GB Masonry Collection Fire & Sound Manual

East Coast

less than 45% basalt

masonry.
build in style

austral masonry™

contents.

Designing Masonry for Fire Resistance

When a masonry wall is subjected to fire, which is usually only on one side, a thermal gradient is created through the thickness of the wall and the expansion of the material causes bowing towards the fire source. If this bowing extends far enough it can cause collapse of the wall. If the wall does not collapse, it can crack due to internal stresses caused by restraint of the thermal expansion, or it can heat up sufficiently to allow flammable material on the side away from the fire to ignite. Both these consequences may allow the fire to spread.

The National Construction Code (NCC) requires that walls be designed in accordance with Section 6: Design for Fire Resistance of AS3700:2011, to provide the required fire resistance in buildings. This system provides an accurate method of predicting the ability of a wall to maintain its strength in a fire and to resist the spread of fire. The Austral Masonry™ Queensland Denseweight™ and GB Masonry™ concrete masonry ranges comply with these standards. Note that these products contain less than 45% basalt in their mix designs.

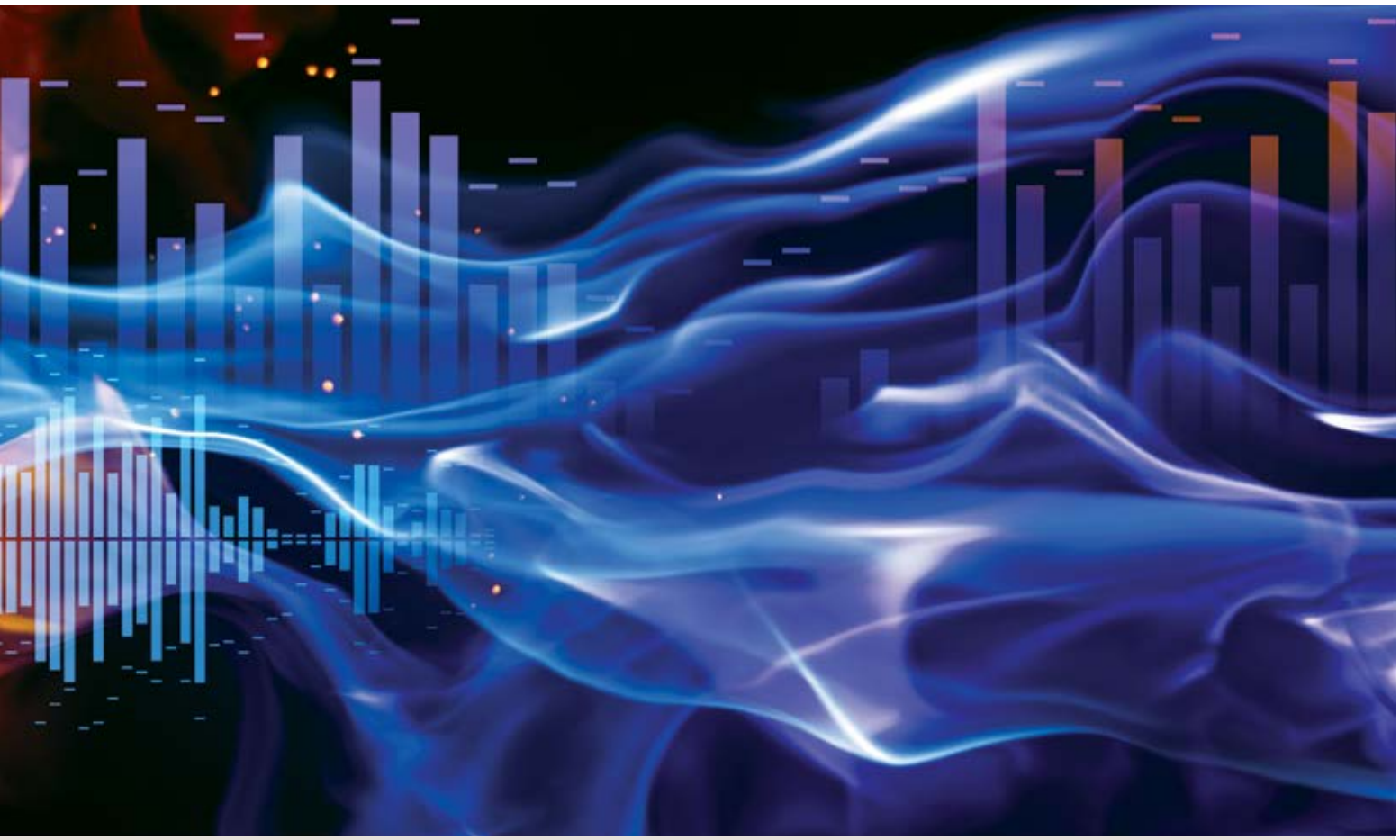
The fire resistance level (FRL) is given in the form of three numbers, for example 180/120/120, which represent the required FRL (in minutes) for structural adequacy/integrity/insulation.

Structural Adequacy
Structural adequacy is the ability of a wall to continue to perform its structural function for the fire resistance period. The fire resistance period for structural adequacy is a function of the slenderness ratio for the wall and is governed by three formulae in AS3700:2011, Clause 6.3.2.2. These formulae use the masonry panel's height, length, thickness and restraint conditions around the perimeter to calculate the panel's slenderness ratio for fire (Srf).

The relevant Srfs for Queensland Denseweight™ and GB Masonry™ product ranges are outlined in AS3700:2011 Table 6.1. (<45% Basalt) The charts on pages 6 to 11 of this guide can be used to determine the FRL structural adequacy for a variety of wall sizes and restraint conditions.

Restraint at the top of a wall can be provided by a load-bearing concrete slab, head ties from infill walls to the underside of a concrete slab or ties to a braced roof frame. End restraints can be provided by bonded corners, ties to columns or buttresses with a length greater than the wall height multiplied by 0.2. Where a wall butts into and is tied to the proposed fire wall, it divides that wall into two panels for the purpose of calculating Srf.

