

# CELCRETE BLOCK BUILDING SYSTEM

## General Description

A solid load bearing wall construction system comprising 100mm – 300mm thick autoclaved aerated concrete blocks reinforced at intervals by vertical steel rods anchored into the foundations of the building (see figs 1&3). It is suitable for both the external and internal walls of both single and two storeyed residential or light commercial buildings when finished with a **CELCRETE** recommended **external plaster system**. The external surfaces are coated with a reinforced plaster system, while the interior surfaces may be directly lined with plasterboard or plastered. The system is also suitable for internal bracing walls (see figs 4&5).

The system is fully compatible with the **CELCRETE Panel Building System** and may be used in conjunction with the panel system to achieve construction economies or special design features where appropriate.

The solid AAC blocks are available in the following dimensions:

Thickness <u>mm</u>	Length <u>mm</u>	Heights <u>mm</u>
100	600	200/300
125	600	200/300
150	600	200/300
200	600	200/300
250	600	200
300	600	200

The blocks are solid AAC, typically 600mm long and 200 - 300mm high, and are laid and mortared in stretcher bond to form required walls. There is one 32mm hole in each **CELCRETE BLOCK** to accommodate a 12mm threaded reinforcing rod which is anchored into the foundation beam (see figs 1 & 2).

## Material Properties

**CELCRETE BLOCKS** have the following material properties:

<b>Dry Density:</b>	500 kg/m <sup>3</sup>
<b>Compressive strength, f'c:</b>	4.0 MPa
<b>Modulus of Elasticity, E:</b>	1500 MPa

<b>Water absorption (by volume):</b>	up to 24 – 35%
<b>Thermal Conductivity:</b>	0.1397 W/(mK)
<b>Thermal Resistivity, R:</b> (200mm wall, lined and plastered)	1.6 m <sup>2</sup> K/W
<b>Sound Transmission Class</b> (200 mm wall)	43
<b>Fire Resistance:</b> (overseas testing)	4 hours

## Performance

**CELCRETE BLOCK WALLS** constructed in accordance with the details and instructions following will meet the relevant sections of the New Zealand Building Code (NZBC) including

- B1 – Structure
- B2 – Durability
- E2 – External Moisture
- F2 – Hazardous Building Materials
- H1 – Energy Efficiency

### **Structure:**

The block walls are specifically designed to withstand earthquake and wind loadings in terms of NZS 4203:1992.

### **Durability:**

When constructed in accordance with this technical information as an exterior block wall system, **CELCRETE BLOCK BUILDING SYSTEM** will meet the requirements of NZBC Clause B2.3.1. NZBC requires a minimum life of 50 years for structural walls. The life of **CELCRETE BLOCKS** will greatly exceed this time frame.

### **External Moisture:**

Provided that the integrity of the external plaster system is maintained, the requirements of clause E2.3.3 relating to water penetration are met by the system.

**Maintenance:** To ensure the integrity of the external plaster system is maintained, regular cleaning and inspections of the jointing and coating

systems must be carried out and routine maintenance performed as and when required. Any damage to the plaster system must be promptly repaired.

### **Hazardous Building Materials:**

**CELCRETE BLOCKS** are non-hazardous in terms of F2 providing the safety precautions included in this literature are adhered to.

### **Mass:**

The dry mass of 200mm thick **CELCRETE BLOCKS** without the coating system is 100 kg/m<sup>2</sup>.

### **Thermal resistivity:**

The thermal resistivity of the 200mm **CELCRETE BLOCK BUILDING SYSTEM** exceeds the requirements of NZS 4218:1996 for solid walls in Climate Zones 1 & 2 by 275%.

**CELCRETE BLOCK BUILDING SYSTEMS 125mm, 150mm and 200mm** exceed the requirements of NZS 4218:1996 for solid walls in Climate Zone 3 by up to 70%.

### **Fire Resistance:**

The fire resistance of 4 hours is more than is required for any domestic or normal commercial exterior wall rating. **CELCRETE BLOCKS** are 'non-combustible' and have an ignitability index of zero when considering the acceptable properties of external walls in terms of NZBC C3 Clause 4.9.2.

### **Sound Absorption and Insulation:**

The aerated structure of **CELCRETE BLOCKS** provides superior sound absorption properties to that provided by concrete and higher sound insulation efficiency than concrete blocks or clay bricks.

## **Design Considerations**

### **General:**

The information contained in this manual is intended for product specifiers, designers and installers of the **CELCRETE BLOCK BUILDING SYSTEM** as exterior walls and/or internal bracing walls and partitions.

This section specifies some areas that should be considered when designing a building to be

constructed of **CELCRETE**, to gain full advantage of the economies and other benefits available from using the material.

**CELCRETE BLOCKS** are laid in variable stretcher bond the thickness of the block e.g. 150mm stretcher bond for 150mm thick block. While they can be readily cut to any size, enhanced product efficiency can be achieved where wall lengths and window and door openings are set out in 300mm modules, with allowance being made for corner details (see **figs 1&3**).

### **Footings:**

**CELCRETE BLOCK BUILDING SYSTEM exterior walls** can be seated directly on the edge of a standard floor slab with a perimeter footing, or can be seated in a rebate at the slab edge. (see **fig 5**) Footing reinforcing is required to be located 125mm below the top of the floor slab or rebate to provide clearance for the wall rods.

Internal non-load bearing bracing walls can be located directly on the floor slab. Reinforcing and fixing details are indicated in the following details (see **figs 4&5**).

### **Specific Design:**

**CELCRETE BLOCK BUILDING SYSTEM exterior walls** are reinforced with 12mm threaded reinforcing rods placed through 32mm holes at 600mm centres. The reinforcing rods are drilled and grouted into the floor slab. A nut and 50mm washer is then post tensioned by one and a half turns into the pre-primed, kiln dried top plate – specified by **CELCRETE INTERNATIONAL** (see **figs 3&4**).

**CELCRETE BLOCK BUILDING SYSTEM** requires specific engineering design.

The specific design process establishes the bracing requirement of each wall panel within the building for the specific loads imposed on it.

The engineering design of the **CELCRETE BLOCK BUILDING SYSTEM** is based on the known structural properties of the various components. These parameters are established from the material properties of AAC, reinforcing steel and from the testing programmes undertaken to idealise their performance.

This data is used by our Design Engineers to provide calculations based on accepted engineering principles and the design loadings specific to the project.

The design loads used shall be confirmed with the Territorial Authority for the specific site- conditions prior to making a Building Consent application.

## **Thermal Insulation:**

To meet the requirements of NZBC H1 the overall building insulation is required to be considered including that of the floor and the ceilings.

This is covered as part of the specific design of the proposed building.

## **Control Joints:**

Generally, vertical control joints are located every 6 - 8 metres away from corners, in line with window and door openings. These joints require 8mm gaps between blocks which are injected with expandable foam and sealed with anti-fracture waterproofing membrane. (see fig 1a).

## **Openings:**

**CELCRETE** reinforced AAC lintels are used above window and door openings and are available in a range of dimensions to suit each situation. Windows and doors should be set out in 300mm modules and allow for corners and a minimum of 200mm must be allowed at each end of the lintel for bearing (see fig 1). For openings greater than 2400mm see fig 5a or alternatively a specially designed (Wilco) lintel can be used.

## **Two storeyed construction:**

**CELCRETE BLOCK BUILDING SYSTEM** can be used for two storeyed constructions when specifically designed (see fig 7).

## **Services:**

A groove is chased into the completed wall with a chasing tool. The depth of the chases must not exceed 1/3<sup>rd</sup> the thickness of the wall on the vertical and 1/5<sup>th</sup> on the horizontal.

## **Components** (Supplied by Celcrete International)

### **Reinforcing:**

- Threaded rods
- Couplers
- Hex full nuts
- Galvanised heavy round washers
- Expandable Grout – Rockite

## **Mortar Glue:**

**CELCRETE** Mortar Glue is supplied by **CELCRETE INTERNATIONAL** for use in the jointing and stopping of **CELCRETE BLOCKS**. This mortar is mixed on site and applied with the

aid of a spreader trowel that is available from **CELCRETE INTERNATIONAL**.

## **Flashing**

Celcrete PVC bead flashing

## **Control Joint Materials:**

Expandable foam and anti-fracture waterproof membrane supplied by **CELCRETE INTERNATIONAL** for use in control joints of **CELCRETE BLOCKS**.

Bowmac strip braces are used to support block walls at control joint points (see fig 2).

