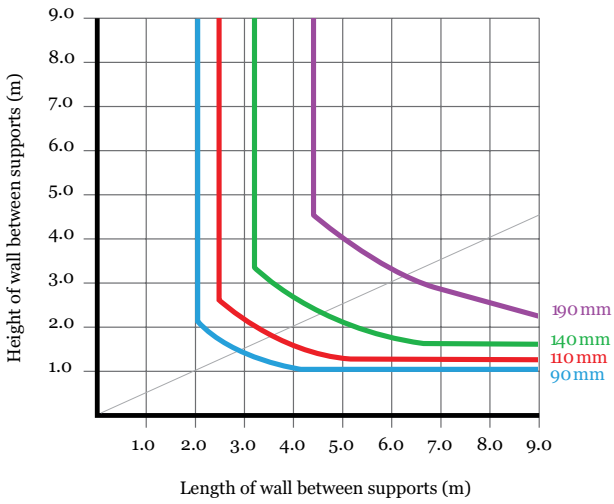
60 to 90-Minutes



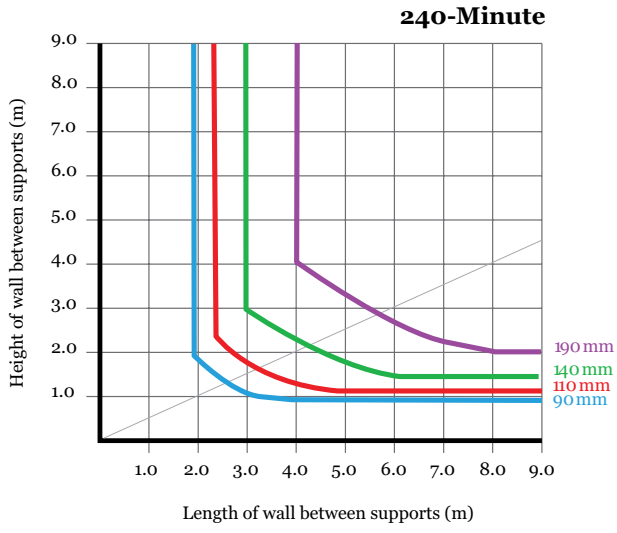
120-Minute



180-Minute



240-Minute

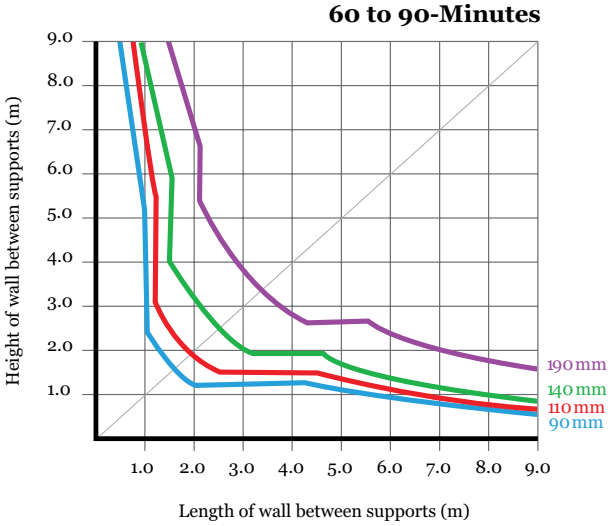


FIRE RESISTANCE LEVELS

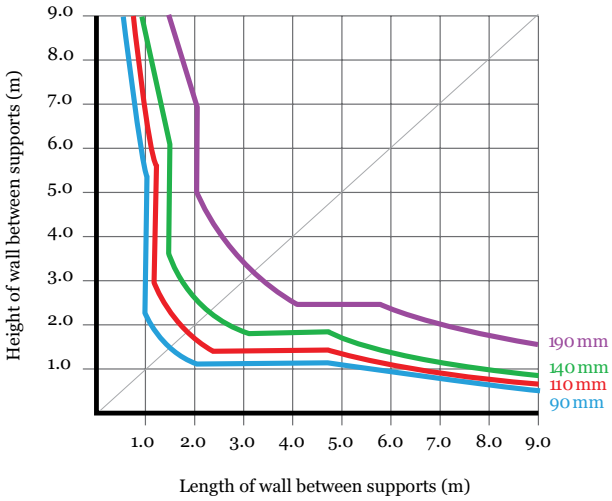
Structural Adequacy FRLs

Laterally supported along one end and base.