Integrity
Integrity is the ability of a wall to maintain its continuity and prevent the passage of flames and hot gases through cracks in the wall for the fire resistance period. Design for integrity is based on Clause 6.4.2 of AS2700 which deems that the FRL for integrity will be met if the wall meets the value for insulation and structural adequacy.



Insulation
Insulation is the ability of a wall to provide sufficient insulation such that the side of the wall away from the fire does not exceed a pre-defined temperature during the fire resistance period. However, it should be noted that at this temperature – a rise of 140°C over the ambient temperature or a maximum of 180 °C – surface finishes and furnishings in contact with or near the wall may combust.

Insulation is governed by the material thickness of the masonry unit. For solid and cored (core volume less than 30%) 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 net or material volume of the unit divided by its face area, commonly referred to as ' equivalent thickness'. If the wall is cement rendered on both sides, the thickness of the thinner coating up to a maximum value of 20mm may be added to the material thickness of the wall.

Cavity walls
For insulation, AS3700 states the material thickness of both leaves is added together and the cavity ignored to give the "material thickness". For structural adequacy where only one leaf is load bearing, the FRL for structural adequacy is based on the loaded leaf alone and the non loaded leaf ignored. If both leaves are similarly 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 secondary curves on the right hand side of the design tables.

Chases
AS3700 Clause 6.7 states chasing of masonry subject to fire shall be kept to a minimum. The effect of chasing fire-rated walls shall be limited by structural adequacy. Vertically spanning walls may be chased vertically. Where the chase is horizontal the lengths limited to four times the wall thickness.

Vertically and horizontally spanning walls, may be chased if the length of the chase is not greater than half the height (for a vertical chase) or half the length (horizontal chase) of the wall.

Where the length of chase is greater than half the height or half the length, the wall must be designed as two walls with unsupported ends (for a vertical chase). For horizontal chases greater than half of the wall length the masonry design thickness must be reduced by the depth of the recess (horizontal chase).

Recesses for services
AS3700 Clause 6.6 states the effect of recesses for services on the fire resistance periods, for structural adequacy, integrity and insulation of a wall shall be ignored, provided that the depth of material removed is not greater than half the wall thickness and the total area of recesses is not more than 10,000mm^2 total of both faces within any 5m^2 of wall area. Where these limits are exceeded , the member thickness of the masonry shall be taken as the overall thickness of the wall less the depth of the recess. Where the wall is constructed of cored or hollow units, the recess can extend into the cores.

Research and Development

In 2011, the National Acoustic Laboratory tested Austral Masonry's 140mm thick 15-01 masonry block. Test Report 2538-2, for a 140mm masonry block with a 64mm independent stud wall system, achieved Rw + Ctr ≥ 50 which satisfies the minimum BCA requirement for walls separating sole-occupancy 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.

This test and other previous tests provided data for Day Design Pty Ltd Acoustic Engineers to provide opinions on the performance of other masonry wall systems.

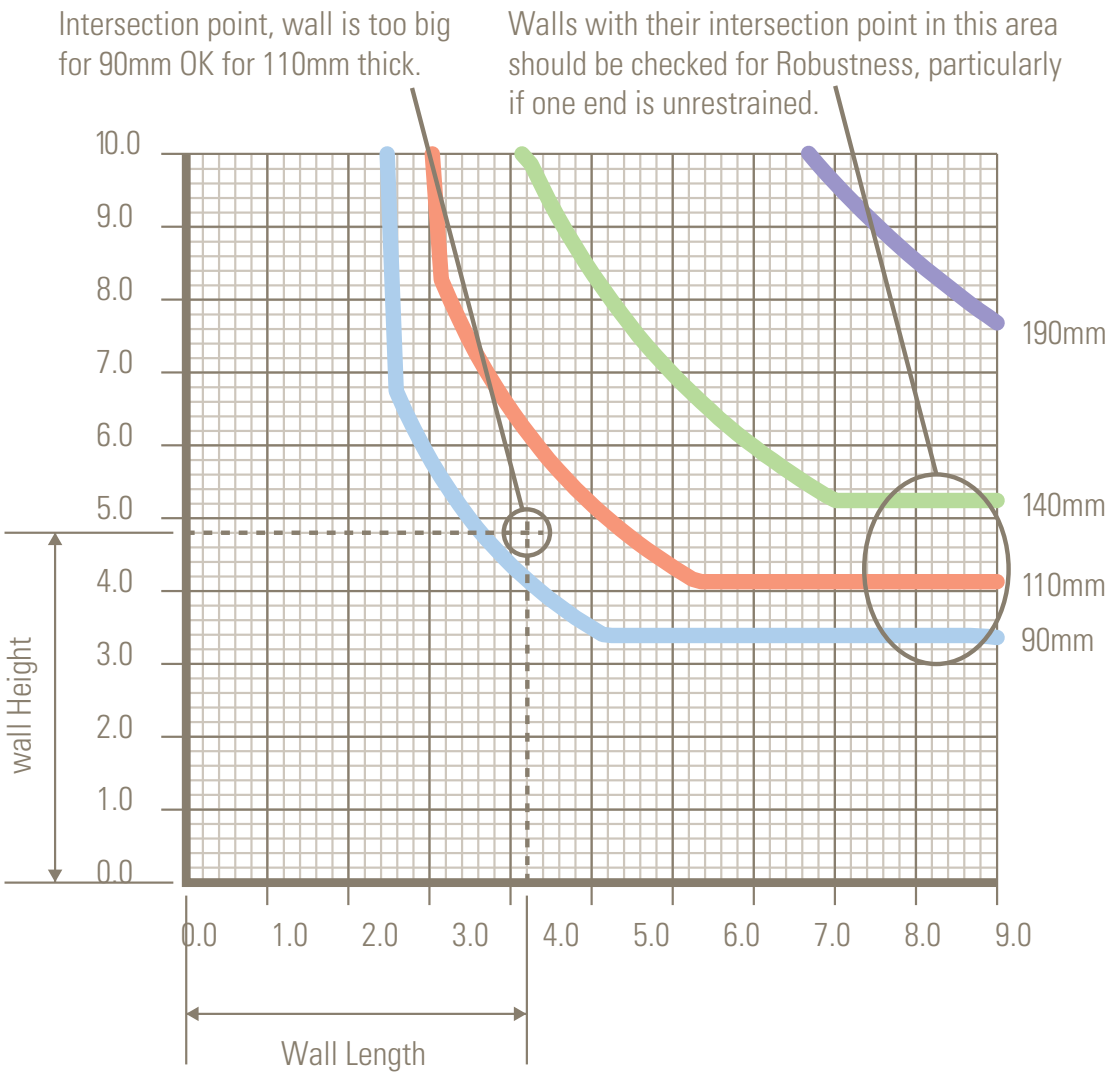
The 15-01 masonry units achieve the NCC fire rating requirements for low to high-rise home unit walls before adding any lining system.

