

# adbri MASONRY

an **ADBRI** company



## Concrete Brick Installation Guide

Selection and Installation advice for Adbri Masonry Concrete Bricks



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This manual discusses the properties, design capacities and methods of installation for concrete masonry bricks manufactured by Adbri Masonry. All information relates to the requirements of the National Construction Code (NCC) and the information provided within the Standards Australia documents relating to masonry including AS3700-Masonry Structures, AS4773-Masonry in Small Buildings, AS4455-Masonry Units and AS4456-Masonry Units – Methods of Test.

The information provided on concrete masonry bricks in this document relates only to product manufactured by Adbri Masonry, and should not be used with product supplied by any other manufacturer.

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# Brick Selection



**Adbri are Australia's leading masonry manufacturer producing a full range of concrete brick products.**

Adbri's brick range is designed to meet the demands of residential, multi-residential and commercial construction with a brick solution for every application. All products within the Adbri brick range are Australian made masonry, they're practical, durable and built to stand the test of time.

The range is composed of common grey concrete bricks and coloured face brick range. The common bricks are available in two profiles which are suitable for applications where walls will be rendered and painted.

This practical common brick range is complemented by an easy-to-lay, coloured face brick range which utilises Adbri's innovative 3-core configuration for improved installation and an exceptional finished look to exposed face brick walls.

## Benefits of Adbri Concrete Bricks

- ✓ Superior dimensional accuracy and uniformity
- ✓ Attractive, consistent slick on brick faces
- ✓ Bricks are coloured through – no risk of coatings or glazes chipping
- ✓ Concrete bricks are cured only using steam – no energy intensive firing required



# Coloured Face Brick

A practical, easy-to-lay face brick for residential, multi-residential and commercial construction.

This durable and aesthetically pleasing face brick utilises Adbri's innovative 3 core configuration to deliver a practical brick to meet the needs of builders, installers and homeowners.

The brick design improves the installation process for concrete bricks with these bricks boasting high dimensional accuracy, consistently true edges and an attractive face finish. The bricks are manufactured with coring of less than 30% and comply with the National Construction Code requirements to attain a minimum 60/60/60 rating when used in veneer applications for external walls.

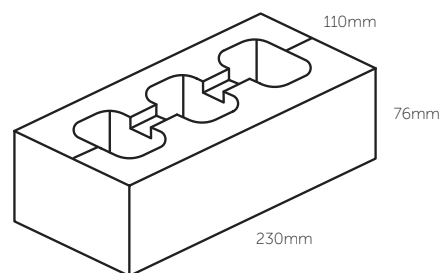


Onyx



Steel

Due to natural variations in the raw materials we use, colours may vary from batch to batch. Always sight a physical sample before purchase.



## Coloured Face Brick

No. per m <sup>2</sup>	52
Approx. Weight	3.1kg

# Common Brick

Easy to install common bricks available in a standard height and a double height 'Quick Brick' which are suitable for applications where the wall will be painted or rendered.



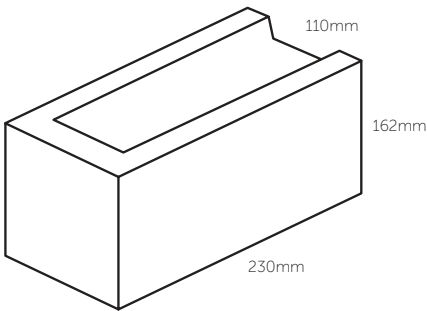
Natural

Due to natural variations in the raw materials we use, colours may vary from batch to batch. Always sight a physical sample before purchase.



**Common Brick**

No. per m <sup>2</sup>	52
Approx. Weight	3.7kg



**Quick Brick**

No. per m <sup>2</sup>	25
Approx. Weight	8.0kg

# Brick Transportation

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Your Adbri Masonry bricks will be delivered to you on a timber pallet. This will allow for ease of movement of the product on site.

The product will be plastic wrapped for protection from the elements.

If removing product from the pallet to stack on the ground, make use of the plastic wrap to lay the product on, as this will prevent the product from drawing moisture from the ground which can result in discoloration and staining.

## Brick Properties

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All Concrete Masonry bricks manufactured by Adbri Masonry are manufactured from quality raw materials, are manufactured in accordance with the requirements of all Australian Standard Masonry Codes and are checked to strict quality tolerances.

