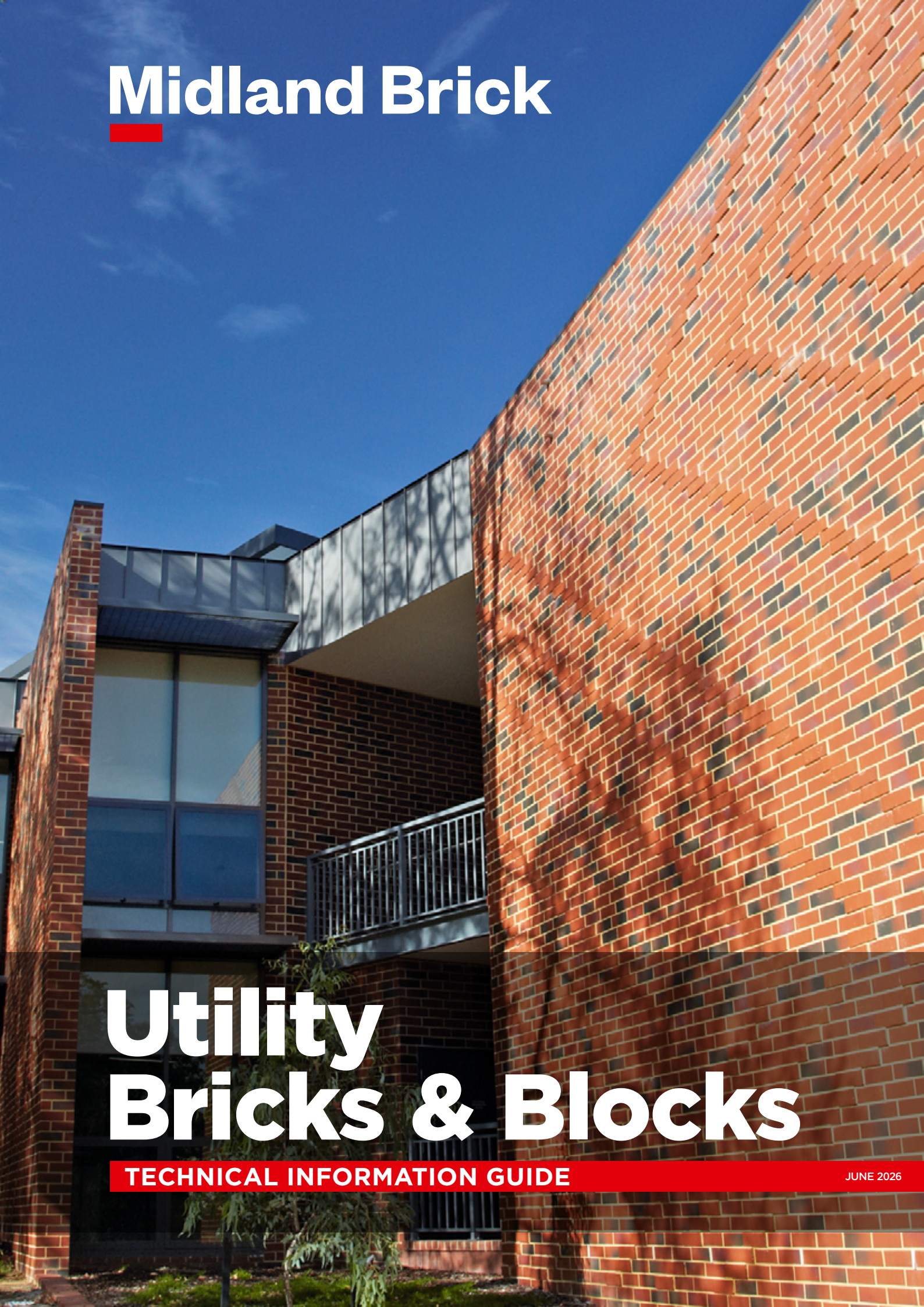
Midland Brick



Utility Bricks & Blocks

TECHNICAL INFORMATION GUIDE

JUNE 2026

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Introduction

Midland Brick has been a trusted name in Australian brick manufacturing for over 80 years. Renowned for our commitment to quality, innovation, and customer service, we've earned a reputation as one of the world's leading producers of clay bricks.

As one of Western Australia's foremost suppliers of clay bricks and pavers, we take pride in delivering products that meet the highest standards of colour consistency, texture, and durability. Our bricks are crafted to perform and built to last.

All products undergo rigorous testing in our NATA-accredited laboratory, ensuring they not only meet industry standards but also anticipate future building needs. Our ongoing research and development efforts continue to drive innovation in building materials.

From residential homes to large-scale commercial and industrial projects, Midland Brick delivers premium building products designed to stand the test of time.

The following information is a concise summary of some of the important features of bricks and masonry.

More detailed information is readily available from:

- Australian Standards relating to Masonry AS4773.1, AS4773.2 and ASNZ4455
- The National Construction Code
- Think Brick Australia, www.thinkbrick.com.au
- Concrete Masonry Association of Australia (CMAA) www.cmaa.com.au

Note

Please refer to the online Technical Manual for latest information. Building codes and Australian Standards may change after printing. We will endeavour to update the online manual as changes occur.

Disclaimer

The information presented herein is supplied in good faith and to the best of our knowledge was correct at the time of preparation. No responsibility can be accepted by Midland Brick Company Pty Ltd, its staff or its agents for any errors or omissions. Users are advised to make their own determination as to the suitability of this information in relation to their particular purposes and specific circumstances. Since the information contained in this document may be applied under conditions beyond our control, no responsibility can be accepted by Midland Brick Company Pty Ltd, its staff or its agents for any loss or damage caused by any person acting or refraining from action as a result of this information. It is recommended that you refer to the online version of our Technical Manual for the latest information.

Brick Dimensions

Properties

The size of a standard brick is:
230mm long x 110mm wide x 76mm high.

Bricks are made in many different work sizes. For example brick heights of 119mm and 162mm to match 1.5 and 2 standard size brick heights, including mortar joint, respectively. 50mm and 90mm high bricks, 90mm wide bricks and 290mm long bricks are made for different structural and aesthetic effects. Larger bricks are often used for more economical laying and as a design feature either on their own or combined with smaller bricks.

In cyclonic areas larger hollow bricks and blocks can be used to allow for concrete filling and reinforcing within the block. Wider (150mm wide) bricks can also be used in walls requiring lower sound transmission, higher fire resistance levels and higher load bearing capacity depending on the specific brick properties.

Bricks are classified according to how much 20 bricks together deviate from 20 times the work size – this is known as the "lay test".

- For standard bricks, Dimensional Category DW1 means the height and width will differ by less than plus or minus 50mm from 20 times the work size, and the length will differ less than plus or minus 90mm.
- For standard bricks, Dimensional Category DW2 means the height and width will differ by less than plus or minus 40mm from 20 times the work size, and the length will differ less than plus or minus 60mm.
- Dimensional Category DW0 means there are no requirements. This is usually reserved for non-standard shaped bricks and bricks that have been rumbled or otherwise distorted during the manufacturing process for aesthetic reasons.

Example – Standard size clay brick (230x110x76mm):

The "lay test" range for 20 bricks selected from a batch of bricks is as below for Category DW1:

1.	(20 x 230)	–	90	=	4510mm	≤	Length 20 Bricks	≤	(20 x 230)	+	90	= 4690mm
2.	(20 x 76)	–	50	=	1470mm	≤	Height 20 Bricks	≤	(20 x 76)	+	50	= 2250mm
3.	(20 x 110)	–	50	=	2150mm	≤	Width 20 Bricks	≤	(20 x 110)	+	50	= 1570mm

Example – 2 Course Brick (290x90x162mm):

The "lay test" range for 20 bricks selected from a batch of bricks is as below for Category DW1:

1.	(20 x 290)	–	100	=	5700mm	≤	Length 20 Blocks	≤	(20 x 290)	+	100	= 5900mm
2.	(20 x 162)	–	90	=	3150mm	≤	Height 20 Blocks	≤	(20 x 162)	+	90	= 3330mm
3.	(20 x 90)	–	50	=	1750mm	≤	Width 20 Blocks	≤	(20 x 90)	+	50	= 1850mm

Example – Full block (390x90x190mm)

The "lay test" range for 20 blocks selected from a batch of bricks is as below for Category DW1:

1.	(20 x 390)	–	100*	=	*7700mm	≤	Length 20 Bricks	≤	(20 x 390)	+	100*	= 7900mm
2.	(20 x 190)	–	90	=	3710mm	≤	Height 20 Bricks	≤	(20 x 190)	+	90	= 3890mm
3.	(20 x 90)	–	50	=	1750mm	≤	Width 20 Bricks	≤	(20 x 90)	+	50	= 1850mm

*For wider blocks refer to AS/NZS 4455.1 - Table 2.1

Brick Strength

Compressive Strength of Bricks

Brick strength is defined as resistance to load per unit area and is expressed in Megapascals (MPa).

Brick strength is measured according to: AS4456.4 Determining Compressive Strength of Masonry Units.

Individually crushing 10 bricks gives the compressive strength of each brick and the mean compressive strength of the lot. These figures are not used in masonry design, but are used to calculate the Unconfined Compressive Strength.

Unconfined Compressive Strength

The Unconfined Compressive Strength is a calculated number based on the compressive strength. To measure the compressive strength of a brick, steel platens are used above and below.

This constrains the surface and where all other factors are equal, a shorter brick will have a higher compressive strength than a taller brick. To remove this test effect, the compressive strength is multiplied by a factor, which varies with the height of the brick.

The resulting number is called the unconfined compressive strength and reflects the performance of the brick in a wall.

Characteristic Unconfined Compressive Strength (f'uc)

Bricks in any one batch have a range of strengths that would usually follow a normal distribution. In a wall, the different strength bricks contribute to the strength of the whole and neither the strongest or the weakest determines the strength of the wall.

The Characteristic Unconfined Compressive Strength (f'uc) of a batch of bricks is a statistical determination that considers the effect of the range of strengths within a lot. 95% of the bricks in the lot should exceed this figure. Engineers use the f'uc to design the masonry structure.

Water Absorption

Cold Water Absorption

The amount of water that a brick can absorb is measured by the cold water absorption test. There is no distinct relationship between water absorption and the water-tightness of walls. The results of water absorption tests are used by the brick manufacturer for quality assurance.

Initial Rate of Absorption

The initial rate of absorption (IRA) is the amount of water absorbed in one minute through the bed face of the brick.

It is a measure of the brick's 'suction' and can be used as a factor in the design of mortars that will bond strongly with units. As mortars, other than the NCC 'deemed to comply' mortars, are rarely used, the impact of the IRA is primarily on the bricklayer. Bricklayers, through practical experience, adjust the mortar, the height of a wall built in a day and the length of time before ironing the joints, according to the suction.

The bond between the masonry unit and mortar is largely influenced by the capacity of the brick to absorb water and the ability of the mortar to retain the water that is needed for the proper hydration of cement. If the brick sucks the water too quickly from the mortar, the next course may not be properly bedded. If the mortar retains too much water, the units tend to float on the mortar bed, making it difficult to lay plumb walls at a reasonable rate. In either case there will be poor bond.

The optimum value of IRA is considered to be between 0.5 and 1.5 kg/m^2/min. However, IRAs can exceed these limits. The mortar's water retentivity should be matched to the brick type where good bond strength is critical.

Movement in Masonry Walls

Movement Control

To allow for movements in masonry (expansion and contraction and footing movement) control joints are required. These can usually be constructed so that the expansion joint and the articulation joint are one and the same.

Co-efficient of Expansion

The phenomenon of long-term permanent change in dimensions, or simply growth, is common to all fired-clay products. It is caused by chemical reactions between water and particular minerals found in the clay body. Therefore, expansion gaps are required in clay brickwork. The location and dimension of expansion gaps are calculated on the basis of the 'Coefficient of Expansion' of the particular brick used.

The coefficient of expansion is an estimate of the potential permanent unrestrained expansion of a brick during its first fifteen years.

The coefficient of expansion is given the symbol 'e_m'. It has also been known as the characteristic expansion and referred to as the 'e' value; however, this is no longer the preferred terminology.

There are some other **important factors** that need to be considered:

- Mortar shrinkage accommodates approximately 10% of the brick growth in the first year after the wall is built.
- Allowances must be made for shrinkage of structural concrete elements adjacent to brickwork.

Typically the coefficient of expansion for Midland Brick products is below 0.6mm/m.

In critical cases where the 'e_m' figure is required for a particular brick Midland Brick will test to determine the coefficient of growth in accordance with Australian Standard AS/NZS4456.11.

The coefficient of expansion, or e-factor value, of clay bricks is tested in accordance with AS/NZS 4456.11 and is an estimate of the amount of growth expected in the first fifteen years after the brick leaves the kiln. Typical values are given only as a guide as:

- there is no pattern in the coefficient of expansion based on brick colour or manufacturing methods, and
- the coefficient of expansion can vary considerably between batches even within a single brick type, due to variations in the manufacturing process and raw materials used.

Control Joints

All building materials change size as their temperature varies or they are subjected to variations in loading. Materials such as concrete and cement products usually shrink after they have been placed in a building whereas clay bricks may expand slowly over a long period of time.

The different responses of materials to changing conditions create differential movements between materials that must be taken into account if damage to the structure is to be avoided. This is done by the provision of control joints between parts of the structure.

Control joints may be in the following form:

- Expansion gaps to allow for brick growth and concrete shrinkage.
- Expansion gaps to allow for thermal expansion and contraction.
- Articulation joints to allow for the movement of foundations and footings.

Another important consideration is that only highly compressible material is placed in the gap so that potentially damaging forces are not transferred across it. A simple caulking material such as butyl-mastic is usually adequate.

Two common faults with the sealing of gaps that may cause problems with expansion:

1. Failure to ensure that gaps were clean and free of hard materials, such as mortar droppings, before sealing.
2. The use of joint fillers that are too rigid with compressive strengths high enough to transfer significant forces.

The design of control joints is more fully dealt with in Design Notes published by the Think Brick (www.thinkbrick.com.au).

Movement in Masonry Walls

Articulation Joints

Articulation joints are vertical gaps that allow for minor footing movements to prevent distress or significant wall cracking.

Articulation joints provide the flexibility needed when building on reactive clay soils and usually are not required for masonry on stable sites (classified according to AS2870).

Spacing of articulation joints depends on the site classification and the slab or footing design. Joints must be placed no closer than 0.5 metres and no further than 3 metres from all corners.

The width of articulation joints depends on the height of the masonry: 10mm for masonry up to 3 metres and 15mm for masonry 3 to 6 metres high.

Control Joints for Concrete Masonry Construction

Because of temperature variations and the shrinkage in a concrete masonry wall after it is constructed, it is necessary to provide control joints in blockwork to prevent cracking.

Control joints should be used beside large openings, where wall thickness changes (except where this is for support eg. engaged piers), where wall height changes by more than 20%, at changes of level in footings, at other points of potential cracking and at the locations shown on the drawings. However, in no case should the length of wall be greater than 6m spacing in residential construction and 8m spacing in other construction. Control joints must not continue through bond beams.

Ideally, control joints are located near a corner and concealed behind a down pipe. The bricklayer and renderer must keep the control joint clean otherwise bridging mortar or render will induce cracks as the masonry moves. External control joints should be finished with a soft flexible sealant to prevent moisture penetration.

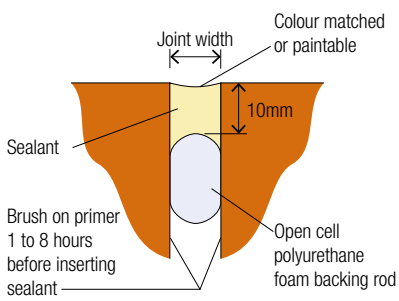
The design and construction of control gaps in the external leaf of a full brick wall is identical to that in brick veneer. In internal masonry, control gaps are not usually required except at re-entrant angles in long walls. However, where an internal control joint is required, the design is as for external leaves but the thermal component may be ignored in calculations. Internal control joints can usually be located at a full-height opening such as a door or window.

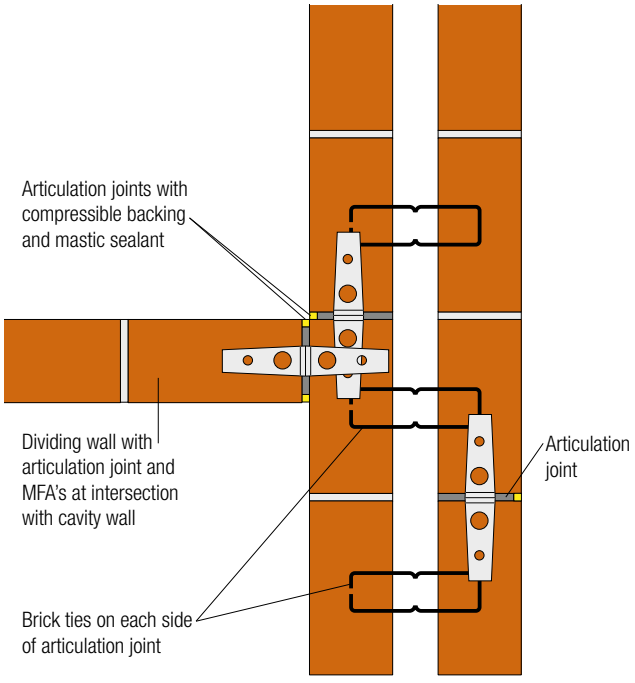
Ties should ideally be used on both sides of a control joint. Where it is not possible to use ties, masonry flexible anchors (MFAs) must be used across the joint. Where MFAs are used in walls over 3 metres high or in walls exposed to high winds, MFAs must be built in at half height and every seventh course (600mm) above.

MFAs are ties that only allow movement in one plane. Unless ties are used, control joints create a 'free end' in terms of Robustness and Fire Resistance Level calculations for structural adequacy, so their positioning is critical to the overall design of the structure. In portal frame construction, the control joint is positioned at a column so that both ends can be tied to the column's flanges.

The principles of control joint construction are illustrated below.

Further technical information regarding masonry products can be found on the Concrete Masonry Association of Australia's web page (www.cmaa.com.au). *MA45 Chapter 12 - Movement.*





Brickwork Durability

Brick Durability

Brick durability is classified in terms of the Durability Classifications as defined in Australian Standard AS/NZS4456.10 and the NCC, as shown below. Provided good brickwork detailing and construction practices are used, products will give satisfactory service in the duty specified.

Exposure Conditions

Classification	Application
Exposure Class (EXP)	Suitable for use in all classifications including severe marine environment and local conditions, such as: • Below damp-proof course in areas where walls are expected to be attacked by salts in the ground water or brickwork itself (salt attack or salt damp). • On sea fronts where walls are exposed to attack from wind-borne salt spray, or in heavily polluted areas subject to deposition of atmospheric pollution (most suitable, although may need further protection in some environments). • In retaining walls situated in aggressive soils. • Under conditions of regular cyclic freezing and thawing.
General Purpose (GP)	Suitable for all uses except exposure class.
Protected (PRO)	Suitable for use above damp-proof course provided they are protected at the top of the wall by appropriate roofs, eaves, copings or toppings in: (a) Internal walls and (b) Coated or rendered external walls.

General purpose and exposure grade are the two grades to which bricks are manufactured.

To ensure the best possible performance of any brickwork, the following weather protection construction techniques should be used:

- Utilise rolled, hosed or flush joints on any face brick.
- Ensure adequate eave overhang and weep holes on external walls.
- Provide a correctly installed damp-proof course and flashing where required (refer to the National Construction Code).
- Provide protection to top of wall by appropriate roofs, eaves, cappings or toppings.
- Salt water pools require the use of exposure grade bricks within the area of the 'splash zone' and at any other location where salt water can enter the ground near a wall.

Mortar Mixes

Additives may be used provided they comply with the appropriate specified rate as per AS3700 1.4.2-4.
Mortar mixes for masonry concrete blocks require the use of methyl cellulose water thickener.

Mortar Class	Brick Classification (as shown above)	Mortar Mixed by Volume – Cement (GB/GP) : Lime : Sand	
		General Use CLS	Suitable for concrete masonry – requires the use of methyl cellulose water thickener*
M2	Protected	1:2:9	1:0:5
M3	General Purpose	1:1:6	1:0:5
M4	Exposure Class	1:0.5:4.5	1:0:4

*__Water Thickener:__ A methyl cellulose additive for mortar which is intended to hold the moisture in suspension thus permitting the proper hydration of the cement and reducing the tendency to dry out. A water thickener may also include an agent which improves workability of the mortar.