## **Installation**

### **General:**

**CELCRETE BLOCK BUILDING SYSTEM** should be constructed or supervised by experienced builders to ensure quality of workmanship.

### **Handling & storage:**

**CELCRETE BLOCKS** should be stored on site on the pallets provided and kept dry until required. Care is required in handling the product and edges and corners must be protected from damage.

### **Safety precautions:**

AAC dust contains crystalline silica in common with the dust from other concrete products including fibre cement products.

This dust is irritating to the eyes, skin and respiratory system and inhalation may cause irreversible damage to health.

Avoid breathing the dust and contact with eyes and skin. Wear suitable protective clothing and gloves.

When cutting, grinding or drilling blocks do so in the open air or in well ventilated spaces and wear approved safety glasses and dust mask.

All aspects of cutting, grinding or drilling must comply with the latest regulations of the Occupational Safety & Health (OSH) division of the Labour Department.

### **Tools:**

Tools that will be required to install **CELCRETE BLOCKS** include:

- § Power drill
- § Carbide tipped handsaw
- § Safety glasses
- § Mortar mixer & bucket
- § Spreader trowel to suit block thickness
- § Stopping blade & sanding float
- § Dust mask

- § Rubber mallet
- § Chasing Tool

### Construction Method:

1. Lay out dimensions of the building on the floor slab for both external and internal walls.
2. Lay damp proof course (dpc) slip joint material or three coats of bituminous paint beneath the alignment of the blocks. The width of the dpc material should be the same as the block width so it is visible from both sides of the wall. The damp proof material acts as a bond breaker to take up differential movements between the floor slab and the block work.
3. Set out for reinforcing rods (see figs 1&3). Rods must be set out at 600mm intervals, however where rods in panels of block work don't fall within the 600mm rule, an extra rod must be inserted and blocks drilled on site. Alternatively, a vertical groove can be chased into the completed block work, 1/3<sup>rd</sup> the thickness of the wall, and the rod inserted and grouted in.
4. Drill 16mm holes at required depth (see fig 7).
5. Clean out holes with compressed air or brush so that the holes are clean and clear of any dust particles, then pour in expandable grout and insert the threaded rods. Generally, rods are 1000mm long and are joined with a coupling at mid wall height.
6. Lay thick bed mortar for first course and place blocks over rods (see fig 1). It is essential that this first course is laid absolutely level, straight and plumb.
7. Subsequent courses are laid with thin bed mortar glue which is applied to the horizontal and vertical joints with a notched spreader trowel. The joints should be approximately 1 – 2mm thick and bedded in with a rubber mallet. Blocks are laid in a variable stretcher bond: 150mm for 150mm block, 200mm for 200mm block etc.
8. Blocks are laid to the top of window height. Precast lintels are drilled on site to suit the threaded reinforcing rods, 100mm for 200mm thick block and 75mm for 150mm block in from the edge of the windows (see figs 1&3). The lintel is placed over the rods and bedded

in with **CELCRETE** mortar glue before the final course of blocks is laid.

9. When wall section has been completed, a dpc is laid on the top course of blocks and a pre-primed kiln dried top plate, specified by **CELCRETE**, is fitted over the protruding

reinforcing rods. The top plate is fixed by applying nuts and washers to the threaded rods which are tensioned down by one and a half turns into the pre-primed kiln dried top plate (see figs 3&4).

10. Internal walls are tied in to external walls with the use of Bowmac strips that are located between every second block of the internal wall (see fig 4). Alternatively, internal walls can be constructed at the same time as external walls using an interlocking system (see fig 5).

### Openings:

All window and door openings are rebated with a glue-on **CELCRETE** strip. Rebates are primed and windows set into a bed of urethane. A PVC bead flashing is adhered to the face of the aluminium joinery and plastered in. Sills can be either cut at 20 degrees or a plant-on sill can be glued on to the face of the blocks (see fig 9).

### Internal linings

#### General:

Standard **GIB Plasterboard** can be fixed directly to the inside faces of the **CELCRETE BLOCKS** using standard **GIB** fixing and finishing procedures. Alternatively the interior walls can be directly plastered with a **CELCRETE INTERNATIONAL** recommended interior plaster system.

### External Plaster System

#### General:

**Rendertek Plaster** is the only approved plaster system to be applied over **CELCRETE**. It is a specially formulated mineral plaster system with a fibreglass mesh reinforcement trowelled into the first coat.

Mineral plasters are vapour permeable, allowing the walls to "breathe" by allowing the free movement of water vapour through the wall to maintain the internal equilibrium of the building.

**Preparation:**

Full and thorough preparation of the **CELCRETE BLOCKS** must be carried out prior to the application of the recommended **External Plaster**.

All joints and fixings holes must be filled with Mortar Glue to a smooth surface. Any damage to blocks must be repaired with Mortar Glue, flush finished and sanded.

All required flashings and sealants around window and door openings must be in place.

All control joints must be filled with an approved expandable foam and sealed with an anti-fracture waterproofing membrane strictly in accordance with the manufacturer's instructions.

All dust and loose particles removed from the prepared surfaces.

**Application:**

The **External Plaster** system should only be applied by an applicator approved by **CELCRETE INTERNATIONAL**.

Before commencing application the applicator must ensure that all required preparation has been carried out and that the **CELCRETE BLOCKS** are ready for the application.

Apply base coat of plaster with the reinforcing mesh trowelled in. Apply the second coat to bring the plaster to a flat and level finish.

Allow the plaster to dry before applying a further finishing coat of plaster if a decorative finish is required.

After application of the plaster, a protective coating of breathable paint is required to provide colour and water protection.

**Maintenance:**

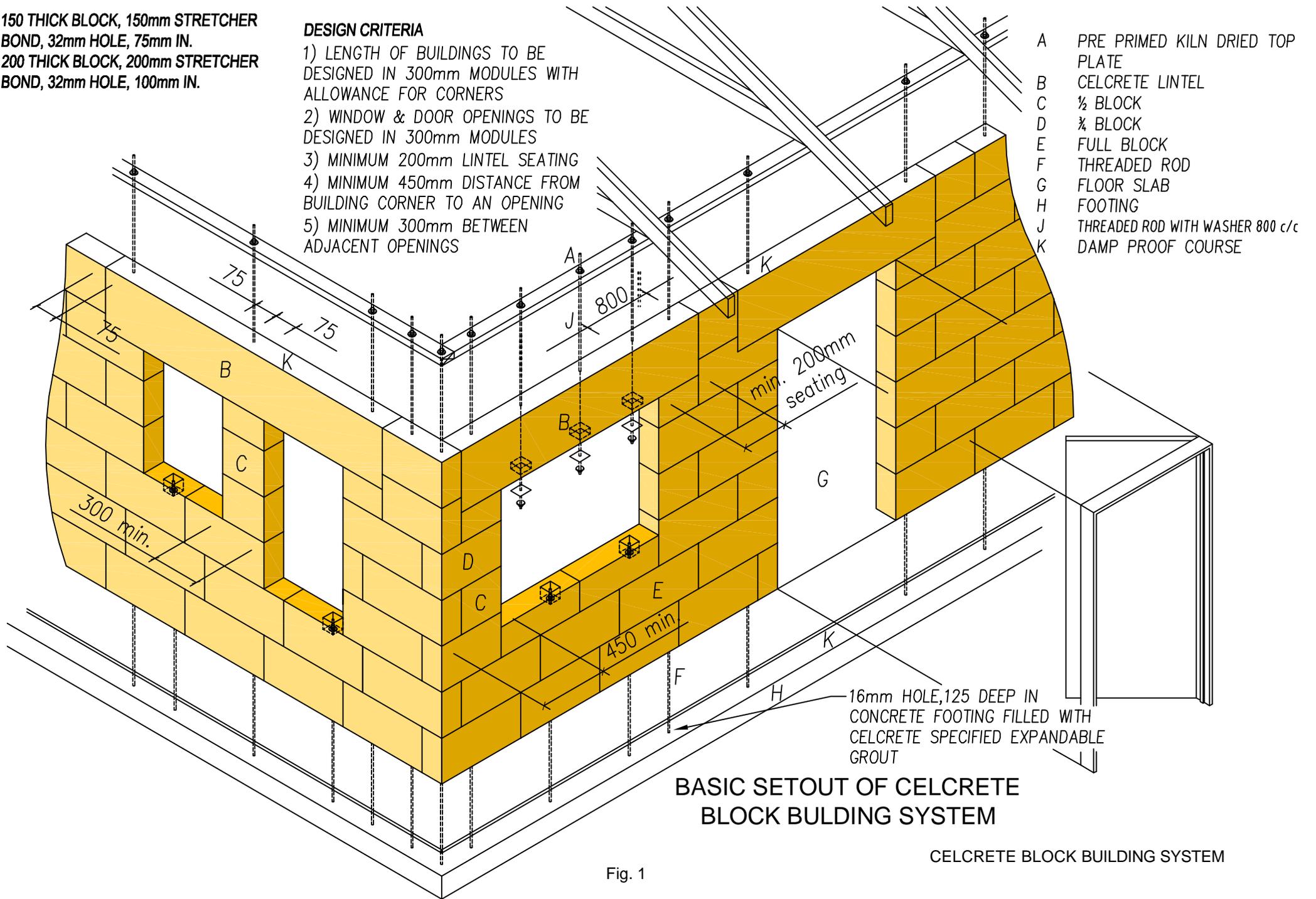
The coating system must be maintained in accordance with a schedule supplied by **CELCRETE INTERNATIONAL** and any damage repaired as soon as is practicable.