### TESTING

All Adbri Masonry Concrete Masonry Bricks are manufactured in accordance with the requirements of AS4455.1 Masonry Units and tested in accordance with the requirements of the relevant volumes of the AS4456 suite of codes Masonry Units – Methods of Test. All Adbri products are tested in our in-house, N.A.T.A accredited testing laboratory.

All bricks are QA tested for Compressive Strength, Potential to Effloresce, Dimensional Tolerance and Rate of Absorption.

Australian Standards require loadbearing bricks to attain a minimum characteristic compressive strength of 5MPa when tested in a full bed configuration. All Adbri Masonry brick is manufactured to achieve a minimum characteristic compressive strength of 8MPa when tested in a full bed configuration.



### CORING

All Adbri Masonry Bricks are manufactured with coring of less than 30%.

Coring percentages are important as they determine the Deemed to Satisfy ratings of the product for Integrity and Insulation when determining Fire Resistance Levels (FRL's) for National Construction Code (NCC) compliance. Units with coring of less than 30% are treated as a solid unit in these cases.

All bricks comply with the NCC requirements to attain a minimum 60/60/60 rating when used in veneer applications for external walls.



## **DIMENSIONAL TOLERANCES**

All Adbri Masonry Units are monitored to ensure compliance with Australian Standard Dimensional Tolerances. The units are assessed for compliance with DW4 dimensional tolerance allowances which requires a standard deviation of not more than 2mm and a difference between the mean and the work size of not more than 3mm. Should you require tighter dimensional tolerances, please discuss this with your Adbri Masonry sales representative. Specific tolerances can be achieved on a made to order project basis where minimum quantities, lead times and project specific pricing apply.

Dimensional tolerances are extremely important as they assist in keeping an aesthetically pleasing line and level in the brickwork during construction. This also ensures the mortar bed and perpend thicknesses will never fall below the industry recommended minimum of 7mm, -3mm from the nominal value of 10mm.

## **SUSTAINABILITY**

Sustainability is generally defined as meeting the needs of the present without damage to the future.

Adbri Masonry manufacture their range of concrete masonry brick products using locally sourced materials.

The Adbri Masonry brick range is steam cured using recycled water in facilities that use solar power. The products have lower cement to aggregate ratios than standard concrete. The products are recyclable at the end of their life.

The use of sustainable materials and manufacturing processes, the small carbon footprint of the products, the design life of concrete masonry products and their ability to be recycled after their usage has ended ensures that the products are extremely sustainable when assessed over the whole of their life.

The thermal efficiency of the product also assists with the long term sustainability of the structures they create.

## **DURABILITY**

Concrete is one of the most durable construction materials available, with early Roman structures, that are still in existence, made using the first forms of concrete. Concrete Masonry, a zero slump concrete product, is equally as durable.

Durability of a concrete masonry unit refers to its ability to withstand exposure to the elements and maintain its structural integrity.

Today, for concrete masonry products, this is measured as the products resistance to salt attack, and the units are classed as being either General Purpose or Exposure Grade.

## **GENERAL PURPOSE**

General Purpose means the product is durable to all but the most aggressive of site conditions.

This classification permits all products to be utilised in any construction where the product is not exposed to saline conditions, such as within 1km of a coastline subject to spray from wave action, or where the product will not be in contact with aggressive soils.

## **EXPOSURE GRADE**

Exposure Grade means the product is durable, even in very aggressive site conditions. Testing or experience has proven that the product is capable of remaining whole, even when exposed to spray from saltwater environments, or when founded into aggressive soil conditions.

# Brick Strength

All Adbri Masonry bricks are tested for compressive strength. Bricks with less than 30% coring are tested as full bed units. This is defined as the units being installed with a full layer of mortar covering the entire upper surface of the brick unit.

The Australian Standard for Masonry in Small Buildings requires loadbearing bricks to be manufactured to a minimum characteristic compressive strength of 5MPa.

Adbri Masonry concrete masonry bricks are all manufactured to achieve a minimum characteristic compressive strength of 8MPa.

Design Tables are provided to supply the compressive design capacity for the different brick types. There are two calculations undertaken for unreinforced masonry acting in compression.  $F'_o$  is the compressive capacity of the masonry wall, whereas  $F_d$  is the actual design compressive capacity of the wall.  $F_d$  is a factored value of  $F'_o$ . The factor applied to determine the design compressive capacity  $F_d$  is calculated based on the restraint conditions of the wall and how the load is applied to the wall ie does it apply an eccentricity and therefore introduce bending forces.