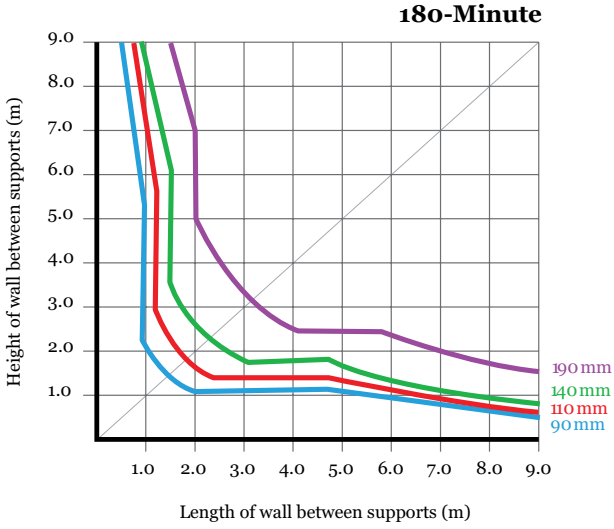
60 to 90-Minutes



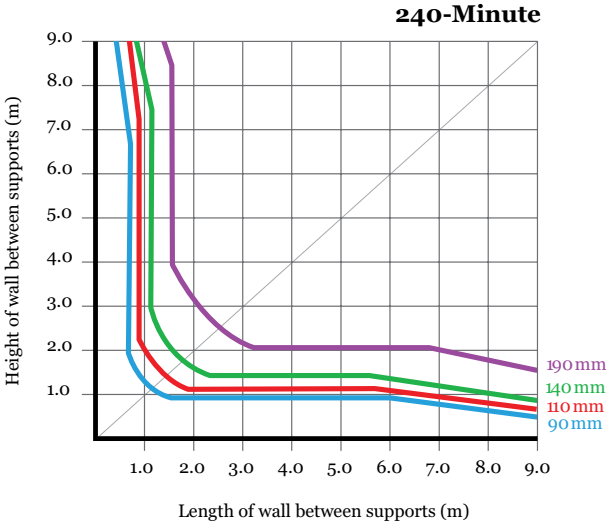
120-Minute



180-Minute



240-Minute



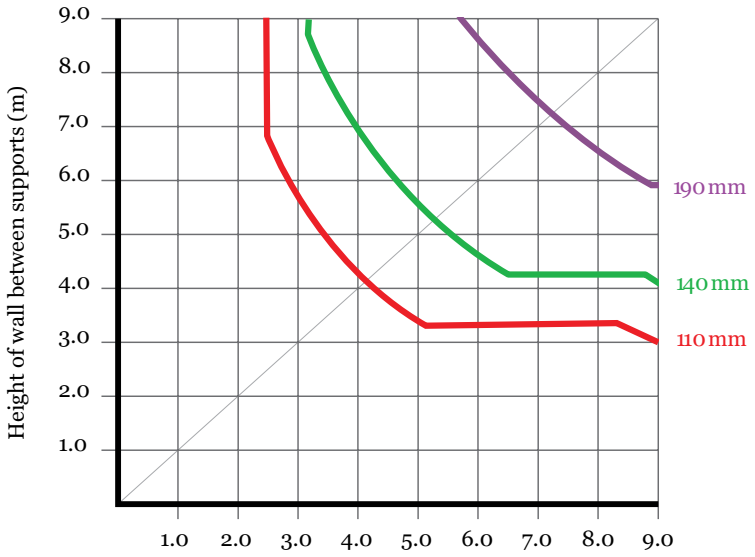
FIRE RESISTANCE LEVELS

Structural Adequacy FRLs

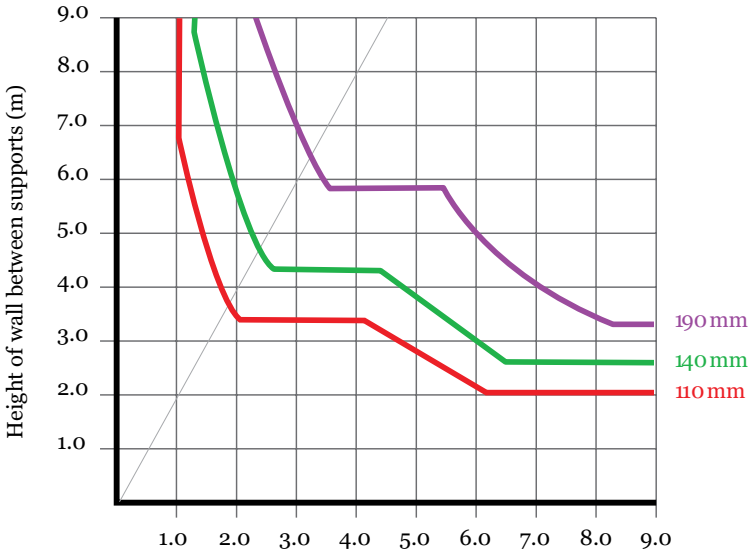
LOAD Bearing 60-Minute Structural Adequacy FRL (S_{rf} = 22.93)

NB: Integrity (S_{rf} 21.14 governs)

LOADBEARING
Laterally supported along top, both ends and base.



LOADBEARING
Laterally supported along top, one end and base.



