



# Q Block™

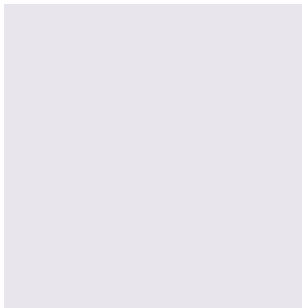
Technical Manual

**bricks.**  
style with  
substance



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## The Austral Brick Company

Since 1908 Austral Bricks, Australia's leading brick manufacturer, has supplied the world with high quality clay bricks and pavers.

The products are continually changing with the times and the demands of architects, designers, developers and homeowners. The Q Block system is the latest in a range of innovations from Australia's leading brick manufacturer. Should you require any additional advice please contact us, and our Technical Experts will be at your disposal.

# What is the Q Block System?

Q Block is a non-loadbearing clay block system for internal walls. Blocks are manufactured similarly to conventional clay bricks, but are precision ground on the bedding surfaces to achieve a block height accurate to  $\pm 0.2\text{mm}$ . The blocks have tongue and grooved ends to provide horizontal alignment, but the vertical perpend is not mortared.

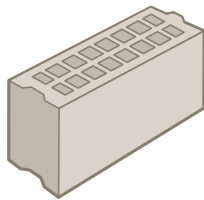
Figure 1: Q Block



Q Blocks are bonded together on the horizontal surfaces only, with Q Block Adhesive - a thin bed mortar. Mortar joints are approximately 1mm thick. The dimensions of the blocks are such that the coursing heights are equivalent to conventional brickwork with traditional mortar joints.



## Specifications



### Block

Size (mm): 310L x 90W x 171H

Weight (each): 5.9 kg

18.8 blocks per square metre





### Applications

Typical applications where the Q Block system proves extremely effective are:

- Multi unit construction
- Fire walls
- Sound rated walls
- Inter-tenancy walls
- Partition walls in multistorey developments
- Where rapid construction of walls is required

### BRANZ Appraisal

BRANZ (Building Research Association of New Zealand) has independently assessed the Q Block Wall System as meeting the requirements of the National Construction Code Series (NCC)/Building Code of Australia (BCA). BRANZ Appraisal Certificate No. 794(2012) covers the system.





## Product

### Q Block

Q Block is manufactured in 90mm thickness and is classified General Purpose for resistance to salt attack, in accordance with AS/NZS 4456.10.

### Specifications

Table 1 - Properties of 90mm Q Block	
<b>Dimensions</b>	
Length	310 mm
Length including tongue	318 mm
Width	90 mm
Height	171 mm
<b>Dimensional Category</b>	DW2
<b>Compressive Strength of Unit, <math>f'_{uc}</math></b>	>15 MPa
<b>Flexural Tensile Strength of Masonry, <math>f'_{mt}</math></b>	>0.7 MPa
<b>Coefficient of Expansion (e-factor)</b>	<1.0 mm/m
<b>Durability Class</b>	General Purpose
<b>24 hour Cold Water Absorption</b>	8-10 %

### Q Block Adhesive

The blocks are bonded together with Q Block Adhesive. The mortar joint formed by Q Block Adhesive is approximately 1mm thick and provides an extremely strong bond between blocks. Q Block Adhesive is a two-part mortar adhesive system that has been exclusively developed for Austral Bricks. Q Block Powder, a dry pre-mixed bagged mortar is mixed with Q Block Liquid and water to form Q Block Adhesive. The adhesive is applied by dipping the bottom bearing face of the block in a tray of the adhesive. Q Block Adhesive has a durability classification equivalent to, or better than, M4 mortar as defined by AS 3700.



### System Components

The Q Block system consists of the following components:

Table 2 - Q Block Track Components			
Item	Cross section (W x H)	BMT (Base metal thickness)	Purpose
Base Track (Steel deflection head track)	92 x 50 mm	0.75 mm	Track half-filled with self-levelling compound to provide a plumb and level surface for the first course
Side Track (Steel deflection head track)	92 x 50 mm	1.15 mm	To provide a vertical restraint
Head Track (Steel equal angle)	50 x 50 mm	0.75 mm	To provide a horizontal restraint at the top of the wall

### Alternate Base Course

Base track (with a self-levelling compound) may be replaced with traditional thick bed mortar for the bedding course if required.

### Ties and Connectors

The side track and the head track may be replaced with ties or connectors. All ties must be embedded at least 50mm into the adhesive joint and at least 15mm cover must be provided from any exposed surface.

A range of special intersecting wall connectors and door frame ties designed for Q Block are available from Austral Bricks.

### Door Frames

The fitting of door frames is the same as conventional blockwork except that Q Block door frame ties must be used. Q Block door frame ties are 0.8mm stainless steel and are required to be installed every second course of blocks. Door frames should be filled with mortar to provide a solid supporting frame.