The below is included to provide the value of  $F'_o$  for the Adbri Masonry brick range, and the  $F_d$  values for two different forms of installation. Bricks are not suitable for the attachment of a load to the face of the units.

Product	Wall Height (mm)	Slenderness Ratio	$K_{sl}$	$K_{ti}$	$F_d$		$F'_o$ (kN/m)
					Supporting concrete slab (kN/m)	Supporting timber framing (kN/m)	
Render brick Coloured face brick Architectural brick	2400	21.82	0.51	0.37	165.26	120.51	321.75
	2600	23.64	0.48	0.33	153.56	105.89	
	2800	25.45	0.44	0.28	141.86	91.26	
	3000	27.27	0.40	0.24	130.16	76.64	
	3200	29.09	0.37	0.19	118.46	62.01	
	3400	30.91	0.33	0.15	106.76	47.39	
	3600	32.73	0.30	0.10	95.05	32.76	
	3800	34.55	0.26	0.06	83.36	18.14	
	4000	36.36	0.22	0.01	71.66	3.51	
Quick brick	2400	21.82	0.51	0.37	196.66	143.41	382.88
	2600	23.64	0.48	0.33	182.74	126.00	
	2800	25.45	0.44	0.28	168.82	108.60	
	3000	27.27	0.40	0.24	154.89	91.20	
	3200	29.09	0.37	0.19	140.97	73.79	
	3400	30.91	0.33	0.15	127.05	56.39	
	3600	32.73	0.30	0.10	113.12	38.98	
	3800	34.55	0.26	0.06	99.20	21.58	
	4000	36.36	0.22	0.01	82.28	4.18	

Basic Compressive Capacity and Design Compressive Capacity of Bricks using simplified method (AS3700-2108 Clause 7.3.3)

The values in the table should be considered in addition to the slenderness ratio limitations for FRL values. In many instances it will be necessary for external walls to use a cavity or veneer system, or to utilise engaged piers.

In terms of the values above, the design capacity  $F_d$  is the maximum load that can be applied to the wall and the wall maintains structural adequacy. The ultimate loads applied to the wall should be calculated based on the dimensions and detailing of the structure.

For example, a 2 storey home with a tiled roof, 3m high walls and a 175 thick slab for the upper floor, bedrooms to the upper floors and a structure width of 10m that subjects your walls to a 5m load width, would be roughly calculated as follows:

DEAD LOADS
<b>Roof</b> 5m load width x 1.2 load factor x 0.4kPa for roof sheeting, timber framing, ceiling & insulation = 2.4kN/m
<b>Upper Wall</b> 3m high x 0.11m wide x 21kN/m <sup>3</sup> density x 1.2 load factor = 8.3kN/m
<b>Slab</b> 5m load width x 1.2 load factor x 0.175m deep slab x 24kN/m <sup>3</sup> density = 25.2kN/m
<b>Lower Wall</b> 2.9m high x 0.11m wide x 21kN/m <sup>3</sup> density x 1.2 load factor = 8kN/m
LIVE LOADS
<b>Roof</b> Allow 1.5kPa for maintenance x 1.5 load factor x 5m load width = 11.25kN/m
<b>Slab</b> Allow 3kPa for bedroom x 1.5 load factor x 5m load width = 22.5kN/m
<b>Total Load applied to base course of brick</b> = 2.4 + 8.3 + 25.2 + 8 + 11.25 + 22.5 = <b>77.65kN/m</b>

Face and Common Bricks have a design capacity of 130.16kN/m for a 3m high wall restrained at the top by a concrete slab, therefore would be structurally sound in this type of application.

Quick Brick has a design capacity of 154.89kN/m for a 3m high wall restrained at the top by a concrete slab, therefore would be structurally sound in this type of application.

Timber framing attached to the top of the wall will give you a lower design capacity, but will also impose less dead load than a reinforced concrete slab.

The load width carried by a wall will have a great impact on the design force applied to the wall. The wall height will also determine the factor applied to the wall to determine design capacity. The greater the wall height, the lower that factor will be, timber framing attached to the top of the wall offers virtually no capacity at all when walls get to 3.5m in height or higher.

External walls or internal walls where loads are applied with an eccentricity should be calculated independently using the refined method provided in Clause 7.3.4 of AS3700-2018.