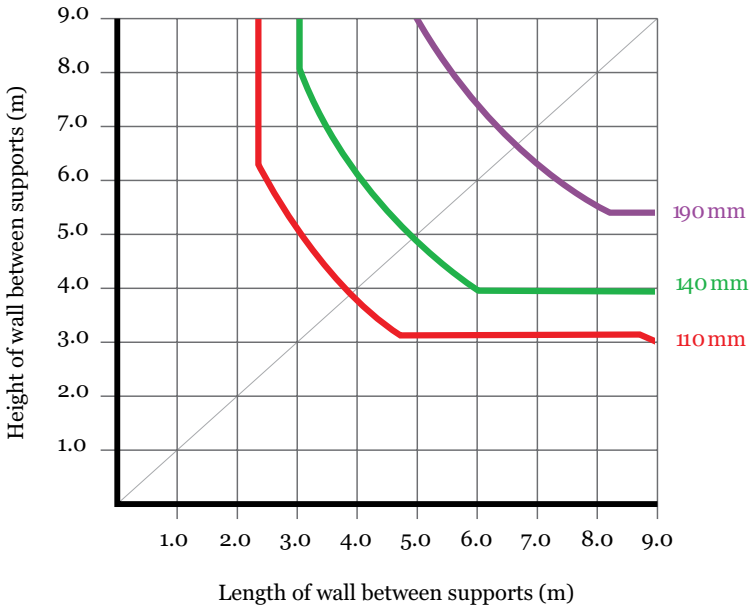
FIRE RESISTANCE LEVELS

Structural Adequacy FRLs

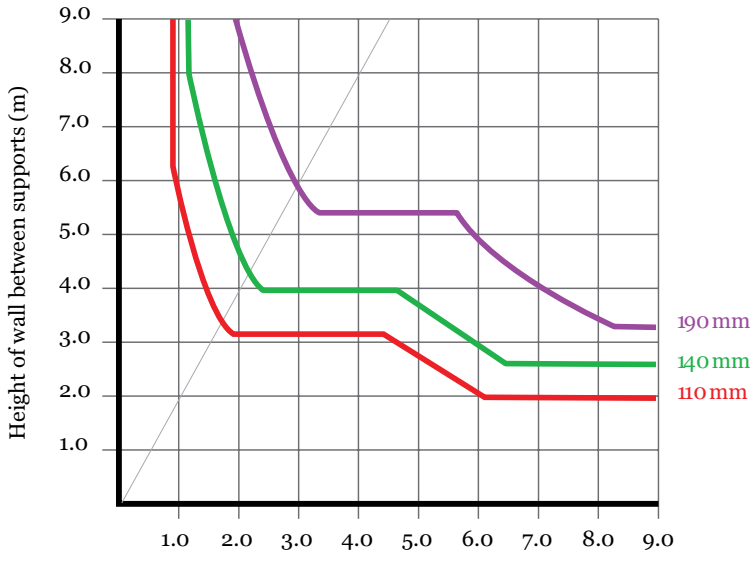
LOAD Bearing 90-Minute Structural Adequacy FRL (S_{rf} = 21.31)

NB: Integrity (S_{rf} ≤ 21.14 governs)

LOADBEARING
Laterally supported along top, both ends and base.



LOADBEARING
Laterally supported along top, one end and base.

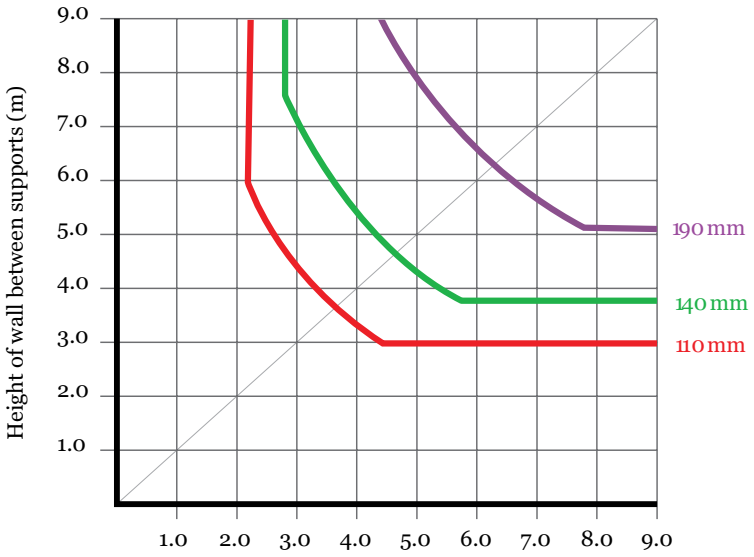


FIRE RESISTANCE LEVELS

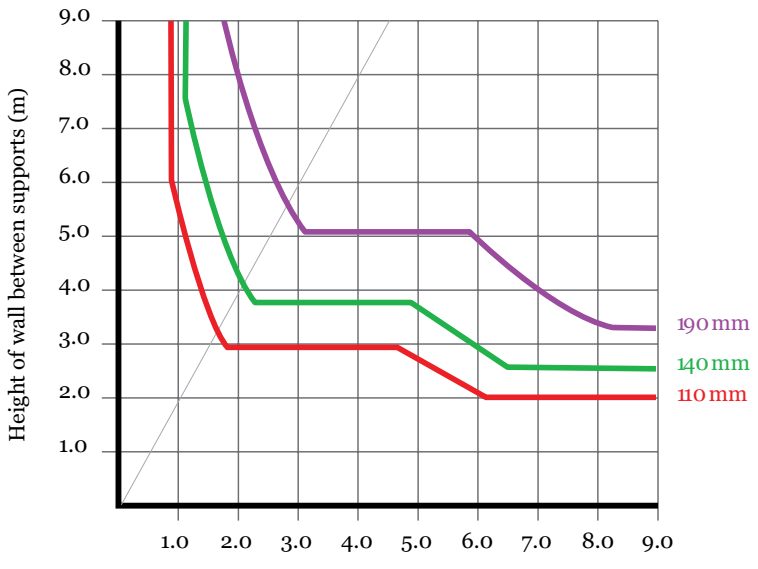
Structural Adequacy FRLs

LOAD Bearing 120-Minute Structural Adequacy FRL (S_{rf} = 20.16)

LOADBEARING
Laterally supported along top, both ends and base.



LOADBEARING
Laterally supported along top, one end and base.