**For additional technical information and advice on construction methods please phone; 0508 CELCRETE (0508 235 2 7383) or your local distributor.**

150 THICK BLOCK, 150mm STRETCHER  
 BOND, 32mm HOLE, 75mm IN.  
 200 THICK BLOCK, 200mm STRETCHER  
 BOND, 32mm HOLE, 100mm IN.

**DESIGN CRITERIA**

- 1) LENGTH OF BUILDINGS TO BE DESIGNED IN 300mm MODULES WITH ALLOWANCE FOR CORNERS
- 2) WINDOW & DOOR OPENINGS TO BE DESIGNED IN 300mm MODULES
- 3) MINIMUM 200mm LINTEL SEATING
- 4) MINIMUM 450mm DISTANCE FROM BUILDING CORNER TO AN OPENING
- 5) MINIMUM 300mm BETWEEN ADJACENT OPENINGS



- A PRE PRIMED KILN DRIED TOP PLATE
- B CELCRETE LINTEL
- C ½ BLOCK
- D ¼ BLOCK
- E FULL BLOCK
- F THREADED ROD
- G FLOOR SLAB
- H FOOTING
- J THREADED ROD WITH WASHER 800 c/c
- K DAMP PROOF COURSE

**BASIC SETOUT OF CELCRETE  
 BLOCK BUILDING SYSTEM**

CELCRETE BLOCK BUILDING SYSTEM

Fig. 1

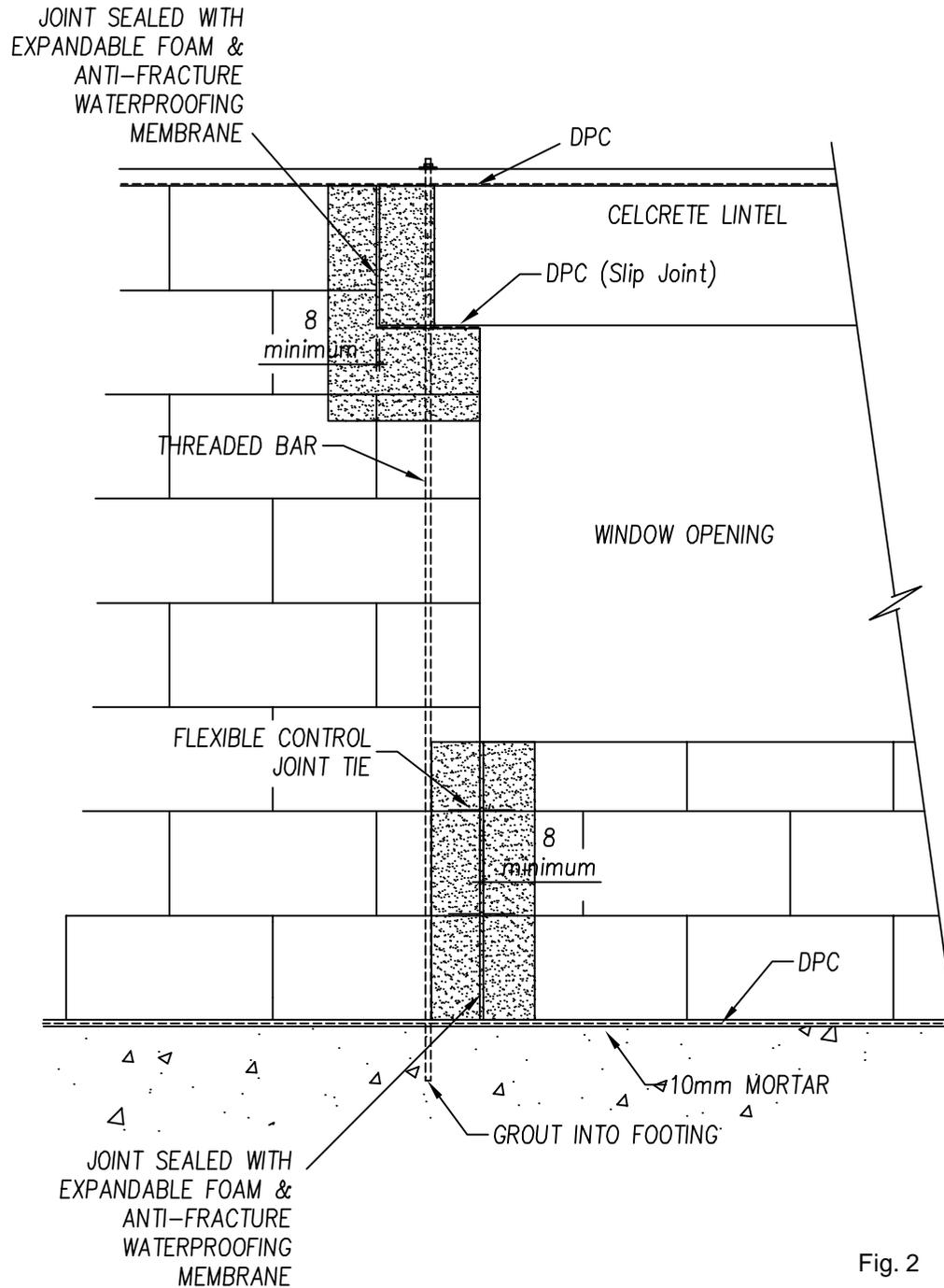
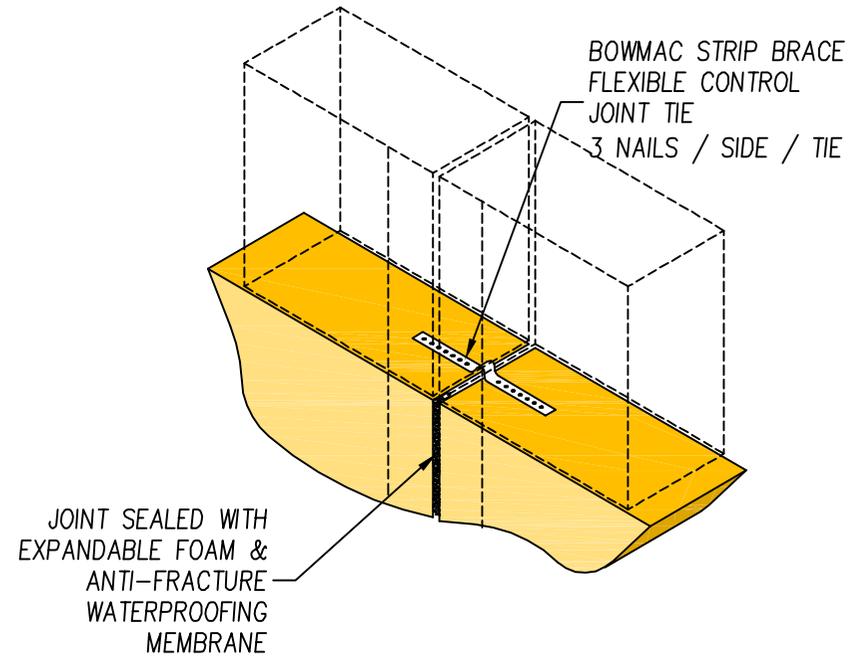