The design capacity of the Adbri Masonry concrete masonry bricks will permit multi storey structures up to 15m in height to be constructed, as long as earthquake loading is adequately provided for, the load widths and wall heights are within reason, and engaged piers are used to assist in carrying loads where required.



# Potential to Effloresce

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Efflorescence is a white bloom that may appear on the surface of masonry products.

Efflorescence is a naturally occurring phenomenon that is part of the hydration process of cement. Water ingress into a structure, or prolonged exposure to moisture during or after construction, will contribute to the possibility of efflorescence occurring.

To minimise the risk of efflorescence occurring, all Adbri Masonry concrete masonry bricks are steam cured following production to ensure there is adequate moisture content for full hydration to occur. The units are also manufactured using an admixture that reduces the rate of moisture absorption once the product is cured.

Adbri Masonry also offers guidance on additional measures that can be taken through the installation process to minimise the risk of efflorescence occurring. These measures include never storing the product on the ground during the construction process, a pallet or plastic membrane should always be used. This information and more can be found on the Adbri Masonry data sheet of Efflorescence and the treatment of it.

**PLEASE NOTE:** It is recommended by Adbri Masonry that all sand used for mortar mixes be double washed to ensure no salts, that can cause efflorescence, are introduced into the wall via the mortar.

It is important to note that efflorescence is not detrimental to the structural integrity of the concrete masonry brick, and can be cleaned away using a variety of procedures. The easiest method is to brush the efflorescence away using a dry stiff broom, and to collect the displaced material. This will prevent it reabsorbing into the wall when wet.

All Adbri Masonry brick products have been tested and found to meet the lowest possible level of risk for efflorescence occurring.

## Initial Rate of Absorption

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The initial rate of absorption is the volume of water that the product is capable of absorbing within 1 minute of the bed of the product coming in contact with moisture. This test is important as it helps determine the susceptibility of the product to effloresce, but it also determines the ability of the product to bond with the mortar bed.

Adbri Masonry have optimised their brick design to ensure the best possible bond strength with the lowest risk of efflorescence.

## Acoustic Ratings

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Another valued aspect of concrete masonry bricks are their inherent acoustic properties. The bricks themselves provide a good base level against the transmission of sound through the wall, but won't achieve the required NCC values for  $R_w + C_{tr}$  by themselves.

Please refer to the Adbri Masonry Fire and Sound brochure for details on how to construct our concrete masonry bricks with plasterboard, studs or furring channels, and insulation to achieve these values.

# Fire Ratings

Concrete Masonry is a non-combustible material that is very suited for use in applications where a fire resistance level is required by the National Construction Code (NCC).

Concrete masonry products will always attain integrity and insulation ratings of between 60 and 240 minutes.

The NCC requires a minimum FRL of 60/60/60 for external walls within 900mm of a property boundary for residential construction. NCC nominates a performance solution as masonry or masonry veneer construction where the masonry skin is a minimum of 90mm in width for these applications.

If longer FRL's, or more information on the calculation of a products values, are required, please refer to the fire and sound brochure for your state to ascertain the performance levels of bricks based on test results and application.

# Thermal Efficiency

Concrete masonry bricks are solid, thermally efficient units that provide a good base for building up the NCC required R ratings (thermal resistance) for construction. Thermal resistance is a measure of how well a construction material prevents heat from transferring through it.

The bricks themselves will provide a portion of your required rating, as noted in the table below. It will be necessary to use other materials such as plasterboard, render or a layer of insulation to build the thermal efficiency up to your required values. Further information on how this can be achieved can be found in the Adbri Masonry Thermal Efficiency guide.

## THERMAL EFFICIENCY (R) OF ADBRI MASONRY BRICKS

	Bare R Rating	R rating with internal and external air film
Quickbrick Dense	0.14	0.3
Quickbrick Light	0.21	0.37
Common Brick	0.13	0.29
Coloured Face Brick	0.14	0.3



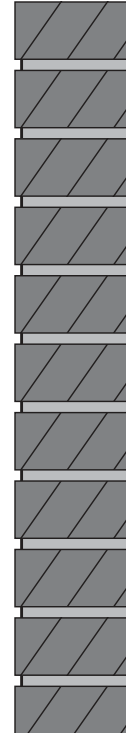
# Construction Details

Adbri Masonry bricks are extremely versatile and can be used in numerous forms of construction.

## SINGLE SKIN

Single skin construction, as it suggests, is the installation of a brick wall with the overall wall thickness being the thickness of the individual brick unit.