Note: (a) Cement in mortar mixes must comply with Australian Standard AS3972.
(b) Lime in mortar mixes must comply with Australian Standard AS1672.
(c) Sand in mortar mixes must be fine aggregate with low clay content and free from efflorescing salts.
(d) Water in mortar mixes must be potable (drinkable).

Mortar Durability

Mortar is subject to degradation due to salt attack and exposure to severe conditions in the same way bricks are.

Mortars also need to be suited to the location. Mortar mixes used for masonry construction must be mixed by volume in the proportions shown in the table above, as defined in the National Construction Code and in AS3700.

Cleaning of Clay Masonry

The Basics of Brick Cleaning

The cleaner the bricklayer leaves the wall, the easier will be the cleaning task. The majority of the mortar residues and smears should be cleaned before they set hard. However, in most cases some additional cleaning will be required to completely remove the mortar residue. It is generally best to schedule cleaning at least seven days after brickwork is completed.

Cleaning techniques may involve high-pressure water jet equipment or hand methods. Whatever technique is used, the following requirements must be observed to ensure additional staining problems are avoided.

Test Areas

Testing in one or more small areas is the safest way to determine the correct technique and chemical solution to remove mortar residues and stains. This must occur well before final cleaning as it will usually not be possible to assess the effectiveness of the test clean until the masonry dries.

Clean Soluble Salt Deposits First

Efflorescence, a white 'fluffy' deposit, cannot be removed by water or acid. Dry brushing to remove the efflorescence before washing is the most effective way to remove it successfully. If efflorescence is wetted, the salts go into solution and are drawn back into the brickwork and will reappear as the masonry dries. Efflorescence will eventually disappear through natural weathering.

Vanadium Staining

Vanadium salts produce a green or yellow efflorescence or stain (mainly seen on cream and light coloured clay bricks). Hydrochloric acid will make these stains much worse and may make them impossible to clean. It is therefore imperative that the vanadium stains are removed before the main task of removing mortar smears is commenced.

Mild vanadium stains may be treated with sodium hypochlorite (household bleach). Spray or brush on dry brickwork and leave until the stain disappears, then rinse off. Proprietary mould cleaners containing sodium hypochlorite and sodium hydroxide can be used as above and have been found very effective.

Proprietary brick cleaners may also be effective but should be used only according to the manufacturer's instructions. Proprietary cleaners usually contain acids that must be neutralised after use with a solution of 60-65 grams of sodium bicarbonate per litre of water.

More than one chemical application may be required and the walls should be rinsed thoroughly after each treatment.

High Pressure Cleaning

High-pressure water washing is not recommended. However if used, the pressure must be kept below 1000psi (7000kPa), the nozzle must be kept 300-500mm from the brick face and the nozzle must be a wide fan jet type with an angle of 15 degrees.

The following practices must be observed:

- Cleaning should not start until the mortar has hardened.
- Hard lumps or persistent smears should be removed by hand.
- Mask adjacent materials.
- Do not apply acid with the high-pressure sprayer. Use a low-pressure spray or broom it on.
- Clean from top to bottom in small sections.
- Work in the shade, ahead of the sun, if possible.
- DO NOT USE EXCESSIVE PRESSURE OR GET TOO CLOSE as this will damage the face of the brick and the mortar joint. Mortar joints that are no longer smooth with sharp edges are a clear sign of excessive pressure. Excessive pressure is used to make cleaning faster; it does not do a better job of cleaning.

Saturate the Wall Surface

Failure to completely saturate the surface of the wall is in itself a major cause of cleaning stains. Cleaning solutions containing dissolved mortar particles and acids will be drawn into a dry masonry wall, causing staining. Furthermore, saturating the surface of the wall keeps the acid solution on the face of the masonry where the mortar smears are present. It is not true that face saturation weakens the acid and slows the cleaning.

Water should be trained on the wall until the brick suction is exhausted. The area to be cleaned must be saturated as well as all brickwork areas below. If the wall appears to be drying on the surface, reapply water until ready to apply the cleaning solution.

Cleaning of Clay Masonry

Acids – The Basics

The traditional masonry-cleaning chemical is hydrochloric acid. Its main function is to dissolve the cement in the mortar mix. It has few other uses and in many stain situations should not be used.

The recommended acid strength for light coloured clay bricks is 1 part acid to 20 parts water and for other bricks is 1 part acid to 10 parts water. Acid takes time to dissolve the cement and should be left on for 1-2 minutes (or 3-6 minutes if needed) before washing off.

After washing the wall with water, a solution of 60-65g of sodium bicarbonate per litre of water should be sprayed on to neutralise any remaining acid. This should be done within one hour of the acid wash.

Excess hydrochloric acid will eventually evaporate from the brickwork, however, it is likely to cause staining of the bricks and damage to built-in components.

Other acids such as sulphuric acid or nitric acid will not evaporate and are not used in brick cleaning.

Proprietary masonry cleaning solutions containing a mixture of acids are available. If used, the manufacturer's recommendations must be strictly adhered to. Excessive and incorrect use of some proprietary cleaning solutions has, in the past, produced very bad staining.

Safety Precautions

All masonry-cleaning acids are dangerous. Acids that do not dissolve cement as quickly as hydrochloric acid are not necessarily safer and can be very much more dangerous to human health.

To avoid personal injury:

- Use in a well ventilated area.
- Wear goggles, gloves and protective clothing.
- Always pour acids into water – this avoids splashes of highly concentrated acid onto the operator.
- If splashed onto the body, wash with clean water and, if possible, neutralise with a mixture of bicarbonate of soda and water.
- If splashed into the eye, wash the eye thoroughly with copious amounts of water.
- The manufacturer's instructions and safety precautions must be strictly adhered to if proprietary cleaning products are used.
- Refer to Think Brick website for additional information (www.thinkbrick.com.au).
  Manual 13 - Clay Masonry Cleaning.

Fire Resistance Levels

NCC Considerations

Fire resistance levels (FRLs) are specified in the National Construction Code and the Masonry Code (AS3700). This system provides an accurate method of predicting the ability of a wall to maintain strength in a fire and to resist its spread. *Note that the fire resistance levels are quoted in minutes.*

The fire resistance level of a wall depends not only on the thickness of the wall but also on its height, length and how the top, bottom and ends of the wall are connected to the other building elements. For this reason it is impossible to give an FRL for a particular brick – it will always depend on the details of the wall built with a particular brick.

Three different terms are used to define the overall fire resistance of a wall:

1. **Structural Adequacy**
   The ability of a wall to continue to perform its structural function.
2. **Integrity**
   The ability of a wall to prevent the passage of flames and hot gases.
3. **Insulation**
   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.

A typical fire resistance level for a wall could be 'FRL 90/90/90', that is 90 minutes for each of the three FRL components of structural adequacy, integrity and insulation.

The insulation value is a function of the material thickness of a masonry wall and is defined in the table below:

Fire Insulation Value

Material Thickness of Wall (mm)	Fire Resistance Period for Insulation (minutes)
60	30
90	60
110	90
130	120
160	180
180	240

Material Thickness

As a rule the material thickness is the actual thickness of the units used in the wall. However there are some qualifications. To be deemed as full thickness, bricks need to have a coring percentage of less than 30%.

Cored or Solid Units

For a wall built from cored (<30% coring) or solid units (including those with frogs), or from hollow units fully grouted, the material thickness is the overall thickness of the wall.

Cavity Walls

The material thickness for insulation for a cavity wall is the sum of the material thicknesses of each of the separate leaves of the wall.

Render

If the fire resistance period (FRP) is required for a fire approaching from either side of the wall, then render must be applied to both sides of the wall if it is to contribute to the FRP. However only the thickness of the coat on the side away from the fire (to a maximum of 20mm) is added to the wall thickness to determine the material thickness.

Note: This may lead to two different FRPs according to the thickness of the render and the direction of the fire.

Fire Resistance Levels

Chasing

Structural Adequacy

According to the Think Brick Fire Resistance Technical Manual and AS 3700 Section 6, chasing may be constructed in accordance with the information below.

For the purposes of structural adequacy, chases in vertically spanning walls may be ignored if:

- The chase is vertical, or
- The chase is horizontal and its length is less than four times the wall thickness.

Otherwise the slenderness ratio of the wall is to be based on the overall thickness of the wall less the depth of the chase.

Chases in walls spanning both horizontally and vertically (panel action) can be ignored if:

- The length of the chase is not greater than half the wall length (for a horizontal chase), or
- Not greater than half the wall height (for a vertical chase).

Otherwise the slenderness ratio of the wall is to be based on the thickness of the wall less the depth of the chase.

Where a vertical chase is greater than half the height of the wall the chase may be regarded as an unsupported edge and the wall designed as two sub-panels.

Integrity and Insulation

For the purposes of integrity and insulation the effect of chases can be ignored if:

The chase depth is less than 30mm.

The section of chase is less than 1000mm^2.

The total chased face area on both sides of the wall is less than 100,000mm^2 per five square metres of walling.

Otherwise determine integrity and insulation based on the wall thickness less the chase depth. For ungrouted hollow masonry units determine integrity and insulation based on the wall thickness less the chase depth.

The Think Brick Australia publication, Design Manual 5, Design of Clay Masonry Walls for Fire Resistance, available at www.thinkbrick.com.au, fully explains the system and allows designers to 'assemble' a fire resistance level by referring to several tables and taking a direct reading from the appropriate chart.

For concrete masonry please refer to Concrete Masonry Association of Australia (www.cmaa.com.au).

Acoustic Design

Acoustic Performance Rating

Acoustic performance for various class buildings are set out in the NCC. It must be remembered that the NCC requirements are the minimum requirements and some Local Authorities may require better performance.

Check with Local Councils for specific requirements above the NCC minimums.

Weighted Sound Reduction Index (R_W)

The sound level reduction achieved by a structural unit must be measured over a range of frequencies as different materials transmit sound differently at each frequency.

The R_W is obtained from a standard procedure (AS/NZS 1276.1) that subjects the building element to a standard range of frequencies that roughly equate to the normal human hearing range.

R_W is a single-number rating of the sound reduction through a wall or other building element. Two spectral corrections can be applied to R_W: C and C_{tr}. C compensates for medium to high frequency noise and C_{tr} compensates for low frequency noise. C and C_{tr} are both negative numbers. The C_{tr} is a correction designed to allow for low frequency noise, for example – entertainment systems. A full description of acoustic performance is defined by these three terms. ie R_W (C, C_{tr}).

Wall performance is defined in terms of R_W only or R_W + C_{tr}.

Impact Sound Resistance

To achieve impact sound insulation, the NCC requires that walls consist of two leaves with at least a 20mm cavity between them and, if ties are needed in masonry walls, they must be of the resilient type. Except for the resilient ties in masonry walls there are to be no mechanical linkages between the walls, except at the periphery (ie through adjoining walls, floors and ceilings).

NCC Deemed-to-Satisfy Walls

The NCC deemed-to-satisfy provisions for airborne sound insulation are as follows:

- Walls between an apartment and a plant room, stairway, lift shaft, public lobby or the like require an R_W of not less than 50.
- Walls between apartments require an R_W + C_{tr} not less than 50.
- Walls between a bathroom, laundry or kitchen and a habitable room (not a kitchen) in an adjoining unit, would need to be discontinuous construction and have an R_W + C_{tr} of not less than 50.
- Discontinuous construction means a wall having a cavity between two separate dwellings with no mechanical linkage between leaves, except at the periphery. Resilient wall ties are not considered to be mechanical linkage.

The NCC requirements are met by:

1. Testing a sample of constructed walls to verify that they meet the Weighted Standardised Level Difference ($D_{nt,w}$),
2. Constructing walls using the same materials and techniques as walls that have been constructed and tested in a laboratory and shown to meet the Weighted Sound Reduction Index (R_W) requirements, or
3. Constructing walls using the materials and techniques in the 'Acceptable Construction Practice' section of the NCC; and,
4. Where impact sound reduction is required, it is to be achieved by discontinuous construction.
5. Except where the requirements are verified by on-site testing, chasing of services into masonry walls is not allowed and electrical outlets on either side of the wall must be offset by no less than 100mm.

NCC Volume 2, Part 10.7 outlines sound insulation requirements.

Deemed-to-satisfy clay brick walls are detailed on the following pages.

Acoustic Design

Solid v Cavity Walls

Acoustic performance with single leaf masonry follows the 'Mass Law'. The acoustic performance of these walls depends on their mass. More mass gives better performance.

Cavity walls behave differently to single skin walls because sound waves can resonate in cavities. Sound reduction performance improves as the cavity size increases. Insulation in the cavity helps absorb resonating sound and narrow cavities should have bond breaker board to prevent mortar from providing a bridge for sound to travel between the leaves.

Brick Walls With Render

Render on one side of a brick wall can increase the sound reduction of the brick wall by up to 2 or 3dB to the wall's R_W. Adding render to the second side only adds 1dB to the wall's R_W. The render appears to fill defects in the wall surface reducing the sound transmission, but this is a one-off benefit.

Brick Walls with Plasterboard

Daubs fixed plasterboard directly to brick walls, create a small cavity in which resonance occurs. Brick walls with daub fixed plasterboard on both sides stop **less noise** than the same walls bare. Adding extra daubs (halving spacing) gives **lower** performances, presumably due to extra 'bridges' through the daubs.

Plasterboard on furring channel is better than daub fixed. A bigger cavity between the wall and the plasterboard makes it harder for resonating energy to build up pressure on the board. When standard furring channel clips are used, this system transfers vibrations to the plasterboard via the channels and clips. Impact Clips have a rubber shank on their masonry anchor that isolates the vibrations from the masonry. The use of mounts can add 3 or 4dB to the wall's R_W. Polyester and glass wool in the cavity helps prevent resonance and further decreases the sound transmission. Denser grades of plasterboard and additional layers of plasterboard (fixed with grab screws and leaving no cavities) also decrease sound transmission.

On acoustic rated walls, plasterboard on daubs of glue must NOT be used. Plasterboard can only be fixed to brickwork after the wall has been inspected to ensure all joints are full flush jointed, then plasterboard sheeting can only be installed using a screeded glue as per laboratory tests detailed on pages 21/22.

Points to Consider

When Designing Walls for Acoustic Performance

The NCC specifies minimum levels for sound isolation but experience shows that achieving the minimum standards is not always sufficient to satisfy occupants. In view of this it is recommended that architects, developers, builders, etc, consider a higher level of sound insulation, commensurate with the expectations of the end user. End user expectations are frequently related to the cost of occupying the unit.

Wall design is a balance between acoustical performance, thickness, weight and cost. Frequently it is not possible to optimise one factor without compromising the others.

Acoustic Performance On-Site

The R_W ratings on walling systems are obtained from laboratory tests which comply with the Australian/New Zealand Standard (AS/NZS ISO 717.1) under controlled conditions. When identical partitions in buildings are tested in-situ, it is often found that the actual result obtained, called the Weighted Standardised Level Difference ($D_{nt,w}$), is lower than the laboratory R_W.

This reduction in performance can be due to rooms being too small, varying size of the element being tested, flanking paths (noise passing through other parts of the building) or background noise.

Attention to detail in the design and construction of the partition and its adjoining floor/ceiling and associated structure is of prime importance. Even the most basic elements, if ignored, can seriously downgrade the sound insulation performance.

The most common field faults include bricklayers not completely filling all mortar joints, poor sealing between walls and other building elements, electrical power outlets being placed back to back, chasing masonry and concrete walls, leaving gaps in insulation, screwing into insulation and winding it around the screw when attaching sheet materials, not staggering joints in sheet materials and poor sealing of penetrations.

Midland Brick cannot guarantee that field performance ratings will match laboratory performance. However, with careful attention during construction of the wall, correct installation to specification and proper caulking/sealing, the assembly should produce a field performance close to and comparable with tested values. The following items can also affect the acoustic performance on site.

Acoustic Design

Clay Brick Construction

Provides Superior Sound Insulation

Full brick construction can provide greater sound insulation from both internal and external noise, especially when walls are rendered with hard wall plaster

This is due to their mass and density, sound is partially absorbed by bricks and then slowed down and deflected, reducing intensity on the other side of the wall.

Perimeter Acoustical Sealing

As the R_W of a wall increases, the control of flanking paths becomes more critical. Consequently, the perimeter sealing requirements for a low sound rating wall, such as R_W 45, are much less than for a high sound rating wall, such as R_W 60. Note: It is neither necessary nor cost-effective to provide very high perimeter acoustic sealing for a low R_W wall.

Effective sealants have the following properties:

- Good flexibility (elastic set)
- Low hardness
- Excellent adhesion, usually to concrete, timber, plaster and galvanised steel
- Minimal shrinkage (less than 5%)
- Moderate density (greater than 800kg/m³)
- Fire rated where required. (All walls r³equired by the NCC to be sound rated also have fire ratings).

All of the above properties must be maintained over the useful life of the building, that is, longer than 20 years.

Note: Use of expanding foam sealants is not acceptable.

Refer to the manufacturer to ensure the particular type or grade of sealant is suitable for the purpose.

Doors

Hollow, cored and even solid doors generally provide unsatisfactory sound insulation. Doors can provide direct air leaks between rooms lowering the overall R_W of the wall in which they are inserted. Where sound insulation is important, specialised heavyweight doors or, preferably, two doors separated by an absorbent lined airspace or lobby should be used.

Lightweight Panels Above Doors

Panels are often incorporated for aesthetic reasons, however, they should not be used unless they have an R_W equal to or better than the wall's requirement.

Air Paths Through Gaps, Cracks or Holes

Seal all gaps, cracks or openings, however small, with an acoustic sealant. Holes readily conduct airborne sounds and can considerably reduce the R_W of a wall.

Appliances

Noise producing fixtures or appliances such as water closets, cisterns, water storage tanks, dishwashers, washing machines and pumps should be isolated from the structure with resilient mountings and flexible service leads and connections.

Electrical Outlets and Service Pipes

Penetrations of all sorts should be avoided but if unavoidable, seal around them effectively. If possible introduce a discontinuity in pipe work between fittings, such as a flexible connection within or on the line of a partition. Use acoustically rated boxes for all general power outlets, light switches, telephone connections, television outlets, etc. Seal the sides of electrical boxes and the perimeter of all penetrations with acoustic sealant. Offset all power outlets on either side of a wall by at least 100mm.

Acoustic Performance Rating Tables

NCC for walls separating two or more Class 1 Buildings

Wall Separating		Wall Rating
Sole occupancy unit – all areas	Sole occupancy unit – all areas except those below	$R_w + C_{tr} \geq 50$
Sole occupancy unit – bathroom, sanitary compartment, laundry or kitchen	Sole occupancy unit – habitable room except a kitchen	$R_w + C_{tr} \geq 50$ and discontinuous construction

NCC for walls separating sole occupancy units from other parts of the building in Class 2 and 3 Buildings

Wall Separating		Wall Rating
Sole occupancy unit – all areas except those below	Sole occupancy unit – all areas except those below	$R_w + C_{tr} \geq 50$
Sole occupancy unit – bathroom, sanitary compartment, laundry or kitchen	Sole occupancy unit – habitable room except a kitchen	$R_w + C_{tr} \geq 50$ and discontinuous construction
Sole occupancy unit – all areas	Plant room or lift shaft	$R_w \geq 50$ and discontinuous construction
Sole occupancy unit – all areas	Stairways, public corridor, public lobby or areas of different classification	$R_w \geq 50$

NCC for walls separating sole occupancy units from other parts of the building in Class 9c Buildings (aged care facilities)

Wall Separating		Wall Rating
Sole occupancy unit – all areas	Sole occupancy unit – all areas except those below	$R_w \geq 45$
Sole occupancy unit – all areas	Laundry, kitchen	$R_w \geq 45$ and discontinuous construction or No less resistant to impact noise than a deemed-to-satisfy wall
Sole occupancy unit – all areas	Bathroom, sanitary compartment (but not an associated ensuite), plant room, utilities room	$R_w \geq 45$

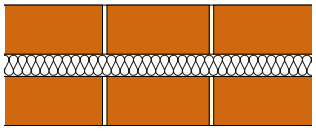
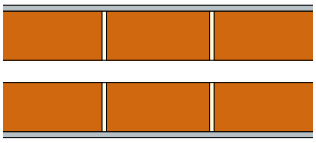
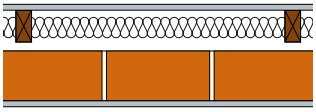
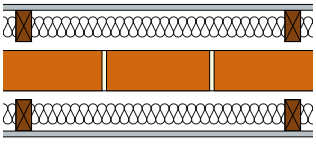
NCC requirements for service separation*

Wall Separating		Wall Rating
A duct, soil, waste, water supply or stormwater pipe passing through a separating wall	Sole occupancy unit habitable room other than a kitchen	$R_w + C_{tr} \geq 40$
	Sole occupancy unit kitchen or non-habitable room	$R_w + C_{tr} \geq 25$

* In Class 1 buildings the requirements apply to those services that pass through more than one building.
- In Class 2, 3 and 9c requirements apply to all stormwater pipes and other services that pass through more than one sole occupancy unit.