### Lintels

Lintels are necessary to support blockwork over openings and must have adequate strength and stiffness to support loads. Q Block walls are non-loadbearing and lintels only need to carry the load of the blockwork above the opening.

Lintels should be built into the masonry to have a bearing length at each end of 100mm for spans up to 1000mm and 150mm for larger spans.

Appropriate lintels are 8 or 10mm arch bars or angle lintels. For information on the load capacity of lintels refer to the manufacturer's literature.

### Fasteners

The type and specification of the fasteners to affix tracks are important as they determine the support of tracks and robustness of the wall. A fastener used for the Q Block system should satisfy the following requirements.

1. Fasteners should be corrosion resistant.
2. Fasteners must provide more than 0.77kN/m of shear capacity (example: Ramset TrakFast™ FPP Series Gas Pins at 500mm maximum centres as detailed in Appendix C).
3. Screw and nail fixings should have expanding plugs or be expansion bolts.



### Sound Insulation

The National Construction Code Series (NCC)/Building Code of Australia (BCA) has requirements for walls between adjacent occupancies in Class 1-9 buildings in terms of sound insulation. The Q Block system can be used for all the internal walls mentioned in Table 3.

Table 3 - Acoustic Requirements of BCA				
Building Class	Area 1	Area 2	Requirement	Discontinuous Construction Required
1, 2 and 3	Habitable (Living room, dining room, bedroom and study and the like)	Habitable	$R_w + C_{tr} \geq 50$	No
1, 2 and 3	Habitable	Wet (Kitchen, bathroom, sanitary compartment or laundry)	$R_w + C_{tr} \geq 50$	Yes
2 and 3	Habitable	Public area (Stairway, public corridor, public lobby or the like)	$R_w \geq 50$	No
2 and 3	Habitable	Public area (Lift shaft or plant room)	$R_w \geq 50$	Yes
9c	Habitable	Habitable	$R_w \geq 45$	No
9c	Habitable	Wet	$R_w \geq 45$	Yes

A variety of sound insulation systems are available to meet the requirements of NCC/BCA as shown in Table 4.



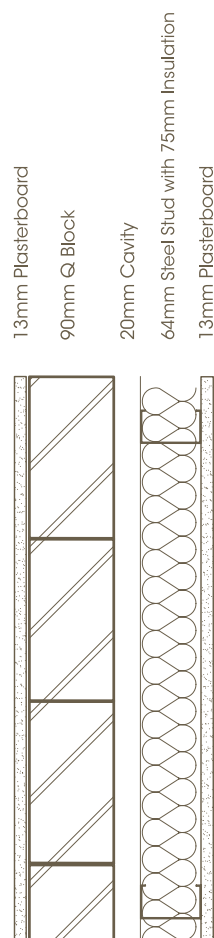


Figure 2: Q Block Wall Tested

### Fire Resistance

The National Construction Code Series (NCC)/BCA has requirements for Fire Resistance Levels (FRLs) for occupancies in Class 2-9 buildings. The Q Block system has been tested by CSIRO to AS 1530.4 as having the Fire Resistance Level of -/120/60 (Report FSV 1548).

Table 4 – Acoustic Attenuation of 90 mm Q Block Walls

Wall Type	$R_w$	$R_w + C_{tr}$
13mm Standard Plasterboard 90mm Q Block 20mm Cavity 64mm Steel Stud with 75mm Glasswool Insulation (11 kg/m <sup>3</sup> ) 13mm Standard Plasterboard	57	46
13mm Standard Plasterboard 90mm Q Block 20mm Cavity 64mm Steel Stud with 75mm Glasswool Insulation (11 kg/m <sup>3</sup> ) 2 Layers of 13mm Standard Plasterboard	62	54
13mm Sound Rated Plasterboard 90mm Q Block 20mm Cavity 64mm Steel Stud with 75mm Glasswool Insulation (11 kg/m <sup>3</sup> ) 13mm Sound Rated Plasterboard	61	51
13mm Sound Rated Plasterboard 90mm Q Block 20mm Cavity 64mm Steel Stud with 75mm Polyester Insulation (14 kg/m <sup>3</sup> ) 13mm Sound Rated Plasterboard	61	51
13mm Fire Rated Plasterboard 90mm Q Block 20mm Cavity 64mm Steel Stud with 75mm Glasswool Insulation (11 kg/m <sup>3</sup> ) 13mm Fire Rated Plasterboard	60	49

The Q Block system tested comprised a single leaf 90mm non-loadbearing Q Block wall. The wall was lined with 13mm standard plasterboard one side and 13mm standard plasterboard on a 64mm steel frame with 75mm glasswool insulation. The details of the construction of the Q Block wall are shown in Appendix A.