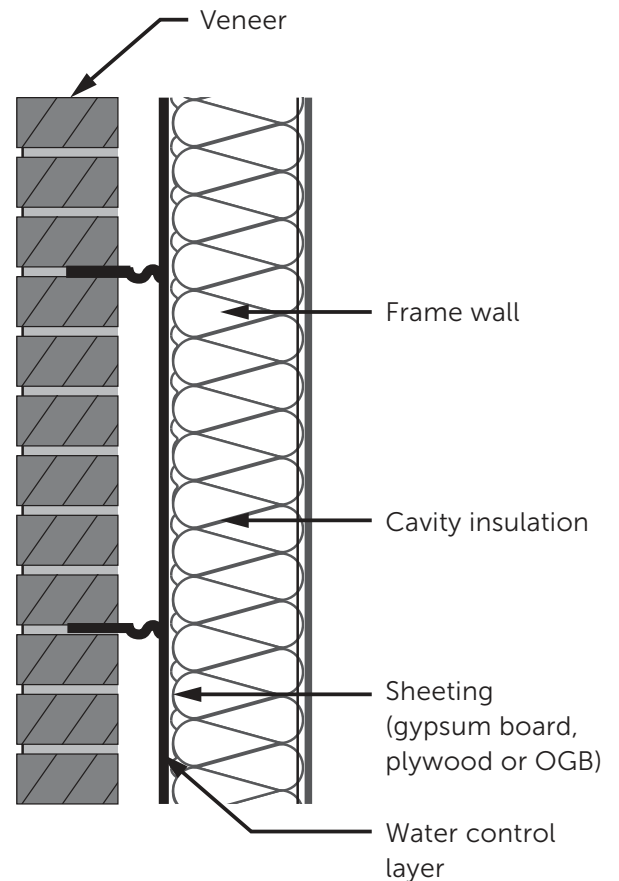
Single skin walls are often installed with engaged piers, or as infill panels between other loadbearing members.



## VENEER

A veneer application includes a non-loadbearing brick wall, tied back to a structural frame, at regular centres.

The structural frame may be comprised of timber or steel framing, and will carry all of the structural loads for the wall.



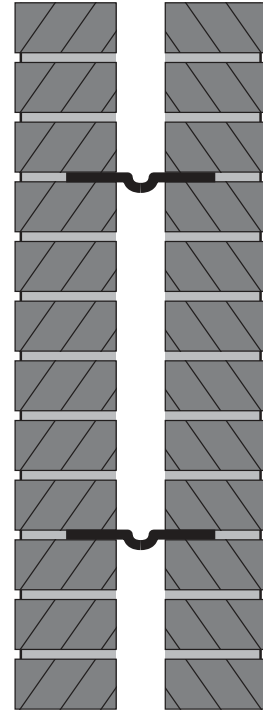


## CAVITY WALL

A cavity wall is a wall comprising two individual brick walls with a small void between them. The two walls are tied together at regular centres with wall ties to ensure lateral loads are shared.

The wall may be loadbearing, with either one or both sections of wall carrying the structural loads. External loadbearing brick walls are usually cavity construction.

The cavity is often filled with insulation to provide an acoustic rating that complies with the NCC rating for  $R_w + C_{tr} > 50$  discontinuous.