Denseweight and GB Masonry
Maximum insulation FRL in minutes

				Maximum Slenderness Ratio (Srf)				
			Hollow and Solid	18	17	16	15.5	15
			Reinforced and Core-filled	36	36	36	36	36
Code	Dimensions L x H x T (mm)	Unit Type	f'uc MPa	FRL Insulation (minutes)				
				60	90	120	180	240
10-01 DW	390 x 190 x 91	Cored	15					
10-31 DW	390 x 190 x 90	Solid	15					
8001LB DW	230 x 162 x 110	Cored	10					
12-01 DW	390 x 190 x 110	Hollow	15					
12-801 DW	390 x 190 x 110	Cored	15					
15-01 DW	390 x 190 x 140	Hollow	15					
15-42 DW	390 x 190 x 140	Reinforced and core filled	15					
15-48 DW	390 x 190 x 140	Reinforced and core filled	15					
15-801 DW	390 x 190 x 140	Cored	15					
20-01 DW	390 x 190 x 190	Hollow	15					
20-42 DW	390 x 190 x 190	Reinforced and core filled	15					
20-48 DW	390 x 190 x 190	Reinforced and core filled	15					
30-42 DW	390 x 190 x 190	Reinforced and core filled	15					
30-48 DW	390 x 190 x 290	Reinforced and core filled	15					

This data represents average results from commercial production lots and is for general description purposes only. Figures are accurate at date of publication and subject to change without notice. Contact Austral Masonry for confirmation of product specification.

Structural Adequacy Charts & Tables



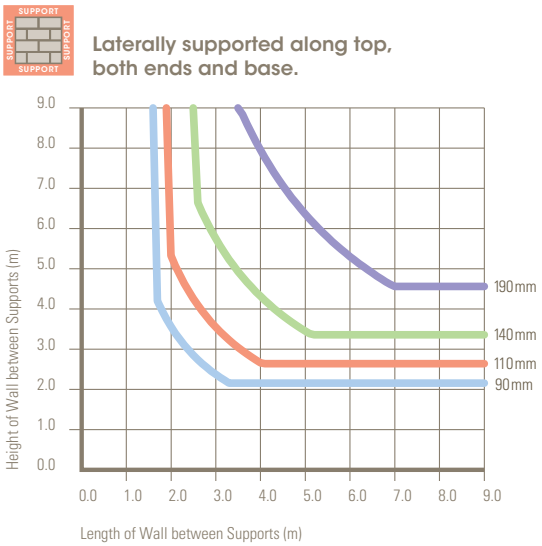
How to use the charts

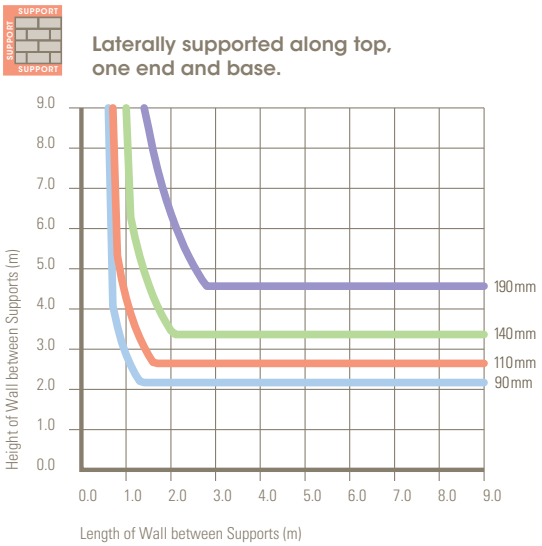
First, find the page with the required FRL: 60, 90, 120, 180 or 240 minutes. Next, find the graph with the restraint conditions of your proposed wall. Finally, plot the intersection of your wall's height and length on the appropriate graph.

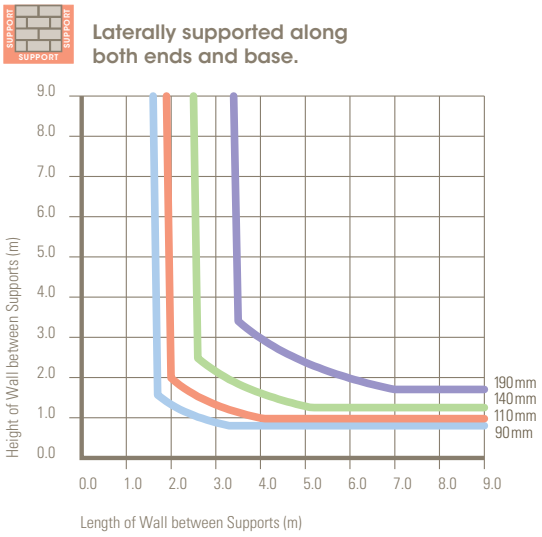
The thickness required is represented by those lines clear of the intersection point. Denseweight™ and GB Masonry™ masonry that is designed for other loads (vertical, bending, earthquake, etc.) can be checked for its FRL structural adequacy by using the following graphs.