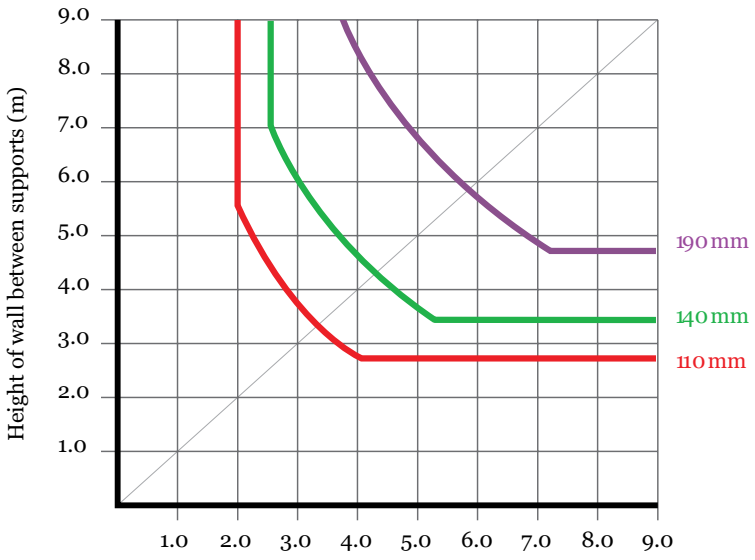


FIRE RESISTANCE LEVELS

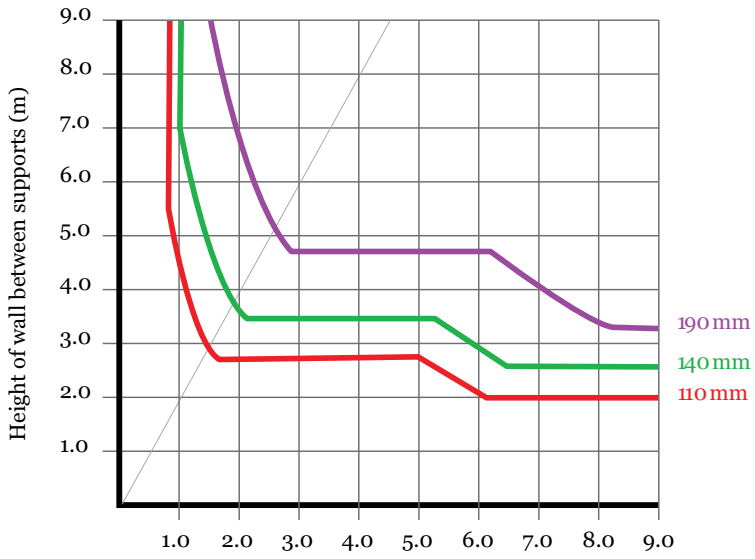
Structural Adequacy FRLs

LOAD Bearing 180-Minute Structural Adequacy FRL (S_{rf} = 18.54)

LOADBEARING
Laterally supported along top, both ends and base.



LOADBEARING
Laterally supported along top, one end and base.

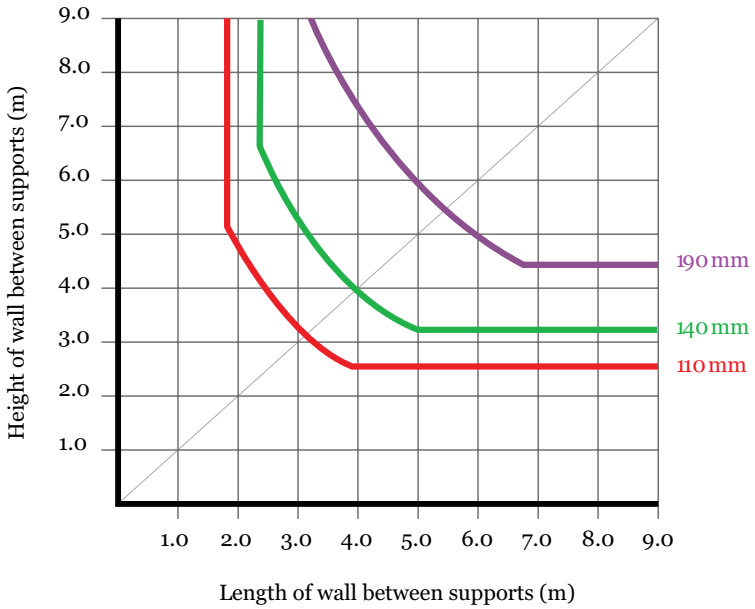


FIRE RESISTANCE LEVELS

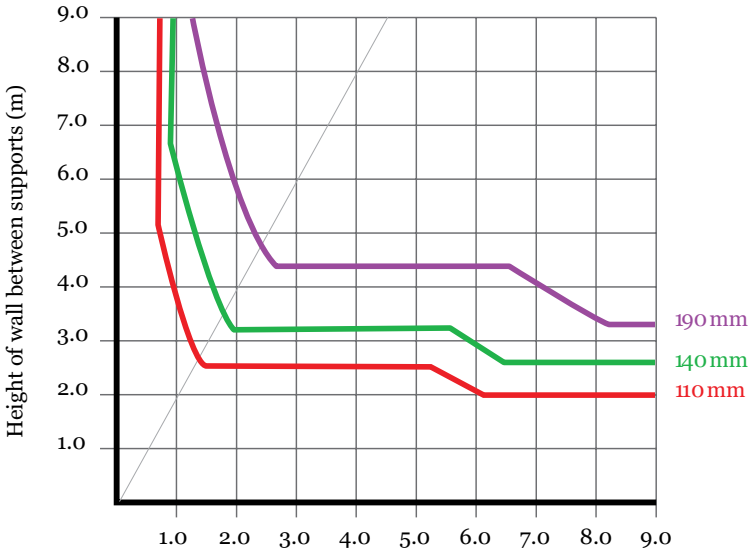
Structural Adequacy FRLs

LOAD Bearing 240-Minute Structural Adequacy FRL (S_{rf} = 17.39)

LOADBEARING
Laterally supported along top, both ends and base.



LOADBEARING
Laterally supported along top, one end and base.