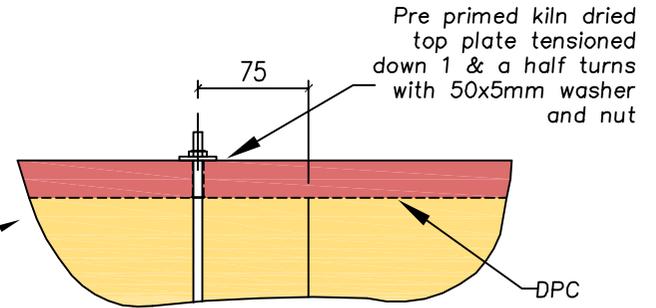
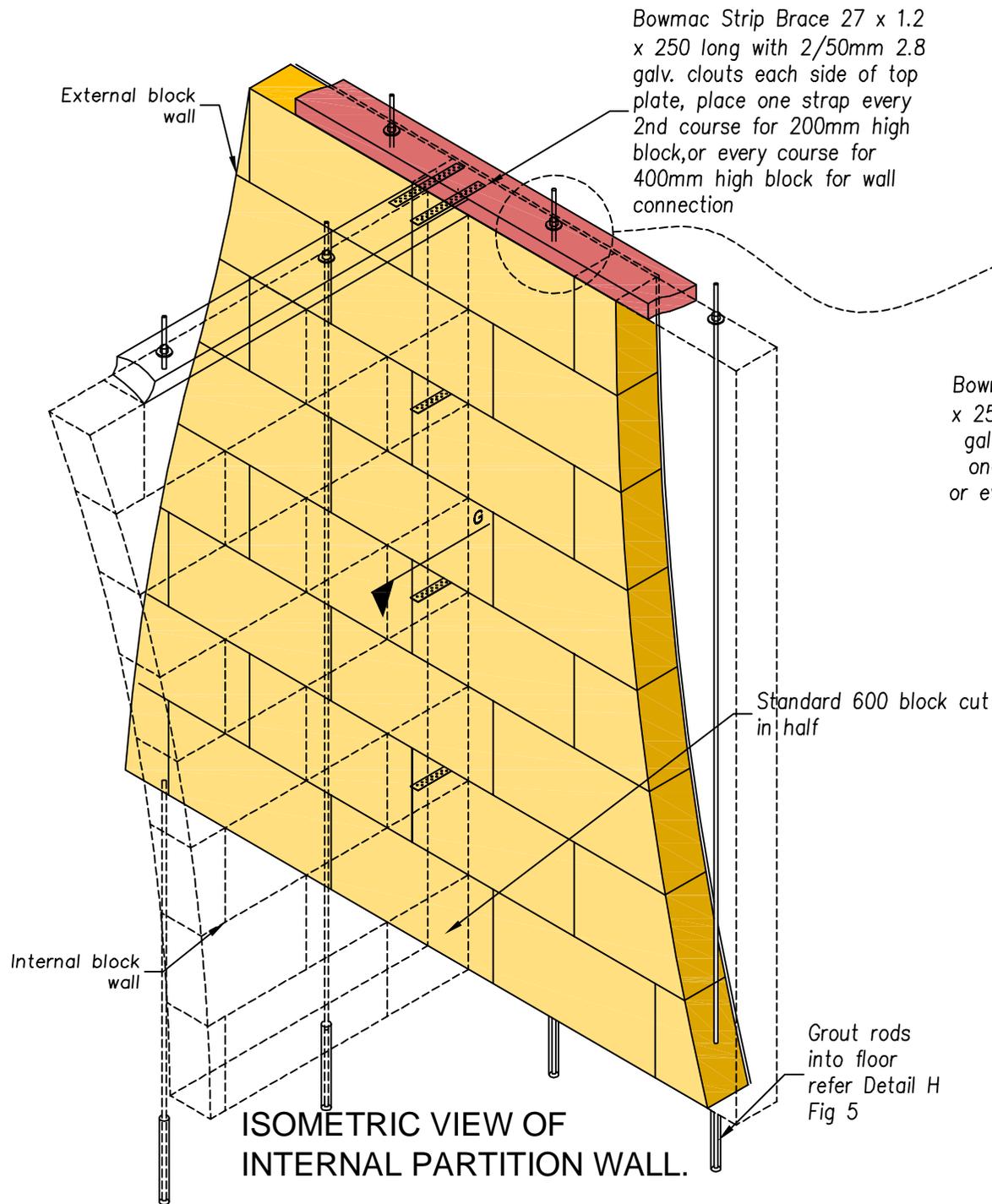
Fig. 2



**EXPANSION JOINT DETAIL**

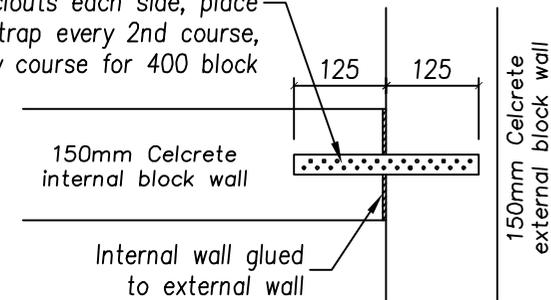
- NOTE:
1. Ties to be installed at each course for 400mm block & every second course for 200mm block.
  2. Control joints are recommended at a maximum spacing of 6-8 metre spacings.



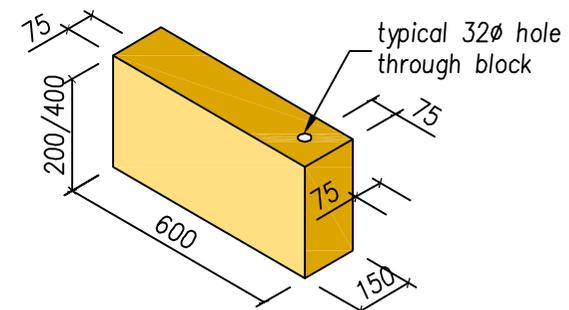


**TOP PLATE DETAIL**

Bowmac Strip Brace 27 x 1.2 x 250 long with 2/50mm 2.8 galv. clouts each side, place one strap every 2nd course, or every course for 400 block



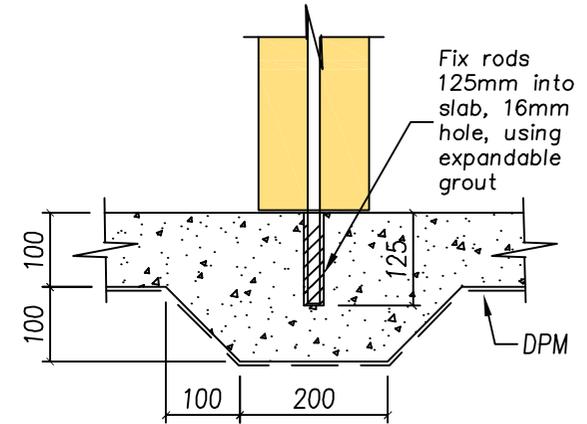
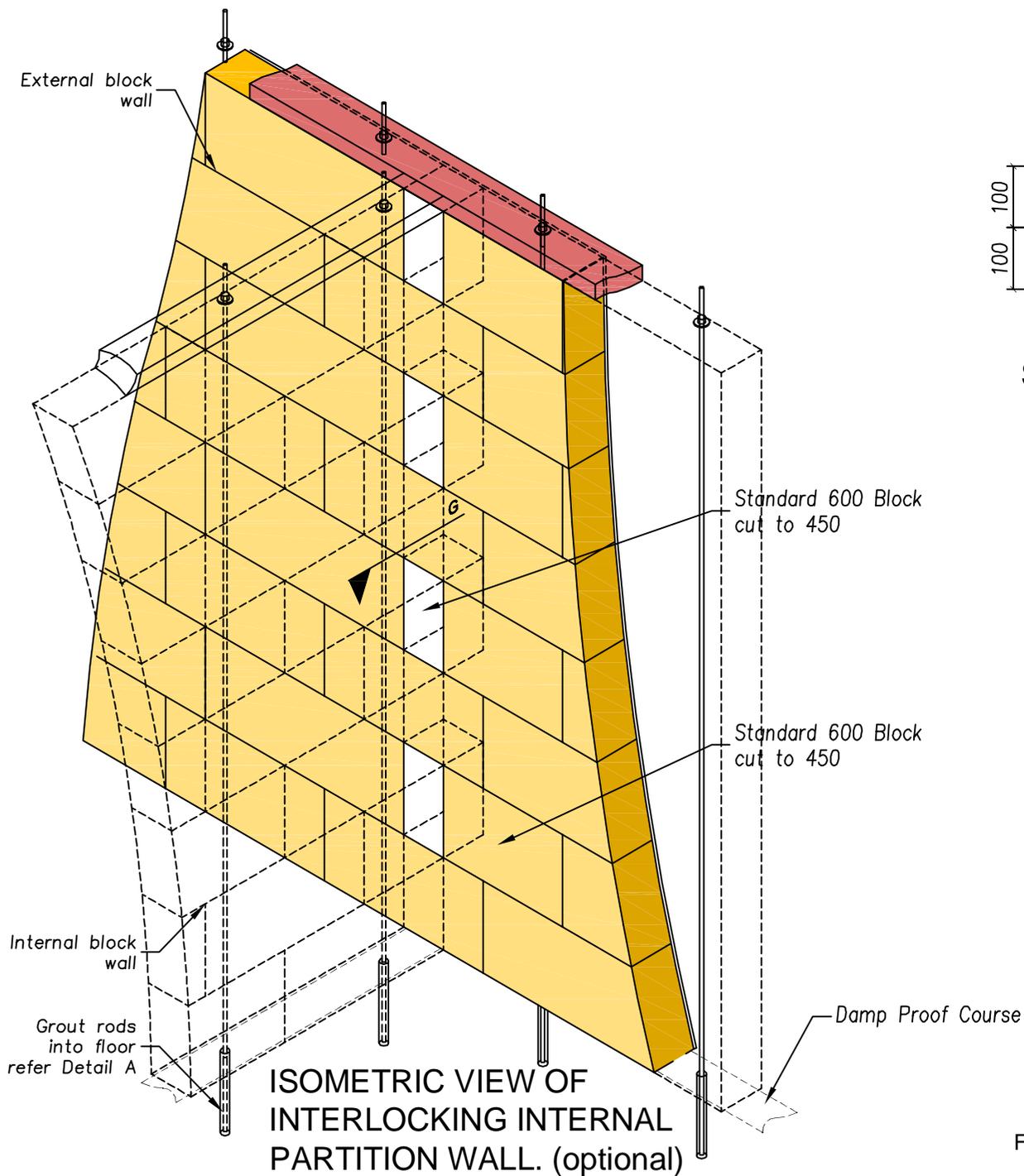
**SECTION G**