### Robustness

Robustness is a general term used to indicate that a wall has sufficient strength and stiffness to be able to resist conditions it is likely to be subjected to in service. Robustness applies in addition to the requirement to design for all the prescribed loads. It is intended to ensure that a wall will not be so slender as to fail under some unintended or accidental loads. AS 3700 requires masonry members and their connections to have an adequate degree of robustness, regardless of the level of load to which they are subjected. Specifically, it requires walls to resist an ultimate uniformly distributed out-of-plane load of 0.5kPa. Refer to Table 5 for the robustness of walls that are supported top and bottom.

### Wind and Earthquake Loads

All non-loadbearing walls must be designed to resist any in-plane and out-of-plane loading due to wind or earthquake. These should be calculated for each wall within each building, but the following generalisations may be made.

- Internal non-loadbearing walls and partitions may (in some circumstances) be subject to internal wind pressures and suctions, depending on the building location, topography, shielding and dominant openings. Refer to AS/NZS 1170.2 or AS 4055 for the appropriate values.
- Internal non-loadbearing walls and partitions are subject to in-plane and out-of-plane earthquake loadings. Both are proportional to the total seismic weight of the wall, including the masonry, render and any attachments. These loads are usually of the order of 10% to 30% of the total weight. i.e. 0.2kN/m<sup>2</sup> to 0.5kN/m<sup>2</sup> (kPa).

### Delivery

After firing, the Q Blocks are strapped into packs for delivery to site. The packs are loaded by forklift onto trucks or crane trucks for delivery. Q Block Powder is packaged in 24kg bags, Q Block Liquid is packaged in 20L pails and ties are packaged in boxes. Q Block Powder, Q Block Liquid and ties are delivered on pallets.

### Unloading

Delivery to site is typically done by truck and unloading is by means of forklift or small boom crane fitted to the truck.

### Storage on Site

The blocks should be stored on site in areas where they will not be immersed in ponded water and clear of possible damage caused by site movement and construction. The block packs should be covered with plastic sheeting. This will prevent wetting and subsequent delays. Bags of Q Block Powder must be stored in dry conditions, preferably inside, off the ground on timber pallets or the like. Similarly Q Block Liquid must be protected in particular from contamination by dust, rain and the like. Shelf-life of Q Block Powder is 6 months and Q Block Liquid is 12 months.

**Table 5 - Permissible Heights and Connections of 90mm Q Block Walls Supported Top and Bottom**

Wall thickness	$t_u$	90 mm
Characteristic flexural tensile strength	$f'_{mt}$	0.7 MPa
Capacity reduction factor	$\Phi$	0.6
Design out-of-plane bending capacity	$w$	0.5 kPa
Vertical span of wall	$H$	3.07 m
Connections at top and bottom	Ramset TrakFast™ FPP Series Gas Pins at 500 mm maximum centres, or TrakMaster™ SC620 Series Gas Pins at 200 mm maximum centres embedded at least 16 mm in 25 MPa concrete	

Refer to Appendix B for calculation of out-of-plane bending capacity.

## Building Steps

### Tools Required

Following tools are required for installation of the Q Block system:

- Dipping tray
- Tray mesh
- Magno-Guide™
- Electric drill mixer (recommended)

### Step 1:

#### Installation of Tracks

Before the Q Blocks are laid, install the base track (Figure 3a), side track (Figure 3b) and one of the head track angles (Figure 3c). It is important that all tracks are installed level and aligned. For fixing details, follow the requirements in the "Fasteners" section. Please refer to Appendix A for details.

Other features such as door frames should now be positioned and installed.

Once the bottom track is installed, a cement based self-levelling compound must be poured into the bottom track (Figure 3d), to ensure the first course is plumb and level. The self-levelling compound must have a minimum compressive strength of 10MPa after 24 hours. The self-levelling compound should be approximately 10mm thick and must cover heads of the fixings. It should be allowed to cure prior to laying Q Blocks.

An alternative method of installation is to use traditional thick bed mortar for the base course with connection ties for side edge and top restraint.



a



b



c



d

Figure 3: Installation of the tracks (a, b & c) and pouring self-levelling compound (d).



## Step 2:

### Mixing Q Block Adhesive

The units of Q Block are laid using Q Block Adhesive, which is a two-part thin bed mortar mix. For the best results use of an electric drill mixer (900W electric drill, Festo or the like) is recommended. Typical adhesive coverage rates of Q Block Adhesive are shown in Table 6.