Acoustic Design

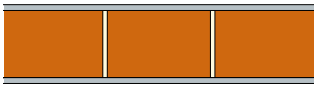
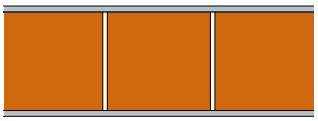
NCC Deemed-to-Satisfy Walls

Construction Description	Construction Diagram	Rating
Two leaves of 110mm clay brick masonry with: (a) a cavity not less than 50mm between leaves; and (b) 50mm thick glass wool insulation with a density of 11 kg/m³ or 50mm thick polyester insulation with a density of 20 kg/m³ in the cavity.		$R_W + C_{tr} \geq 50$
Two leaves of 110mm clay brick masonry with: (a) a cavity not less than 50mm between leaves; and (b) 13mm cement render on each outside face.		$R_W + C_{tr} \geq 50$
Single leaf of 110mm clay brick masonry with: (a) a row of 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced 20mm from the masonry wall; and (b) 50mm thick mineral insulation or glass wool insulation with a density of 11 kg/m³ positioned between studs; and (c) one layer of 13mm plasterboard fixed to outside face of studs and outside face of masonry.		$R_W + C_{tr} \geq 50$
Single leaf of 90mm clay brick masonry with: (a) a row of 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced 20mm from each face of the masonry wall; and (b) 50mm thick mineral insulation or glass wool insulation with a density of 11 kg/m³ positioned between studs in each row; and (c) one layer of 13mm plasterboard fixed to studs on each outside face.		$R_W + C_{tr} \geq 50$

– If ties are needed in masonry walls they must be of the resilient type.

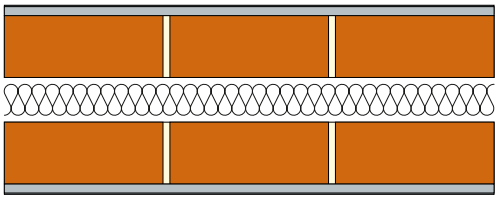
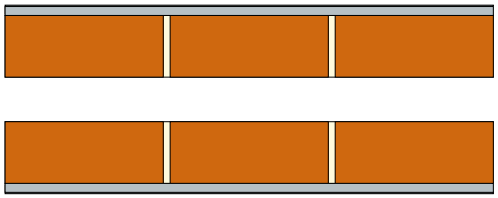
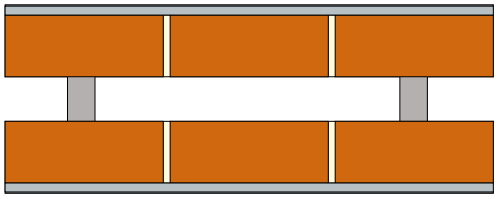
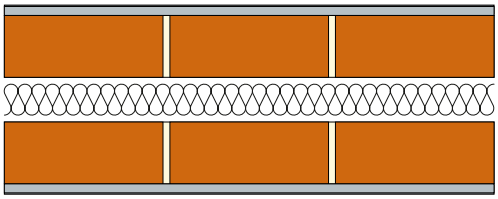
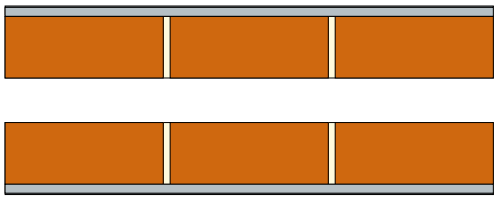
Acoustic Design

NCC Deemed-to-Satisfy Walls

Construction Description	Construction Diagram	Rating
Single leaf of 150mm brick masonry with 13mm cement render on each face.		$R_W \geq 50$
Single leaf of 220mm brick masonry with 13mm cement render on each face.		$R_W + C_{tr} \geq 50$
Single leaf of 110mm brick masonry with 13mm cement render on each face.		$R_W \geq 45$
Single leaf of 190mm concrete solid blockwork.		$R_W \geq 45$

Specific Results for Acoustic Maxibrick Cavity Walls

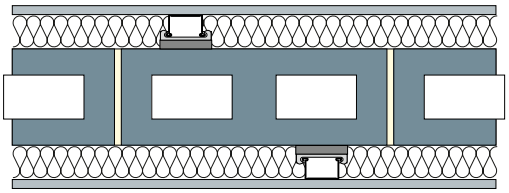
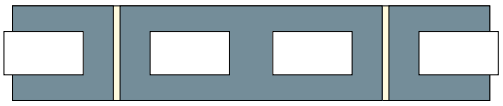
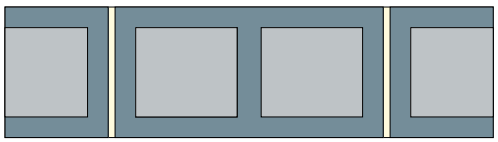
Tests comply with AS1191-2016. Conducted by Acoustic Laboratories Australia

Construction Description	Construction Diagram
Sound reduction of wall consisting of two leaves of 90mm Acoustic Maxibrick with: (a) all joints filled solid with mortar; and (b) a cavity of not less than 70mm between leaves; and (c) 75mm thick glass wool insulation with a density of 11kg/m³ in the cavity; and (d) no wall ties; and (e) 13mm render with 2mm plaster set coat on each outside face. Test No ALA-05-082-1	 Rating: R_W 67, $R_W + C_{tr}$ 61
Sound reduction of wall consisting of two leaves of 90mm Acoustic Maxibrick with: (a) all joints filled solid with mortar; and (b) a cavity of not less than 70mm between leaves; and (c) no wall ties; and (d) 13mm render with 2mm plaster set coat on each outside face. Test No ALA-05-082-2	 Rating: R_W 60, $R_W + C_{tr}$ 55
Sound reduction of wall consisting of two leaves of 90mm Acoustic Maxibrick with: (a) all joints filled solid with mortar; and (b) a cavity of not less than 70mm between leaves; and (c) Matrix resilient wall ties; and (d) 13mm render with 2mm plaster set coat on each outside face. Test No ALA-05-082-3	 Rating: R_W 59, $R_W + C_{tr}$ 53
Sound reduction of wall consisting of two leaves of 90mm Acoustic Maxibrick with: (a) all joints filled solid with mortar; and (b) a cavity of not less than 70mm between leaves; and (c) 75mm thick glass wool insulation with a density of 14kg/m³ (CSR Acoustigard 75mm Partition Roll) in the cavity; and (d) no wall ties; and (e) 13mm plasterboard fixed with CSR Gyprock Drywall Masonry Adhesive to full face of wall surface applied with 10mm notched trowell, firmly fixed to the wall (no drumming) on each outside face. Test No ALA-25-093-4	 Rating: R_W 61, R_W + Ctr 56
Sound reduction of wall consisting of two leaves of 90mm Acoustic Maxibrick with: (a) all joints filled solid with mortar; and (b) a cavity of not less than 70mm between leaves; and (c) no wall ties or insulation; and (d) 13mm plasterboard fixed with CSR Gyprock Drywall Masonry Adhesive to full face of wall surface applied with 10mm notched trowell, firmly fixed to the wall (no drumming) on each outside face. Test No ALA-25-093-5	 Rating: R_W 60, $R_W + C_{tr}$ 55

Note: Midland Brick is not in a position to give opinions on performance of walls that fall outside the above tested wall systems For further information please consult a qualified Acoustic Engineer.

Specific Results for 140mm and 190mm Masonry Block

Tests comply with AS1191-2016. Conducted by Acoustic Laboratories Australia

Construction Description	Construction Diagram
Sound reduction of wall consisting of single leaf of 140mm reduced core hollow concrete block (15.705) with the following on both sides: (a) 13mm Boral plasterboard mounted on 28mm furring channels held to wall with Rondo STSC adjustable furring channel anchors; and (b) Insulation Solution 50mm Noise Control Batts with a density of 14kg/m³ placed in both 50mm cavities. Test No ALA-05-083-2	 Rating: R_W 62, $R_W + C_{tr}$ 51
Sound reduction of wall consisting of single leaf of 140mm reduced-core hollow concrete block (15.705) – bare wall. Test No ALA-05-083-1	 Rating: R_W 52, $R_W + C_{tr}$ 46
Sound reduction of wall consisting of single leaf of 190mm hollow concrete block, core filled – bare wall. Test No ALA-05-083-4	 Rating: R_W 54, $R_W + C_{tr}$ 49

Note: Midland Brick is not in a position to give opinions on performance of walls that fall outside the above tested wall systems For further information please consult a qualified Acoustic Engineer.

Thermal Properties

The performance requirements of NCC 2022 energy efficiency prescribes the minimum thermal performance and maximum energy usage of the operation of a building. It offers three Deemed-to-Satisfy (DTS) pathways to comply with the energy efficiency requirements; energy rating, verification by using a reference building and elemental design provisions. These three strategies can be used to pass the NCC provisions.

To check that the thermal and energy performance of a building meets the prescribed requirements, the NCC allows the use of energy rating software to calculate a buildings heating and cooling loads, net equivalent energy usage, and other energy saving features such as thermal breaks, compensation for loss of ceiling insulation, floor edge insulation and building sealing.

NCC 2022 Volume Two allows for energy rating software to be used as either a DTS solution or a verification method for a performance solution to comply with energy efficiency requirements.

Residential spaces in non-residential buildings can be DTS by passing a house energy rating software accredited under the Nationwide House Energy Rating Scheme (NatHERS). The National Australian Built Environment Rating System (NABERS) Energy or the Green Star rating scheme can be used to verify a performance solution for nonresidential buildings. NCC 2022 Volume Two also allows for a building to be DTS if the building meets the requirements in Specification 42. This specification requires homes to achieve a 7-star rating using a house energy rating software, with exception to homes in certain climate zones. The definition of a house rating software used in Volume Two requires for the software used to be accredited under NatHERS.

Thermal mass plays a pivotal role in the thermal and energy performance of a building. Your Home describes thermal mass as the ability for a material to absorb, store and release heat.

Heavyweight building materials (like bricks) have a higher thermal mass, allowing for a more thermally comfortable and consistent environment capable of stabilising internal temperatures especially when the climate experiences hot days and cold nights. A study done by the University of Newcastle found that Brick masonry, even without insulation, far thermally outperformed lightweight walling systems, highlighting how brick masonry is the pre-eminent material for maximising the thermal performance of walling systems.

From a sustainability perspective, high thermal mass is ideal as it reduces the dependency for artificial heating and cooling in buildings, meaning less energy is used to improve thermal comfort for building occupants.

For further detailed information please visit www.thinkbrick.com.au Manual 8 Sustainability and Energy Efficiency.

Terminology

R-Value (m^2 K/W)

The measure of thermal resistance. Total R-Value means the sum of the 'R' values of the individual component layers in a composite element including any air spaces and associated surface resistances. Good insulation 'R' value provides significant value in terms of comfort and energy efficiency.

Thermal Transmittance or U-Value (W/m^2K)

The rate at which heat moves through a wall. Total U-Value means thermal transmittance of the composite element including any air space and associated surface transmittances. This is simply the inverse of the 'R' value.

Thermal Conductivity (W/mK)

The rate at which heat is transmitted through a material, measured in watts per square of surface area for a temperature gradient of one Kelvin per metre thickness simplified to W/mK. Typical thermal conductivity for a 110mm clay brick is K0.55. To calculate the R-Value, divide the wall thickness (in metres) by the K-Value.

Surface Density of Walls

Surface density of a brick veneer wall is approximately 187kg/m^2.

Listed below are examples of high-mass masonry walls > 220kg/m^2.

Examples of High-Mass Masonry Walls > 220kg/m^2

Description	Surface Density
Two leaves of 110mm brick with cavity, rendered one side	360kg/m^2
One leaf of 110mm face brick and one leaf of 90mm Maxibrick with cavity, rendered one side	310kg/m^2
Two leaves of 90mm Maxibrick with cavity, rendered both sides	280kg/m^2
Two leaves of 90mm Maxibrick with cavity, rendered one side	260kg/m^2

Solar Absorptance

Solar Absorptance, Reflectance & Light Reflectance Value

Solar Absorptance (SA) is the fraction of the sun's radiation that the surface absorbs and is used by the NCC 2022 to provide limitations on walling and roofing materials.

Typically, the SA of a material is primarily determined by its colour. Lighter colours have lower SA values which indicates the surface absorbs a lesser amount of solar radiation (heat), and darker colours have higher SA values which indicates the surface absorbs a larger amount of solar radiation.

As the effect of absorptance by walls is not large (predominately roof colour related), it is usually shown as either 'light,' 'medium,' or 'dark.' Light materials have a lower Solar Absorptance and will reflect more heat, while dark materials have a higher Solar Absorptance and will absorb more. Unlike many other materials, clay masonry units absorb and release heat almost equally well.

NCC Solar Absorptance Classifications

Light <0.4
Medium 0.4-0.6
Dark >0.6

Approximate Solar Absorptance Value* for each colour.

Colour	Value
Slate (dark grey)	0.90
Red, Green	0.75
Yellow, buff	0.60
Zinc aluminium-dull	0.55
Galvanised steel-dull	0.55
Light grey	0.45
Off white	0.35
Light cream	0.30

**Approximate only*

SA is an effective way to measure the ability of a wall to reject solar heat, but it does not consider the wall's ability to radiate out any absorbed heat. The alternative, more accurate method to measure this is the Solar Reflectance Index (SRI).

Solar Reflective Index

The Solar Reflectance Index (SRI) is an indicator of how hot a material can get, **with higher values suggesting a cooler surface** and lower values suggesting a hotter surface. SRIs are calculated using the solar absorptance and thermal emittance of a specific material.

SRI is a more accurate measure than SA as it accounts for the thermal-emissive properties of the material itself rather than just it's colour.

This index combines both solar reflectance and thermal emittance to provide a comprehensive measure of a material's ability to reject solar heat. It is expressed on a scale from 0 (least reflective) to 100 (most reflective) where higher values indicate better performance in keeping surfaces cool.

Solar reflectance is the inverse of solar absorptance and is a measure of a materials ability to bounce back solar energy that is, to reflect light.

Choosing lighter coloured bricks and roof tiles will reduce the amount of heat energy entering your home, leading to lower energy bills and increased thermal comfort.

SAI focuses solely on how much solar energy is absorbed, while SRI provides a more holistic view by considering both reflection and emission properties to assess how well a material can stay cool under solar exposure.

Light Reflectance Value

Light Reflectance Value (LRV) quantifies the lightness and brightness of a colour, the degree to which colour reflects light.

Measured on a scale of 0 to 100, black being closest to 0%, white closer to 99%.

Below the mid-point of 50% the colour will tend to be darker absorbing more light than it will reflect back into the room. Colours with LRV higher than 50% will be lighter and will reflect more light back into the room than is absorbed.

Light and colour play fundamental roles in architecture. LRV is also a consideration where safety is a concern. Higher LRV colours can be used to improve visibility and lighting in areas like parking garages, staircases, walkways and other safety-critical zones and where visual contrast and area demarcation is required for safety.

Examples listed below of Light Reflectance Values* for dry and wet, face bricks and pavers.

Product	Dry	Wet
2 Course Face Bricks		
Bremer Bay	46.10	35.93
Bullara	62.69	43.32
Kennedy	10.12	7.47
Loongana Limestone	43.06	41.69
Shale	27.29	20.14
Standard Face Bricks		
Cream Mexi	42.09	32.63
Red Smooth	14.99	13.02
Concrete Pavers		
Arctic	38.25	21.49
Charcoal	9.36	3.99
Pewter	25.22	13.58
Sea Mist	34.70	14.51
Silver	39.79	30.07
Storm Cloud	15.24	6.01
Tundra	44.00	23.81
Heavy Duty Clay Pavers		
Golden Dune	34.12	24.15
Red	13.95	10.49
Cautional Tactile Pavers 60mm		
Charcoal	7.52	3.63
Limestone	35.25	26.22
Pewter	15.10	9.82

**Assessed by Midland Brick*

Joint Selection

Joint Types

The type of joint can dramatically affect the overall appearance of brick masonry. Joints can be used to create a casual, rustic or formal look to brickwork. There are many different joints; the most common ones used in Australia are shown below.

Terminology and joint preference differ in different countries and within Australia. Where there is any confusion, always use a drawing or physical sample to avoid misunderstandings.

Shallow rolled joints are recommended in areas requiring exposure-grade bricks and mortar. Tooling the joint to produce rolled and struck joints is equivalent to steel trowelling concrete and produces a dense smooth surface which sheds water and dirt better than other types of joint. Rolled and struck joints should always be used for bricks with straight sharp edges such as smooth-face bricks.

Raked joints may be used with any type of brick but they tend to retain dirt and may lead to streaks down the masonry in dirty environments. Raking must not come closer than 5mm to any core. This usually limits raking to less than 10 mm, however it is best to check the bricks that are being used before raking. AS3700 specifies that joints in walls in marine, severe marine or aggressive environments or on aggressive soils must be tooled to a dense smooth surface. This precludes raking and in practice, rolled joints are the only ones that consistently meet the requirement.

Flush joints may be used with any type of brick. However they are particularly effective with rumbled bricks as flush joints make the joints look to be of variable thickness that gives a pleasing rustic look.

Joint Sizes

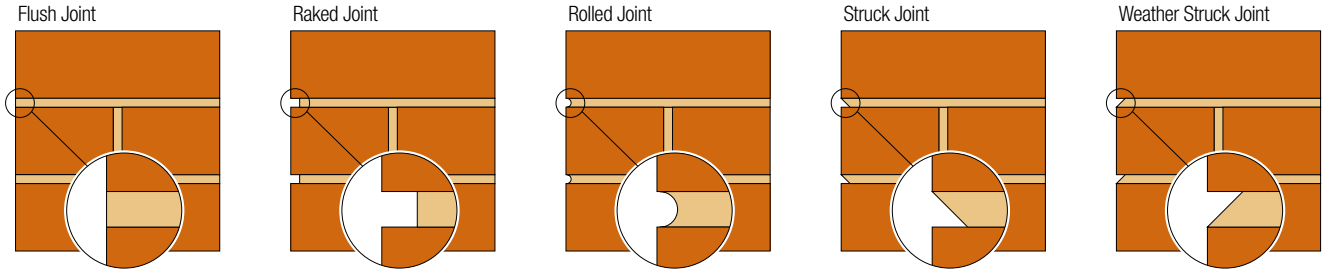
Mortar bed joints are required to be a nominal thickness of 10mm unless the design specifies another thickness. A different thickness may only be specified after the designer has considered the effect on compressive and flexural strength of the masonry. During construction mortar bed joints are allowed to deviate by ±3mm. Because of poor practice or lack of proper direction some slabs and footings are finished at the wrong height. Mortar joints up to 50mm thick are sometimes used to get the correct coursing, although this is not allowed under AS3700.

Perpends are to have a minimum design thickness of 5mm. In structural brickwork perpends may be up to 10mm thicker than the specified thickness but no thinner. In face brickwork perpends may deviate by ±5mm from the average width but in any one wall the maximum difference allowable between any two perpends is 8mm.

The preceding tolerances do not apply in the case of thin bed mortars and perpend tolerances do not apply where perpends are not filled with mortar.

Weepholes

Weepholes allow moisture that collects in the cavity to escape. Weepholes should be spaced at less than 1200mm centres wherever flashing is built into the masonry to shed water from the cavity. Weepholes are usually empty perpends (10mm wide) but proprietary products are available to prevent the entry of insects. In high wind areas it has been known for water to be blown up the cavity onto the inner wall and, as this is very undesirable, a greater number of narrower weepholes is usually built into the wall. It is essential that weepholes remain open and that render and other applied coatings, where used, are raked out of the joint.