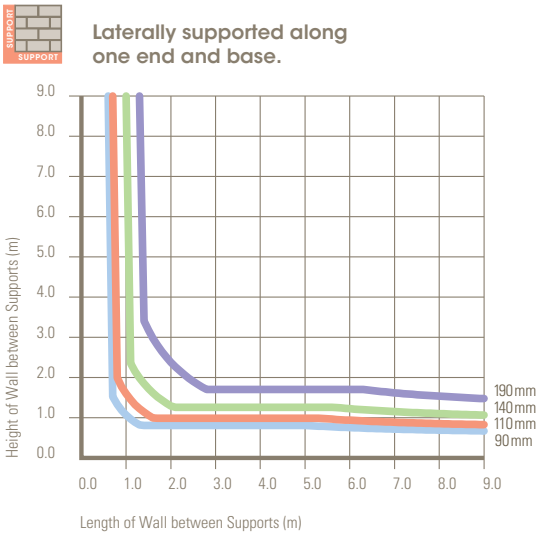
The three formulae are graphed, with a line for each wall thickness: 90, 110, 140 and 190mm.

60 Minute Structural Adequacy FRL (Srf ≥18)



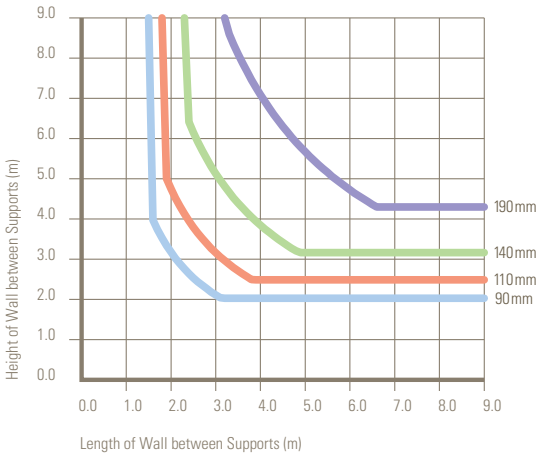




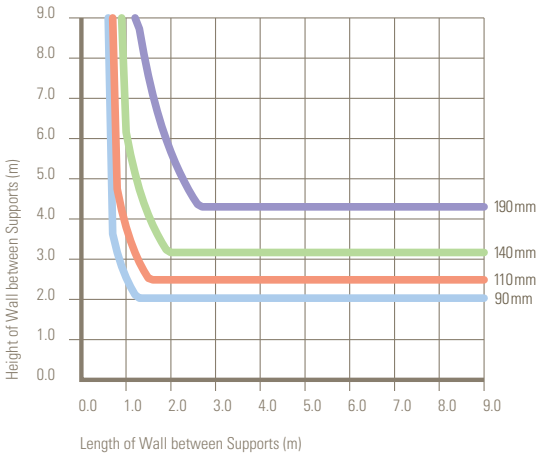


90 Minute Structural Adequacy FRL (Srf ≥17)

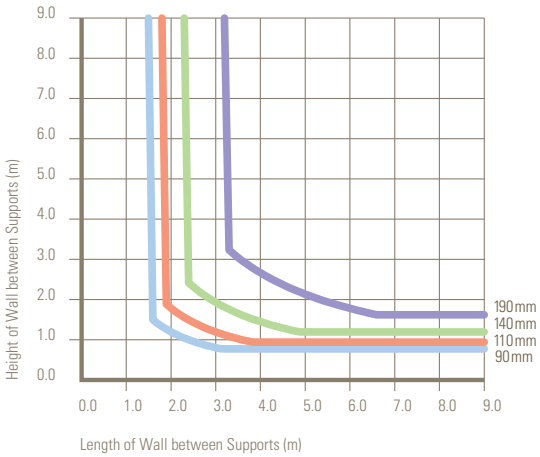
Laterally supported along top, both ends and base.



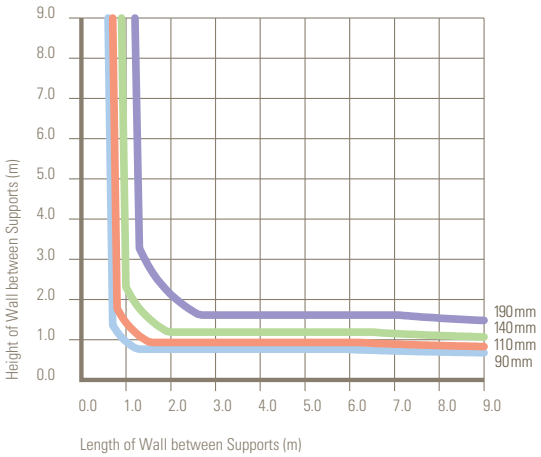
Laterally supported along top, one end and base.



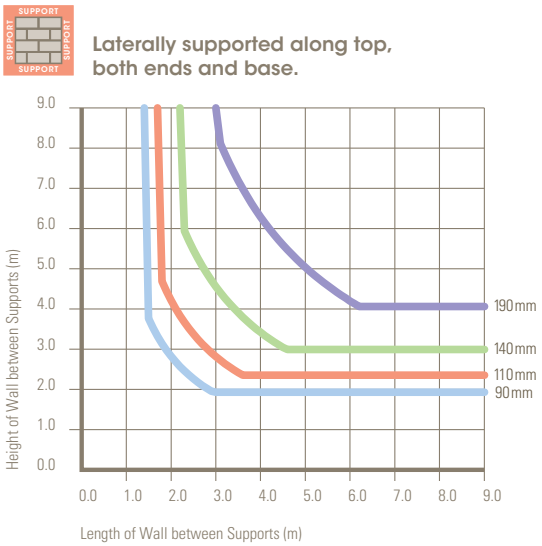
Laterally supported along both ends and base.