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## NON-LOADBEARING

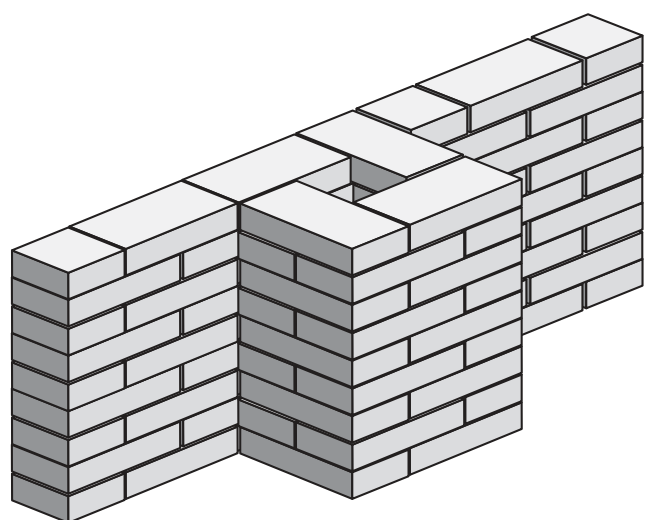
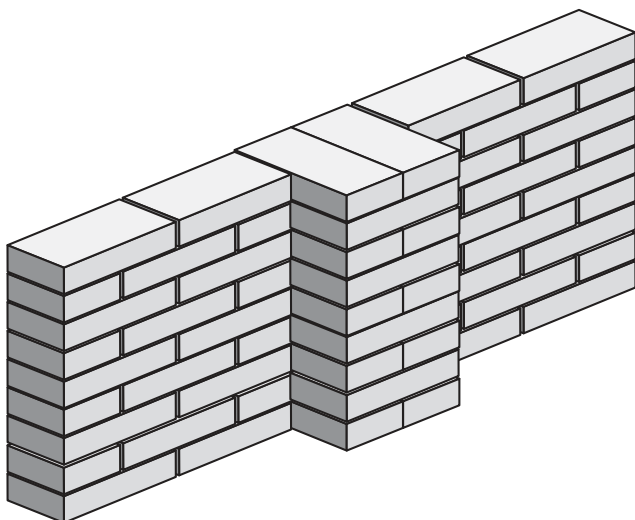
A non-loadbearing wall is installed as a partition or façade, but is not physically carrying any of the structural loads of the building. Non-loadbearing walls are often installed to provide fire rated partitions between structures, a durable and thermally efficient façade, or an aesthetically pleasing exterior.

## LOADBEARING

Loadbearing walls are structural walls that carry their own self weight in addition to other loading from the floors, roofs or walls above in a single storey or multi-storey structure. Walls may require engaged piers, or return walls, to work as panels to maintain an adequate FRL.

## ENGAGED PIERS

Engaged Piers are piers constructed at regular centres that are tied to the wall face. Engaged piers will stiffen a wall and are used in loadbearing walls to assist in carrying heavy loads, but also to create panels of walling between them. These panels will have better FRL's than single skin walls spanning from floor to ceiling.



## **WATERPROOFING**

Concrete masonry is a material with the capacity to absorb minor amounts of moisture. Both the bricks and the mortar contain fine pores or capillaries that can draw water. Problems relating to moisture penetration can be avoided by using appropriate methods of construction and treating the masonry for weatherproofing, as recommended.

It is recommended by AS3700 to weatherproof masonry walls constructed in single skin applications, or to adequately ventilate and allow seepage from veneer or cavity wall installations.

Single skin masonry can be weatherproofed by painting or rendering and painting the exposed face of the brickwork, or a sealant can be used as long as the eaves overhang meets the minimum requirements of AS3700.

Cavity or veneer walls are considered to be weatherproof due to the manner in which they are constructed. These types of construction are based on the theory that a physical break is provided between the wet outer skin of brickwork and the dry inner skin of brickwork, which requires all connections between the two skins to be installed in a manner guaranteed not to transfer water. This includes cleaning of mortar droppings and correct installation of wall ties and other accessories.

A cavity or brick veneer wall shall have weepholes installed, with the appropriate flashing material, to allow any moisture that accumulates within the cavity to escape. This will allow any moisture that does penetrate through the external skin to be returned to the outside of the wall by being captured by the flashing and directed out through the weepholes.

A damp proof membrane is often used with brick walls to prevent the risk of rising damp.

## **WALL TIES**

Wall Ties, with levels of galvanising appropriate to the application, shall be installed at no greater than 600mm centres in each direction, between the 2 leaves of brick veneer and cavity brick walls. The wall tie connects the two skins of walling and ensures they act together to accommodate all the relevant design forces being applied to the structure.

The wall ties must be embedded into mortar to a minimum of 50mm, and must maintain 15mm of mortar cover.

## **LINTELS**

Lintels are used over all openings such as doors and windows to support the bricks installed above.

If using a prefabricated stainless steel or hot dip galvanised section, it is recommended to check the suppliers design tables to ensure the appropriate degree of durability protection is provided, and that you are using the correct grade and size of member.

## MORTAR

Mortar has the dual function of providing an even bedding for the brick units, absorbing the dimensional tolerances and permitting units to be laid to a straight line and level, as well as providing a sealed joint between the units to assist with weather tightness.

It is very important that the installed mortar has a good consistency and is mixed to ensure its durability and its bond with the bricks. It is therefore recommended that the mortar used with Adbri Masonry bricks is an M3 class mortar.