Coursing Charts

Standard Brick

FORMAT SIZE: 240 x 120 x 86mm
MANUFACTURE SIZE: 230 x 110 x 76mm
VERTICAL GAUGE: 7 Courses to 600mm

Bricks per m² in wall = 48.5 approx.

All dimensions in mm

No. of Bricks	Length	Opening	Height	No. of Bricks	Length	Opening	Height
1	230	250	86	26	6230	6250	2229
1½	350	370		26½	6350	6370	
2	470	490	172	27	6470	6490	2314
2½	590	610		27½	6590	6610	
3	710	730	257	28	6710	6730	2400
3½	830	850		28½	6830	6850	
4	950	970	343	29	6950	6970	2486
4½	1070	1090		29½	7070	7090	
5	1190	1210	429	30	7190	7210	2572
5½	1310	1330		30½	7310	7330	
6	1430	1450	514	31	7430	7450	2657
6½	1550	1570		31½	7550	7570	
7	1670	1690	600	32	7670	7690	2743
7½	1790	1810		32½	7790	7810	
8	1910	1930	686	33	7910	7930	2829
8½	2030	2050		33½	8030	8050	
9	2150	2170	772	34	8150	8170	2914
9½	2270	2290		34½	8270	8290	
10	2390	2410	857	35	8390	8400	3000
10½	2510	2530		35½	8510		
11	2630	2650	943	36	8630		3086
11½	2750	2770		36½	8750		
12	2870	2890	1029	37	8870		3172
12½	2990	3010		37½	8990		
13	3110	3130	1114	38	9110		3257
13½	3230	3250		38½	9230		
14	3350	3370	1200	39	9350		3343
14½	3470	3490		39½	9470		
15	3590	3610	1286	40	9590		3429
15½	3710	3730		40½	9710		
16	3830	3850	1372	41	9830		3514
16½	3950	3970		41½	9950		
17	4070	4090	1457	42	10070		3600
17½	4190	4210		42½	10190		
18	4310	4330	1543	43	10310		3686
18½	4430	4450		43½	10430		
19	4550	4570	1629	44	10550		3772
19½	4670	4690		44½	10670		
20	4790	4810	1714	45	10790		3857
20½	4910	4930		45½	10910		
21	5030	5050	1800	46	11030		3943
21½	5150	5170		46½	11150		
22	5270	5290	1886	47	11270		4029
22½	5390	5410		47½	11390		
23	5510	5530	1972	48	11510		4114
23½	5630	5650		48½	11630		
24	5750	5770	2057	49	11750		4200
24½	5870	5890		49½	11870		
25	5990	6010	2143	50	11990		4286
25½	6110	6130		100	23990		8572

Not often required. If needed add 20 to length.

2 Course Face Brick

Bricks per m² in wall = 19.5 approx.

FORMAT SIZE: 300 x 100 x 172mm
MANUFACTURE SIZE: 290 x 90 x 162mm
VERTICAL GAUGE: 7 Courses to 1200mm

All dimensions in mm

No. of Bricks	Length	Opening	Height
1	290	310	172
1⅓	390	410	
1⅔	490	510	
2	590	610	343
2⅓	690	710	
2⅔	790	810	
3	890	910	514
3⅓	990	1010	
3⅔	1090	1110	
4	1190	1210	686
4⅓	1290	1310	
4⅔	1390	1410	
5	1490	1510	857
5⅓	1590	1610	
5⅔	1690	1710	
6	1790	1810	1029
6⅓	1890	1910	
6⅔	1990	2010	
7	2090	2110	1200
7⅓	2190	2210	
7⅔	2290	2310	
8	2390	2410	1372
8⅓	2490	2510	
8⅔	2590	2610	
9	2690	2710	1543
9⅓	2790	2810	
9⅔	2890	2910	
10	2990	3010	1714
10⅓	3090	3110	
10⅔	3190	3210	
11	3290	3310	1886
11⅓	3390	3410	
11⅔	3490	3510	
12	3590	3610	2057
12⅓	3690	3710	
12⅔	3790	3810	
13	3890	3910	2229
13⅓	3990	4010	
13⅔	4090	4110	
14	4190	4210	2400
14⅓	4290	4310	
14⅔	4390	4410	
15	4490	4510	2572
15⅓	4590	4610	
15⅔	4690	4710	
16	4790	4810	2743
16⅓	4890	4910	
16⅔	4990	5010	
17	5090	5110	2914
17⅓	5190	5210	
17⅔	5290	5310	
18	5390	5410	3086

The maximum allowable height for internal 90mm masonry is 2400mm. For heights above 2400mm, refer your project to a Structural Engineer.

Coursing Charts

Maxibrick

FORMAT SIZE: 315x100x172mm
MANUFACTURE SIZE: 305x90x162mm
VERTICAL GAUGE: 7 Courses to 1200mm

Bricks per m² in wall = 33.3 approx.

NOTE: This measurement allows for mortar in perpends and in horizontal joints.

All dimensions in mm

No. of Bricks	Length	Opening	Height	No. of Bricks	Length	Opening	Height
1	305	325	172	26	8180	8200	
1⅓	405	425		26⅓	8280	8300	
1⅔	505	525		26⅔	8380	8400	
2	620	640	343	27	8495		
2⅓	720	740		27⅓	8595		
2⅔	820	840		27⅔	8695		
3	935	955	514	28	8810		
3⅓	1035	1055		28⅓	8910		
3⅔	1135	1155		28⅔	9010		
4	1250	1270	686	29	9125		
4⅓	1350	1370		29⅓	9225		
4⅔	1450	1470		29⅔	9325		
5	1565	1585	857	30	9440		
5⅓	1665	1685		30⅓	9540		
5⅔	1765	1785		30⅔	9640		
6	1880	1900	1029	31	9755		
6⅓	1980	2000		31⅓	9855		
6⅔	2080	2100		31⅔	9955		
7	2195	2215	1200	32	10070		
7⅓	2295	2315		32⅓	10170		
7⅔	2395	2415		32⅔	10270		
8	2510	2530	1372	33	10385		
8⅓	2610	2630		33⅓	10485		
8⅔	2710	2730		33⅔	10585		
9	2825	2845	1543	34	10700		
9⅓	2925	2945		34⅓	10800		
9⅔	3025	3045		34⅔	10900		
10	3140	3160	1714	35	11015		
10⅓	3240	3260		35⅓	11115		
10⅔	3340	3360		35⅔	11215		
11	3455	3475	1886	36	11330		
11⅓	3555	3575		36⅓	11430		
11⅔	3655	3675		36⅔	11530		
12	3770	3790	2057	37	11645		
12⅓	3870	3890		37⅓	11745		
12⅔	3970	3990		37⅔	11845		
13	4085	4105	2229	38	11960		
13⅓	4185	4205		38⅓	12060		
13⅔	4285	4305		38⅔	12160		
14	4400	4420	2400	39	12275		
14⅓	4500	4520		39⅓	12375		
14⅔	4600	4620		39⅔	12475		
15	4715	4735	2572	40	12590		
15⅓	4815	4835		40⅓	12690		
15⅔	4915	4935		40⅔	12790		
16	5030	5050	2743	41	12905		
16⅓	5130	5150		41⅓	13005		
16⅔	5230	5250		41⅔	13105		
17	5345	5365	2914	42	13220		
17⅓	5445	5465		42⅓	13320		
17⅔	5545	5565		42⅔	13420		
18	5660	5680	3086	43	13535		
18⅓	5760	5780		43⅓	13635		
18⅔	5860	5880		43⅔	13735		
19	5975	5995		44	13850		
19⅓	6075	6095		44⅓	13950		
19⅔	6175	6195		44⅔	14050		
20	6290	6310		45	14165		
20⅓	6390	6410		45⅓	14265		
20⅔	6490	6510		45⅔	14365		
21	6605	6625		46	14480		
21⅓	6705	6725		46⅓	14580		
21⅔	6805	6825		46⅔	14680		
22	6920	6940		47	14795		
22⅓	7020	7040		47⅓	14895		
22⅔	7120	7140		47⅔	14995		
23	7235	7255		48	15110		
23⅓	7335	7355		48⅓	15210		
23⅔	7435	7455		48⅔	15310		
24	7550	7570		49	15425		
24⅓	7650	7670		49⅓	15525		
24⅔	7750	7770		49⅔	15625		
25	7865	7885		50	15740		
25⅓	7965	7985		50⅓	15840		
25⅔	8065	8085		50⅔	15940		

Permissible height for single leaf wall per National Construction Code Part 3.3.

Above permissible height, subject to structural engineer's opinion.

Longreach

FORMAT SIZE: 315x100x86mm
MANUFACTURE SIZE: 305x90x76mm
VERTICAL GAUGE: 7 Courses to 600mm

Bricks per m² in wall = 37 approx.

All dimensions in mm

No. of Bricks	Length	Opening	Height	No. of Bricks	Length	Opening	Height
1	305	325	86	24	7550	7570	2057
1⅓	405	425		24⅓	7650	7670	
1⅔	505	525		24⅔	7750	7770	
2	620	640	172	25	7865	7885	2143
2⅓	720	740		25⅓	7965	7985	
2⅔	820	840		25⅔	8065	8085	
3	935	955	257	26	8180	8200	2229
3⅓	1035	1055		26⅓	8280	8300	
3⅔	1135	1155		26⅔	8380	8400	
4	1250	1270	343	27	8495	8515	2314
4⅓	1350	1370		27⅓	8595	8615	
4⅔	1450	1470		27⅔	8695	8715	
5	1565	1585	429	28	8810	8830	2400
5⅓	1665	1685		28⅓	8910	8930	
5⅔	1765	1785		28⅔	9010	9030	
6	1880	1900	514	29	9125	9145	2486
6⅓	1980	2000		29⅓	9225	9245	
6⅔	2080	2100		29⅔	9325	9345	
7	2195	2215	600	30	9440	9460	2572
7⅓	2295	2315		30⅓	9540	9560	
7⅔	2395	2415		30⅔	9640	9660	
8	2510	2530	686	31	9755	9775	2657
8⅓	2610	2630		31⅓	9855	9875	
8⅔	2710	2730		31⅔	9955	9975	
9	2825	2845	772	32	10070	10090	2743
9⅓	2925	2945		32⅓	10170	10190	
9⅔	3025	3045		32⅔	10270	10290	
10	3140	3160	857	33	10385	10405	2829
10⅓	3240	3260		33⅓	10485	10505	
10⅔	3340	3360		33⅔	10585	10605	
11	3455	3475	943	34	10700	10720	2914
11⅓	3555	3575		34⅓	10800	10820	
11⅔	3655	3675		34⅔	10900	10920	
12	3770	3790	1029	35	11015	11035	3000
12⅓	3870	3890		35⅓	11115	11135	
12⅔	3970	3990		35⅔	11215	11235	
13	4085	4105	1114	36	11330	11350	3086
13⅓	4185	4205		36⅓	11430		
13⅔	4285	4305		36⅔	11530		
14	4400	4420	1200	37	11645		
14⅓	4500	4520		37⅓	11745		
14⅔	4600	4620		37⅔	11845		
15	4715	4735	1286	38	11960		
15⅓	4815	4835		38⅓	12060		
15⅔	4915	4935		38⅔	12160		
16	5030	5050	1372	39	12275		
16⅓	5130	5150		39⅓	12375		
16⅔	5230	5250		39⅔	12475		
17	5345	5365	1457	40	12590		
17⅓	5445	5465		40⅓	12690		
17⅔	5545	5565		40⅔	12790		
18	5660	5680	1543	41	12905		
18⅓	5760	5780		41⅓	13005		
18⅔	5860	5880		41⅔	13105		
19	5975	5995	1629	42	13220		
19⅓	6075	6095		42⅓	13320		
19⅔	6175	6195		42⅔	13420		
20	6290	6310	1714	43	13535		
20⅓	6390	6410		43⅓	13635		
20⅔	6490	6510		43⅔	13735		
21	6605	6625	1800	44	13850		
21⅓	6705	6725		44⅓	13950		
21⅔	6805	6825		44⅔	14050		
22	6920	6940	1886	45	14165		
22⅓	7020	7040		45⅓	14265		
22⅔	7120	7140		45⅔	14365		
23	7235	7255	1972	46	14480		
23⅓	7335	7355		46⅓	14580		
23⅔	7435	7455		46⅔	14680		

Coursing Charts

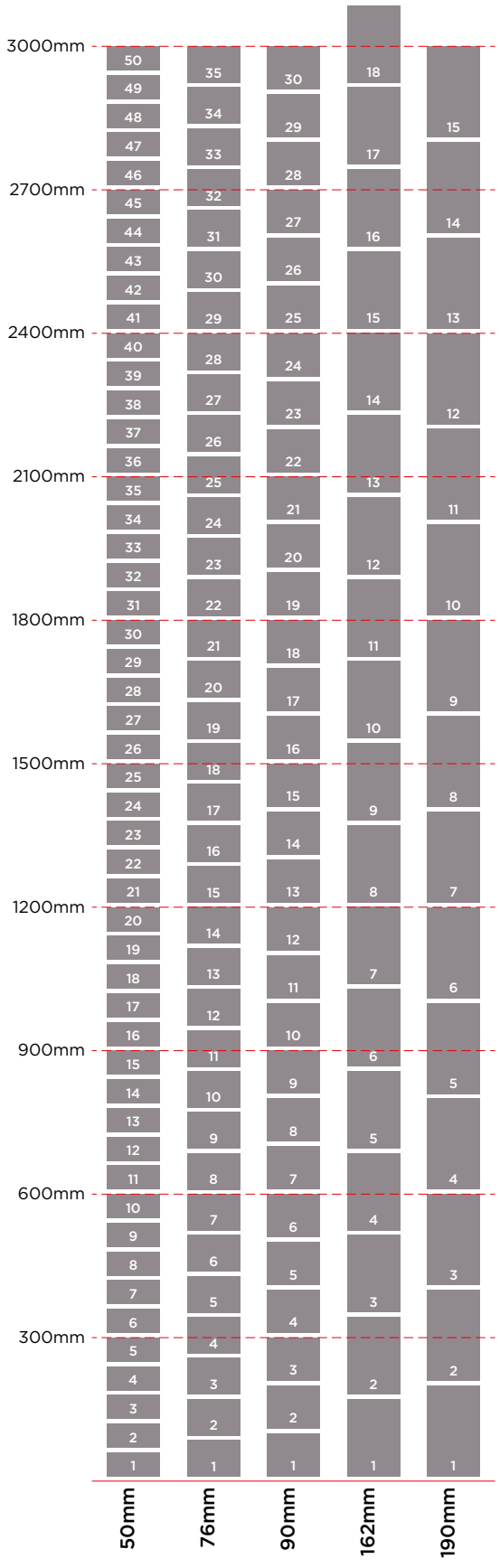
Blockwork

FORMAT SIZE: 400x100, 150, 200, 300x200;
MANUFACTURE SIZE: 400x100, 150, 200x100
390x90, 140, 190, 290x190; 390x90, 140, 190x90

All dimensions in mm

No. of Blocks	Length	Opening	Height		No. of Blocks	Length	Opening	Height	
			100 Coursing	200 Coursing				100 Coursing	200 Coursing
1	390	410	100	200	15¼	6090	6110		
1¼	490	510			15½	6190	6210		
1½	590	610			15¾	6290	6310		
1¾	690	710			16	6390	6410	1600	3200
2	790	810	200	400	16¼	6490	6510		
2¼	890	910			16½	6590	6610		
2½	990	1010			16¾	6690	6710		
2¾	1090	1110			17	6790	6810	1700	3400
3	1190	1210	300	600	17¼	6890	6910		
3¼	1290	1310			17½	6990	7010		
3½	1390	1410			17¾	7090	7110		
3¾	1490	1510			18	7190	7210	1800	3600
4	1590	1610	400	800	18¼	7290	7310		
4¼	1690	1710			18½	7390	7410		
4½	1790	1810			18¾	7490	7510		
4¾	1890	1910			19	7590	7610	1900	3800
5	1990	2010	500	1000	19¼	7690	7710		
5¼	2090	2110			19½	7790	7810		
5½	2190	2210			19¾	7890	7910		
5¾	2290	2310			20	7990	8010	2000	4000
6	2390	2410	600	1200	20¼	8090	8110		
6¼	2490	2510			20½	8190	8210		
6½	2590	2610			20¾	8290	8310		
6¾	2690	2710			21	8390	8410	2100	4200
7	2790	2810	700	1400	21¼	8490	8510		
7¼	2890	2910			21½	8590	8610		
7½	2990	3010			21¾	8690	8710		
7¾	3090	3110			22	8790	8810	2200	4400
8	3190	3210	800	1600	22¼	8890	8910		
8¼	3290	3310			22½	8990	9010		
8½	3390	3410			22¾	9090	9110		
8¾	3490	3510			23	9190	9210	2300	4600
9	3590	3610	900	1800	23¼	9290	9310		
9¼	3690	3710			23½	9390	9410		
9½	3790	3810			23¾	9490	9510		
9¾	3890	3910			24	9590	9610	2400	4800
10	3990	4010	1000	2000	24¼	9690	9710		
10¼	4090	4110			24½	9790	9810		
10½	4190	4210			24¾	9890	9910		
10¾	4290	4310			25	9990	10010	2500	5000
11	4390	4410	1100	2200	25¼	10090	10110		
11¼	4490	4510			25½	10190	10210		
11½	4590	4610			25¾	10290	10310		
11¾	4690	4710			26	10390	10410	2600	5200
12	4790	4810	1200	2400	26¼	10490	10510		
12¼	4890	4910			26½	10590	10610		
12½	4990	5010			26¾	10690	10710		
12¾	5090	5110			27	10790	10810	2700	5400
13	5190	5210	1300	2600	27¼	10890	10910		
13¼	5290	5310			27½	10990	11010		
13½	5390	5410			27¾	11090	11110		
13¾	5490	5510			28	11190	11210	2800	5600
14	5590	5610	1400	2800	28¼	11290	11310		
14¼	5690	5710			28½	11390	11410		
14½	5790	5810			28¾	11490	11510		
14¾	5890	5910			29	11590	11610	2900	5800
15	5990	6010	1500	3000					

Height Ready Reckoner



Building Procedures

Maxibrick, Acoustic Maxibrick and Maxi-One

Bond

Generally laid in 3rd bond.

Joints

Generally laid with the perpend joints filled. Perpend joints should not exceed 12mm.

Acoustic Maxi

Manufactured to meet acoustic and fire rating requirements. Stamped with 'Acoustic Maxi' name for quick and easy identification. Easily integrated with normal Maxibrick construction.

Maxi-One

Lighter, and have an average MPA of 8. Ideal for single storey construction or second floor application.

Wall Ties

Ties must meet Australian Standard AS3700 and AS4773.1 and 2 requirements. Ties are laid in every third course and spaced 600mm apart. Extra ties are required around openings such as doors and windows. The National Construction Code (NCC) outlines typical tie spacings.

Bonding

At the junctions of internal and cavity walls use alternative course bonding or bedded approved ties in every course. At the junction of internal walls use alternative course bonding or approved ties in every second course.

Heights/Two Storey Construction

The height limits of all masonry walls are stated in AS3700 and AS4773. The Australian Standards limits 90mm internal non-loadbearing masonry walls, laterally supported at the top to a height of 2.4 metres. However it is possible to achieve heights greater than 2.4 metres by consulting a suitably qualified structural engineer.

It is also recommended consulting a suitably qualified structural engineer when using Maxibrick for multi-storey construction.

Chasing into Brickwork

Chasing should not be deeper than 25mm. Where a wall is chased on both sides, the chases should not be made into the same level of the brick. Guidance is provided in AS3700 for allowable chase depth and lengths.

External use

The external use of Maxibrick without a rendered finish is not recommended.

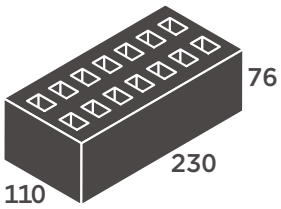
Benefits

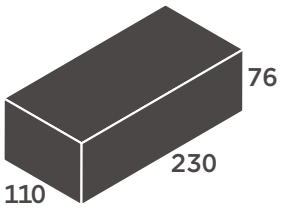
Excellent thermal and sound insulation properties and durability compared to most other forms of lightweight construction.

To complement your choice of Maxibrick, Acoustic Maxibrick and Maxi-One on your project, consider using the 'Reinforced Fired Clay Lintel' system with the benefits of speed and efficiency and the added strength of clay brick.