For a 24kg bag of Q Block Powder, use 2L of Q Block Liquid and 4L of water (For smaller mix quantities, use multiples of 6kg (¼ bag) Q Block Powder + 0.5L Q Block Liquid + 1L water). Follow the steps below for mixing of the adhesive;

1. Mix Q Block Liquid and potable (drinkable) water in a clean bucket (Figure 5a).
2. Slowly add Q Block Powder to the premixed liquid (Figure 5b) while mixing slowly to blend. When all the powder has been added, mix until smooth (mix speed may be increased) without sucking air into mix (Figure 5c). Mixing time is approximately 5 minutes. Do not over mix.
3. Allow mix to stand for 10 minutes to allow the chemicals in the liquid to activate, then re-mix. The adhesive is then ready to use. Transfer adhesive into the dipping tray (Figure 5d) and place tray mesh as shown in Figure 5e.

**CAUTION:** For handling of Q Block Liquid and Q Block Powder, personal protection such as safety glasses with side shields and chemical gloves must be worn. Please refer to the Q Block Liquid and Q Block Powder MSDS for more details.

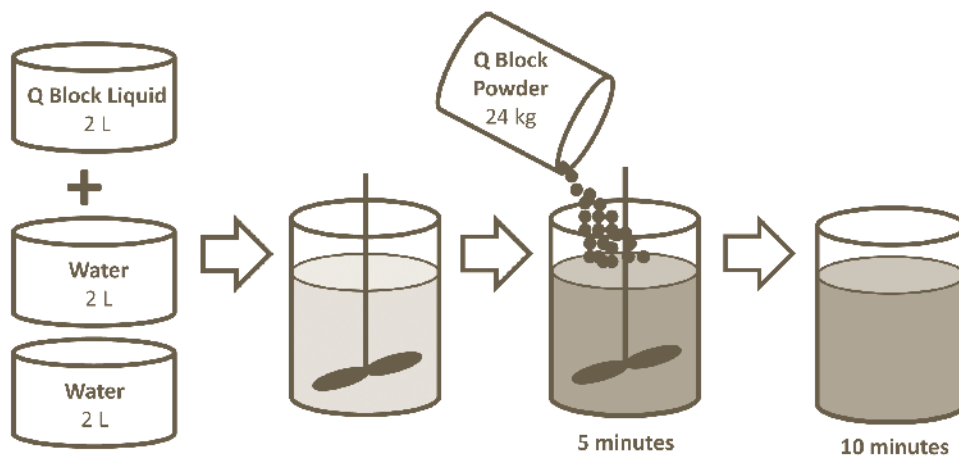


Figure 4: Mixing of Q Block Adhesive

Table 6 - Typical Adhesive Coverage Rates for Q Block Walls		
Number of Q Block and Area covered	Amount of Q Block Powder required	Amount of Q Block Liquid required
1000 blocks (Approx. 53 m <sup>2</sup> )	96 kg (4 x 24kg bags)	8 L
1 m <sup>2</sup> (Approx 19 blocks)	1.8 kg	0.15 L



Figure 5: Mixing of Q Block Adhesive

The pot life of Q Block Adhesive is 2 hours. If the pot life is exceeded, the mix must be discarded and a fresh batch must be made. However, a one-off addition of water up to 500mL per 24kg of powder may be carried out within the pot life. The addition of water must be done slowly, as too much water will make the adhesive too thin to use.



Figure 6: Dipping of Q Block

### Step 3:

#### Laying First Course

Once the self-levelling compound is cured the Q Block can then be laid. Q Block Adhesive must be applied by dipping the blocks in the adhesive (Figure 6) to apply a thin layer over the base of the block (Figure 7). The Q Block should be placed in the bottom track and slid into position (Figure 8) so that the bottom bedding face adheres to the self-levelling compound. No adhesive is required on perpend joints.



Figure 7: Adhesive application



Figure 8: Q Block positioned and slid into place



## Step 4:

### Position Magno-Guide™

Magno-Guide consists of the Magno-Guide stud (Figure 9a) and Magno-Guide horizontal bar (Figure 9b). The Magno-Guide studs attach to the top and bottom tracks and provide a sliding platform for the Magno-Guide horizontal bar. The Magno-Guide studs are placed at appropriate intervals as shown in Figure 9a and the Magno-Guide horizontal bar is then placed on the Magno-Guide studs to provide a backing guide for blocks as shown in Figure 9b and 9c.

### Laying Subsequent Courses

Subsequent courses must also be laid with Q Block Adhesive. The adhesive self-adjusts the mortar thickness to approximately 1mm. Tongue and groove of the blocks must be lined up and blocks must be placed in position by the sliding action using Magno-Guide as a backing.

Blocks should be laid in half bond stretcher pattern, but a quarter bond may also be used. After application of the adhesive, blocks may be re-positioned for up to 3 minutes. Initial setting of the adhesive, forming a solid bed will be reached within 10 minutes. The blocks can be removed up to 2 hours after application of the adhesive using a bolster. Re-application of the adhesive can be done after removing the old adhesive layer.