The mortar shall comprise sand, cement, water and may also include lime or admixtures. Sands shall be washed to prevent salt contamination, as this can lead to efflorescence, and to minimise the silt and clay content. Excessive silt and clay content can result in smears and stains on the finished product that will require intensive cleaning. Excessive silt and clay content can also affect the long term strength of the mortar. Mortar beds and perp ends shall be a nominal 10mm in thickness, but never less than 7mm. There are many types of mortar joints that can be used with bricks, but the ironed or tooled joint is considered the most durable.

### PLEASE NOTE:

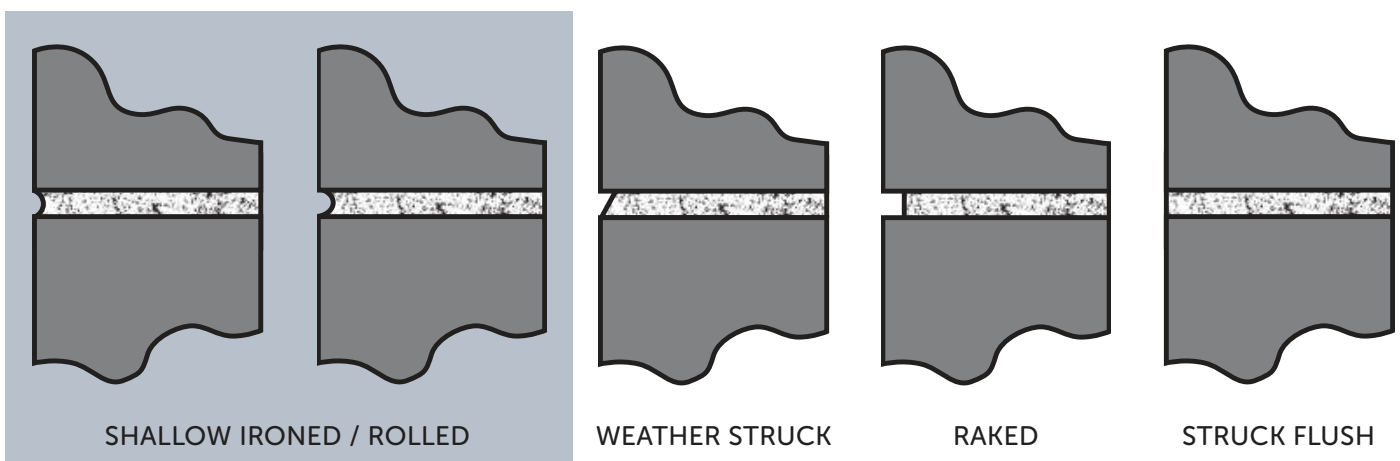
Adbri Masonry recommends the use of colour matched mortars for ease of cleaning after installation. If contrasting mortars are specified for use, extra care must be given to cleaning the bricks as they are laid to avoid mortar stains and smears.

When preparing a mortar mix for use laying concrete bricks, Adbri recommends the use of an appropriate admixture in the mortar mix to reduce the risk of efflorescence. Please consult manufacturer of admixtures for information about product suitability.

## M3 MORTAR CLASSIFICATION

Cement (GP)	Masonry Cement	Building Lime	Sand	Water Thickener
1	0	1	6	Optional
1	0	0	5	Yes
0	1	0	4	Yes

## MORTAR JOINT TYPES



Adbri recommends ironed/rolled joints for Adbri concrete bricks.



## CONTROL JOINTS

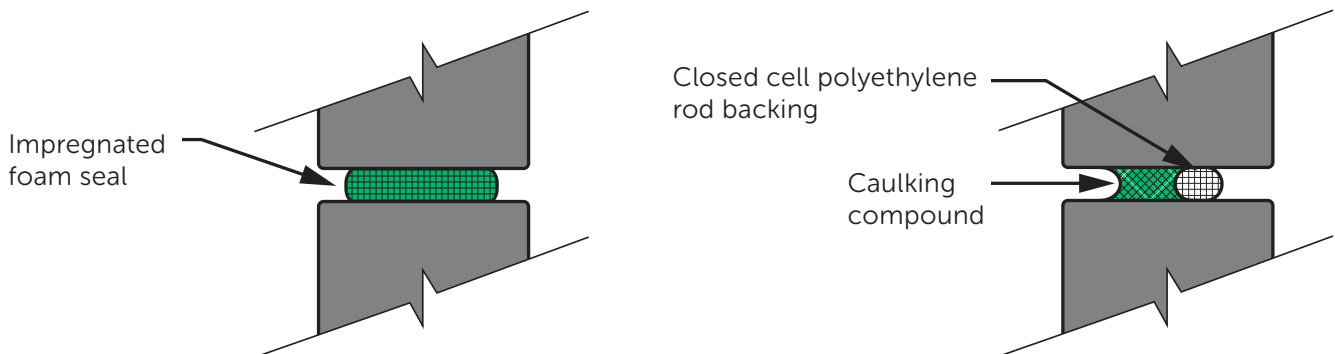
Concrete Masonry shrinks as part of the curing process, and can be subject to thermal expansion and contraction. For this reason, control joints should be installed at regular centres to mitigate the risk of cracking in the unreinforced masonry.