**TYPICAL 600 BLOCK**

Fig. 4

CELCRETE BLOCK BUILDING SYSTEM

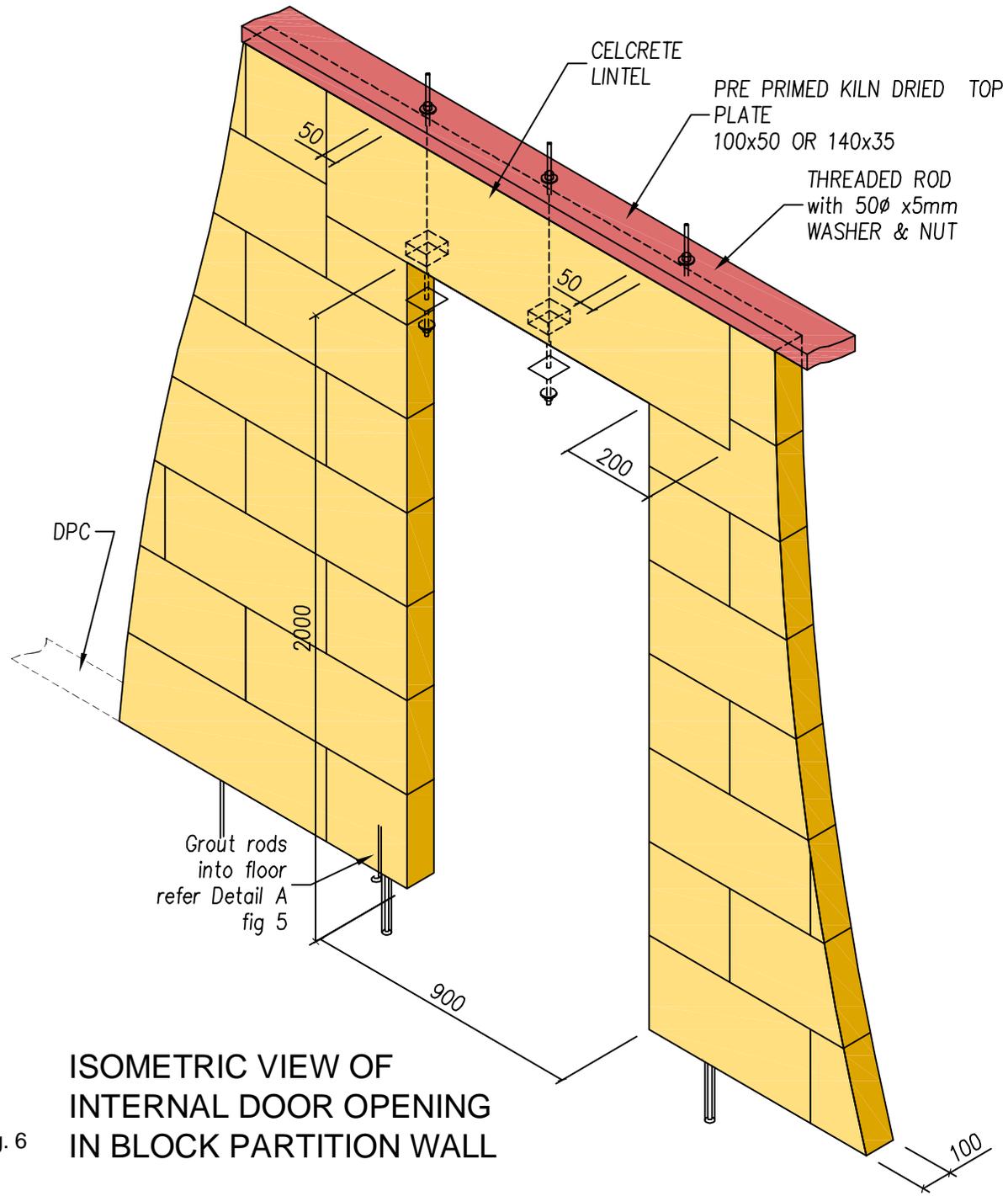


SLAB THICKENING UNDER INTERNAL WALLS

A Detail  
- 1:10

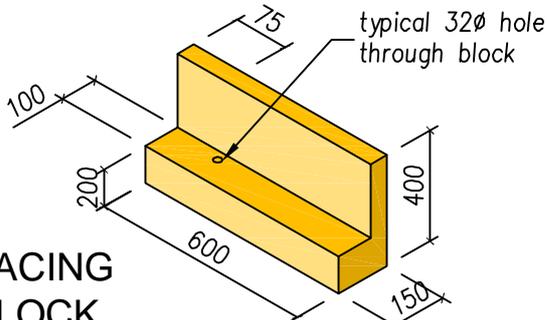
CELCRETE BLOCK BUILDING SYSTEM

Fig. 5



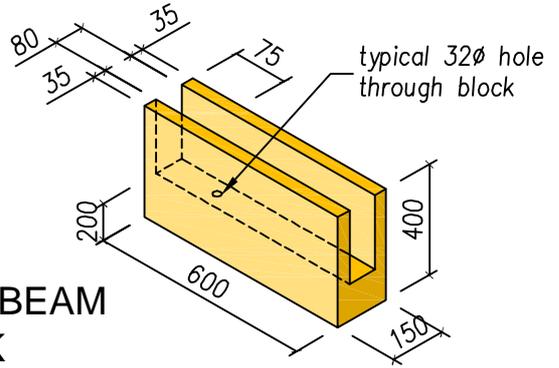
ISOMETRIC VIEW OF INTERNAL DOOR OPENING IN BLOCK PARTITION WALL