Brick Specifications – Commons 110mm Wide

Common





Specification

Product Information	Cored	Solid
Work Size (mm)	230 x 110 x 76	230 x 110 x 76
Dimensional Category	DW1	DW1
Approximate Unit Weight (kg)	2.7	3.8
Approximate No. per m²	48.5	48.5
Nominal Wall Surface Density (kg/m²)	170	215
No. per pack	264	264
Pack Weight (kg)	734	1004
Pack Dimensions (mm)	940 x 700 x 890	940 x 700 x 890
Unconfined Compressive Strength (MPa)	>12	>18
Cold Water Absorption (%)	<10	<10
Dry Density (kg/m³)	1,460	1,980
Coefficient of Expansion (mm/m)	<0.6	<0.6
Durability Class	General Purpose	General Purpose
Initial Rate of Absorption (kg/m²/min)	<1.4 (gross bed area)	<1.4
Potential to Effloresce	Slight	Slight
Core Percentage (%)	<30	<30

Fire Resistance

Fire Resistance Level	Cored	Solid
Insulation (minutes)	90	90
Insulation – Rendered 20mm both sides (minutes)	120	120

For further information on FRL and Weighted Sound reduction index R_W for 110mm walls – see page 32.

Notes:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

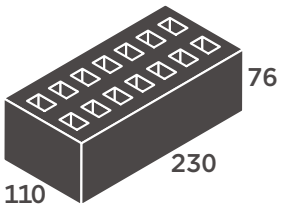
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

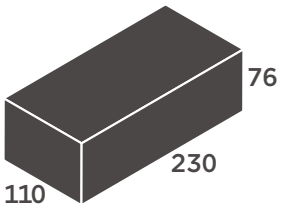
h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Brick Specifications – Commons 110mm Wide

Common Paint Grade





Specification

Product Information	Cored	Solid
Work Size (mm)	230 x 110 x 76	230 x 110 x 76
Dimensional Category	DW1	DW1
Approximate Unit Weight (kg)	3	3.8
Approximate No. per m²	48.5	48.5
Nominal Wall Surface Density (kg/m²)	170	215
No. per pack	264	264
Pack Weight (kg)	816	1033
Pack Dimensions (mm)	940 x 700 x 890	940 x 700 x 890
Unconfined Compressive Strength (MPa)	>12	>18
Cold Water Absorption (%)	<10	<10
Dry Density (kg/m³)	1,460	1,980
Coefficient of Expansion (mm/m)	<0.6	<0.6
Durability Class	General Purpose	General Purpose
Initial Rate of Absorption (kg/m²/min)	<1.4 (gross bed area)	<1.4
Potential to Effloresce	Nil to Slight	Nil to Slight
Core Percentage (%)	<30	<30

Fire Resistance

Fire Resistance Level	Cored	Solid
Insulation (minutes)	90	90
Insulation – Rendered 20mm both sides (minutes)	120	120

For further information on FRL and Weighted Sound reduction index R_W for 110mm walls – see page 32.

Notes:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

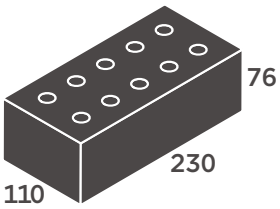
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Brick Specifications – Commons 110mm Wide

Common Load Bearing



Specification

Product Information	15 MPa f′uc	20 MPa f′uc
Work Size (mm)	230 x 110 x 76	230 x 110 x 76
Dimensional Category	DW1	DW1
Approximate Unit Weight (kg)	2.8 (range 2.8 – 3.5)	3.5
Approximate No per m²	48.5	48.5
Nominal Wall Surface Density (kg/m²)	170 (range 170 – 200)	200
No per pack	264	264
Pack Weight (kg)	761 (range 739 – 924)	951
Pack Dimensions (mm)	940 x 700 x 890	940 x 700 x 890
Characteristic Unconfined Compressive Strength (MPa)	>15	>20
Cold Water Absorption (%)	<9	<9
Dry Density (kg/m³)	1,460 (range 1460 – 1820)	1,820
Coefficient of Expansion (mm/m)	<0.6	<0.6
Durability Class	General Purpose	General Purpose
Initial Rate of Absorption (kg/m²/min)	<1.3 (gross bed area)	<1.3 (gross bed area)
Potential to Effloresce	Nil to Slight	Nil to Slight
Core Percentage (%)	<30	<30

Fire Resistance

Fire Resistance Level	15 MPa f′uc	20 MPa f′uc
Insulation (minutes)	90	90
Insulation – Rendered 20mm both sides (minutes)	120	120

For further information on FRL and Weighted Sound reduction index R_W for 110mm walls – see page 32.

Notes:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Brick Specifications – Commons 110mm Wide

Fire Resistance and R_W – Common (110mm Wide) Walls

Fire Resistance Level (FRL)

The FRL of a wall depends not only on the thickness of the wall but also on the height, length and how the top, bottom and ends of the wall are connected to the other building elements. For this reason it is impossible to give a standard FRL for a particular brick – it will always depend on the construction details of the wall being built.

Walls are required to be given a fire resistance level which has three components:

1. **Structural Adequacy.** The ability of a wall to continue to perform its structural function.
2. **Integrity.** The ability of a wall to prevent the passage of flames and hot gases.
3. **Insulation.** The ability of a wall to provide sufficient insulation such that the side of the wall away from the fire does not exceed a predefined temperature.

A typical fire resistance level for a wall could be 'FRL 90/90/90', that is 90 minutes for each of the three FRL components of structural adequacy, integrity and insulation.

Information on how to calculate these is provided in Think Brick *Manual 5: Fire Resistance Levels for Clay Brick Walls* available at www.thinkbrick.com.au

Midland Brick recommends that the design of any fire-rated wall should be checked by a suitably qualified engineer.

Weighted Sound Reduction Index (R_W)

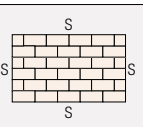
The R_W has two spectrum adaptation terms to account for medium to high frequency noise (C) and low frequency noise (C_{tr}). The reduction figures are added to the R_W and are written R_W (C,C_{tr}).

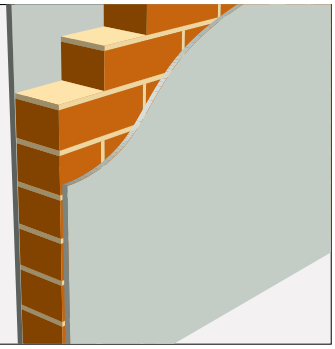
To achieve impact sound insulation, the NCC requires that walls consist of two leaves with at least a 20mm cavity between them and if ties are needed in masonry walls they must be of the resilient type. Except for the resilient ties in masonry walls there are to be
no mechanical linkages between the walls, except at the periphery (ie through walls, floors and ceilings).

More detailed information is readily available from:
- Australian Standards relating to Masonry AS3700-2001
- The National Construction Code

FRL for bare wall, height up to 2.9m	120/90/90
FRL for bare wall, height up to 3.0m	90/90/90
Sound reduction of wall consisting of single leaf of 110mm brick with 13mm render on both sides	**$R_W \geq 45$**

NCC deemed-to-satisfy.





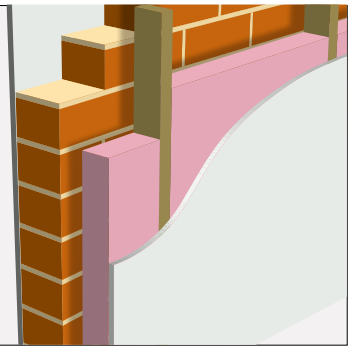
Sound reduction of wall consisting of single leaf of 110mm clay brick masonry with:

a. a. a row of 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced 20mm from the masonry wall; and

b. b. 50mm thick mineral insulation or glass wool insulation with a density of 11kg/m³ positioned between studs; and

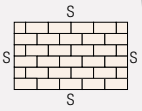
c. c. one layer of 13mm plasterboard fixed to outside face of studs and outside face of masonry. **$R_W + C_{tr} \geq 50$ and impact sound insulation**

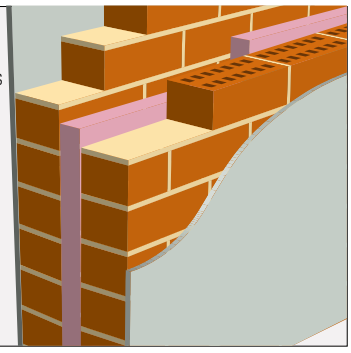
NCC deemed-to-satisfy.



FRL for bare wall, height up to 3.5m	180/180/240
Sound reduction of wall consisting of two leaves of 110mm brick with a 50mm cavity	
• Rendered 13mm on both sides	**$R_W + C_{tr} \geq 50$ and impact sound insulation**
• Unrendered with 50mm glass wool insulation with a density of 11kg/m³	**$R_W + C_{tr} \geq 50$ and impact sound insulation**
• Unrendered with 50mm polyester insulation with a density of 20kg/m³	**$R_W + C_{tr} \geq 50$ and impact sound insulation**

– If ties are needed in masonry walls they must be of the resilient type. NCC deemed-to-satisfy.

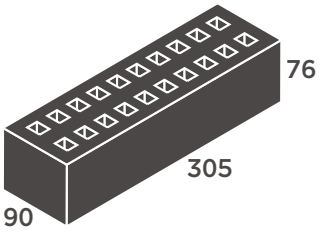


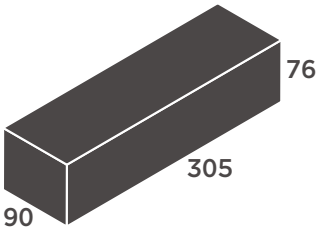


S = Simply Supported i.e. timber truss on tied brickwork. F = Free. *R*w based in NCC "deemed to comply" provisions.

Brick Specifications – Longreach

Longreach





Specification

Product Information	Cored	Solid
Work Size (mm)	305 x 90 x 76	305 x 90 x 76
Dimensional Category	DW1	DW1
Approximate Unit Weight (kg)	3.1	4.2
Approximate No. per m²	37	37
Nominal Wall Surface Density (kg/m²)	140	180
No. per pack	252	252
Pack Weight (kg)	805	1090
Pack Dimensions (mm)	920 x 700 x 910	920 x 700 x 910
Characteristic Unconfined Compressive Strength (MPa)	>12	>16
Cold Water Absorption (%)	<10	<10
Dry Density (kg/m³)	1,480	2,010
Coefficient of Expansion (mm/m)	<0.6	<0.6
Durability Class	General Purpose	General Purpose
Initial Rate of Absorption (kg/m²/min)	<1.4 (gross bed area)	<1.4 (gross bed area)
Potential to Effloresce	Nil to Slight	Nil to Slight
Core Percentage (%)	<40	<30

Fire Resistance

Fire Resistance Level	Cored	Solid
Insulation (minutes)	60	60
Insulation – Rendered 20mm both sides (minutes)	90	90

For further information on FRL and Weighted Sound reduction index R_W for 90mm walls – see page 35.

Notes:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

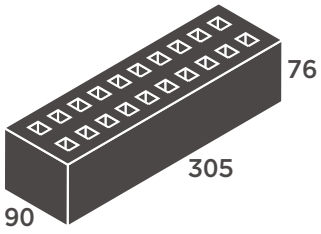
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Brick Specifications – Longreach

Longreach Load Bearing



Specification

Product Information	15 MPa f′uc	20 MPa f′uc
Work Size (mm)	305 x 90 x 76	305 x 90 x 76
Dimensional Category	DW1	DW1
Approximate Unit Weight (kg)	3.1	3.5
Approximate No per m²	37	37
Nominal Wall Surface Density (kg/m²)	140	153
No per pack	252	252
Pack Weight (kg)	805	908
Pack Dimensions (mm)	920 x 700 x 910	920 x 700 x 910
Characteristic Unconfined Compressive Strength (MPa)	>15	>20
Cold Water Absorption (%)	<11	<11
Dry Density (kg/m³)	1,480	1,680
Coefficient of Expansion (mm/m)	<0.6	<0.6
Durability Class	General Purpose	General Purpose
Initial Rate of Absorption (kg/m²/min)	<1.4 (gross bed area)	<1.4 (gross bed area)
Potential to Effloresce	Nil to Slight	Nil to Slight
Core Percentage (%)	<40	<40

Fire Resistance

Fire Resistance Level	15 MPa f′uc	20 MPa f′uc
Insulation (minutes)	60	60
Insulation – Rendered 20mm both sides (minutes)	90	90

For further information on FRL and Weighted Sound reduction index R_W for 90mm walls – see page 35.

Notes:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Brick Specifications – Longreach

Fire Resistance and R_W – Longreach (90mm Wide) Walls

Fire Resistance Level (FRL)

The FRL of a wall depends not only on the thickness of the wall but also on the height, length and how the top, bottom and ends of the wall are connected to the other building elements. For this reason it is impossible to give a standard FRL for a particular brick – it will always depend on the construction details of the wall being built.

Walls are required to be given a fire resistance level which has three components:

1. **Structural Adequacy.** The ability of a wall to continue to perform its structural function.
2. **Integrity.** The ability of a wall to prevent the passage of flames and hot gases.
3. **Insulation.** The ability of a wall to provide sufficient insulation such that the side of the wall away from the fire does not exceed a predefined temperature.

A typical fire resistance level for a wall could be 'FRL 90/90/90', that is 90 minutes for each of the three FRL components of structural adequacy, integrity and insulation. Information on how to calculate these is provided in Think Brick *Manual 5: Fire Resistance Levels for Clay Brick Walls* available at www.thinkbrick.com.au

Midland Brick recommends that the design of any fire-rated wall should be checked by a suitably qualified engineer.

Weighted Sound Reduction Index (R_W)

The R_W has two spectrum adaptation terms to account for medium to high frequency noise (C) and low frequency noise (C_{tr}). The reduction figures are added to the R_W and are written R_W (C,C_{tr}).

To achieve impact sound insulation, the NCC requires that walls consist of two leaves with at least a 20mm cavity between them and if ties are needed in masonry walls they must be of the resilient type. Except for the resilient ties in masonry walls there are to be
no mechanical linkages between the walls, except at the periphery (ie through walls, floors and ceilings).

More detailed information is readily available from:

- Australian Standards relating to Masonry AS3700-2001
- The National Construction Code

FRL for bare wall, height up to 2.5m (<30% coring)	90/60/60
FRL for wall with 20mm render on both sides, height up to 2.7m	60/60/90

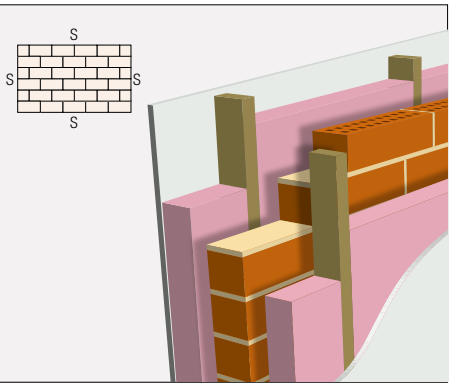
Sound reduction of wall consisting of single leaf of 90mm clay brick masonry with:

a. a row of 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced 20mm from each face of the masonry wall; and

b. 50mm thick mineral insulation or glass wool insulation with a density of 11kg/m³ positioned between studs in each row; and

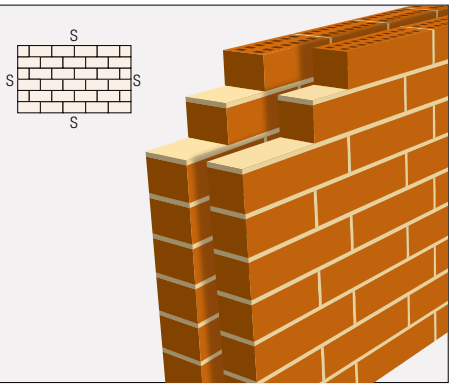
c. one layer of 13mm plasterboard fixed to studs on each outside face. **$R_W + C_{tr} \geq 50$ and impact sound insulation**

Heights above 2.4m should be referred to a suitably qualified engineer.



FRL for bare wall consisting of single leaf of 90mm clay brick masonry and single leaf of 110mm clay brick masonry with 40mm cavity (minimum), height up to 3.3m (<30% coring)	90/90/240

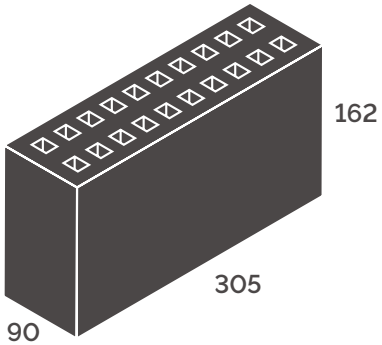
Heights above 2.4m should be referred to a suitably qualified engineer.



S = Simply Supported i.e. timber truss on tied brickwork. F = Free.

Brick Specifications – Maxibrick

Maxibrick



Specification

Product Information	Cored
Work Size (mm)	305 x 90 x 162
Dimensional Category	DW1
Approximate Unit Weight (kg)	5.6 (range 5.0 – 5.6)
Approximate No. per m²	18.5
Nominal Wall Surface Density (kg/m²)	120 (rendered 13mm one side – 140)
No. per pack	132
Pack Weight (kg)	660-786
Pack Dimensions (mm)	920 x 715 x 980
Characteristic Unconfined Compressive Strength (MPa)	>12
Cold Water Absorption (%)	<12
Dry Density (kg/m³)	1,260
Coefficient of Expansion (mm/m)	<0.6
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<1.8 (on face shell)
Potential to Effloresce	Slight
Core Percentage (%)	>30

Fire Resistance

Fire Resistance Level	Cored
Insulation (minutes)	30
For 60 minute (or longer) insulation contact your Midland Brick Sales Representative	

For further information on FRL see page 40.

Notes:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

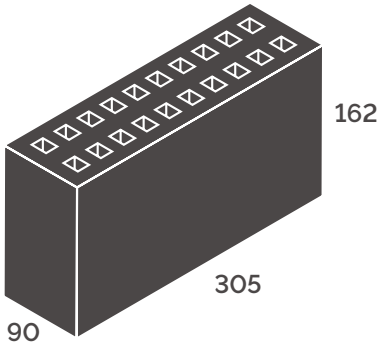
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Brick Specifications – Maxibrick

Maxibrick Paint Grade



Specification

Product Information	Cored
Work Size (mm)	305 x 90 x 162
Dimensional Category	DW1
Approximate Unit Weight (kg)	5.6 (range 5.0 – 5.6)
Approximate No. per m²	18.5
Nominal Wall Surface Density (kg/m²)	120 (rendered 13mm one side – 140)
No. per pack	132
Pack Weight (kg)	660-786
Pack Dimensions (mm)	920 x 715 x 980
Characteristic Unconfined Compressive Strength (MPa)	>12
Cold Water Absorption (%)	<12
Dry Density (kg/m³)	1,260
Coefficient of Expansion (mm/m)	<0.6
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<1.8 (on face shell)
Potential to Effloresce	Slight
Core Percentage (%)	>30

Fire Resistance

Fire Resistance Level	Cored
Insulation (minutes)	30
For 60 minute (or longer) insulation contact your Midland Brick Sales Representative	

For further information on FRL see page 40.

Notes:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

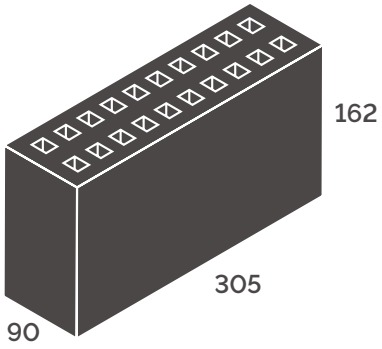
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Brick Specifications – Maxibrick

Maxibrick Load Bearing



Specification

Product Information	15 MPa f'_{uc}	18 MPa f'_{uc}
Work Size (mm)	305 x 90 x 162	305 x 90 x 162
Dimensional Category	DW1	DW1
Approximate Unit Weight (kg)	5.6 (range 5.1 – 6.3)	5.6 (range 5.1 – 6.3)
Approximate No per m²	18.5	18.5
Nominal Wall Surface Density (kg/m²)	120 (rendered 13mm one side – 140)	124 (rendered 13mm one side – 145)
No per pack	132	132
Pack Weight (kg)	740-870	740-870
Pack Dimensions (mm)	920 x 715 x 980	920 x 715 x 980
Characteristic Unconfined Compressive Strength (MPa)	>15	>18
Cold Water Absorption (%)	<12	<12
Dry Density (kg/m³)	1,260	1,330
Coefficient of Expansion (mm/m)	<0.6	<0.6
Durability Class	General Purpose	General Purpose
Initial Rate of Absorption (kg/m²/min)	<1.8 (on face shell)	<1.8 (on face shell)
Potential to Effloresce	Slight	Slight
Core Percentage (%)	<30	<30

Fire Resistance

Fire Resistance Level	15 MPa f'_{uc}	18 MPa f'_{uc}
Insulation (minutes)	60	60
Insulation – Rendered 20mm both sides (minutes)	90	90

For further information on FRL see page 40.