### Intersecting Walls

Intersecting walls should be toothed into the blockwork every second course. Alternatively, the perpend of the blocks used to construct the perpendicular wall should be coated with the Q Block adhesive and positioned against the side face of the block wall. In addition, flat builders strapping 0.7mm thick and 25mm wide, must be placed every second course.

### Cleaning

Excess or spilt adhesive should be cleaned off immediately while still wet with a wet cloth or stiff brush. Once dry the adhesive can be removed from blocks with a product such as Davco Tile and Grout Cleaner. The adhesive has a pot life of 2 hours at 25°C. It must not be used in exposed situations if it is raining or if rain is imminent. DO NOT use the adhesive if the temperature is below 8°C or above 45°C.

Tools should be washed with water while the adhesive is still wet. DO NOT allow the adhesive to dry on tools, as it will be very difficult to clean off when dry.

Open pallets of blocks must be protected from rain by covering with plastic sheeting.



Figure 9: Magno-Guide

## Step 5:

### Finishing Wall

For inter-tenancy walls, once the blocks have been laid to the underside of the ceiling install a backing rod and fire rated sealer (Figure 10a & b) to manufacturers specifications. The rod should be continuous and shall be joined by overlapping a minimum of 200mm.

Once gap sealer has been applied, install the second head track angle against the face of blocks and fix to the underside of the ceiling (Figure 10c).

For partition walls that have no acoustic or fire resistance requirements, installation of the backing rod and sealer at the top of the wall is not essential, but still recommended. However, the second head track angle must be installed to the face of the blockwork to provide lateral restraint.