Fig. 6



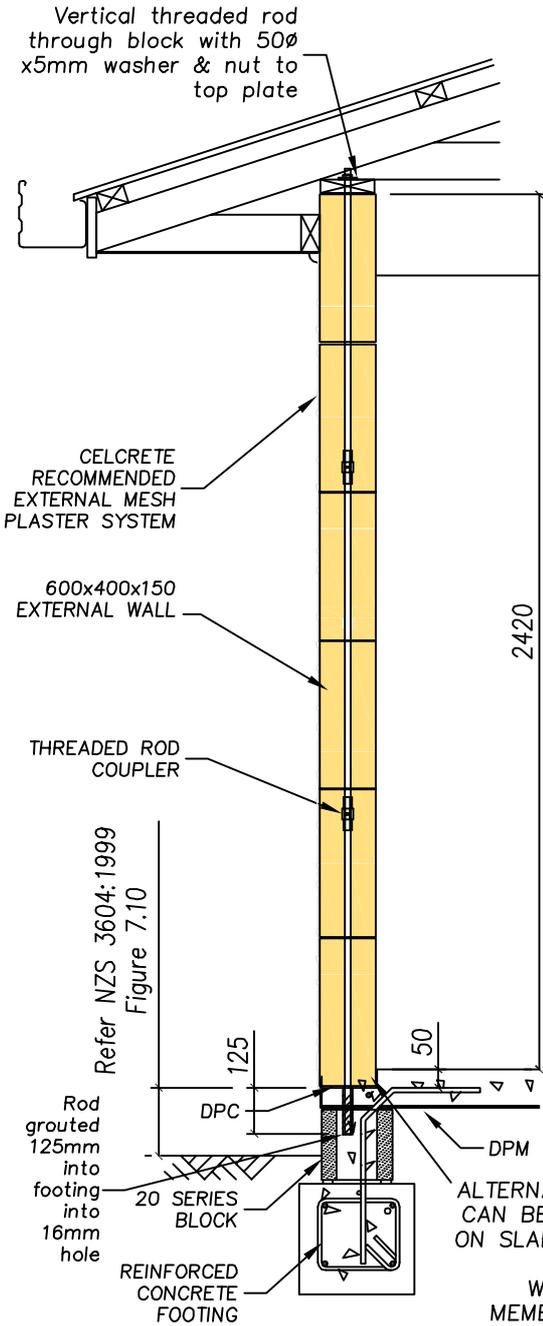
**FACING BLOCK**

(to be cut onsite from full blocks)



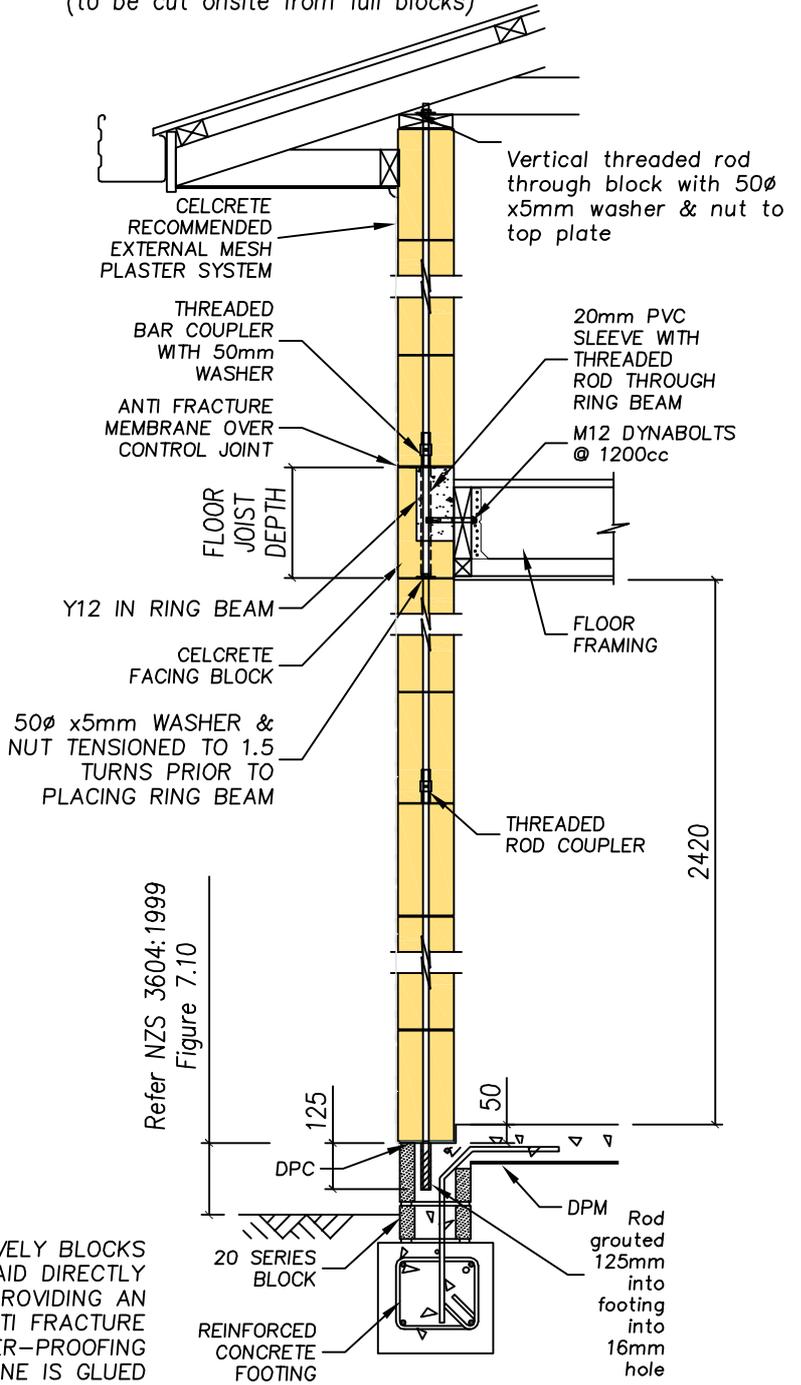
**BOND BEAM BLOCK**

(to be cut onsite from full blocks)