FIRE RESISTANCE LEVELS

Structural Adequacy FRLs

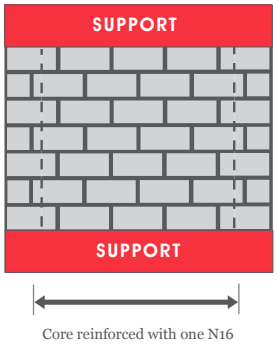
Partially Reinforced Masonry

Structural Adequacy FRL = 240 minutes

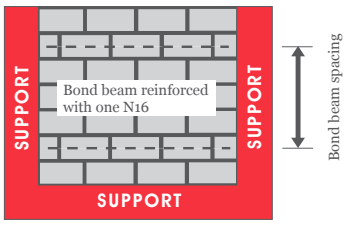
Srf ≤ 36 (AS3700:2011, Table 6.1)

Robustness = 0.5kPa (from CMAA Design Guide, Horizontal Loads)

Wall Height	***Reinforced Core Spacing One 16mm Reinforcement Bar***	
	t = 140mm	***t = 190mm***
3.0m	7.6m	N/A
4.0m	4.4m	6.4m
5.0m	2.8m	4.0m
6.0m	2.0m	2.8m
7.0m	Srf > 36	2.0m
8.0m	-	1.4m



Wall Height	***Reinforced Bond Beam Spacing One 16mm Reinforcement Bar***	
	t = 140mm	***t = 190mm***
3.0m	4.4m	5.8m
4.0m	3.8m	5.0m
5.0m	3.4m	4.4m
6.0m	Srf > 36	4.0m
7.0m	-	Srf > 36
8.0m	-	-



Disclaimer:
Please note: It is the designer's responsibility to allow for the effects of control joints; chases; openings; the strength and stiffness of connectors & supports, in addition to consideration of loads and masonry properties.

ACOUSTIC RATINGS

This section describes the measurement of acoustic ratings, the BCA requirements for residential buildings and details of research and development of successful wall systems for Denseweight and Lightweight masonry.

R_w (weighted sound reduction index)
"R_w" is a type of average of low to high frequencies, calculated from a wall's sound transmission losses over 16 frequencies. It is measured in decibels (dB).

Low frequency sound waves (e.g. from a bass guitar) are large and intrusive. Their sound transmission loss is below R_w (average). At the other end of the scale, high frequency sound waves (e.g. violin, piccolo) are short wave, less intrusive and their sound transmission loss is above average.

A typical sound rating is expressed as R_w 55 (-1; -5). The first figure in the brackets is "C" which indicates irregular performance in the high frequencies. It is not addressed in the BCA. The second figure in the brackets is "C_{tr}" and is essential in BCA requirements for party walls.

C_{tr} (low frequency spectrum adaptor) "C_{tr}" is an indicator of how much lower the wall's performance would be if the noise source was mainly low frequency. C_{tr} is a negative number. The sound rating above of R_w 55 dB with a C_{tr} of -5 gives $R_w + C_{tr} = 50$.

Party Walls:

These walls are described in the BCA, Part F5, as walls that "separate sole-occupancy units" (also known as inter-tenancy walls). This includes townhouses, high-rise home units, three-storey flats, hotels and similar residential buildings. Except for Class 9c buildings (aged care units); party walls require a minimum sound rating of $R_w + C_{tr}$ 50.

A party wall that separates one sole-occupancy unit's wet area (a bathroom, laundry, kitchen etc.) from a habitable room in another sole-occupancy unit is required to be of *discontinuous construction* .

ACOUSTIC RATINGS

Discontinuous Construction:

The BCA describes *discontinuous construction* as “a wall having a minimum 20mm cavity between 2 separate leaves”. See following diagrams for details. Where the 2 separate leaves are both masonry, the BCA allows resilient wall ties “if required”. As they are rarely required, their omission will not only save money but improve the acoustic performance of cavity (double-leaf masonry) walls.

Discontinuous construction is also required where a wall separates a sole-occupancy unit from a plant room or lift shaft.

Corridor Walls:

Walls that separate a sole-occupancy unit from a plant room, lift shaft, corridor, stair, foyer or similar public area, require a minimum sound rating of R_w 50. There is no C_{tr} adjustment. See following diagrams for details.

Walls that separate a sole-occupancy unit from a plant room or lift shaft are required to be of *discontinuous construction:* e.g: the independent stud system.

Research and Development:

In 2011, the National Acoustic Laboratory tested 140mm thick 15-01 masonry. Test N° 2538-2, with a 64mm independent stud wall system, achieved $R_w + C_{tr}$ 50 (the BCA requirement for walls separating home units).

This wall also meets the BCA requirement to resist the transmission of impact-generated sound wherever an inter-tenancy wall separates a wet area (bathroom / laundry / kitchen etc) from a habitable room.

These and previous tests provided data for Day Design to form opinions on the performance of other types of masonry as follows.

The 15-01 masonry units achieve the BCA fire rating requirements for low to high-rise home unit walls before adding any lining system.

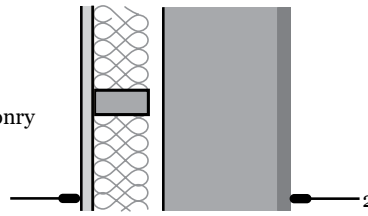
ACOUSTIC RATINGS

90mm Masonry Systems - Block Codes: 10-01DW & 10-01LW

2 layers 13mm standard-core plasterboard
on
28mm furring channel on standard clips
Minimum cavity: 30mm
with
25mm Glasswool
or 30mm Polyester in cavity

Corridor Wall: R_w 50 (including unit to stairs, unit to foyer)

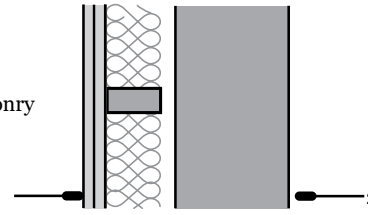
1 layer 13mm Sound Rated plasterboard
on
70mm timber stud, 20mm clear of masonry
with
R1.5 Glasswool or Polyester



Party Wall: $R_w + C_{tr}$ 50

NB: Wall ties must be RESILIENT, to comply with discontinuous construction.