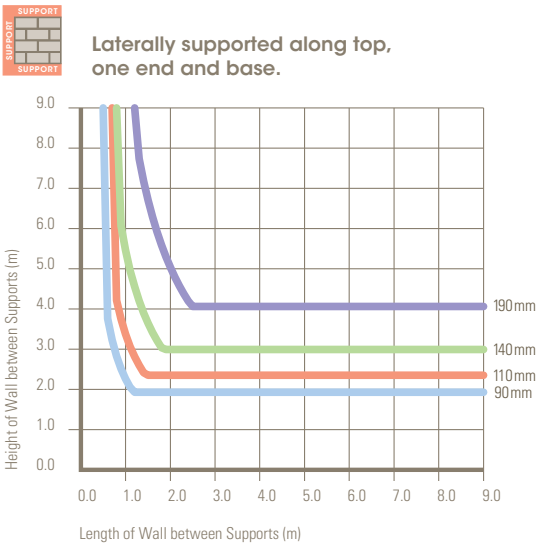


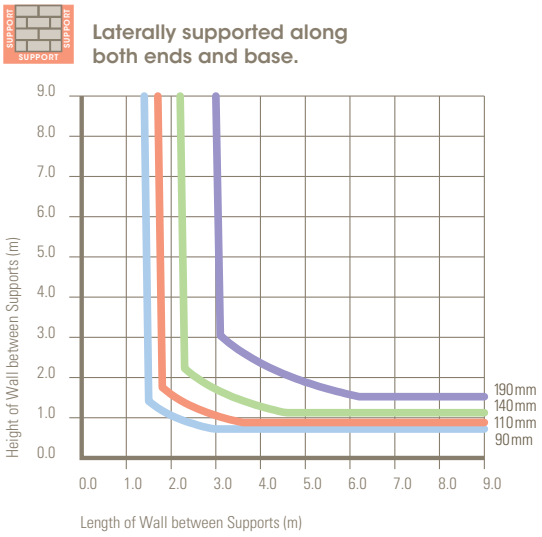
Laterally supported along one end and base.