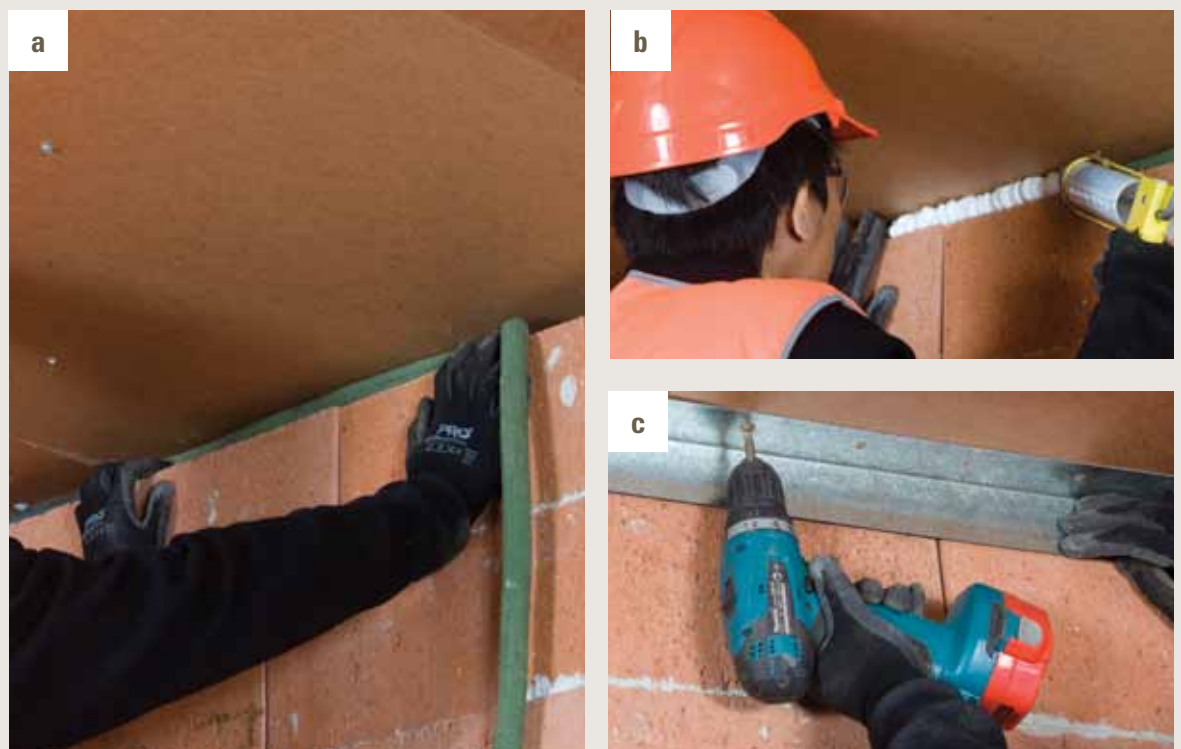
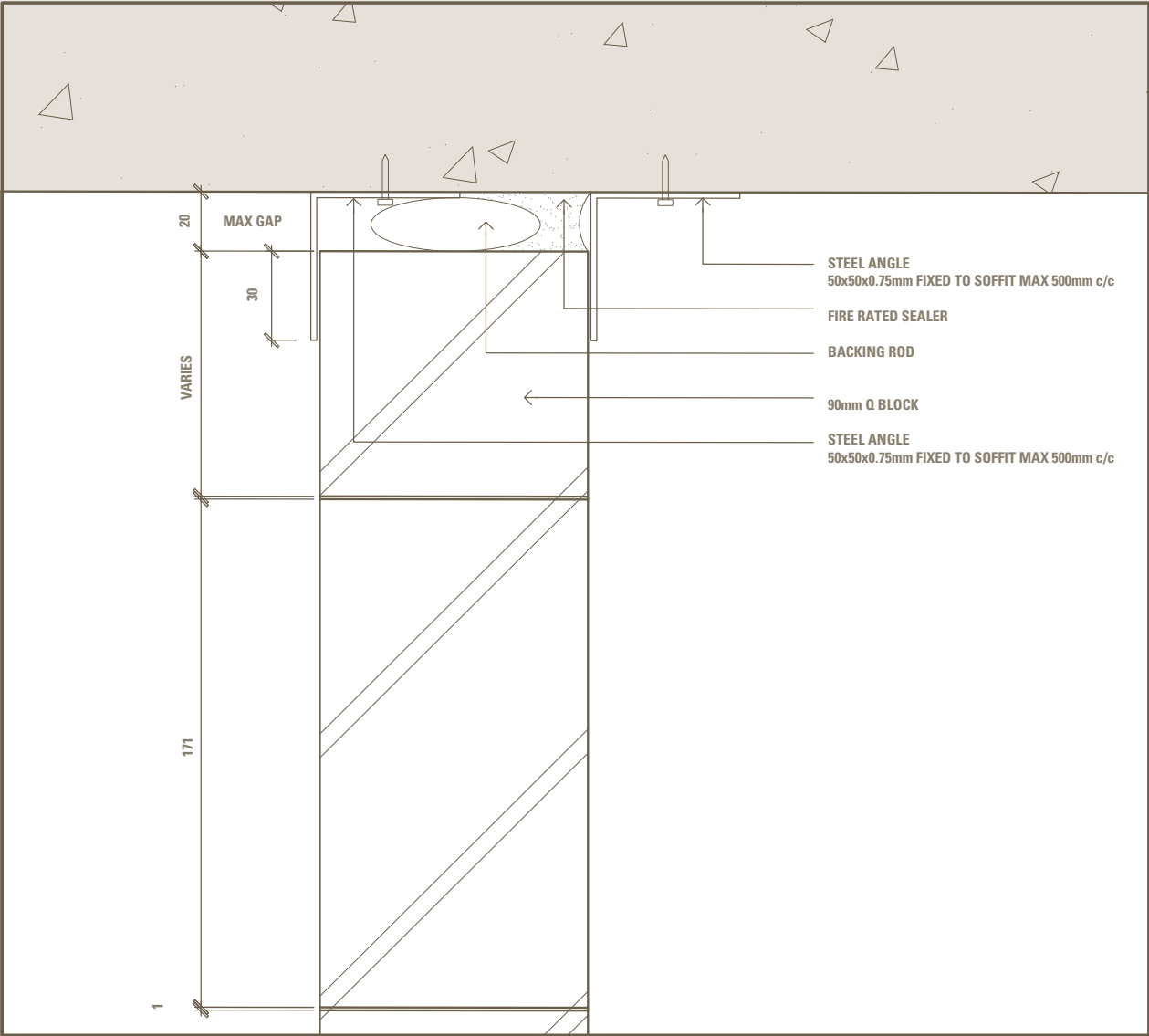