2 layers 10mm std plasterboard
on
70mm timber stud, 20mm clear of masonry
with
R1.5 Glasswool or Polyester



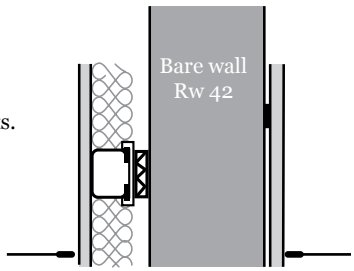
Party Wall: $R_w + C_{tr}$ 50

NB: Wall ties must be RESILIENT, to comply with discontinuous construction.

ACOUSTIC RATINGS

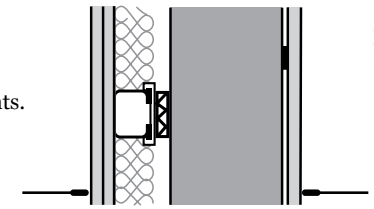
110mm Masonry Systems - Codes: 12-01DW & 12-01LW

13mm standard-core plasterboard
on
28mm furring channel on resilient mounts.
Minimum cavity: 30mm
with
25mm Glasswool or
30mm Polyester in cavity



Corridor Wall: R_w 50 (including unit to stairs, unit to foyer)

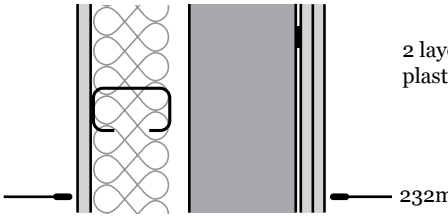
2 layers of
13mm standard-core plasterboard
on
28mm furring channel on resilient mounts.
Minimum cavity: 50mm
with
50mm Glasswool or
50mm Polyester in cavity



Party Wall: $R_w + C_{tr}$ 50

NB:Not suitable for wet-to-dry areas. See Discontinuous detail below.

13mm Standard-core plasterboard
on
64mm steel studs
20mm clear of masonry
with
75mm Glasswool or
65mm Polyester



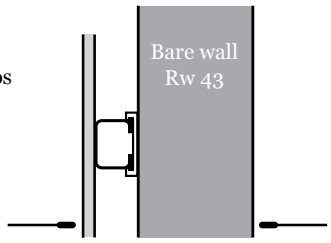
Party Wall: $R_w + C_{tr}$ 50

Discontinuous Construction. Suitable for all Party Walls.

ACOUSTIC RATINGS

140mm Masonry Systems - Codes: 15-01DW & 15-01LW

13mm standard-core plasterboard
on
28mm furring channel on standard clips
Minimum cavity: **30mm**

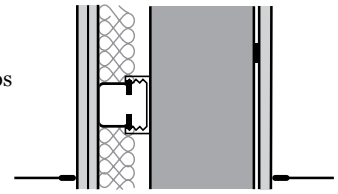


No lining required

183mm

Corridor Wall: R_w 50 (including unit to stairs, unit to foyer)

2 layers of
13mm standard-core plasterboard
on
28mm furring channel on standard clips
Minimum cavity: **50mm**
with
50mm Glasswool or
50mm Polyester in cavity



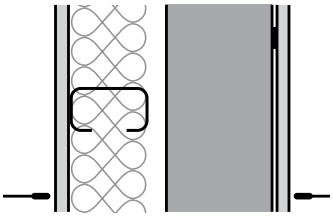
13mm standard-core plasterboard, daub-fixed

234mm

Party Wall: $R_w + C_{tr}$ 50

NB:Not suitable for wet-to-dry areas. See Discontinuous detail below.

13mm Standard-core plasterboard
on
64mm steel studs
20mm clear of masonry
with
75mm Glasswool or
65mm Polyester



13mm standard-core plasterboard, daub-fixed

255mm

Party Wall: $R_w + C_{tr}$ 51

Discontinuous Construction. Suitable for all Party Walls.

If wall ties are required, they must be resilient type. (No ties is better).

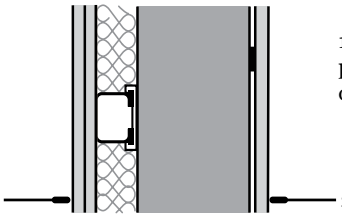
ACOUSTIC RATINGS

140mm Grouted Systems - Block Code: 15-48 DW & 15-48 LW

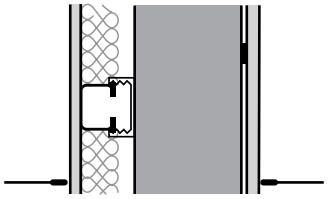
Corridor Wall: R_w 50

(including unit to stairs, unit to foyer)

2 layers of
13mm standard-core plasterboard
on
28mm furring channel on standard clips.
Minimum cavity **30mm**
with
25mm Glasswool or
30mm Polyester in cavity



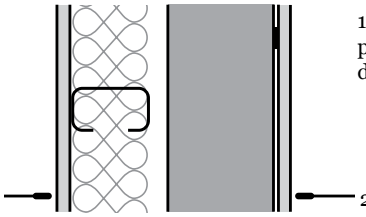
13mm standard-core plasterboard
on
28mm furring channel on standard clips
Minimum cavity: 50mm
with
50mm Glasswool or
50mm Polyester in cavity



Party Wall: $R_w + C_{tr}$ 51 (both options)

NB: Not suitable for wet-to-dry areas. See Discontinuous detail below.