Notes:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

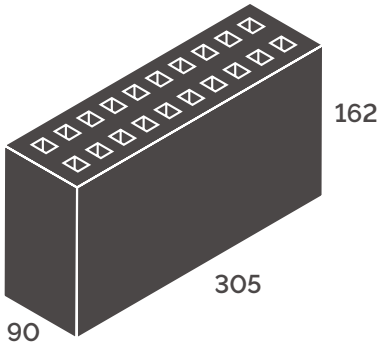
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Brick Specifications – Maxibrick

Maxi-One



Specification

Product Information	Cored
Work Size (mm)	305 x 90 x 162
Dimensional Category	DW1
Approximate Unit Weight (kg)	5.6 (range 4.7-5.6)
Approximate No. per m²	18.5
Nominal Wall Surface Density (kg/m²)	120 (rendered 13mm one side – 140)
No. per pack	132
Pack Weight (kg)	637-782
Pack Dimensions (mm)	920 x 715 x 980
Characteristic Unconfined Compressive Strength (MPa)	>7
Cold Water Absorption (%)	<12
Dry Density (kg/m³)	1,260
Coefficient of Expansion (mm/m)	<0.6
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<1.8 (on face shell)
Potential to Effloresce	Slight
Core Percentage (%)	>30

Fire Resistance

Fire Resistance Level	Cored
Insulation (minutes)	30
Insulation – Rendered 20mm both sides (minutes)	60

For further information on FRL see page 40.

Notes:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Brick Specifications – Maxibrick

Fire Resistance – Maxibrick (90mm wide) Walls

Fire Resistance Level (FRL)

The FRL of a wall depends not only on the thickness of the wall but also on the height, length and how the top, bottom and ends of the wall are connected to the other building elements. For this reason it is impossible to give a standard FRL for a particular brick – it will always depend on the construction details of the wall being built.

Walls are required to be given a fire resistance level which has three components:

1. **Structural Adequacy.** The ability of a wall to continue to perform its structural function.
2. **Integrity.** The ability of a wall to prevent the passage of flames and hot gases.
3. **Insulation.** The ability of a wall to provide sufficient insulation such that the side of the wall away from the fire does not exceed a predefined temperature.

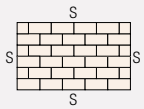
A typical fire resistance level for a wall could be 'FRL 90/90/90', that is 90 minutes for each of the three FRL components of structural adequacy, integrity and insulation. Information on how to calculate these is provided in Think Brick *Manual 5: Fire Resistance Levels for Clay Brick Walls* available at www.thinkbrick.com.au

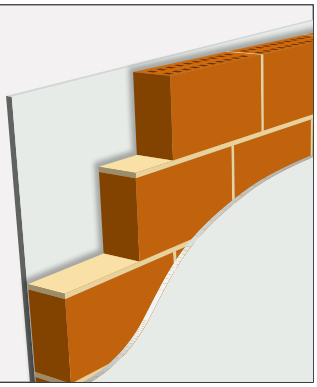
Midland Brick recommends that the design of any fire-rated wall should be checked by a suitably qualified engineer.

FRL for bare wall, height up to 2.4m	90/60/60
FRL for wall with 20mm render on both sides, height up to 2.4m	90/90/90

Heights above 2.4m should be referred to a suitably qualified engineer.

Maxibrick must be 5.2kg or greater. Please contact your Midland Brick Sales Representative for more information.

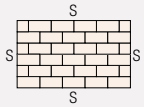


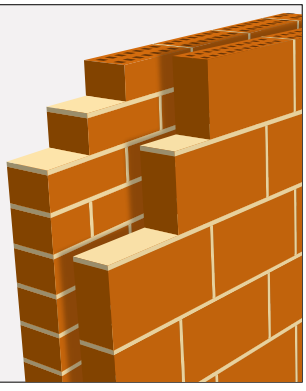


FRL for bare wall consisting of single leaf of 90mm clay brick masonry and single leaf of 110mm clay brick masonry with 40mm cavity (minimum), height up to 3.3m	90/90/240

Heights above 2.4m should be referred to a suitably qualified engineer.

Maxibrick must be 5.2kg or greater. Please contact your Midland Brick Sales Representative for more information.

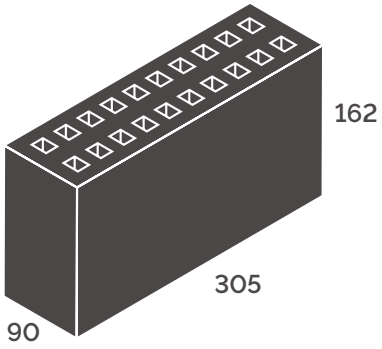




S = Simply Supported i.e. timber truss on tied brickwork. F = Free.

Brick Specifications – Maxibrick

Maxibrick Fire-Rated Acoustic



Specification

Product Information	Cored
Work Size (mm)	305 x 90 x 162
Dimensional Category	DW1
Approximate Unit Weight (kg)	6.3 – 6.6
Approximate No per m²	18.5
Nominal Wall Surface Density (kg/m²)	139 (rendered 13mm one side – 159)
No. per pack	132
Pack Weight (kg)	857-938
Pack Dimensions (mm)	920 x 715 x 980
Unconfined Compressive Strength (MPa)	>12
Cold Water Absorption (%)	<12
Dry Density (kg/m³)	1,417
Coefficient of Expansion (mm/m)	<0.6
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<1.8 (on face shell)
Potential to Effloresce	Slight
Core Percentage (%)	<30

Fire Resistance

Fire Resistance Level	Cored
Insulation (minutes)	60
Insulation – Rendered 20mm both sides (minutes)	90

For further information on FRL and Weighted Sound reduction index R_W for 90mm walls – see page 43.

Notes:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

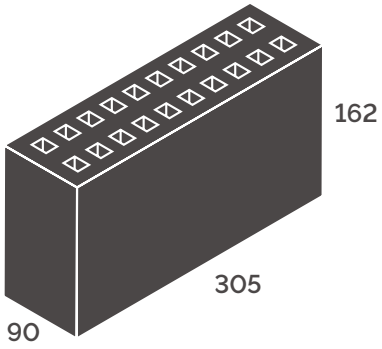
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Brick Specifications – Maxibrick

Maxibrick Fire-Rated Acoustic Load Bearing



Specification

Product Information	15 MPa f′uc	18 MPa f′uc
Work Size (mm)	305 x 90 x 162	305 x 90 x 162
Dimensional Category	DW1	DW1
Approximate Unit Weight (kg)	6.3 – 6.6	6.3 – 6.6
Approximate No per m²	18.5	18.5
Nominal Wall Surface Density (kg/m²)	139 (rendered 13mm one side – 159)	139 (rendered 13mm one side – 159)
No. per pack	132	132
Pack Weight (kg)	857-938	857-938
Pack Dimensions (mm)	920 x 715 x 980	920 x 715 x 980
Characteristic Unconfined Compressive Strength (MPa)	>15	>18
Cold Water Absorption (%)	<12	<12
Dry Density (kg/m³)	1,417	1,417
Coefficient of Expansion (mm/m)	<0.6	<0.6
Durability Class	General Purpose	General Purpose
Initial Rate of Absorption (kg/m²/min)	<1.8 (on face shell)	<1.8 (on face shell)
Potential to Effloresce	Nil to Slight	Nil to Slight
Core Percentage	<30	<30

Fire Resistance

Fire Resistance Level	15 MPa f′uc	18 MPa f′uc
Insulation (minutes)	60	60
Insulation – Rendered 20mm both sides (minutes)	90	90

For further information on FRL and Weighted Sound reduction index R_W for 90mm walls – see page 43.

Note:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.
b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.
c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.
d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.
e. R_W by test, opinion, or deemed to comply with the NCC.
f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.
h. Unit weight and dry density quoted are approximate values and can vary.
i. This technical information is subject to change without notice.

Brick Specifications – Maxibrick

Fire Resistance and R_W – Maxibrick Fire-Rated Acoustic (90mm Wide) Walls

Fire Resistance Level (FRL)

The FRL of a wall depends not only on the thickness of the wall but also on the height, length and how the top, bottom and ends of the wall are connected to the other building elements. For this reason it is impossible to give a standard FRL for a particular brick – it will always depend on the construction details of the wall being built. Walls are required to be given a fire resistance level which has three components:

1. **Structural Adequacy.** The ability of a wall to continue to perform its structural function.
2. **Integrity.** The ability of a wall to prevent the passage of flames and hot gases.
3. **Insulation.** The ability of a wall to provide sufficient insulation such that the side of the wall away from the fire does not exceed a predefined temperature.

A typical fire resistance level for a wall could be 'FRL 90/90/90', that is 90 minutes for each of the three FRL components of structural adequacy, integrity and insulation.

Information on how to calculate these is provided in Think Brick *Manual 5: Fire Resistance Levels for Clay Brick Walls* available at www.thinkbrick.com.au

Weighted Sound Reduction Index (R_W)

The R_W has two spectrum adaptation terms to account for medium to high frequency noise (C) and low frequency noise (C_{tr}). The reduction figures are added to the R_W and are written R_W (C,C_{tr}).

To achieve impact sound insulation, the NCC requires that walls consist of two leaves with at least a 20mm cavity between them and if ties are needed in masonry walls they must be of the resilient type. Except for the resilient ties in masonry walls there are to be no mechanical linkages between the walls, except at the periphery (ie through walls, floors and ceilings).

More detailed information is readily available from:

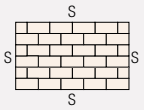
- Australian Standards relating to Masonry AS3700-2001
- The National Construction Code

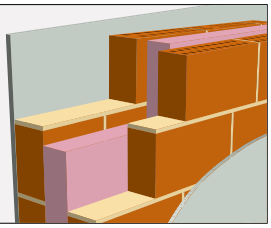
Midland Brick recommends that the design of any fire-rated wall should be checked by a suitably qualified engineer.

FRL for bare wall height up to 3.3m – 90/90/240

Sound reduction of wall consisting of two leaves of 90mm Acoustic Maxibrick with:

a. all joints filled solid with mortar; and
b. a cavity of not less than 70mm between leaves; and
c. 75mm thick glass wool insulation with a density of 11kg/m³ in the cavity; and
d. no wall ties; and
e. 13mm render with 2mm plaster set coat on each outside face.

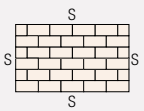


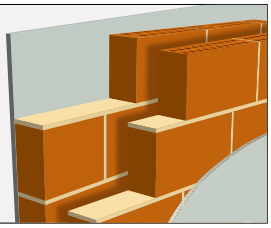


R_W 67, R_W + C_{tr} 61 and impact sound insulation Test No. ALA-05-082-1

Sound reduction of wall consisting of two leaves of 90mm Acoustic Maxibrick with:

a. all joints filled solid with mortar; and
b. a cavity of not less than 70mm between leaves; and
c. no wall ties; and
d. 13mm render with 2mm plaster set coat on each outside face.

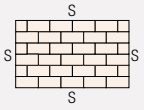


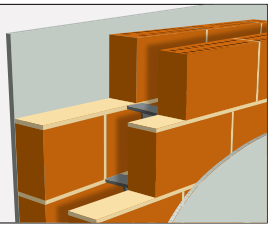


R_W 60 R_W + C_{tr} 55 and impact sound insulation Test No. ALA-05-082-2

Sound reduction of wall consisting of two leaves of 90mm Acoustic Maxibrick with:

a. all joints filled solid with mortar; and
b. a cavity of not less than 70mm between leaves; and
c. Matrix resilient wall ties; and
d. 13mm render with 2mm plaster set coat on each outside face.

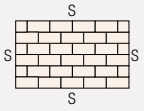


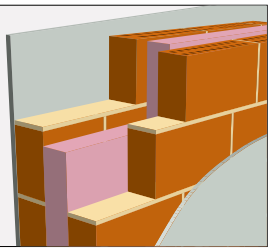


R_W 59 R_W + C_{tr} 53 and impact sound insulation Test No. ALA-05-082-3

Sound reduction of wall consisting of two leaves of 90mm Acoustic Maxibrick with:

a. all joints filled solid with mortar; and
b. a cavity of not less than 70mm between leaves; and
c. 75mm thick glass wool insulation with a density of 14kg/m3 (CSR Acoustigard 75mm Partition Roll) in the cavity; and
d. no wall ties; and
e. 13mm plasterboard fixed with CSR Gyprock Drywall Masonry Adhesive to full face of wall surface applied with 10mm notched trowell, firmly fixed to the wall (no drumming) on each outside face.

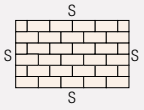


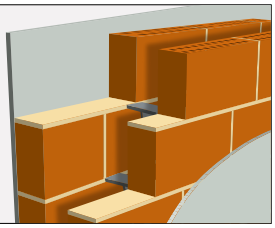


R_W 61, R_W + C_{tr} 56 and impact sound insulation Test No. ALA-25-093-4

Sound reduction of wall consisting of two leaves of 90mm Acoustic Maxibrick with:

a. all joints filled solid with mortar; and
b. a cavity of not less than 70mm between leaves; and
c. no wall ties or insulation; and
d. 13mm plasterboard fixed with CSR Gyprock Drywall Masonry Adhesive to full face of wall surface applied with 10mm notched trowell, firmly fixed to the wall (no drumming) on each outside face.

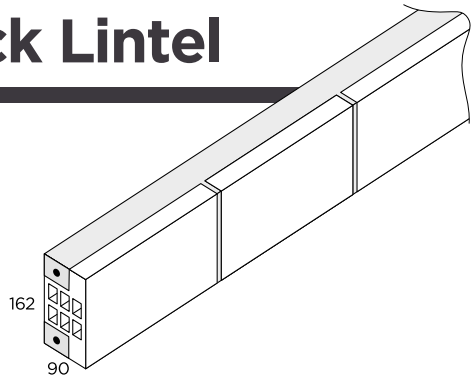




R_W 59, R_W + C_{tr} 54 and impact sound insulation Test No. ALA-25-093-5

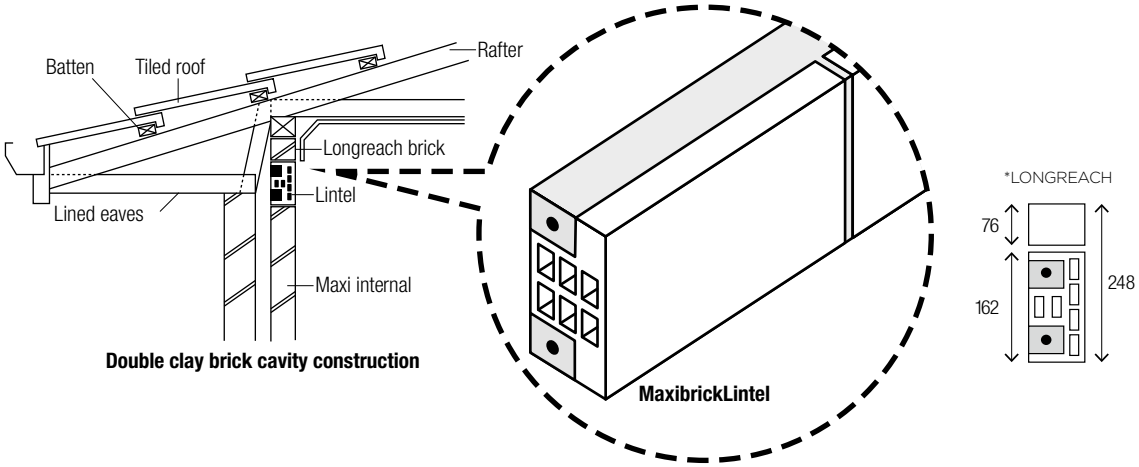
Heights above 2.4m should be referred to a suitably qualified engineer.
S = Simply Supported i.e. timber truss on tied brickwork. F = Free.

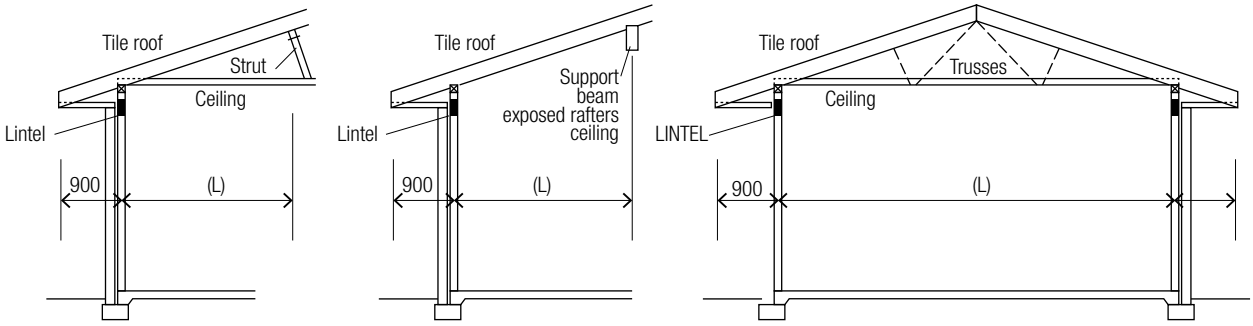
Brick Specifications – Maxibrick Lintel



Typical Domestic Construction

Maxibrick Lintel – Galvanised – Reinforced Fired Clay





Allowable Roof Span

Calculations are based on a tiled roof at 22.5° pitch and 900mm eaves with timber rafters or trusses and battens and a suspended plasterboard ceiling giving a total load of 1.00kPa at a maximum opening of 2410mm. Allowable total load 4.5kN per metre run.

Table below gives allowable roof spans (L) over various openings for different types of roof construction as shown.

*One course of Midland Brick Longreach (305x90x76mm) must be laid above the Lintel.

The Midland Brick Reinforced Fired Clay Lintel is designed for internal use.

Maxibrick Lintel

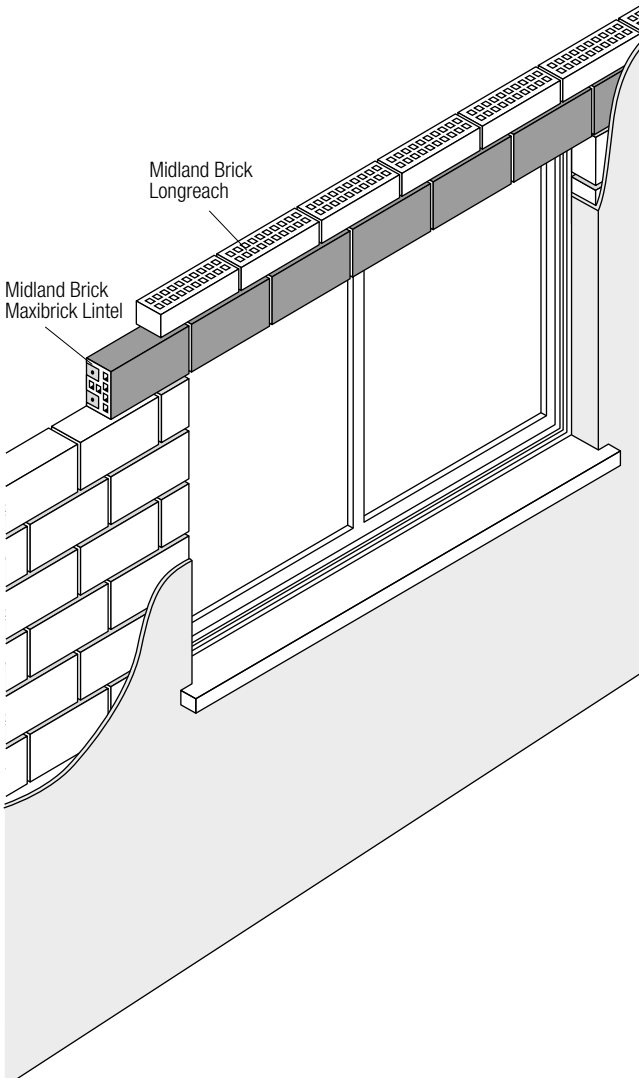
Allowable Roof Span				
Window Opening (mm)	1500	1800	2100	2410
Roof Span (L) (mm)	17500	12000	8300	6000

Brick Specifications – Maxibrick Lintel

Typical Domestic Construction

Standard Lintel Lengths

No. of Clay Bricks in Lintel	Overall Lintel Length (m)	Approx Lintel Weight (kg)
3	0.935	27
4	1.250	36
5	1.565	45
6	1.880	55
7	2.195	64
8	2.510	72
9	2.825	80
10	3.140	92



Placing the Lintels

After the correct bearing (230mm) is allowed, make sure these points are followed:

1. Bed the Lintel on a mortar joint.
2. Make sure the clay face of the Lintel faces into the room as this allows a better plastering key and stops problems with fixing into steel reinforcing bars.
3. Ensure the window doesn't take the weight of the Lintel. Up to 5mm clearance above the window head is adequate.
4. Make sure the window head ties are bedded into the bed joint above the Lintel.