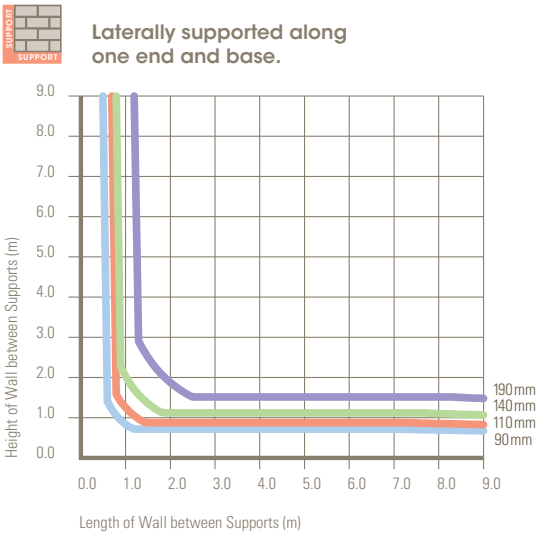


120 Minute Structural Adequacy FRL (Srf ≥16)

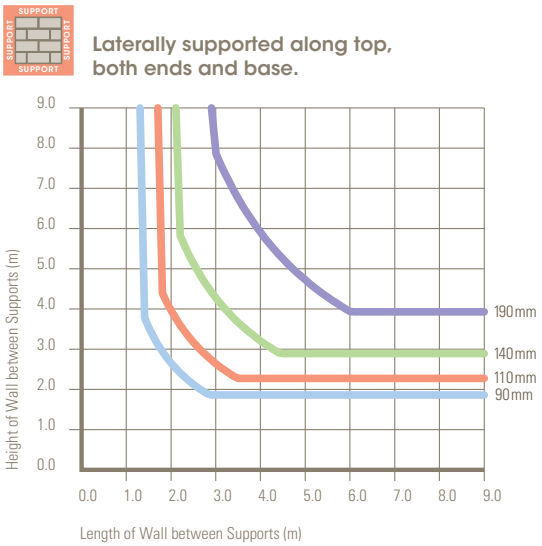


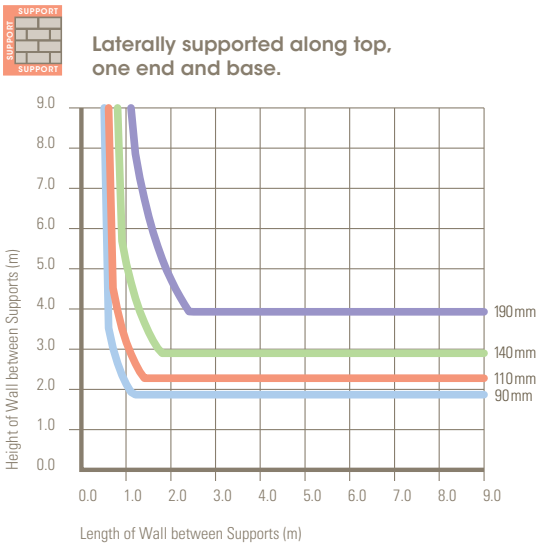


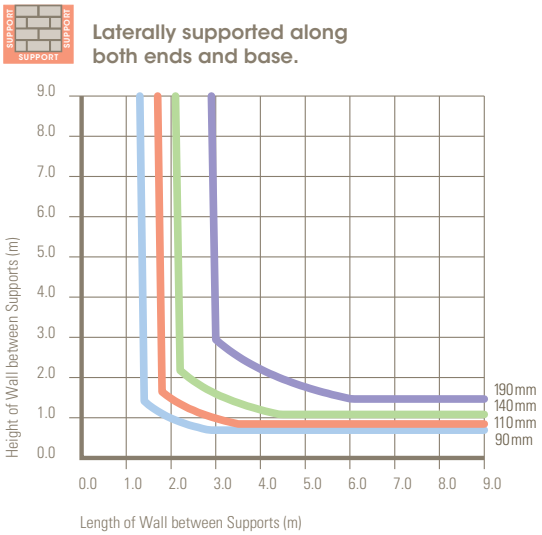


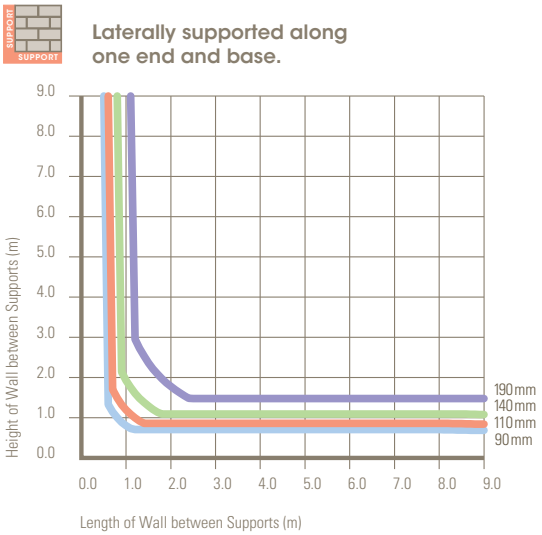


180 Minute Structural Adequacy FRL (Srf ≥15.5)

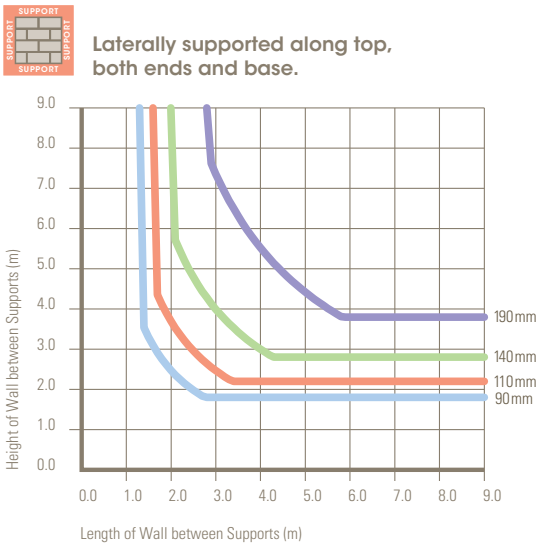


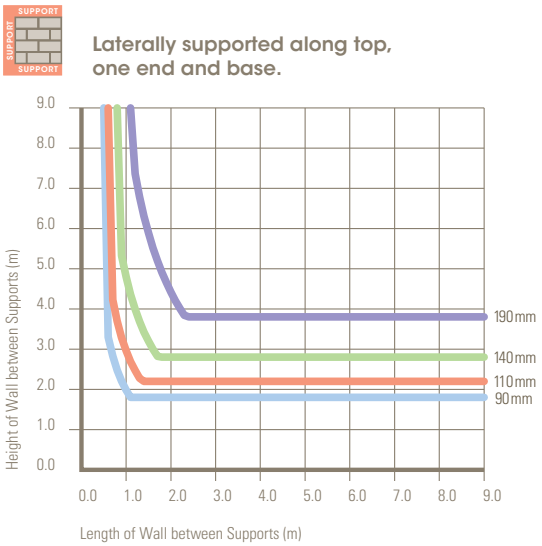


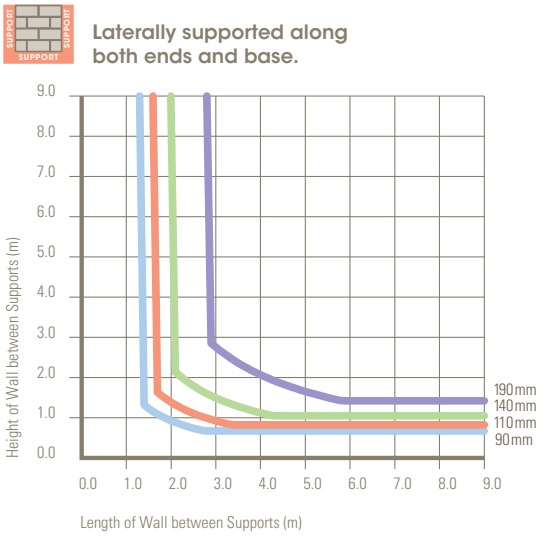


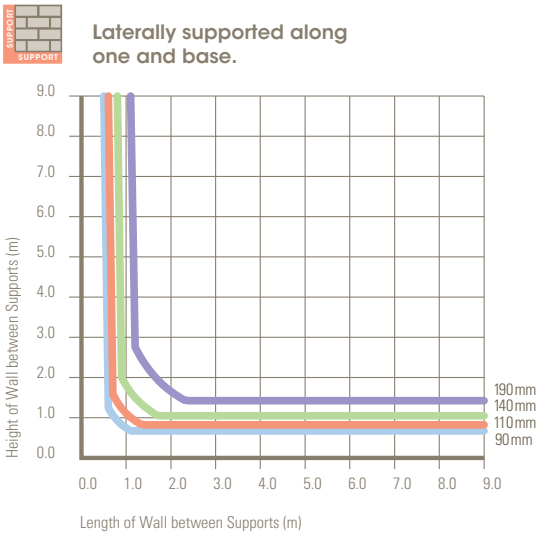


240 Minute Structural Adequacy FRL (Srf ≥15)





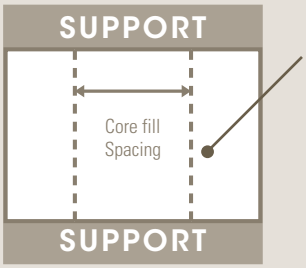




Reinforced Masonry

60 to 240 minutes

Maximum vertical load on wall + 11.25H kN/m where H is in metres. Reinforced masonry is to comply with AS3700:2011, Section 8.

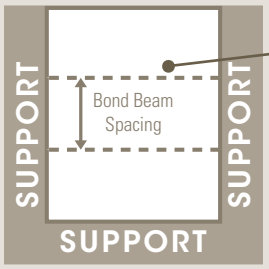


Single steel reinforced and fully grouted cores.

Maximum wall height (Metres)	Steel	Core Fill Spacing (Metres)	Leaf Thickness (mm)
4.000	N12	Every 10th core (2m)	140 mm
5.040	N16	Every 10th core (2m)	140 mm
4.800	N12	Every 10th core (2m)	190 mm
6.400	N16	Every 10th core (2m)	190 mm
6.840	N16	Every 8th core (1.6m)	190 mm

60 to 240 minutes

Maximum vertical load on wall + 11.25H kN/m where H is in metres. Reinforced masonry is to comply with AS3700:2011, Section 8.