The required spacing of the control joints is determined by the application and finish applied to the product.

Masonry wall construction and surface finish	Maximum joint spacing (m)
External masonry that is face finish, rendered and/or painted	7.0
Internal masonry that is face finish or sheeted	6.0
Internal masonry that is rendered and/or painted	5.0
External masonry with openings more than 900mm in height	5.0

Control Joints should be installed so that they form a complete separation of the two adjacent sections of wall. They should be installed with a mastic sealant and a backing rod to ensure water tightness of the joint. The joints should be full height of the structure and should not be saw toothed.

Control joints should always be located where there is a major change in wall height, for example alongside windows and doors, as these locations are more prone to cracking occurring.



## ARTICULATION JOINTS

Articulation joints, similar to control joints, are installed to accommodate potential movement in the structure due to foundation movement. Articulation joints, if required, will be installed at closer centres as recommended by your geotechnical engineer.

The method of construction for articulation joints shall be as for control joints.

## BRACING DURING CONSTRUCTION

All unreinforced masonry, installed without being tied back to a structural frame, shall be braced during the installation process to ensure its structural adequacy during wind events.

Bracing shall be in accordance with the industry funded guide "Safety in Masonry Construction" available from state workplace health and safety websites in all states apart from Victoria.

# Cleaning

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During the installation process, the surface of your masonry brickwork may have been contaminated by mortar smears or general construction site staining, it will be necessary to clean the concrete as soon as possible after the stain is identified. Prolonged exposure of the brick surface to these materials will make the cleaning process more difficult and may result in damage to the brick face due to extreme measures undertaken by brick cleaning subcontractors.

Completed walls may be covered with plastic to prevent disfiguration from any other construction materials. All masonry cleaning shall be undertaken in accordance with the recommendations in the Concrete Masonry Association of Australia Cleaning and Maintenance Guide.

# Sealing

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If sealing your brick wall, it is recommended to clean the product of all construction contamination or environmental contamination first. The product should then be allowed to dry fully prior to the application of your selected sealant. The sealant should be applied in accordance with manufacturers instructions, and it is recommended that a test panel be applied prior to full application.

# General Information

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Concrete masonry and clay masonry should never be used in mixed construction. This is because concrete masonry shrinks and clay masonry expands. If it is not avoidable to use the two materials in one structure, they should be appropriately separated by control joints between panels of the individual materials, or slip joints if one product is installed above the other.

Some construction may require many pallets of product to be delivered. As this product may have come from different stages of a large production run, or even from different production runs, it is recommended to install the brickwork using the process called blending. Blending involves using product from a number of pallets delivered to site, randomly throughout the construction, rather than constructing with one pallet at a time. This process distributes the minor colour variations that may occur from batching raw materials with natural colour variances throughout the entire project and prevents the risk of patchiness.

Construction should be avoided when the weather is excessively hot, excessively cold or excessively wet. If wet weather occurs, the tops of the walls should be protected with a plastic membrane to minimise the risk of saturation of the product.

Mortar should be allowed to cure for seven days after installation, prior to any loads being applied to the walls. This will allow the mortar to gain a large percentage of its design strength and ensure its structural adequacy.



BRICKS

| BESSER® BLOCKS

| PAVERS

| RETAINING WALLS



AdbriMasonryAus



adbrimasonry

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Free pallet collection service freecall 1800 674 961 or drop pallets back to place of purchase or lodge your pallet pick up online at [adbrimasonry.com.au](http://adbrimasonry.com.au)

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Concrete Brick installation guide - September 2020

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