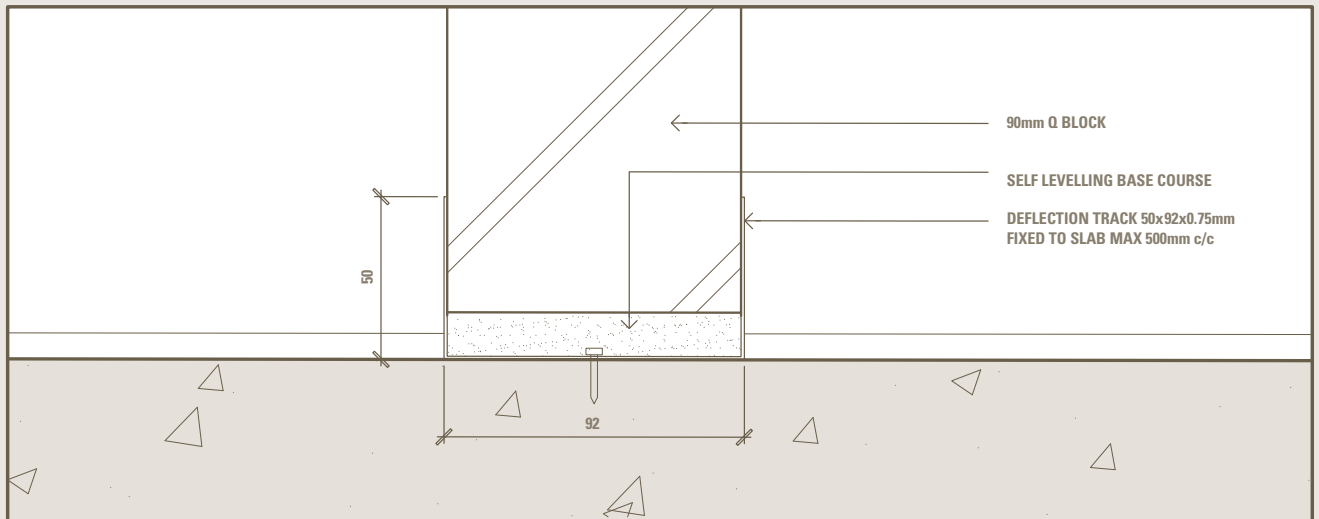
Figure 10: Finishing Wall

Appendix A:

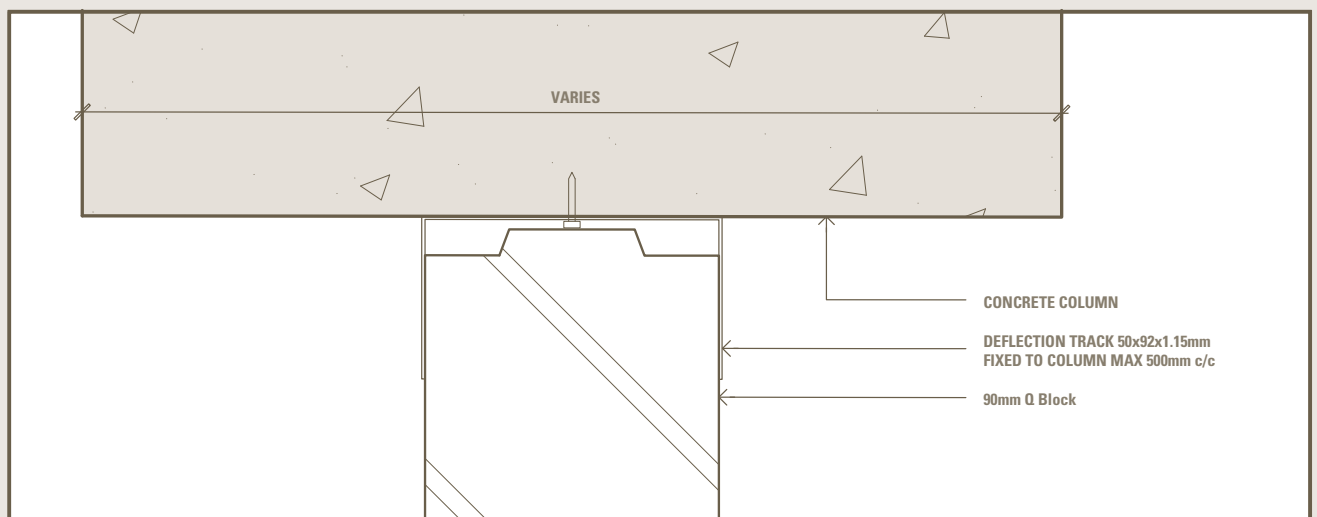


SOFFIT JUNCTION DETAIL





**FLOOR JUNCTION DETAIL**



**COLUMN JUNCTION DETAIL**

## Appendix B: Calculation of Out-of-Plane Bending Capacity

The 90mm Q-Block system achieves characteristic flexural tensile strength ( $f'_{mt}$ ) of 0.7MPa, which for a 3.072m high wall translates to a vertical bending moment capacity  $M_{cv}$  of 0.59kN.m per metre width.

AS 3700-2011 requires a wall to satisfy  $M_{dv} < M_{cv}$  where  $M_{dv}$  is the design vertical bending moment resulting from transient out-of-plane forces acting on the member in vertical spanning action, for vertical bending (when the wall is supported at its bottom and top).

The following table provides the permissible heights and connection requirements of 90mm Q Block walls, when they are supported top and bottom.

Permissible Heights and Connections of 90mm Q Block Walls Supported Top and Bottom		
Wall thickness	$t_u$	90mm
Characteristic flexural tensile strength	$f'_{mt}$	0.7MPa
Capacity reduction factor	$\phi$	0.6
Design out-of-plane face wall load pressure	$w$	0.50kPa
Vertical span of wall	$H$	3.07m
Connections at top and bottom	TrakFast™ FPP Series Gas Pins at 500mm maximum centres, or TrakMaster™ SC620 Series Gas Pins at 200mm maximum centres embedded at least 16 mm in 25MPa concrete.	