Maximum wall height (Metres)	Steel	Bond Beam Spacing (Metres)	Leaf Thickness (mm)
4.000	N12	Every 10th core (2m)	140 mm
5.040	N16	Every 10th core (2m)	140 mm
4.800	N12	Every 10th core (2m)	190 mm
6.400	N16	Every 10th core (2m)	190 mm
6.840	N16	Every 8th core (1.6m)	190 mm

Acoustic Ratings

This brochure provides guidance on the measurement of acoustic ratings, the BCA requirements for residential buildings and details of testing and development of successful wall systems for Denseweight™ and GB Masonry™.

The BCA requires that building elements have certain levels of insulation from airborne noise and impact sound. Rw is the weighted sound reduction index, which is used to measure the acoustic performance of a construction system. It is a single number quantity for the airborne sound insulation rating of building elements. As the acoustic performance of a material or construction improves, the higher the Rw value will be.

The Rw rating system has two correction factors (C and Ctr) which take into account different spectra of noise sources. C relates mainly to high frequency noise while Ctr relates to lower frequency noises. These correction factors are used to indicate the performance drop of the wall in the corresponding frequency range.

Rw + Ctr is the value of the index when the low frequency correction factor (Ctr) is applied. For example, if a wall is measured as Rw (C;Ctr) of 55 (-1;-4) the Rw rating is 55 and Rw + Ctr is 55 + (-4) = 51.

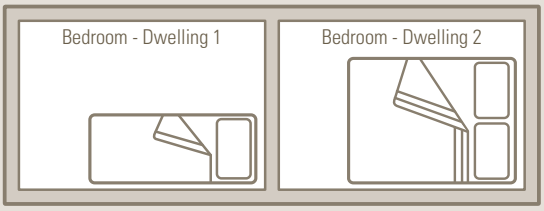
This brochure is designed to provide you with up to date data and information on the acoustic performances of Austral's masonry wall systems.

Building Code of Australia Acoustic Requirements

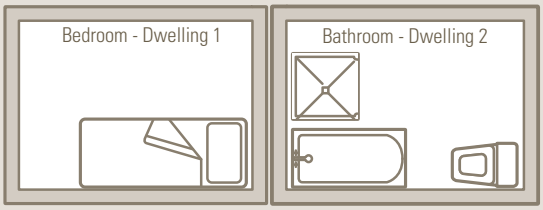
The NCC requires that walls separating sole-occupancy units in Class 1, 2 and 3 buildings are required to have an Rw + Ctr of not less than 50. In addition, the construction must be discontinuous if the wall separates a habitable room (living room, dining room, bedroom, study and the like) from a wet room (kitchen, bathroom, sanitary compartment or laundry). Walls in Class 2 or 3 buildings that separate a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like must have an Rw of not less than 50. If this wall separates a sole-occupancy unit from a plant room or a lift shaft, the construction must be discontinuous.

Discontinuous construction requires a minimum 20mm cavity between two separate leaves. If wall ties are to be used they must be resilient wall ties.

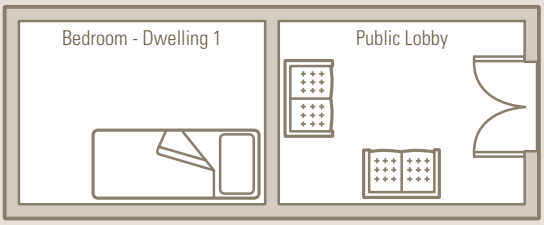
Construction: Habitable to habitable and wet to wet.
Requirements: Rw + Ctr ≥ 50.



Construction: Habitable to wet.
Requirements: Rw + Ctr ≥ 50 with discontinuous construction.

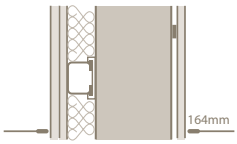
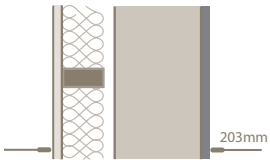
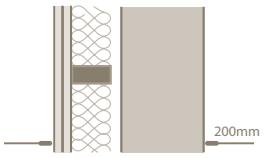


Construction: Sole occupancy to corridor or public area.
Requirements: Rw + > 50 with discontinuous construction (if lift shaft or plant room).

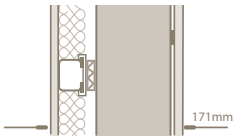
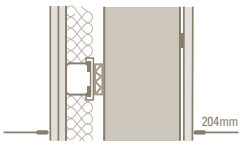
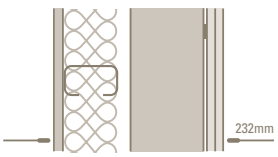


Acoustic Performance of Masonry Walls

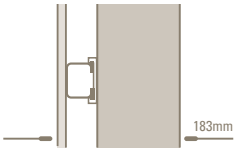
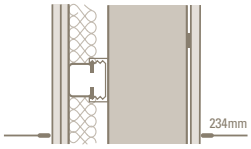
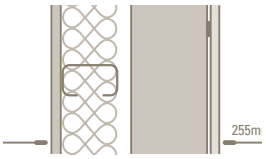
90mm Masonry Systems - Code: Denseweight 10-01 & 10-31

Corridor Wall: Rw ≥ 50 Including unit to stairs, unit to foyer Bare Wall: Rw 40	2 layers of 13mm standard-core plasterboard on 28mm furring channel on standard clips Minimum cavity: 30mm with 25 mm Glasswool or 30mm Polyester in cavity		13mm standard-core plasterboard, daub-fixed
Party Wall: Rw + Ctr ≥ 50 NB: Wall ties must be resilient, to comply with discontinuous construction.	13 mm Sound Rated plasterboard on 70mm timber stud, 20mm clear of masonry with R1.5 Glasswool or Polyester		10mm cement render
Party Wall: Rw + Ctr ≥ 50 NB: Wall ties must be resilient, to comply with discontinuous construction.	2 layers of 10mm standard-core plasterboard on 70mm timber stud, 20mm clear of masonry with R1.5 Glasswool or Polyester		Bare Wall

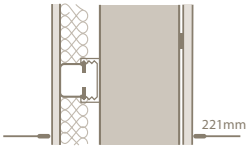
110mm Masonry Systems - Code: Denseweight 12-01 (60 minute FRL) &12-709 (90 minute FRL)