Features

- Specially designed for use with Midland Brick' 90mm wide utility bricks.
- Greater compatibility with clay brickwork than steel or concrete Lintel because it is made with the same material.
- Span opening sizes to 2410mm.
- Minimal deflection at maximum design loads.
- Lintels are made with galvanised steel for extended life.

Benefits

- Less maintenance and improved plaster finish – as there is no difference in material movement, as would be, between the steel lintel and clay brick, cracking is minimised.
- Improves key for plastering – render adheres to clay brick much better than it adheres to steel, in turn minimising cracking.
- Superior detail plaster finish to under window head.
- Eliminates the need to prime and paint metal lintels.

Masonry Blocks

Reinforced Core-Fill Masonry Walls

Concrete blocks (140, 190 and 290mm) have large cores which facilitate the placement of steel reinforcing rods and the pouring/pumping of grout (grout is highly workable concrete).

If a wall is reinforced with bars spaced 800mm centres or less and fully grouted, the wall is referred to as 'reinforced masonry' These walls can have similar strength and 'flexure' characteristics to reinforced insitu concrete walls. Partially reinforced block walls are only grout filled where the reinforcement is placed, usually in bond beams and vertically in cores.

All reinforced walls must be designed by a Structural Engineer.

Grout Filling

Grout Specification

The correct grout specification (mix design) is critical to achieving the structural design of a reinforced wall – it is advised to consult with a Structural Engineer for specifications.

The approximate number of blocks filled per cubic metre of grout is shown below (based on 10mm rounded aggregate and 300kg/m³ cement).

Blocks Filled per Cubic Metre of Grout

Block Type	Blocks Filled per m³ of Grout (approx)
15.01 Full	190
15.42 Notch	190
15.48 H Block (Single Web)	175
20.01 Full	120
20.42 Notch	120
20.48 H Block (Single Web)	100
30.42 Trough Block	65

Grouting

Grout may be mixed on site and poured from buckets into hoppers placed on top of a wall. Alternatively, for large jobs, the grout may be delivered by transit mixer and pumped into the cores, using a small nozzle on the hose.

Before commencing placement of the grout, it is important that the cores should be clean and free of mortar 'dags' projecting into the core. A steel rod is pushed down the core to knock off these 'dags' and to break up any mortar that has dropped onto the footing. The cores are then hosed or swept out from the bottom of each core through the 'clean-out' space. The vertical steel rods are tied to the starter bars, and then the clean-out blocks are covered with formwork, ready for grouting. An alternative method, which may be used in low height walls, is to leave a gap in the mortar bed at the bottom of each core and to hose out the dropped mortar and dags before the mortar has set.

In hot weather it may be necessary to hose the cores out with water in order to cool the blocks and so prevent 'flash-setting' of the grout. If so, this hosing should be completed at least 30 minutes before the grout is placed.

Because of the high pressure developed at the bottom of the cores when they are filled, grouting in lifts of no more than 1.2 metres should not be attempted in one pour. Where the lift is more than 1.2 metres, it is preferable to fill the cores in two stages at least 30 minutes apart.

When grouting Series 150 blocks, lifts should be reduced to 800mm (4 courses) to ensure no voids are left in the wall.

Masonry Blocks

Joint Reinforcement

Commonly known as Tram Track

Masonry Mesh Joint Reinforcement is recommended for non-load bearing and load-bearing wall applications.

The mesh should be laid between courses at height intervals of 600mm. This equates to every three courses using 190mm high standard unit.

At all openings, mesh should be included in the two courses above and below the opening.

- 50mm wide mesh to be used for 90mm blockwork.
- 100mm wide mesh to be used for 190mm wide blockwork.
- 150mm wide mesh to be used for 190mm wide blockwork.

Block Sizes

Blocks have a face dimension (nominal) of 400mm long x 200mm high. Because an allowance is made for 10mm wide mortar joints, the actual face size of the block is 390mm x 190mm. There are 12.5 blocks per m^2.

Most blocks are available in three thicknesses of 90mm (series 100), 140mm (Series 150) and 190mm (Series 200).

Blocklaying

Blocks should be laid dry except in extremely dry, hot weather when a light spray on the bonding surfaces prior to laying may be necessary to slow the absorption of moisture out of the mortar. Unfinished masonry must be covered with plastic to keep rainwater out of the cores, because this can cause efflorescence.

For every 800 blocks or 64m^2 of wall, about 1m^3 of mortar mix is required, allowing for wastage.

Cleaning Concrete Masonry

Good Building Practice

Block layers must exercise extra care when laying face concrete masonry to minimise mortar staining.

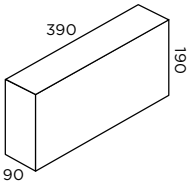
Block layers must:

- Keep face blocks as clean as possible while laying and tooling.
- Keep unused pallets of blocks and tops of unfinished walls covered during rain to prevent water penetration and excessive efflorescence.
- Clean any dags and mortar smears before they set hard.

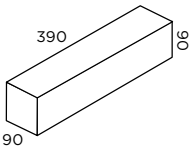
For further information on cleaning concrete masonry please refer to CMAA publication *MA55 Section 19 – Cleaning and Maintenance* (www.cmaa.com.au).

Masonry Block Specifications – 100mm Series

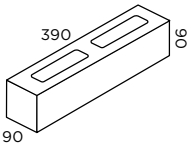
100mm Series Blocks – Full & Half Height



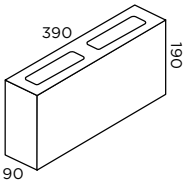
10.31/20.83
Full Length
14.2kg
108 per pallet
1534kg pallet weight



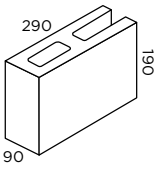
10.83
Full Length
6.8kg
252 per pallet
1714kg pallet weight



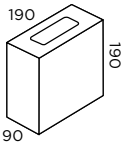
10.71
Full Length
5.4kg
288 per pallet
1555kg pallet weight



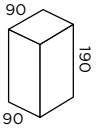
10.01
Full Length
10kg
180 per pallet
1800kg pallet weight



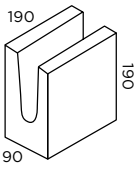
10.02
Three Quarter
7.7kg
240 per pallet
1848kg pallet weight



10.03
Half
5.3kg
216 per pallet
1526kg pallet weight



10.04/10.85
Quarter
3.2kg
532 per pallet
1702kg pallet weight



10.12
Lintel
5.3kg
360 per pallet
1908kg pallet weight

Fractions and Accessory Blocks

Some purpose made fraction blocks are not available to order.

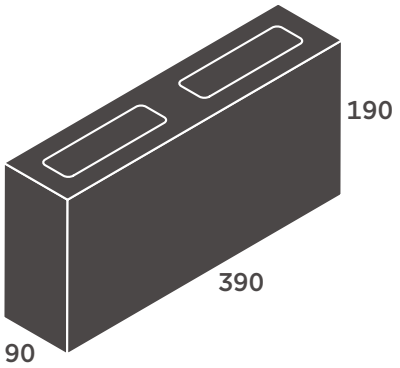
To meet your projects' requirements, these fractions can be cut onsite from available cored or solid blocks.

For further information and advice, please consult with your Midland Brick Representative.

Fraction Block Required	Cut from Block
10.72, 10.73, 10.74,	10.01
10.32, 10.33, 10.84, 10.85	10.31
10.103 split face	10.101 split face

Masonry Block Specifications – 100mm Series

10.01 Concrete Block



Specification

Product Information	Cored
Work Size (mm)	390 x 90 x 190
Dimensional Category	DW1
Approximate Unit Weight (kg)	10
Approximate No per m²	12.5
Nominal Wall Surface Density (kg/m²)	150
No per pallet	180
Pallet Weight (kg)	1854
Pallet Dimensions (mm)	1000 x 1200 x 1100
Characteristic Unconfined Compressive Strength (MPa)	>12 (Face Shell)
Cold Water Absorption (%)	<7.0
Material Density (kg/m³)	2,100 – 2,300
Coefficient of Contraction (mm/m)	<0.4
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<3.0
Potential to Effloresce	Nil to Slight
Core Percentage (%)	<30

Fire Resistance

Fire Resistance Level	Cored
Insulation (minutes)	60
Insulation – Rendered 13mm both sides (minutes)	90

For further information on FRL – see page 50.

Note:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.
b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.
c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.
d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.
e. R_W by test, opinion, or deemed to comply with the NCC.
f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.
h. Unit weight and dry density quoted are approximate values and can vary.
i. This technical information is subject to change without notice.

Masonry Block Specifications – 100mm Series

Fire Resistance – 10.01 Concrete Block

Fire Resistance Level (FRL)

The FRL of a wall depends not only on the thickness of the wall but also on the height, length and how the top, bottom and ends of the wall are connected to the other building elements.

For this reason it is impossible to give a standard FRL for a particular brick – it will always depend on the construction details of the wall being built.

Walls are required to be given a fire resistance level which has three components:

1. **Structural Adequacy**
   The ability of a wall to continue to perform its structural function.
2. **Integrity**
   The ability of a wall to prevent the passage of flames and hot gases.
3. **Insulation**
   The ability of a wall to provide sufficient insulation such that the side of the wall away from the fire does not exceed a predefined temperature.

A typical fire resistance level for a wall could be 'FRL 90/90/90', that is 90 minutes for each of the three FRL components of structural adequacy, integrity and insulation. For further information on concrete masonry fire resistance levels please refer to Concrete Masonry Association of Australia website – www.cmaa.com.au MA 55 Chapter 9.

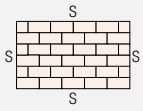
Midland Brick recommends that the design of any fire-rated wall should be checked by a suitably qualified engineer.

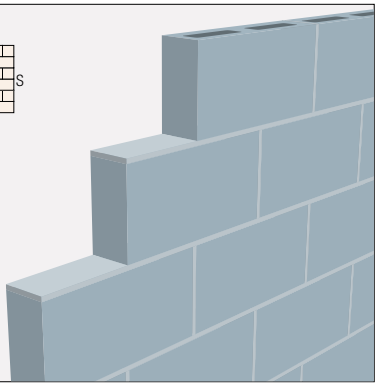
More detailed information is readily available from:

- Australian Standards relating to Masonry AS3700-2001
- The National Construction Code
- Concrete Masonry Association of Australia (CMAA).

FRL for bare wall consisting of single leaf of 90mm brick masonry, height up to 2.0m	90/60/60
FRL for wall for wall consisting of single leaf of 90mm brick masonry, with 13mm render on both sides, height up to 2.1m	60/60/90

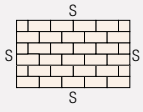
Heights above 2.4m should be referred to a suitably qualified engineer.

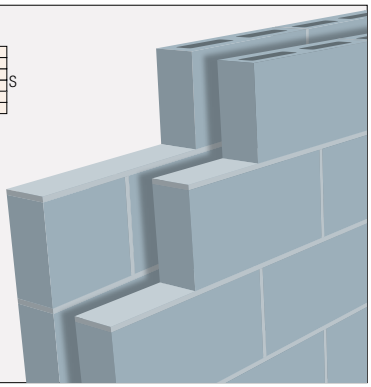




FRL for bare wall consisting of two leaves of 90mm brick masonry with 50mm cavity (minimum), height up to 2.7m	90/90/240

Heights above 2.4m should be referred to a suitably qualified engineer.

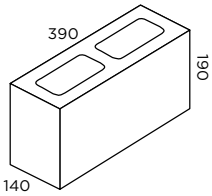




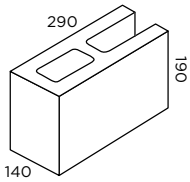
S = Simply Supported i.e. timber truss on tied brickwork. F = Free.

Masonry Block Specifications – 150mm Series

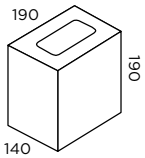
150mm Series Blocks – Full & Half Height



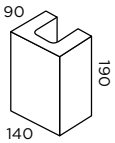
15.01
Full Length
12.5kg
120 per pallet
1500kg pallet weight



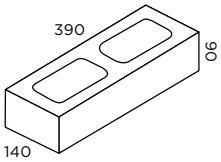
15.02
Three Quarter
10.2kg
160 per pallet
1632kg pallet weight



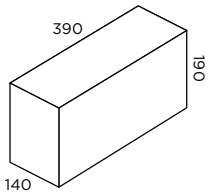
15.03
Half
6.9kg
240 per pallet
1656kg pallet weight



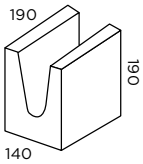
15.04
Quarter
5.0kg
336 per pallet
1680kg pallet weight



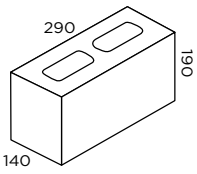
15.71
Full Length
6.4kg
240 per pallet
1536kg pallet weight



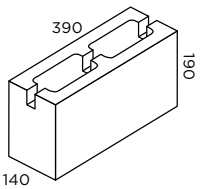
15.31
Full Length
21.6kg
72 per pallet
1555kg pallet weight



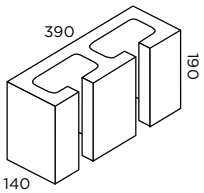
15.12
Lintel
7.0kg
240 per pallet
1680kg pallet weight



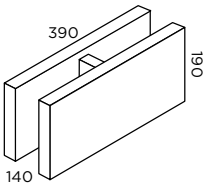
15.702(reduced core)
Three Quarter
12.9kg
128 per pallet
1651kg pallet weight



15.42
Trough Block
13.0kg
120 per pallet
1560kg pallet weight



15.45
Clean Out
11.8kg
120 per pallet
1416kg pallet weight



15.48
H Block
13.0kg
120 per pallet
1560kg pallet weight

Fractions and Accessory Blocks

Some purpose made fraction blocks are not available to order.

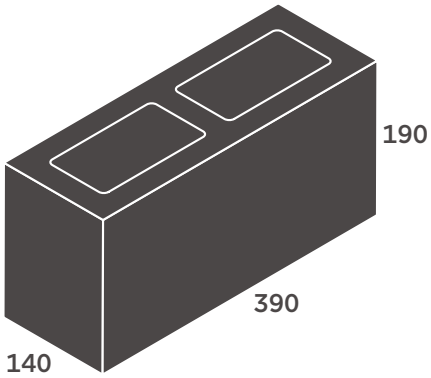
To meet your projects' requirements, these fractions can be cut onsite from available cored or solid blocks.

For further information and advice, please consult with your Midland Brick Representative.

Fraction Block Required	Cut from Block
15.72, 15.73, 15.74, 15.97, 15.83, 15.22 corner	15.01
15.703 2 hour fire rated	15.702 2 hour fire rated

Masonry Block Specifications – 150mm Series

15.01 Concrete Block



Specification

Product Information	Cored
Work Size (mm)	390 x 140 x 190
Dimensional Category	DW1
Approximate Unit Weight (kg)	12.5
Approximate No per m²	12.5
Nominal Wall Surface Density (kg/m²)	189
No per pallet	120
Pallet Weight (kg)	1545
Pallet Dimensions (mm)	1000 x 1200 x 1300
Characteristic Unconfined Compressive Strength (MPa)	>12 (Face Shell)
Cold Water Absorption (%)	<7.0
Material Density (kg/m³)	2,100 – 2,300
Coefficient of Contraction (mm/m)	<0.4
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<3.0
Potential to Effloresce	Nil to Slight
Core Percentage (%)	>30

Fire Resistance

Fire Resistance Level	Cored
Insulation (minutes)	60
Insulation – fully grouted	120

For further information on FRL – see page 53.

Note:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.
b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.
c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.
d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.
e. R_W by test, opinion, or deemed to comply with the NCC.
f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.
h. Unit weight and dry density quoted are approximate values and can vary.
i. This technical information is subject to change without notice.

Fire Resistance – 15.01 Concrete Block

Fire Resistance Level (FRL)

The FRL of a wall depends not only on the thickness of the wall but also on the height, length and how the top, bottom and ends of the wall are connected to the other building elements.

For this reason it is impossible to give a standard FRL for a particular brick – it will always depend on the construction details of the wall being built.

Walls are required to be given a fire resistance level which has three components:

1. **Structural Adequacy**
   The ability of a wall to continue to perform its structural function.
2. **Integrity**
   The ability of a wall to prevent the passage of flames and hot gases.
3. **Insulation**
   The ability of a wall to provide sufficient insulation such that the side of the wall away from the fire does not exceed a predefined temperature.

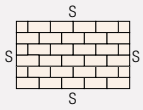
A typical fire resistance level for a wall could be 'FRL 90/90/90', that is 90 minutes for each of the three FRL components of structural adequacy, integrity and insulation. For further information on concrete masonry fire resistance levels please refer to Concrete Masonry Association of Australia website – www.cmaa.com.au

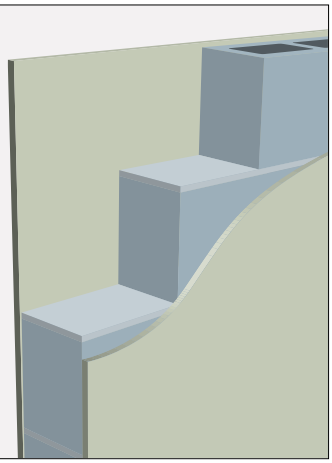
Midland Brick recommends that the design of any fire-rated wall should be checked by a suitably qualified engineer.

More detailed information is readily available from:

- Australian Standards relating to Masonry AS3700-2001
- The National Construction Code
- Concrete Masonry Association of Australia (CMAA).

FRL for wall consisting of single leaf of 140mm brick masonry, with 13mm render on both sides, height up to 3.1m	90/90/90

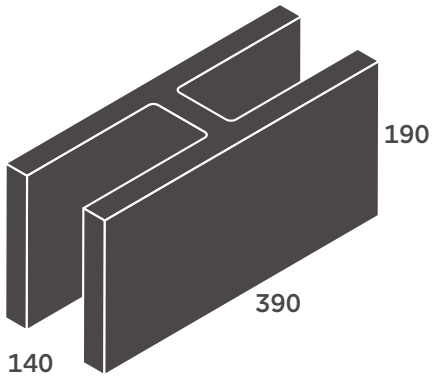




S = Simply Supported i.e. timber truss on tied brickwork. F = Free.