13mm Standard-core plasterboard
on
64mm steel studs
20mm clear of masonry
with
75mm Glasswool or
65mm Polyester



Party Wall: $R_w + C_{tr}$ 52

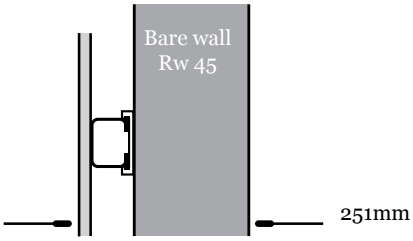
Discontinuous Construction. Suitable for all Party Walls.

If wall ties are required, they must be resilient type. (No ties is better).

ACOUSTIC RATINGS

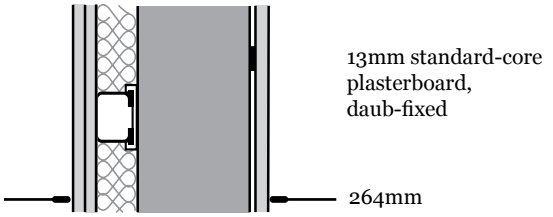
190mm Masonry Systems - Codes: 20-01DW & 20-01LW

13mm standard-core plasterboard
on
28mm furring channel on standard clips
Minimum cavity: **30mm**



Corridor Wall: R_w 50 (including unit to stairs, unit to foyer)

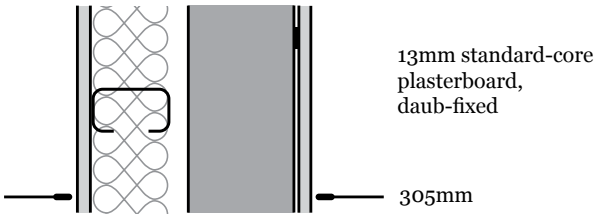
2 layers of
13mm standard-core plasterboard
on
28mm furring channel on standard clips
Minimum cavity: 30mm
with
25mm Glasswool or
30mm Polyester in cavity



Party Wall: $R_w + C_{tr}$ 50

NB: Not suitable for wet-to-dry areas. See Discontinuous detail below.

13mm Standard-core plasterboard
on
64mm steel studs
20mm clear of masonry
with
75mm Glasswool or
65mm Polyester



Party Wall: $R_w + C_{tr}$ 50

Discontinuous Construction. Suitable for all Party Walls.

If wall ties are required, they must be resilient type. (No ties is better).

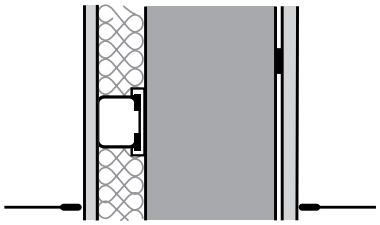
ACOUSTIC RATINGS

190mm Grouted Systems - Block Code: 20-48 DW & 20-48 LW

Corridor Wall: R_w 50

(including unit to stairs, unit to foyer)

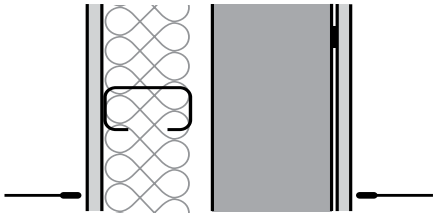
13mm standard-core plasterboard
on
28mm furring channel on standard clips.
Minimum cavity 30mm
with
25mm Glasswool or
30mm Polyester in cavity



Party Wall: $R_w + C_{tr}$ 50

NB: Not suitable for wet-to-dry areas. See Discontinuous detail below.

13mm Standard-core plasterboard
on
64mm steel studs
20mm clear of masonry
with
75mm Glasswool or
65mm Polyester



Party Wall: $R_w + C_{tr}$ 52

Discontinuous Construction. Suitable for all Party Walls.

If wall ties are required, they must be resilient type. (No ties is better).

THERMAL MASS

information

Thermal mass (also known as thermal inertia or thermal capacitance) is the ability of a material to retain heat when subjected to a temperature differential. Denseweight concrete has high thermal mass. If a building with high thermal mass is subject to a heating and cooling cycle that crosses the comfort zone, the material with high thermal mass will maintain its heat energy for an extended period. In practical terms, in summer a building with dense concrete floors and walls will remain relatively cool during the day time, while in winter the same building will remain relatively warm.

PROPERTIES OF CONCRETE MASONRY

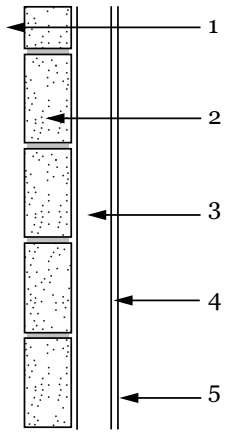
- Concrete masonry has moderate thermal insulation properties (controlling the passage of applied heat out of the building in winter or atmospheric heat into the building in summer). It has good thermal mass (slowly releasing stored heat in winter and slowly absorbing atmospheric heat in summer) It is a relatively inexpensive building material, providing attractive life-cycle costings, particularly when the building life is relatively short. The amount of energy used to produce concrete masonry is relatively low when compared to most other building materials. Generally, materials that are good thermal insulators are incapable of supporting heavy loads. Conversely, most good load-supporting materials are poor insulators. Concrete masonry is a notable exception to these general rules.