Corridor Wall: Rw ≥ 50 Including unit to stairs, unit to foyer Bare Wall: Rw 42 (12-01)	13mm standard-core plasterboard on 28mm furring channel on resilient clips Minimum cavity: 30mm with 25 mm Glasswool or 30mm Polyester in cavity		13mm standard-core plasterboard, daub-fixed
Party Wall: Rw + Ctr ≥ 50 NB: Not suitable for wet-to-dry areas. See Discontinuous detail below.	2 layers of 13mm standard-core plasterboard on 28mm furring channel on resilient clips Minimum cavity: 50mm with 50mm Glasswool or 50mm Polyester in cavity		13mm standard-core plasterboard, daub-fixed
Party Wall: Rw + Ctr ≥ 50 Discontinuous Construction. Suitable for all Party Walls. If wall ties are required, they must be resilient type.	13mm sound rated plasterboard on 64mm steel studs 20mm clear of masonry with 75 mm Glasswool or 65mm Polyester		2 layers of 10mm standard-core plasterboard

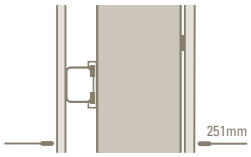
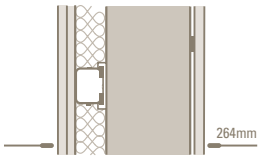
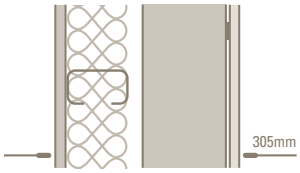
140mm Masonry Systems - Code: Denseweight 15-01 (60 minute FRL) &15-709 (120 minute FRL)

Corridor Wall: Rw ≥ 50 Including unit to stairs, unit to foyer Bare Wall: Rw 43 (15-01)	13mm standard-core plasterboard on 28mm furring channel on standard clips Minimum cavity: 30mm		Bare Wall
Party Wall: Rw + Ctr ≥ 50 NB: Not suitable for wet-to-dry areas. See Discontinuous detail below.	2 layers of 13 mm 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
Party Wall: Rw + Ctr ≥ 50 Discontinuous Construction. Suitable for all Party Walls. If wall ties are required, they must be resilient type.	13 mm standard-core plasterboard on 64mm steel studs 20mm clear of masonry with 75mm Glasswool or 65mm Polyester		13mm standard-core plasterboard, daub-fixed

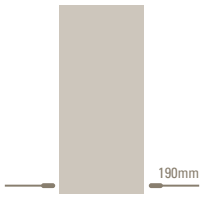
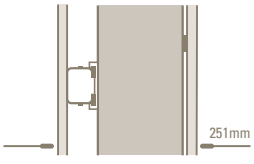
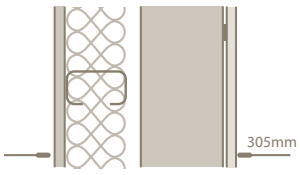
140mm Grouted Systems - Code: Denseweight 15-48

Corridor Wall: Rw ≥ 50 Including unit to stairs, unit to foyer Bare Wall: Rw 50			No lining required
Party Wall: Rw + Ctr ≥ 50 **(both options)** NB: Not suitable for wet-to-dry areas. See Discontinuous detail below.	2 layers of 13 mm 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, daub-fixed
	13 mm 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
Party Wall: Rw + Ctr ≥ 50 Discontinuous Construction. Suitable for all Party Walls. If wall ties are required, they must be resilient type. (No ties are better)	13 mm standard-core plasterboard on 64mm steel studs 20mm clear of masonry with 75mm Glasswool or 65mm Polyester		13mm standard-core plasterboard, daub-fixed

190mm Masonry Systems - Code: Denseweight 20-01

Corridor Wall: Rw ≥ 50 Bare Wall: Rw 45 Including unit to stairs, unit to foyer	13 mm standard-core plasterboard on 28mm furring channel on standard clips Minimum cavity: 30mm		13mm standard-core plasterboard, daub-fixed
Party Wall: Rw + Ctr ≥ 50 NB: Not suitable for wet-to-dry areas. See Discontinuous detail below.	2 layers of 13 mm 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, daub-fixed
Party Wall: Rw + Ctr ≥ 50 Discontinuous Construction. Suitable for all Party Walls. If wall ties are required, they must be resilient type.	13 mm standard-core plasterboard on 64mm steel studs 20mm clear of masonry with 75mm Glasswool or 65mm Polyester		13mm standard-core plasterboard, daub-fixed

190mm Grouted Systems - Code: Denseweight 20-48

Corridor Wall: Rw ≥ 50 Bare Wall: Rw 50 Including unit to stairs, unit to foyer.			No lining required
Party Wall: Rw + Ctr ≥ 50 NB: Not suitable for wet-to-dry areas. See Discontinuous detail below.	13 mm 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, daub-fixed
Party Wall: Rw + Ctr ≥ 50 Discontinuous Construction. Suitable for all Party Walls. If wall ties are required, they must be resilient type. (No ties are better)	13 mm standard-core plasterboard on 64mm steel studs 20mm clear of masonry with 75mm Glasswool or 65mm Polyester		13mm standard-core plasterboard, daub-fixed

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5. **Important Notice.** Please consult with your local council for design regulations prior to the construction of your wall. Councils in general require those walls over 0.5m in height and/or where there is loading such as a car or house near the wall be designed and certified by a suitably qualified engineer.
6. **Max wall heights disclaimer**
   The gravity wall heights are maximum heights calculated in accordance with CMAA MA-53 Appendix D guidelines and a qualified engineer should confirm the suitability of the product for each application. As such, due consideration must be given to but not limited to:
   - Cohesion
   - Dry backfill, no ingress of any water into the soil behind the retaining wall.
   - All retaining walls are designed for zero surcharge unless noted otherwise.

These walls are intended for structure Classification A walls only as defined in AS4678 Earth Retaining Structures as being where failure would result in minimal damage and/or loss of access.

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