If vertical supports are also provided, the out-of-plane strength is increased, although the benefit diminishes as distance from the vertical support increases. Those parts of a 90mm Q Block wall that are more than 1.2m from a vertical support should be designed for top and bottom support only.

### Sample Calculation

#### Height of wall

(Trial height determined by iteration)

$$H' = 3.072 \text{ m}$$

#### Wall thickness

$$t_u = 90 \text{ mm}$$

#### Wall density

$$\begin{aligned} \rho &= 1,237 \text{ kg/m}^3 \\ &= 12.13 \text{ kN/m}^3 \end{aligned}$$

**Vertical stress at mid height due to self weight**

$$f_d = 0.5 H \rho t_u / t_u \times 10^{-3}$$

$$= 0.018 \text{ MPa}$$

**Flexural tensile strength**

$$f'_{mt} = 0.7 \text{ MPa}$$

This is the 95 percentile characteristic value determined by tests with 75% confidence, determined in accordance with AS 3700-2011 Appendix B.

**Capacity reduction factor**

$$\phi = 0.6$$

A capacity reduction factor of 0.6 is consistent with AS 3700-2011 Table 4.1.

**Bending modulus**

$$Z_d = (t_u^2 / 6) \times 10^3$$

$$= (90^2 / 6) \times 10^3$$

$$= 1,350,000 \text{ mm}^3/\text{m}$$

**Vertical bending moment capacity**

$$M_{cv} = (\phi f'_{mt} + f_d) Z_d$$

$$= ([0.6 \times 0.7] + 0.018) \times 1,350,000 \times 10^{-6}$$

$$= 0.59 \text{ kN.m/m}$$

**Bending moment factor**

$$k = 0.125$$

A value of 0.125 is appropriate for one-way bending between top and bottom supports.

**Design out-of-plane face wall load pressure**

$$w = 0.50 \text{ kPa}$$

The wall should be checked for all possible loads, including wind, earthquake, fire and robustness. In this example, a value of 0.5 kPa has been chosen, corresponding to the robustness requirements of AS 3700-2011 Clause 4.6.2.

**Vertical span of wall**

$$H = (M_{cv} / [w \cdot k])^{0.5}$$

$$= (0.59 / [0.50 \times 0.125])^{0.5}$$

$$= 3,072 \text{ mm}$$



## Appendix C: Calculation of Connectors Spacing

### Top and Bottom Connection

Factored out-of-plane connection load

$$\begin{aligned}V_c &= 0.5 H \cdot w \\&= 0.5 \times 3.07 \times 0.5 \\&= 0.77 \text{ kN/m}\end{aligned}$$

### Connector type

TrakFast™ FPP Series Gas Pins embedded at least 16 mm in 25 MPa concrete

### Factored shear capacity of each connector

$$\phi V_{sc} = 0.42 \text{ kN/pin}$$

The Working Load Limit (WLL) recommended in Ramset Technical Data Sheet TDS01061 (dated 11/5/12) is 0.42 kN/pin in shear. This corresponds approximately to a capacity reduction factor,  $\phi$ , of approximately 0.33 applied to the ultimate characteristic strength.

### Spacing of connectors

$$S = 500 \text{ mm}$$

### Factored shear capacity per metre length of wall

$$\begin{aligned}V_c / m &= \phi V_u / S \\&= 0.42 / (500 \times 10^{-3}) \\&= 0.84 \text{ kN/m}\end{aligned}$$

> 0.77 kN/m therefore satisfies shear capacity requirement



## Associated Companies Brickworks Group of Companies



### **Austral Masonry**

The acquisition of a number of concrete masonry manufacturers, most notably GB Masonry in Queensland, complemented established manufacturing Victorian facilities and led to the formation of Austral Masonry.

Through natural growth and acquisition Austral Masonry has become a significant player in the market for grey block building materials in Queensland and provides further diversification of earnings for the group.



### **Austral Precast**

Austral Precast is Australia's premier supplier of high quality, innovative and customisable precast concrete product solutions, to meet the needs of an evolving building and construction industry.

Operating from five plants located across Australia using state of the art technology, production techniques and systems, Austral Precast produces a diversified range of customised wall, floor, column, and client specific precast solutions.



#### **Bristile Roofing**

Bristile Roofing was established in 1929 when Sir Lance Brisbane opened his first terracotta products factory in Perth. The division is now one of Australia's largest manufacturers and expert installers of quality terracotta, and concrete roof tiles.



#### **Auswest Timbers**

Auswest Timbers manufactures a diverse range of timber products including heavy structural timbers, roof tile battens through to floor boards and decking. The company has manufacturing plants in Western Australia, Victoria and the A.C.T.





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