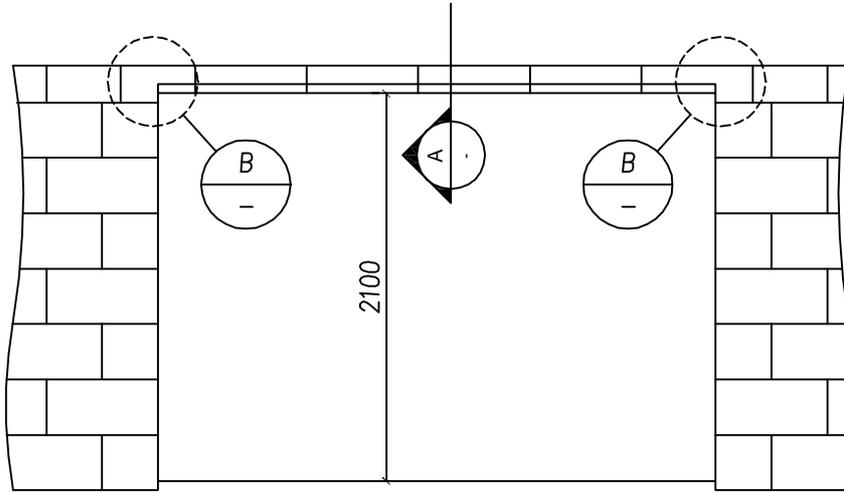
**SINGLE STOREY**

Fig. 7

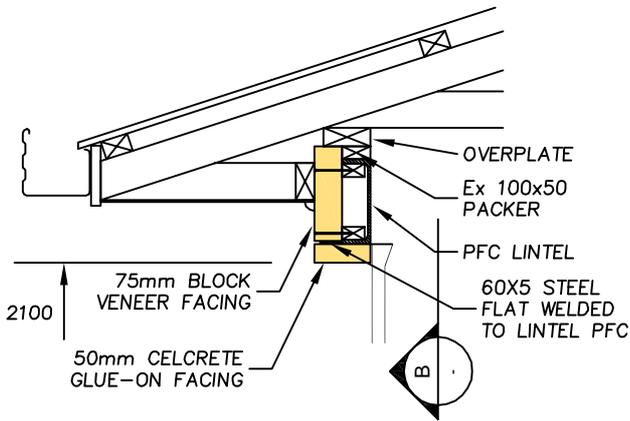


**TWO STOREY**

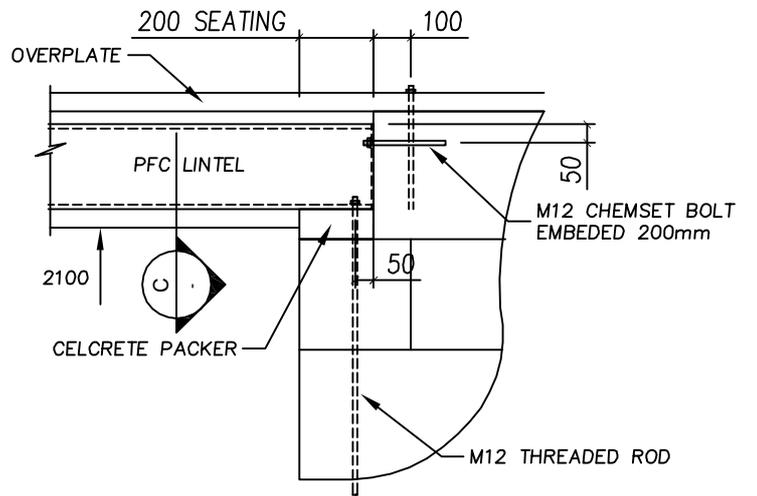
CELCRETE BLOCK BUILDING SYSTEM



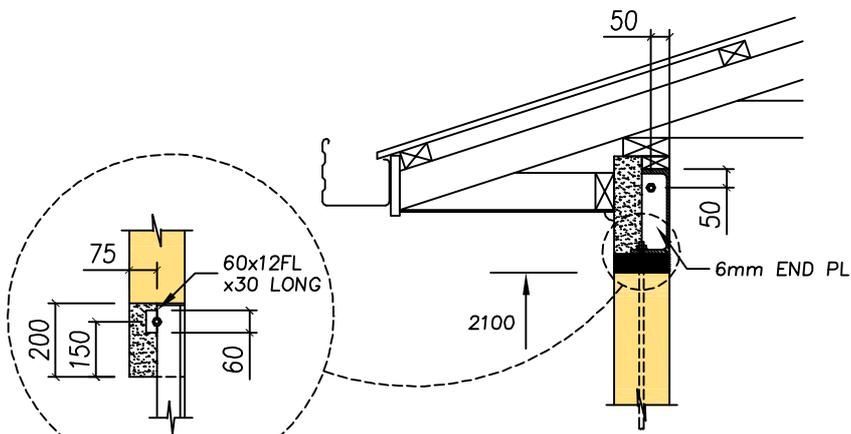
**GARAGE DOOR  
LINTEL ELEVATION**



**A LINTEL SECTION**  
1:20

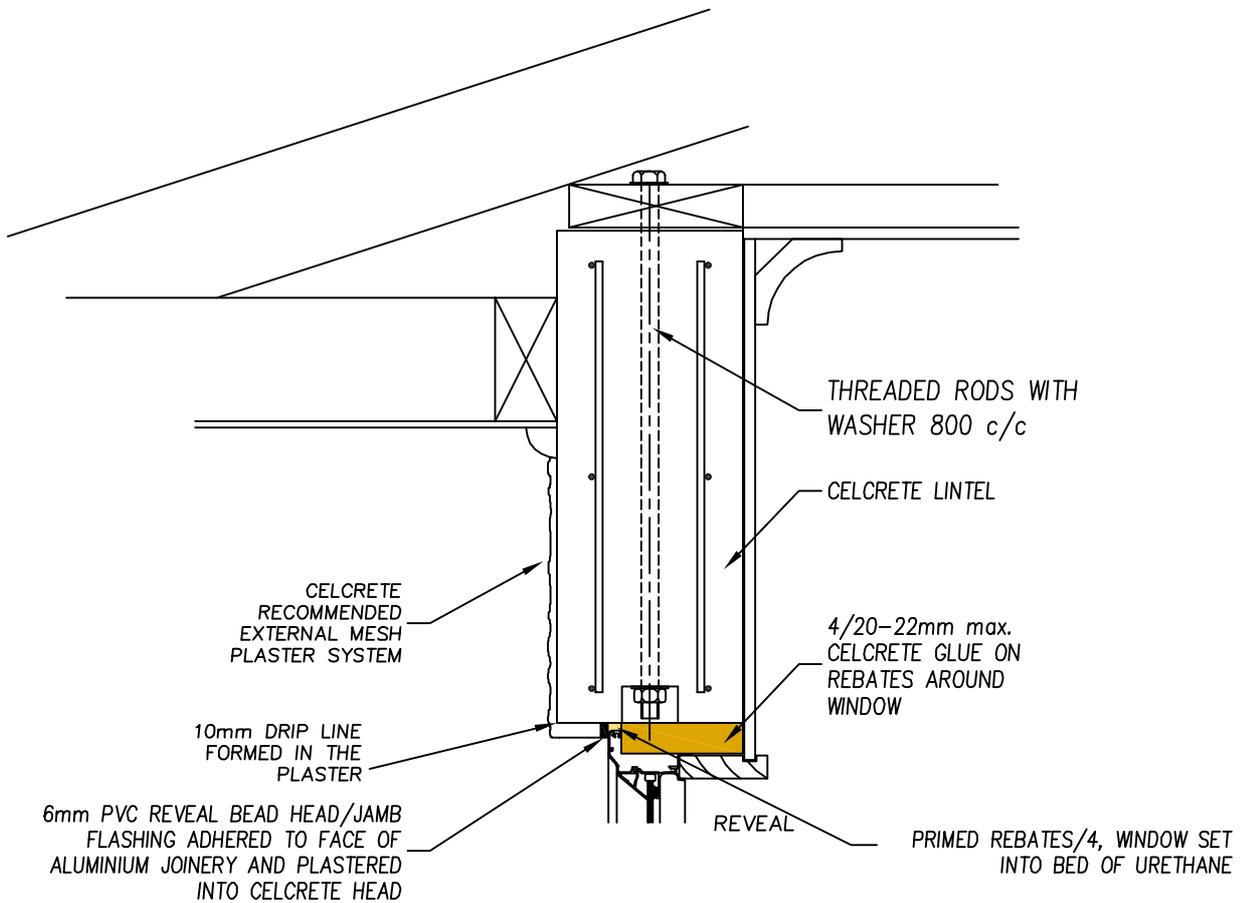


**B LINTEL SEATING**  
1:20

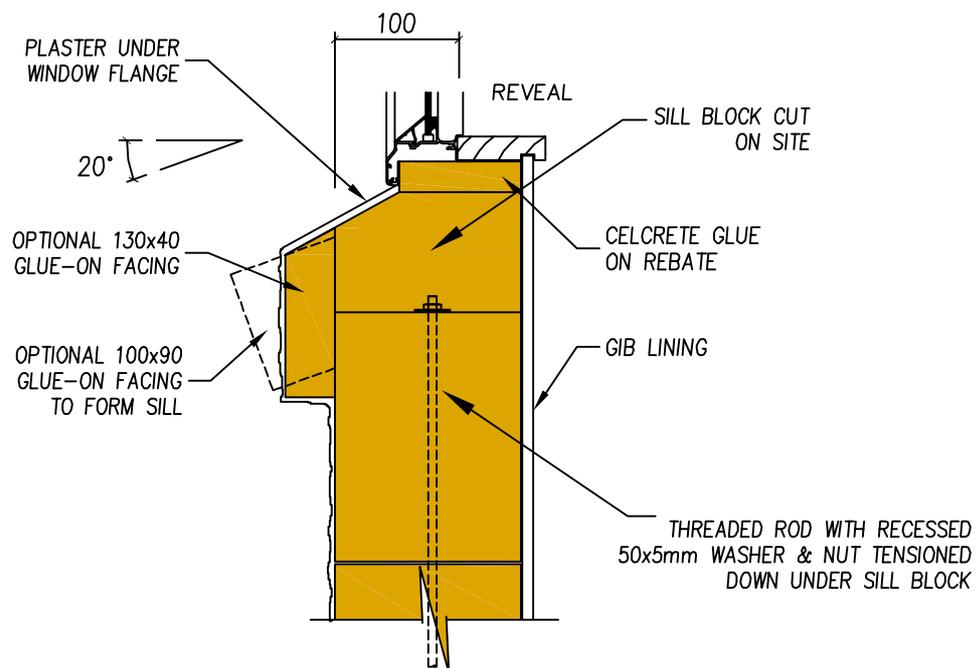


**C LINTEL END PLATE FIXING**  
1:20

Fig. 8

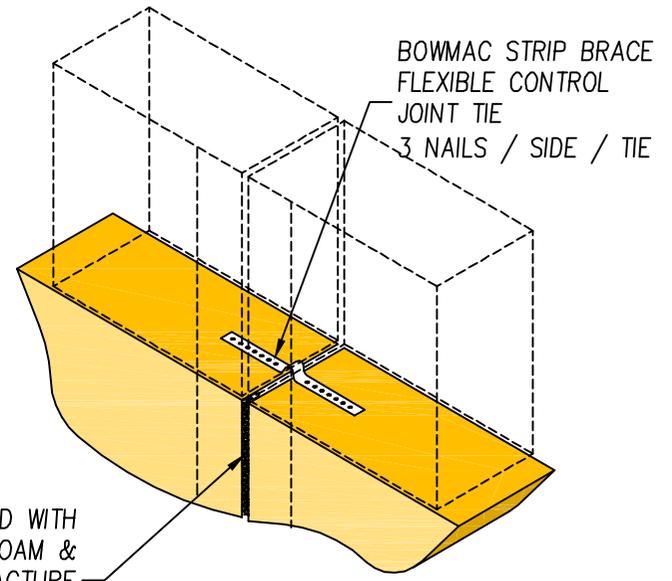