- Its good insulating qualities are derived primarily from the minute voids in the concrete of the units. In general, it will be found that masonry units of lower density concrete will have higher thermal resistance because of their greater voids content. Thermal resistance is generally improved by substituting lightweight aggregates for dense aggregates in the masonry concrete. It may be further improved by filling the cores of walls of hollow blocks with granular insulating materials such as perlite or vermiculite. Where cores are filled in this way, measures must be taken to prevent entry of moisture to the wall cores and the core-filling material. Such precautions include the use of cavity wall construction, moisture- resistant external coatings and the preventing of water entry by good flashing and weathering practice *

** Source: CMAA MA55 (www.cmaa.com.au)*

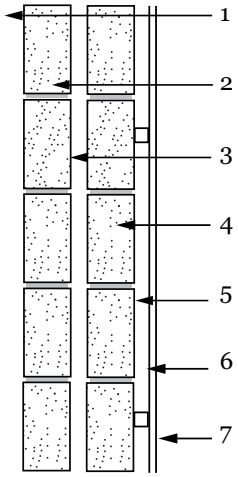
BCA SPECIFICATION J1.5 WALL CONSTRUCTION

Masonry Veneer 25mm to 50mm cavity, 10mm internal plaster on 90mm stud frame



Item	*Item Description*	*R-Value*
1.	Outdoor air film (7m/s)	0.04
2.	Australite 90mm thick block	0.16
3.	Cavity and airpsace (115 to 140mm, made up of 90mm stud + 25mm to 50mm air-space non-reflective and ventilated)*	0.17
4.	Plasterboard, gypsum (10mm, 880kg/m^3)	0.06
5.	Indoor air film (still air)	0.12
	Total R-Value before adding insulation	**0.55**

Cavity Masonry 20mm to 50mm cavity, 10mm internal plaster on battens or furring channels

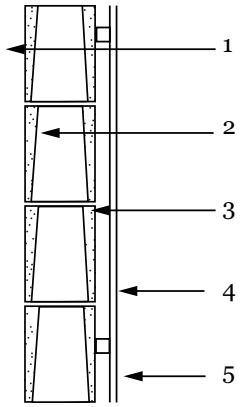


Item	*Item Description*	*R-Value*
1.	Outdoor air film (7m/s)	0.04
2.	Australite 90mm thick block	0.16
3.	Airpsace (20 to 40mm non-reflective and ventilated)	0.17
4.	Australite 90mm thick block	0.16
5.	Airspace (20mm to 35mm, non-reflective and unventilated)*	0.17
6.	Plasterboard, gypsum (10mm, 880kg/m^3)	0.06
7.	Indoor air film (still air)	0.12
	Total R-Value before adding insulation	**0.88**

*** ADD INSULATION TO ACHIEVE THE REQUIRED R-VALUE**

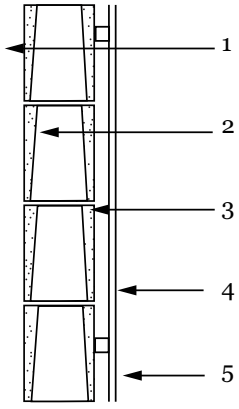
BCA SPECIFICATION J1.5 WALL CONSTRUCTION

110mm Australite hollow block with internal plaster on battens or furring channels



Item	*Item Description*	*R-Value*
1.	Outdoor air film (7m/s)	0.04
2.	110mm Australite concrete block	0.18
3.	Airpsace (20 to 40mm batterns or furring non-reflective and ventilated)*	0.17
4.	Plasterboard, gypsum (10mm, 880kg/m^3)	0.06
5.	Indoor air film (still air)	0.12
	Total R-Value before adding insulation	**0.57**

140mm Australite hollow concrete block with internal plaster on battens or furring channels

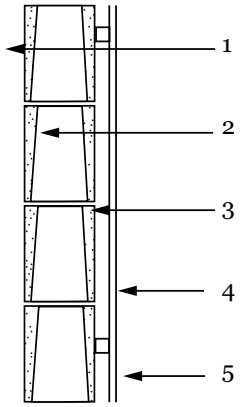


Item	*Item Description*	*R-Value*
1.	Outdoor air film (7m/s)	0.04
2.	140mm Australite concrete block	0.21
3.	Cavity and airpsace (115 to 140mm, made up of 90mm stud on batterns or furring channels + 25mm to 50mm airspace non-reflective and ventilated)*	0.17
4.	Plasterboard, gypsum (10mm, 880kg/m^3)	0.06
5.	Indoor air film (still air)	0.12
	Total R-Value before adding insulation	**0.60**

*** ADD INSULATION TO ACHIEVE THE REQUIRED R-VALUE**

BCA SPECIFICATION J1.5 WALL CONSTRUCTION

190mm Australite hollow concrete block with internal plaster on battens or furring channels



Item	*Item Description*	*R-Value*
1.	Outdoor air film (7m/s)	0.04
2.	190mm Australite **hollow** concrete block	0.22
3.	Airpsace (20 to 40mm, non-reflective and ventilated)*	0.17
4.	Plasterboard, gypsum (10mm, 880kg/m^3)	0.06
5.	Indoor air film (still air)	0.12
	Total R-Value before adding insulation	**0.61**

*** ADD INSULATION TO ACHIEVE THE REQUIRED R-VALUE**

NOTES

NOTES

STYLE AND FUNCTION

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