Masonry Block Specifications – 150mm Series

H Block 15.48 Concrete Block



Specification

Product Information	15.48
Work Size (mm)	390 x 140 x 190
Dimensional Category	DW1
Approximate Unit Weight (kg)	13.5
Approximate No per m²	12.5
Nominal Wall Surface Density (kg/m²)	188
No per pallet	120
Pallet Weight (kg)	1668
Pallet Dimensions (mm)	1000 x 1200 x 1300
Characteristic Unconfined Compressive Strength (MPa)	>12 (Face Shell)
Cold Water Absorption (%)	<7.0
Material Density (kg/m³)	2,100 – 2,300
Coefficient of Contraction (mm/m)	<0.4
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<3.0
Potential to Effloresce	Nil to Slight
Core Percentage (%)	>30

Fire Resistance

Fire Resistance Level	15.48
Insulation – fully grouted (minutes)	120

Note:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

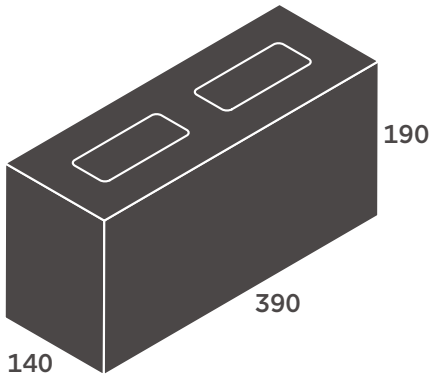
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Masonry Block Specifications – 150mm Series

Reduced Core 120 Minute Fire Resistant Concrete Block



Specification

Product Information	15.702
Work Size (mm)	290 x 140 x 190
Dimensional Category	DW1
Approximate Unit Weight (kg)	12.9
Approximate No per m²	16.7
Nominal Wall Surface Density (kg/m²)	243
No per pallet	128
Pallet Weight (kg)	1651
Pallet Dimensions (mm)	1000 x 1200 x 950
Characteristic Unconfined Compressive Strength (MPa)	>12 – (Face Shell)
Cold Water Absorption (%)	<7.0
Material Density (kg/m³)	2,100 – 2,300
Coefficient of Contraction (mm/m)	<0.4
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<3.0
Potential to Effloresce	Nil to Slight
Core Percentage (%)	<30

Fire Resistance

Fire Resistance Level	15.702
Insulation (minutes)	120

For further information on FRL and Weighted Sound reduction index R_W – see page 56.

Note:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Masonry Block Specifications – 150mm Series

Fire Resistance and R_W – 120 Minute Fire Resistant Concrete Block

Fire Resistance Level (FRL)

The FRL of a wall depends not only on the thickness of the wall but also on the height, length and how the top, bottom and ends of the wall are connected to the other building elements.

For this reason it is impossible to give a standard FRL for a particular brick – it will always depend on the construction details of the wall being built.

1. **Structural Adequacy**
   The ability of a wall to continue to perform its structural function.
2. **Integrity**
   The ability of a wall to prevent the passage of flames and hot gases.
3. **Insulation**
   The ability of a wall to provide sufficient insulation such that the side of the wall away from the fire does not exceed a predefined temperature.

A typical fire resistance level for a wall could be 'FRL 90/90/90', that is 90 minutes for each of the three FRL components of structural adequacy, integrity and insulation.

For further information on concrete masonry fire resistance levels please refer to Concrete Masonry Association of Australia website – www.cmaa.com.au

Midland Brick recommends that the design of any fire-rated wall should be checked by a suitably qualified engineer.

Weighted Sound Reduction Index (R_W)

The R_W has two spectrum adaptation terms to account for medium to high frequency noise (C) and low frequency noise (C_{tr}). The reduction figures are added to the R_W and are written R_W (C,C_{tr}).

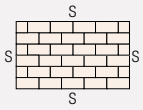
To achieve impact sound insulation, the NCC requires that walls consist of two leaves with at least a 20mm cavity between them and if ties are needed in masonry walls they must be of the resilient type. Except for the resilient ties in masonry walls there are to be
no mechanical linkages between the walls, except at the periphery (ie through walls, floors and ceilings).

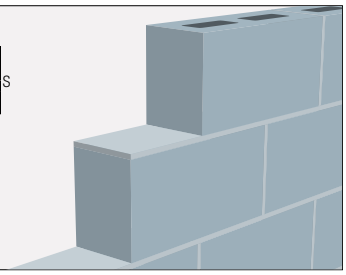
More detailed information is readily available from:

- Australian Standards relating to Masonry AS3700-2001
- The National Construction Code
- Concrete Masonry Association of Australia (CMAA).

Tests comply with AS1191-2002. Conducted by Acoustic Laboratories Australia.

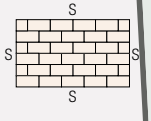
FRL for bare wall, height up to 2.9m	120/120/120
FRL for bare wall, height up to 3.1m	90/90/120
Sound reduction of wall consisting of single leaf of 140mm reduced core hollow concrete block (15.705) – bare wall.	**R_W 52, $R_W + C_{tr}$ 46**

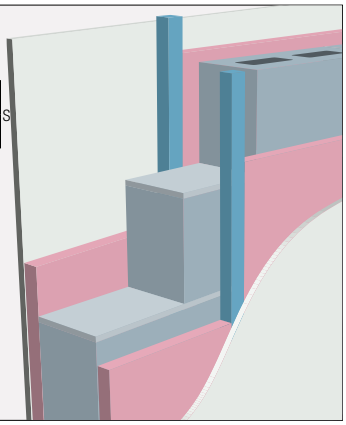




Test No ALA-05-083-1

FRL for bare wall, height up to 2.9m	120/120/120
FRL for bare wall, height up to 3.1m	90/90/120
Sound reduction of wall consisting of single leaf of 140mm reduced core hollow concrete block (15.705) with the following on both sides: a. 13mm Boral plasterboard mounted on 28mm furring channels held to wall with Rondo STSC adjustable furring channel anchors; and b. Insulation Solution 50mm Noise Control Batts with a density of 14kg/m³ placed in both 50mm cavities.	**R_W 62, $R_W + C_{tr}$ 51**



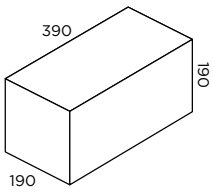


Test No ALA-05-083-2

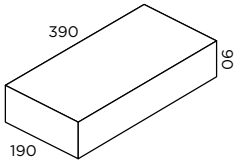
S = Simply Supported i.e. timber truss on tied brickwork. F = Free.

Masonry Block Specifications – 200mm Series

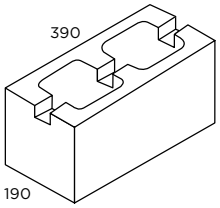
200mm Series Blocks – Full & Half Height



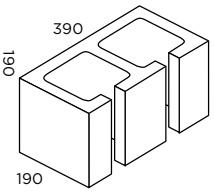
20.31
Full Length
30.1kg
54 per pallet
1626kg pallet weight



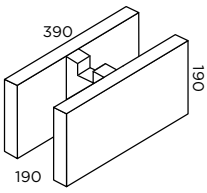
20.83/10.31
Full Length
14.2kg
108 per pallet
1534kg pallet weight



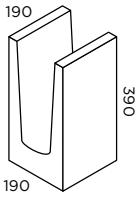
20.42
Trough Block
14.8kg
90 per pallet
1332kg pallet weight



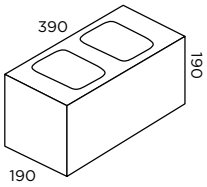
20.45
Clean Out
12.9kg
90 per pallet
1161kg pallet weight



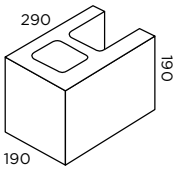
20.48
H Block
13.9kg
90 per pallet
1251kg pallet weight



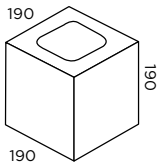
20.18
Lintel
13.0kg
90 per pallet
1170kg pallet weight



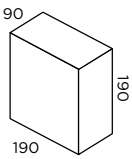
20.01
Full Length
16.2kg
90 per pallet
1458kg pallet weight



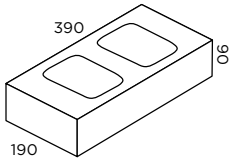
20.02/30.03
Three Quarter
12.5kg
120 per pallet
1500kg pallet weight



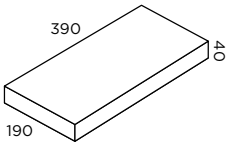
20.03
Half
7.9kg
180 per pallet
1422kg pallet weight



20.04/10.33
Quarter
6.8kg
216 per pallet
1469kg pallet weight



20.71
Full Length
7.3kg
180 per pallet
1314kg pallet weight



50.31
Capping Block
6.5kg
180 per pallet
1170kg pallet weight

Fractions and Accessory Blocks

Some purpose made fraction blocks are not available to order.

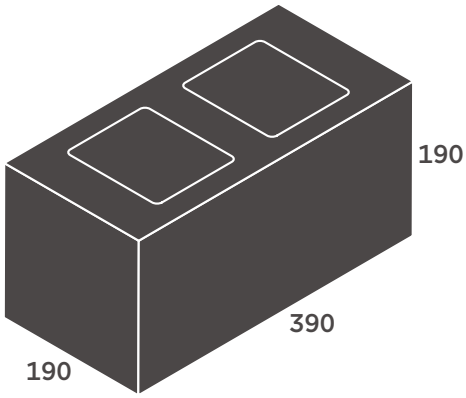
To meet your projects' requirements, these fractions can be cut onsite from available cored or solid blocks.

For further information and advice, please consult with your Midland Brick Representative.

Fraction Block Required	Cut from Block
20.72, 20.73, 20.74, 20.15 lintel, 20.20 bond beam	20.01

Masonry Block Specifications – 200mm Series

20.01 Concrete Block



Specification

Product Information	20.01
Work Size (mm)	390 x 190 x 190
Dimensional Category	DW1
Approximate Unit Weight (kg)	16.2
Approximate No per m²	12.5
Nominal Wall Surface Density (kg/m²)	218
No per pallet	90
Pallet Weight (kg)	1502
Pallet Dimensions (mm)	1000 x 1200 x 1300
Characteristic Unconfined Compressive Strength (MPa)	>12 (Face Shell)
Cold Water Absorption (%)	<7.0
Material Density (kg/m³)	2,100 – 2,300
Coefficient of Contraction (mm/m)	<0.4
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<3.0
Potential to Effloresce	Nil to Slight
Core Percentage (%)	>30

Fire Resistance

Fire Resistance Level	20.01
Insulation (minutes)	60
Insulation – fully grouted (minutes)	240

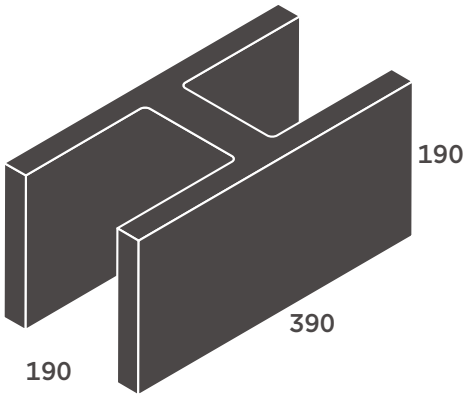
For further information on FRL and Weighted Sound reduction index R_W – see page 60.

Note:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.
b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.
c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.
d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.
e. R_W by test, opinion, or deemed to comply with the NCC.
f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.
h. Unit weight and dry density quoted are approximate values and can vary.
i. This technical information is subject to change without notice.

Masonry Block Specifications – 200mm Series

H Block 20.48 Concrete Block



Specification

Product Information	20.48
Work Size (mm)	390 x 190 x 190
Dimensional Category	DW1
Approximate Unit Weight (kg)	14.3
Approximate No per m²	12.5
Nominal Wall Surface Density (kg/m²)	200
No per pallet	90
Pallet Weight (kg)	1325
Pallet Dimensions (mm)	1000 x 1200 x 1300
Characteristic Unconfined Compressive Strength (MPa)	>12 (Face Shell)
Cold Water Absorption (%)	<7.0
Material Density (kg/m³)	2,100 – 2,300
Coefficient of Contraction (mm/m)	0.4
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<3.0
Potential to Effloresce	Nil to Slight
Core Percentage (%)	>30

Fire Resistance

Fire Resistance Level	20.48
Insulation – fully grouted (minutes)	240

For further information on FRL and Weighted Sound reduction index R_W – see page 60.

Note:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.
b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.
c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.
d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.
e. R_W by test, opinion, or deemed to comply with the NCC.
f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.
h. Unit weight and dry density quoted are approximate values and can vary.
i. This technical information is subject to change without notice.

Masonry Block Specifications – 200mm Series

Fire Resistance and R_W – 20.01 Concrete Block

Fire Resistance Level (FRL)

The FRL of a wall depends not only on the thickness of the wall but also on the height, length and how the top, bottom and ends of the wall are connected to the other building elements.

For this reason it is impossible to give a standard FRL for a particular brick – it will always depend on the construction details of the wall being built.

Walls are required to be given a fire resistance level which has three components:

1. **Structural Adequacy**
   The ability of a wall to continue to perform its structural function.
2. **Integrity**
   The ability of a wall to prevent the passage of flames and hot gases.
3. **Insulation**
   The ability of a wall to provide sufficient insulation such that the side of the wall away from the fire does not exceed a predefined temperature.

A typical fire resistance level for a wall could be 'FRL 90/90/90', that is 90 minutes for each of the three FRL components of structural adequacy, integrity and insulation. For further information on concrete masonry fire resistance levels please refer to Concrete Masonry Association of Australia website – www.cmaa.com.au

Midland Brick recommends that the design of any fire-rated wall should be checked by a suitably qualified engineer.

Weighted Sound Reduction Index (R_W)

The R_W has two spectrum adaptation terms to account for medium to high frequency noise (C) and low frequency noise (C_{tr}). The reduction figures are added to the R_W and are written R_W (C,C_{tr}).

To achieve impact sound insulation, the NCC requires that walls consist of two leaves with at least a 20mm cavity between them and if ties are needed in masonry walls they must be of the resilient type. Except for the resilient ties in masonry walls there are to be no mechanical linkages between the walls, except at the periphery (ie through walls, floors and ceilings).

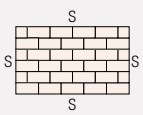
More detailed information is readily available from:

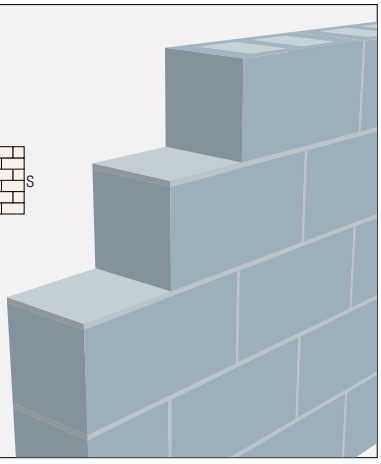
- Australian Standards relating to Masonry AS3700-2001
- The National Construction Code
- Concrete Masonry Association of Australia (CMAA).

Tests comply with AS1191-2002. Conducted by Acoustic Laboratories Australia.

FRL for wall consisting of 190mm hollow concrete block, 13mm render on both sides, height up to 4.3m	90/90/90
Sound reduction of bare wall consisting of single leaf of 190mm hollow concrete block, core filled.	**R_W 54, R_W + C_{tr} 49**

Test No. ALA-05-083-4

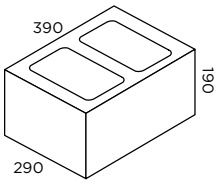




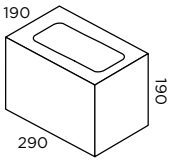
S = Simply Supported i.e. timber truss on tied brickwork. F = Free.

Masonry Block Specifications – 300mm Series

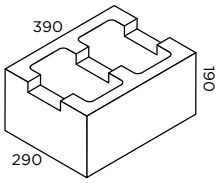
300mm Series Blocks – Full Height



30.01
Full Length
19.5kg
60 per pallet
1170kg pallet weight



30.03/20.02
Half
12.6kg
120 per pallet
1512kg pallet weight



30.42TB
Trough Block
18.2kg
60 per pallet
1092kg pallet weight

Fractions and Accessory Blocks

Some purpose made fraction blocks are not available to order.

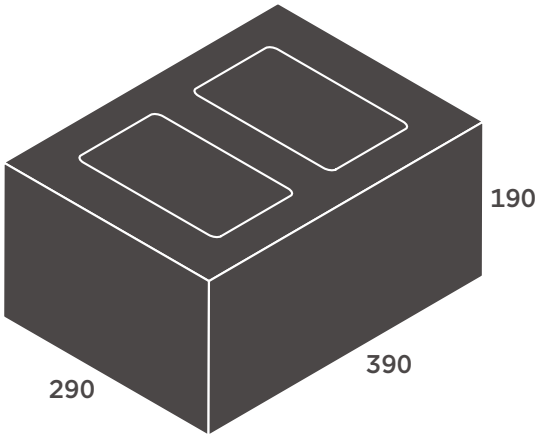
To meet your projects' requirements, these fractions can be cut onsite from available cored or solid blocks.

For further information and advice, please consult with your Midland Brick Representative.

Fraction Block Required	Cut from Block
30.02	30.01

Masonry Block Specifications – 300mm Series

30.01 Concrete Block



Specification

Product Information	30.01
Work Size (mm)	390 x 290 x 190
Dimensional Category	DW1
Approximate Unit Weight (kg)	20.0
Approximate No per m²	12.5
Nominal Wall Surface Density (kg/m²)	291
No per pallet	60
Pallet Weight (kg)	1236
Pallet Dimensions (mm)	1000 x 1200 x 1300
Characteristic Unconfined Compressive Strength (MPa)	>12 (Face Shell)
Cold Water Absorption (%)	<7.0
Material Density (kg/m³)	2,100 – 2,300
Coefficient of Contraction (mm/m)	0.4
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<3.0
Potential to Effloresce	Nil to Slight
Core Percentage (%)	>30

Fire Resistance

Product Information	30.01
Insulation (minutes)	60
Insulation – fully grouted (minutes)	240

Note:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

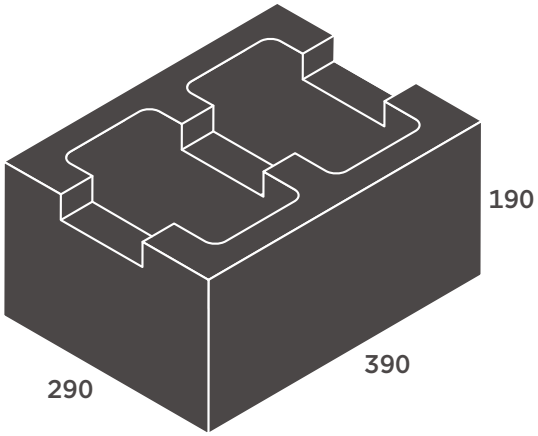
g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Masonry Block Specifications – 300mm Series

30.42 Concrete Block Trough Block



Specification

Product Information	30.42TB
Work Size (mm)	390 x 290 x 190
Dimensional Category	DW1
Approximate Unit Weight (kg)	19.5
Approximate No per m²	12.5
Nominal Wall Surface Density (kg/m²)	291
No per pallet	60
Pallet Weight (kg)	1205
Pallet Dimensions (mm)	1000 x 1200 x 1300
Characteristic Unconfined Compressive Strength (MPa)	>12 (Face Shell)
Cold Water Absorption (%)	<7.0
Material Density (kg/m³)	2,100 – 2,300
Coefficient of Contraction (mm/m)	0.4
Durability Class	General Purpose
Initial Rate of Absorption (kg/m²/min)	<3.0
Potential to Effloresce	Nil to Slight
Core Percentage (%)	>30

Fire Resistance

Product Information	30.05TB
Insulation (minutes)	60
Insulation – fully grouted (minutes)	240

Note:

a. Products with increased compressive strength can be manufactured to order. Contact your Midland Brick Sales Advisor for further information.

b. Constant quality testing is carried out in Midland Brick NATA accredited laboratory.

c. All physical testing is carried out in accordance with Australian Standards AS/NZS4455 and AS/NZS4456.

d. Fire Rating by test or deemed to comply. Design of fire-rated walls should be checked by a suitably qualified engineer.

e. R_W by test, opinion, or deemed to comply with the NCC.

f. Variations may occur in the physical properties quoted. Should particular specifications be required please contact Midland Brick for further information.

g. Durability classification based on testing or product knowledge under local (Perth, Western Australia) climatic conditions.

h. Unit weight and dry density quoted are approximate values and can vary.

i. This technical information is subject to change without notice.

Midland Brick

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Subiaco
Home Base, 55 Salvado Road

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Accreditation 21645
Compliance with
ISO/IEC 17025 – Testing

This information should be viewed as a guide only. The particular circumstances of construction projects vary significantly and often dictate the use of particular materials and techniques. Midland Brick recommends you obtain professional advice before commencing a construction project and selecting materials. Clay bricks and concrete blocks are made from naturally occurring minerals. Variations in colour, texture and size are natural characteristics of these products and variations may occur from batch to batch. Products should be chosen from actual samples current at the time of order and are subject to availability. Customers should ensure that all delivered products are acceptable and any concerns about products are notified to Midland Brick prior to laying.

Building Systems and details are subject to change. To ensure the information you are using is current, Midland Brick recommends you review the latest building information available on the Midland Brick website or contact your nearest Midland Brick Sales Office.