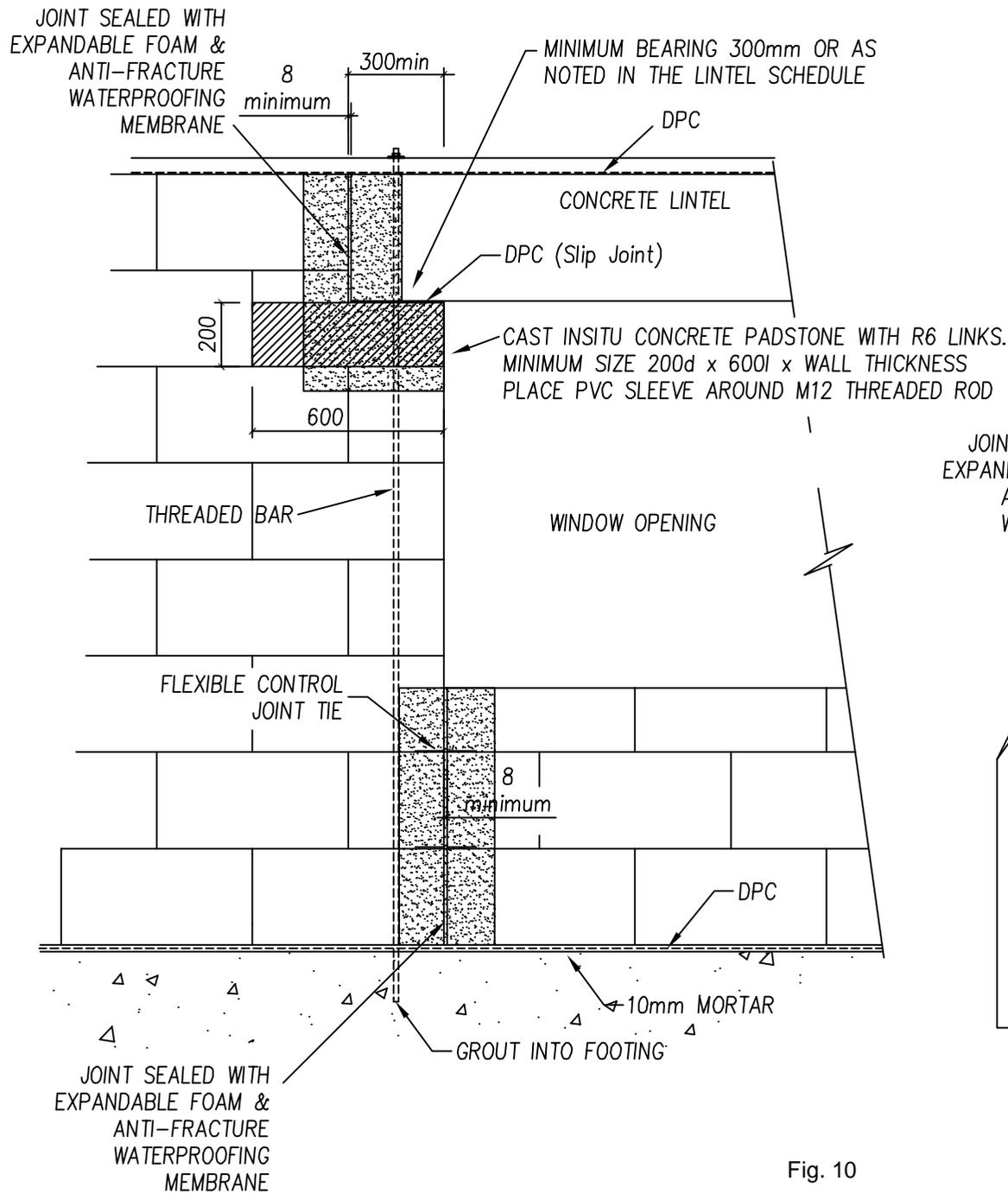


### CELCRETE WINDOW HEAD DETAIL



### CELCRETE WINDOW SILL DETAIL

Fig. 9



### EXPANSION JOINT DETAIL

- NOTE:
1. Ties to be installed at each course for 400mm block & every second course for 200mm block.
  2. Control joints are recommended at a maximum spacing of 6-8 metre spacings.
  3. For lintels over 3.6m or where noted in the lintel schedule the lintel is to be supported on a concrete padstone as shown top-left.

Fig. 10

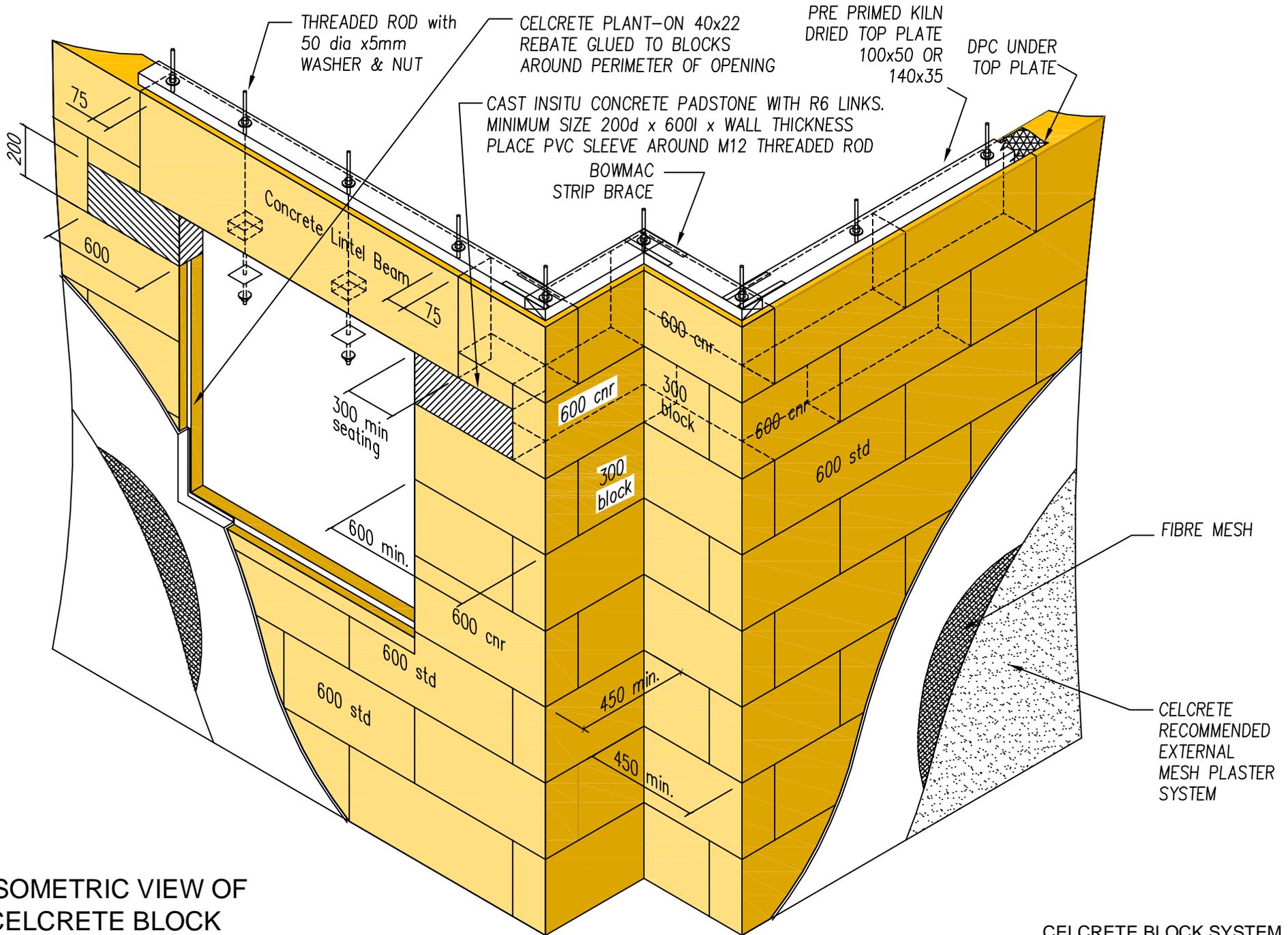


Fig. 11

CELCRETE BLOCK SYSTEM